



# MODERN PEDIATRIC DENTISTRY

### *Salient Features*

- A career-oriented text
- Presents the text with appropriate explanations and functional examples
- Reflects all the aspects of pediatric dentistry including recent advances
- Emphasizes clarity of concepts and importance of mastering the fundamentals
- Useful for undergraduate and postgraduate students as well as faculty of Pedodontics and Preventive Dentistry.

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Has completed his degree course from esteemed King George Medical College (CSM Medical University, Lucknow, UP, India) in 2002. He was elected for the post of Vice President of Junior Doctor Association (JDA) in 2000 at CSM Medical University and worked for the welfare of medical students. Currently, he is a Professor and Head, Department of Pedodontics and Preventive Dentistry, Saraswati Dental College, Lucknow, UP, India.

He is much inspired by the poor oral health of children. He has an enthusiastic approach to relieve them from oral diseases and dental pain through the excellent knowledge and information incorporated in this book. He has various national and international research papers and publications to his credit.

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**Vinay Kumar Srivastava**



Foreword Anil Kohli

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# Contents

<b>1. Scope and Importance of Pediatric Dentistry .....</b>	<b>1</b>
Definition	1
Brief History of Pedodontics in India	1
Scope of Pedodontics	1
Vastness of Pedodontics	2
Procedures and Pictures	2
Importance of Pedodontics	3
Challenges for Pediatric Dentistry in 21st Century	3
<b>2. Infection Control in Pediatric Dental Clinic .....</b>	<b>4</b>
Introduction	4
Infection Control: Precaution and History	4
Sterilization of Endodontic Instrument	4
Autoclave	4
Sterilization of Gutta-percha	5
Sterilization of Silver Cone	5
Sterilization of Glass Slab or Dappen Dishes	5
Sterilization by Formalin Gas Chamber	5
Laser Beam Sterilization	6
Infection Control to the Dental Staff	6
Infection Control to the Patient	6
Infection Control in Diabetic Dental Patient	6
Disinfection of Operatory Surface and Dental Appliances	6
Careful Handling of Biopsy Specimen	7
Infections Control Through Hospital Waste Disposal	8
Classification of Waste	8
Collection of Waste	9
Waste Disposal	9
Microwaves Sterilization	9
Incineration	9
Facility Option	12
Single in House Facility	12
Joint Facilities Serving Several Hospitals	12
Delegating the Task to an Independent Collection Service	12
Waste Treatment	12
Combustion Chamber (Low Temperature Carbonization)	12
Reheating Chamber	13
Heat Exchangers	13
Advantages of Incineration	13
Waste Minimization Options	13
Source Reduction	13
Recycling and Reclamation	14
Conclusion	14
<b>3. Set-up of Pediatric Dental Clinic.....</b>	<b>15</b>
Introduction	15
How to Communicate with the Child in Dental Operatory	18
Record Keeping	18
Health Education Room	18
Modification of Clinic for Disabled Child	19
Dental Office Access	19
<b>4. Child Examination, Diagnosis and Treatment Planning.....</b>	<b>20</b>
Aim and Objective of Childs	
Orofacial Examination	20
Introduction to the Pediatric Dentistry	20
Risk Assessment and Orofacial Examination	20
Prevention	20
Steps of the Examination	20
Interview and Counseling	22
The Child's Position During Dental Treatment	22
Case History	22
Vital Statistics	23
Parental of Caretaker History	23

Prenatal and Natal History	23
Postnatal and Infancy History	23
Clinical Examination of Child	25
General Survey of Child	25
Child-language Development	26
Motor Aphasia	26
Delayed Speech	26
Repetitive Speech or Stuttering	26
Articulatory Speech	26
Hands	27
Temperature of Body	27
Examination of Head and Neck	27
Oral Mucosa	30
Examination of Tongue and Sublingual Space	31
Examination of Palate	31
Pharynx and Tonsil's Examination	31
Examination of Dentition	31
Uniform Dental Recording	32
Other Diagnostic Aids	33
Indication for Radiograph in Children and Adolescence	33
Pulp Vitality Test	33
Electric Pulp Testing	33
Thermal Testing	34
Laser Doppler Flowmetry	34
Pulse Oximetry in Evaluation of Pulp Vitality	34
Fiberoptic Transillumination Test for Teeth	34
Study Casts	34
Laboratory Investigation	35
Photographs	35
Advance Diagnostic Aids	35
Diagnosis	37
Collection of Important Information	37
Evaluation of Patient Record	37
Making the Diagnosis	37
Treatment Planning	37
Revisions of a Treatment Plan	38
Position of Dental Team and Patient Around the Dental Chair	38
Lighting of the Operative Field	39
<b>5. Dental Radiology for Child and Adolescent</b>	<b>40</b>
Definition	40
Radiographic Techniques in Dentistry	41
Intraoral Radiography	41
Paralleling Technique	41
Bisecting Angle Technique	41
Bitewing Technique	42
Occlusal Radiographic Technique	42
Periapical Radiographic Technique	43
Panoramic Radiography	43
Buccal Object Rule	44
Skull Projection	44
TMJ Projection	46
Hazards of Radiation	46
Effect on Cells	46
Precautions	46
<b>6. Normal Child Development</b>	<b>49</b>
Introduction	49
Clinical Significance of Developmental Theories	49
Practical Implication of Temperamental Development	51
<b>7. Behavior Management of Children</b>	<b>55</b>
Childhood Development	55
Tell, Show, do Technique (TSD Technique)	60
Conclusion	63
<b>8. Nutritional Considerations for Children and Adolescents</b>	<b>64</b>
Introduction	64
Dietetics	64
Classification of Foods	64
Proteins	65
Functions of Proteins in the Body	65
Sources of Proteins	65
Fats	65
Fatty Acids	65
Source	65

Functions	65	Talon Cusp	74
Carbohydrate	66	Problems Associated with Talon Cusp	74
Dietary Fiber	66	Treatment	74
Functions of fiber	66	Dilaceration	74
Advantage	66	Treatment	74
Disadvantage	66	Anomalies of Tooth Number	74
Nutritional Requirements	66	Development of Supernumerary Tooth	74
Basic Concepts	66	Treatment	75
Recommended Daily Allowance (RDA)	66	Anodontia	75
Balanced Diet	66	Treatment	75
<b>9. Eruption of Teeth, its Disturbances and their Management..... 69</b>		Anomalies of Tooth Structure	75
Teething Process	69	Enamel Hypoplasia	75
Signs and Symptoms of Teething	69	Etiology of Hypoplasia of Enamel	75
Local Signs	69	In Primary Teeth	76
Systemic Signs	69	In Permanent Teeth	76
Teething and Associated Problems	69	Problem Associated with Hypoplasia and Hypomineralization of Enamel	76
Management of Teething	69	Treatment	76
Local Treatment	69	For Permanent Hypoplastic and Hypomineralized Incisors	77
Systemic Medicament	70	For Hypoplastic Canine and Premolars	77
Eruption Cyst	70	Dentinogenesis Imperfecta	77
Treatment	70	Treatment	77
Submerged Tooth (Infraocclusion)	70	Staining of Teeth	77
Mechanism of Submergence	70	Intrinsic Staining	
Treatment	70	(Mottled Enamel or Tetracycline Staining)	78
Diagnosis of Ectopic Eruption	71	Management of Staining	78
Treatment	71	Technique: Etching and Abrading (Crool and Cavanaugh, 1986)	78
Methods	71	Technique: Etching and Bleaching (Boksman and Jordan, 1983)	78
Kesling or Self Locking Separating Spring	71	Technique: Etching, Bleaching and Abrading, (Chandra and Chawla, 1975)	78
Delayed Eruption of Permanent Teeth	72	A Newer Concept: Removal of Dental Fluorosis Strains	78
Incisors	72	<b>10. Development of Dentition ..... 80</b>	
Canines	72	Prenatal Effect on Facial Development	80
Premolars	72	Embryonic Development	80
Molar	72	Late Fetal Development	80
Impaction and Delayed Eruption of Maxillary Permanent Canines	72	Gum Pad	81
Treatment	72	Eruption of the Primary Teeth	81
Anomalies of Tooth Form	73	Eruption of Permanent Teeth	82
Management of Double Teeth	73	Space Relationship in Replacement of the Deciduous Incisors	83
Peg Shaped Lateral Incisors	73		
Treatment	73		
Tooth within a Tooth (Dens in Dente)	73		
Management of Dens in Dente	73		

- Space Relationships in Replacement of  
Deciduous Canine and Molars 83
- Non Spaced Primary Dentition 84

### 11. Growth and Development of Nasomaxillary Complex and Mandible ..... 85

- Theories of Growth Control 85
- Growth of Maxilla 85
- Rotation of Maxilla 86
- Mandible 86
- Timing of Growth in Width,  
Length and Height 87
- Jaws Rotation During Growth 87
- Mandibular Rotation 88

### 12. Use of Preventive and Interceptive Orthodontics in Pediatric Dentistry .... 89

- Concepts of Preventive Orthodontics 89
- Use of Preventive Orthodontics 89
- Growth and Development 89
- Etiology 90
- Case History, Examinations and Records 90
- Oral Examination 90
- Study Model 91
- Photograph 91
- Radiograph 91
- Classification 91
- Methods of Crossbite Correction 92
- Clinical Preventive Procedure 93
- Summary 94

### 13. Space Maintainers ..... 95

- Introduction 95
- Definition 95
- Class I 95
- Class II 95
- An Ideal Requirement of Space Maintainer 96
- Removable Space Maintainer 96
- Indications 96
- Contraindications of Removable  
Space Maintainer 96
- Technique and Fabrication 96
- Complete Denture 97
- Removable Distal Shoe Space Maintainer 97

- Fixed Space Maintainer 97
- Advantage of Fixed Space Maintainer 97
- Disadvantage of Fixed Space Maintainer 97
- Crown and Loop Space Maintainer 97
- Indications 98
- Technique and Fabrication 98
- Band and Loop Space Maintainer 98
- Lingual Holding Arch Space Maintainers 99
- Indications 99
- Technique and Fabrication 99
- Nance Holding Arch (Maxillary) 99
- Fabrication 100
- Placement 100
- Distal Shoe Space Maintainer (Fixed Type) 100
- Indications and Contraindication 100
- Technique and Fabrication 100
- Placement 101
- Band and Bar Type Space Maintainer 101
- Esthetic Anterior Space Maintainer 101
- Gerber Space Maintainer 101
- Mayne Space Maintainer 101
- Advantage 102
- Disadvantage 102

### 14. Pediatric Oral Habits ..... 103

- Digit Sucking 103
- Etiology 103
- Psychoanalytic Theory 103
- Behavioral Theory 104
- Clinical Feature of Digit Sucking 104
- Corrective Appliances 104
- Mouth Breathing 104
- Clinical Feature 105
- Treatment 105
- Tongue Thrust Habit 105
- Classification of Tongue Thrust 105
- Treatment 106
- Appliance Therapy 106
- Management of Tongue Thrust 106
- Finger Nails Biting Habit 107
- Treatment 107
- Clinical Feature (Dentoalveolar) 107
- Treatment 107

Etiology	107	Disadvantages	124
Clinical Features	108	Advantages	125
Treatment	108	Disadvantages	125
<b>15. Gingival Health Considerations in Children and Adolescents ..... 109</b>		Oral Hygiene Aids in Children with Disabilities	126
Normal Periodontium	109	Flossing Procedure	128
Effect of Growth and Development on Periodontium	109	Dentifrices (see Chapter Dentifrices)	128
Treatment	111	<b>19. Prenatal Oral Health and Oral Health in Pregnancy ..... 129</b>	
Advantages of Electrosurgery	112	Introduction	129
Disadvantages	112	Physiological Changes in the Body of Pregnant Women	129
Advantages of Laser Surgery	112	Psychological Changes in Pregnancy	129
Disadvantages of Laser Surgery	113	Maternal Diet and Nutrition	129
Periodontitis and Loss of Tooth in Young Children	112	Prenatal Fluoride	129
Prepubertal Periodontitis	113	Breastfeeding and Oral Health of Child	130
Treatment	114	Aim and Objective of Prenatal Dental Counseling	130
Juvenile Periodontitis	114	Methods	130
Treatment	114	Contents of Counseling	130
<b>16. Dental Plaque ..... 116</b>		Strategies Associated with Life Stages of Female	131
Introduction	116	Puberty and Adolescence	131
Complexity of Plaque Bacteriology	116	Treatment	131
Criteria for Periodontal Pathogenicity of Oral Bacteria	116	Nutritional Strategies for Adolescent Girl	131
Supragingival Plaque	117	Principle of Dental Surgery for Adult Women	131
Development of Supragingival Plaque (Plaque Maturation)	117	Nutrition During Pregnancy and Lactation	132
Bacterial Growth and Proliferation within Dental Plaque	118	Menopause and Oral Health	133
Concept of Bacterial Specificity	118	Oral Symptoms of Menopause	133
Oral Flora	118	<b>20. Myofunctional Appliance Therapy ..... 135</b>	
Immunologic Response in Gingivitis and Periodontitis	119	Introduction	135
<b>17. Dentifrices ..... 121</b>		Definition	135
Composition of Dentifrices	121	Mode of Action	135
Recent Development in Dentifrices	121	Classification	136
Types of Dentifrices	122	Advantages of Myofunctional Appliances	136
<b>18. Age Specific Plaque Control ..... 123</b>		Disadvantages of Myofunctional Appliances	136
Introduction	123	Indications	137
Positioning	123	Contraindications	137
Advantages	123	Timing of Treatment	137

- Types of Appliances 137
    - Inclined Plane 137
    - Indications 138
    - Contraindications 138
    - Mode of Action 138
    - Modifications 138
    - Indications 139
  - Contraindications 140
    - Limitations of Functional Appliances 140
  - Modifications 140
    - Harvold Activator 140
    - Types of Bionators 140
  - Modifications 141
    - Function Regulator Appliance (Frankel) 141
    - Herbst Appliance 141
    - Twin Bloc 141
- 21. Cariology and Management ..... 142**
- Part I: Theories of Caries Etiology 142**
- Theories of Caries Etiology 142
    - Acidogenic Theory 142
    - Proteolysis Theory 142
    - Proteolysis and Chelation Theory 142
    - Sucrose – Chelation Theory (Phosphorylating Theory) 143
    - Autoimmunity Theory 143
- Part II: Caries 143**
- Definition 143
    - Clinical Classification of Caries 143
    - Sulfatase Theory 143
    - Types of Caries 143
    - Clinical Features 144
    - Chalky Whitespot Lesion 144
    - Frank Cavitation 145
    - Arrested Lesion 145
  - Origin of Dental Caries 145
    - Recent Concept of Caries Development 146
    - Demineralization Process 146
    - Remineralization 146
    - Factors Responsible for Dental Caries 146
      - Primary Factors 146
    - Tetralogy of Dental Caries (New Birth 1982) 146
    - The Tooth 146
    - Role of Oral Microbiota 147
      - Microbiota of Enamel Caries 147
      - Microbiota of Root Surface Caries 147
  - Slavkin Squares Model for Environmental Caries Risk Factor 148
    - Role of Substrate 148
    - Weight-Watchers Phenomenon 149
    - Detergent Food 149
    - Caries Protective Component of Food 149
    - Secondary Factor of Caries Development 150
    - Plaque 151
- Part III: Caries Susceptibility Vs Carries Activity 151**
- Caries Risk Assessment 151
  - Other Factor Causing Caries 151
    - Hereditary Factor 151
  - Systemic Conditions 151
  - Caries Activity Tests 151
    - Uses 153
    - Microbial Test 153
    - Measurement of Mutans Streptococci in Saliva 153
    - Chair Side Method 153
    - Measurement 153
    - Saliva 154
    - Measurement of Salivary Flow Rate 154
    - Measurement of Buffering Capacity of Saliva 154
    - Snyder Test 155
    - Swab Test (Fosdick Calcium Dissolution Test) 155
- Part IV: Diagnosis of Dental Caries 155**
- Visual Examination 155
  - Cariogram 155
  - Aids and Dental Caries 155
    - Tactile Examination 156
    - By Radiographs (Conventional Method) 156
    - Electrical Conductance Measurements 156
    - Fiberoptic Transillumination (FOTI) 156
    - Digital Imaging Fiberoptic Transillumination 157
    - Quantitative Light Induced Fluorescence (QLF) 157
    - Diagnodent 157
    - Disadvantage 157



**Part V: Rampant Caries and Nursing****Bottle Caries 158**

Definition 158

Etiology 158

Clinical Feature 159

Developmental Stages of Nursing Caries 159

Management of Nursing Caries 161

Parent Counseling 161

Prevention 161

**Part VI: Prevention, Caries Control  
and Caries Management 161**

Principles of Preventive Dentistry 161

Role of Pediatric Dentist 161

Role of Hygienist 162

Pediatric Dental Clinic—

A Preventive Program 162

Child's First Dental Visit 163

Postnatal Counseling 163

Diet Counseling 164

A Showroom of Preventive Dentistry 164

Community Activities of

Pediatric Dental Surgeon 164

**Part VII: Use of Pit and Fissure Sealant—  
A Preventive Approach 165**

Introduction 165

Type of Fissures 165

Criteria of Ideal Pits and Fissure Sealant 165

Materials Used as Sealant 165

Classification of Resin Fissure Sealant 165

Selection of Teeth for Sealant Application 166

Indications 166

Contraindications 166

Technique of Fissure Sealant Application 166

**Part VIII: Caries Management 166**

Operative Treatment 167

Free Smooth Surfaces 167

Occlusal Surface 167

Caries vaccine 168

Introduction 168

Why a Vaccine is Needed 168

Strategy 168

Vaccine 168

Function 168

Characteristics of *Streptococcus mutans* 168Mechanism of *Streptococcus mutans*

Adherence to the Tooth Surface 169

Systemic Active Immunization 169

Systemic Passive Immunization 169

**22. Fluorides and Dental Health ..... 170**

Source of Fluoride Intake 170

Absorption of Fluoride 170

Factors Affecting Fluoride Absorption 170

Mechanism of Fluoride Absorption 170

Fluoride in Blood Plasma 171

Storage of Fluoride in Bone 171

Fluoride in Dental Tissues 172

Mechanism of Action of Fluoride 173

Antimicrobial Action of Fluoride 173

Classification of Fluoride Administration 174

Community Water Fluoridation 175

Advantages of Water Fluoridation 175

School Water Fluoridation 175

Dietary Fluoride Supplements 175

Salt Fluoridation 175

Milk Fluoridation 176

Fluoridated Sugar 176

Fluoride in Beverages 176

Unintentional Ingestion of Fluoride 176

Fluoride Sustained Release Device 176

Topical Fluoride Application 176

Professional Application of

Topical Fluoride 176

Sodium Fluoride Solution

(2% NaF, 9040 ppm, pH 7) 177

Knutson Technique (1948) 177

Stannous Fluoride Solutions

(8% SnF<sub>2</sub>, 19360 ppm) 177

Muhler Technique (1957) 177

Acidulated Phosphate Fluoride Solution 178

Brudevold Technique (1963) 178

Other Topical Fluoride Agents 178

Fluoride Varnishes 178

Fluoride Containing Oral Prophylaxis Paste 179

Self Applicable Topical Fluoride 179

Fluoride Toxicity 180

Management of Acute Toxicity of Fluoride 180

Defluoridation (Removal of Fluoride) 181

- Nalgonda Technique 181  
 Procedure 181  
 Nalgonda Calcined Magnesite Technique or  
 Dual Defluoridation Technique 181  
 Prasanti Technology for Defluoridation 181  
 Defluoridation by Reverse Osmosis 181  
 Adsorption and Ion Exchange Method 181  
 Precipitation Method 181
- 23. Pediatric Restorative Dentistry ..... 183**
- Principles of Cavity Preparation 183  
 Finn's Modification of Black's  
 Classification for Primary Teeth 184  
 Class I Preparation for Incipient  
 Caries in a Very Young Child 184  
 Conventional Class I Cavity  
 Preparation in Primary Teeth 184  
 Class II Cavity in Primary Tooth 184  
 Minimal Intervention for Proximal  
 Caries in Primary Teeth 185  
 Tunnel Shaped Cavity Preparation 185  
 Proximal Slot Preparation 185  
 Proximal Approach 185  
 Matrix Bands, Retainers and Wedges 185  
 Classification of Matrix Band 185  
 Spot-Welded Matrix Band 185  
 Wedging 186  
 Wedges 186  
 Consequences of Faulty Wedging 186  
 Class III Cavity 186  
 Class V Cavity 187  
 Esthetic Composite or GIC Restoration for  
 Posterior Primary Teeth 187  
 Veneer Restoration in Primary Teeth 187
- 24. Various Designs of Prefabricated  
 Crown in Pediatric Dentistry ..... 189**
- Introduction 189  
 Factors Influencing the Design of Crown 189  
 Prefabricated Metal Crowns (Gold Ionized, Metal  
 and Stainless Steel Crown Respectively) 190  
 Stainless Steel Crown 190  
 Indications 190  
 Selection of Crowns 191  
 Primary Tooth Preparation 192  
 Primary Anterior Tooth Preparations 192  
 Primary Posterior Tooth Preparation 192  
 Stainless Crown Trimming,  
 Contouring, Crimping and Seating 192  
 Stainless Steel Crown Modifications 194  
 Complications 194  
 Esthetic Restoration of  
 Primary Anterior Teeth by 194  
 Open Face Steel Crown or  
 Chair Side Veneered 194  
 Advantages 194  
 Disadvantages 194  
 Pre-veneered Stainless Steel Crowns 194  
 Advantages 195  
 Disadvantage 195  
 Indications for Full Coronal  
 Coverage of Incisors 195  
 Acid Etched (Strip) Composite Crown 195  
 Selection Criteria 195  
 Tooth Preparation 195  
 Strip Crown Preparation 195  
 Etching 196  
 Positioning 196  
 Advantage 196  
 Disadvantages 196  
 Polycarbonate Crown 196  
 Contraindications 196  
 Manipulation of Polycarbonate Crown 196  
 Crown Selection 196  
 Preparation of Tooth 196  
 Crown Adaptation 196  
 Cementation 197  
 Disadvantages 197  
 Preformed Plastic Crowns 197  
 Stainless Orthodontic Bands 197  
 Castable Glass Ceramic Veneer (Porcelain) 197  
 Acrylic Jacket Crown 197
- 25. Atraumatic Restorative Technique (ART) .. 198**
- Introduction to ART 198  
 Concept of ART 199  
 Aims and Objectives of ART 199  
 Advantages of ART 199  
 Limitations of ART 199  
 Prerequisites for the ART Procedure 200  
 Dentist's Posture and Positions during ART 200  
 Patient Position 200

Use of Natural or Head Lamp Operating Light	201	Determination of Working Length	214
Essential Instruments and Materials for ART Procedure	201	Root Canals Cleaning and Shaping	214
Other Materials Used in ART	202	Canal Irrigating Agent	214
ART for Posterior Teeth	202	Obturation	214
Restoring Multiple Surface Cavities using ART	204	Obturation Technique	214
ART for Anterior Teeth	205	Obturing Materials for Primary Root Canals	214
Evaluation of ART	206	Pulp Treatment for Young Permanent Teeth	215
ART in Primary Dentition	206	Permanent Tooth Pulpotomy Procedure	215
Other Applications of ART	206	Ca (OH) <sub>2</sub> vs MTA as Pulp Therapy Agent	215
Conclusion	207	Apexification	215
<b>26. Endodontic Therapy in Primary and Young Permanent Teeth ..... 209</b>		The Use of Ca(OH) <sub>2</sub> for Apexification	
Primary Root Canal Anatomy	209	Pulpless in Immature Apex	216
Root Canals of Primary Molars	210	Apical Barrier Technique	216
Root Canals of Maxillary 1st Primary Molars	210	MTA Barrier Technique	216
Root Canals of Maxillary Second Molars	210	<b>27. Unconventional Local Anesthesia Techniques for Child and Adolescent ..... 218</b>	
Root Canals of Mandibular 1st Primary Molars	210	Local Anesthetics	218
Root Canals of Mandibular 2nd Primary Molars	210	Composition of Local Anesthetic	219
Pulp Diseases in Primary Teeth	210	Mechanism of Action	219
Procedure	211	Instrumentation	219
Buckley's Formacresol (Original)	212	Needles	219
1/5 Concentration of Buckley's Formacresol	212	Cartridges	220
Indication for Pulpotomy in Primary Teeth	212	Syringe	220
Contraindication for Pulpotomy in Primary Tooth	212	Conventional Cartridge Syringes	220
Technique	212	Single-use Syringes	221
Drawback of Formacresol	212	Powered Injectors or Jet Injectors	223
Gluteraldehyde	212	Ideal Properties of Local Anesthetics	223
Calcium Hydroxide	212	Indications for Local Anesthesia	223
Ferric Sulfate	213	Advantages of LA vs GA	223
Technique	213	Duration of Application	225
Advantage	213	Intraligamentary Injection	225
Cell Inductive Agents	213	Duration of Anesthesia	226
Pulpectomy in Primary Teeth (RCT)	213	Intraseptal Injection	226
Contraindication for Primary Root Canals (Pulpectomy)	213	Nerve Anesthetized	226
Access Opening for RCT in Primary Teeth	213	Duration of Anesthesia	227
		Duration and Spread of Anesthesia	228
		Intrapapillary Techniques	228
		Intrapulpal Anesthesia	229
		Electronic Dental Anesthesia	232
		Mechanism of Action	233
		EDA Indications	234

EDA Contraindications	234		
EDA Advantages	234		
EDA Disadvantages	234		
<b>28. Conventional Local Anesthesia Technique</b>	<b>235</b>		
Introduction	235		
Technique for Maxillary and Mandibular Nerve Block	235		
Method	235		
Supraperiosteal (infiltration) Technique for Maxillary Primary, Permanent Incisors and Canine	236		
Anesthesia for Maxillary Primary Molars and Premolars	237		
Local Anesthesia for Maxillary Permanent Molars	238		
Nasopalatine Nerve Block	238		
Greater Palatine Nerve Block	238		
Infraorbital Nerve Block	240		
Mental Nerve Block	240		
<b>29. Conscious Sedation in Children and Adolescents</b>	<b>241</b>		
Consideration of Anatomic and Physiologic Differences between Adult and Child Patient before Conscious Sedation	241		
Criteria of Patient Selection for Conscious Sedation	242		
Intramuscular Sedation	245		
Combination of Methods and Sedative Agents	245		
Ideal Feature of Inhalation Sedation Equipment	246		
Other Agents Used for Conscious Sedation	247		
Benzodiazepines Group	247		
Midazolam	247		
Benzodiazepine Antagonist	247		
Antihistamines	248		
Sedative Hypnotics	248		
Narcotics	248		
Narcotic Antagonist	248		
<b>30. General Anesthesia in Pediatric Dentistry</b>	<b>250</b>		
Indications for GA in the Treatment of Children	250		
Operating Room Protocol	250		
Properties of Inhalation General Anesthesia	251		
Preparation of Child for General Anesthesia	252		
<b>31. Commonly Used Drugs in Pediatric Dentistry</b>	<b>254</b>		
General Principles of Pediatric Drug Therapy	254		
Important Physiological Considerations Associated with Medications in Children	254		
Bioavailability	254		
Calculations of Drug Dosage	255		
Dosage Forms	255		
Calculation of Dosage in Pediatric Patients	255		
Use of Weight for Determination of Dosage	255		
Using Body Surface Area for Dosage Calculations	255		
<b>32. Dental Injuries and their Management</b>	<b>262</b>		
Introduction	262		
Etiology	262		
Dental History	262		
Medical History	262		
Examination of Maxillofacial Injuries	263		
Tooth Vitality Test	263		
Special Tooth Vitality Test	263		
Treatment Plan	263		
Ellis and Davey Classification of Tooth Fracture	263		
Ellis Class I Fracture and its Management	263		
Clinical Feature	264		
Management	264		
Ellis Class II Fracture and its Management	264		
Ellis Class III Fracture and its Management	265		
Procedure	265		
Restorative Treatment	265		
Cemented Pins	265		

Self-threaded Pins	266	Fracture of the Mandible	279
Friction Lock Pins	266	0 to 2-year-old Child	279
Ellis Class IV Fracture and its Management	267	Treatment	279
Apexification	267	2 to 4-year-old Child	281
Properties of MTA	267	Nasal Fractures	282
Advantages	268	Nasoethmoidal Fracture	282
Disadvantages	268	Orbital Fracture	282
Ellis Class V Fracture and its Management	268	Fracture of Zygomatic Arch	282
Treatment	268	Caution	282
Ellis Class VI Fracture and its Management	268	<b>34. Common Pediatric Oral Pathology</b>	
Investigations and Management	268	<b>and their Management..... 283</b>	
Ellis Class VII Fracture and its Management	269	Congenital Lesions	283
Subluxation and its Management	269	Ankyloglossia	283
Lateral Displacement and its Management	269	Treatment	283
Reimplantation (Replantation)	269	Palatal Cyst	283
Preparation of the Socket	270	Treatment	283
Management of Soft Tissues	270	Alveolar Cyst	283
Ellis Class VIII Fracture and its Management	272	Treatment	283
Criteria for Success of Post and		Alveolar Lymphangiomas	283
Core Restoration	272	Treatment	283
Introduction	272	Median Alveolar Notch	284
Need for a Post	273	Treatment	284
Load Experienced by Endodontically		Oral Leukoedema	284
Treated and Restored Tooth	273	Treatment	284
Principal of Tooth Preparation	273	Hemangiomas	284
Procedure	274	Treatment	284
Procedure	275	Lymphangiomas	284
Primary Tooth Fracture and		Congenital Epulis	284
their Management	275	Treatment	284
Crown Fracture	275	Melanotic Neuroectodermal	
Root Fracture	275	Tumor of Infancy	285
Complications of Traumatic Injuries of	276	Natal Teeth	285
		Commissural Lip Pit	285
<b>33. Considerations of Maxillofacial</b>		Developmental Lesion	285
<b>Injuries in Growing Patient ..... 277</b>		Geographic Tongue	285
Introduction	277	Fissured Tongue	285
Incidence	277	Retrocuspid Papilla	285
Etiology	277	Treatment	286
Classification of Fracture	277	Macroglossia	286
Important Features Associated		Treatment	286
with Jaw Fracture in Children	278	Lingual Thyroid	286
Emergency Treatment	278	Treatment	286
Guideline for Treating Soft Tissues		Fordyce Granules	286
Injuries (Lackmann, et al 1992)	279		

Treatment 286  
 Mucocele 286  
 Treatment 286  
 Odontogenic Cyst 286  
 Eruption Cyst and Hematoma 287  
 Factitial Injuries 288  
 Post Anesthesia Trauma 288  
 Bruxism 288  
 Smokeless Tobacco 289

### 35. Common Infectious Lesion of Oral Cavity in Child and Adolescent ..... 290

Viral Infection of Mouth 290  
 Prevention and Precautions 290  
 Systemic 290  
 Topical 290  
 Mouthwashes 290  
 Herpes Labialis 290  
 Herpangina 291  
 Intraoral Lesion 291  
 Hand, Foot and Mouth Disease 291  
 Recurrent Aphthous Ulcers 291  
 Human Immunodeficiency Virus 291  
 Rubeola 291  
 Treatment 292  
 Infectious Parotitis (Mumps) 292  
 Bacterial Infections 292  
 Impetigo 292  
 Acute Necrotizing Ulcerative Gingivitis (Vincent Infection) or ANUG 292  
 Mycotic Infection 293  
 Candidiasis 293  
 Neonatal Candidiasis 293  
 Treatment 293

### 36. Management of Dental Problems of Handicapped and Systemically Compromised Children ..... 294

Risk Factors 294  
 Advantages 296  
 Disadvantage 296  
 Indications 297  
 Contraindications 297  
 Mechanical Devices to

Hold Mouth in Open Condition 297  
 Wheelchair Head Rest 298  
 Cerebral Palsy Head Support 298  
 Specific Management 298  
 Medically Compromised Patients 298  
 Cardiac Diseases 298  
 Congenital Heart Disease (CHD) 298  
 Acquired Heart Disease 298  
 Management 299  
 Coagulation Disorders 299  
 Treatment 300  
 Complications 300  
 Precaution During Dental Treatment 300  
 Surgical Complications 301  
 Precautions During Dental Management 301  
 Respiratory Disorders 301  
 Precautions During Dental Management 301  
 Precautions During Dental Management 302  
 Emergency Treatment 302  
 Renal Disorders 302  
 Precautions During Dental Management 302  
 Hepatic Disorder 302  
 Precautions During Dental Management 303  
 Endocrine Disorders 303  
 Clinical Manifestation 303  
 Precautions During Dental Management 303  
 Adrenal Insufficiency 304  
 Clinical Manifestation 304  
 Precautions During Dental Treatment 304  
 Convulsive Disorder 304  
 Generalized Convulsions 304  
 Preventive Measures 304  
 Immune Disorder 305  
 Leukemia 305  
 Precautions During Dental Management 305  
 Malabsorptions and Chronic Inflammatory Intestinal Diseases vs Dental Caries 306  
 Developmentally Compromised Patients 306  
 Down Syndrome (Mongolism, also see Chapter Genetic Counseling) 306  
 Management 306  
 Neuropsychological Disabilities 306  
 Mental Retardation 306  
 Oral Manifestation of

Mentally Retarded Patient	306	Responsible for Child Abuse	321
Management	307	Vectors	321
Childhood Autism	307	Treatment of Metal Poisoning	322
Oral Manifestation	307	Accidental and Non-accidental	
Management	307	Oral Trauma	323
Hyperactivity	307	McDonald's Classification	
Management	307	(J Forensic Sci Soc, 1974)	324
Precautions During Dental Management	308	Individual Characteristics	325
Sensory Disabilities	308	Legal Aspect for the Forensic Pedodontist	325
Blindness	308	Recent Advances for	
Treatment Consideration	308	Collecting Forensic Evidences	325
Physical Disabilities	309	Methods of Sex Determination	329
Cleft Lip and Palate	309		
Precautions During Dental Treatment	309		
<b>37. Laser in Dentistry ..... 310</b>		<b>40. Genetic Counseling in Dentistry ..... 330</b>	
Laser for Hard Tissues (Teeth)	310	Introduction	330
Advantages	311	Role of the Pediatric Dentist in	
Capabilities and Limitations of Laser	311	Genetic Counseling	330
Advantages of Laser	312	The Genetic Counselor	331
Laser Safety	312	The Genetic Consultation	331
		At the Genetic Counseling Session	331
<b>38. Dentistry for Sport Players ..... 314</b>		Prenatal Screening for Down Syndrome	336
Introduction	314	Diagnostic Testing for Trisomy 18	336
ADA Recommendations for Mouth Guard	314	Diagnostic Testing for Trisomy 9	336
Types of Mouth Guards	315	Diagnostic Testing for Turner's Syndrome	336
Drawbacks	315		
Drawbacks	316	<b>41. Advances in Dental Instruments ..... 338</b>	
Drawbacks	317	Machined Restoration: CAD/CAM	338
Purpose	318	CAD/CAM Technology: An Introduction	338
		Stages of Machined Restoration Fabrication	338
<b>39. Forensic Science for Pedodontist ..... 319</b>		Disadvantages of CAD/CAM Systems	339
Forensic Dentistry or Odontology		Stages of Machined Restoration	
(Forensic Odontostomatology)	319	with CAD/CAM	339
Definition	319	Dental Air Abrasion (Microdentistry)	340
Importance of Forensic Dentistry	319	Pediatric Dental Uses of Air Abrasion	341
Armamentarium Required for		Advantages of CT Scan	343
Examinations of Body	319	Dental Uses	343
Role of Pedodontist in Forensic Science	320	Apex Locator	343
Child Abuse and Neglect	320	Advantages	343
Battered Baby Syndrome		Disadvantages	343
(Caffey Syndrome)	320	Types of Apex Locator	343
Recognition by the Forensic Pedodontist	321	Resistance Apex Locator	343
Probable Factors of Parents		Working of Resistance Type Apex Locator	344
		Impedance Apex Locator	344
		Frequency Apex Locator	344

Advance Technology	345
Apex Locator vs Radiographs	345
Features	345
Uses	345
Advantages	346
Disadvantages	346
Conclusion	346
Dental Microscope	346
Introduction	346
Uses	346
Advantages	346
Disadvantages	347
Conclusion	347
Intraoral Camera	347
Advantages	347
Disadvantage	347
Conclusion	347
Oximetry	347
Method	347
Indications	347
Other Uses	347
<b>42. Research Methodology and Biostatistics</b>	<b>348</b>
Aim and Objective of Research	348
Types of Research Study	348
Research Design	349
Research Planning	349
Pilot Research Study	349
Program Evaluation	350
Criteria for Research Empirical Studies	350
Review of a Research Study	350
Introduction and Review of Literature	350
Observations and Result	350
Discussion and Interpretation of Results	351
Summary and Conclusion	351
Bibliography and References	351
Keep Few Things in Mind During Selection of a Study	351
Statistics: An Introduction	351
Terms to be Clearly Understood before Beginning of the Research	352
<b>43. Fundamentals of Private Practice in Pediatric Dentistry</b>	<b>354</b>
Introduction	354
Philosophy of Dental Practice	354
Patient Assessment	354
Aim and Objective	354
What is Marketing	354
Selection of a Target Market	354
Fundamentals of Marketing Plan	355
Product	355
Internal Marketing (Internal Promotion)	356
Dental Staff, Policies and Systems	357
Selection Criteria for Dental Personnel	357
<b>Index</b>	<b>359</b>



# Scope and Importance of Pediatric Dentistry

Treating children can be one of the most enjoyable aspects of dental practice. A child's spontaneity, honesty and sense of humor can provide the dentist a refreshing reprieve from the rigors of a daily routine. Although, the majority of children are well behaved patients. Some have fear or anxieties about dentistry that makes their behavior extremely challenging and often frustrating for a pediatric dentist to manage.

## DEFINITION

According to American Academy of Pediatric Dentistry (1999); Pediatric Dentistry is an age defined specialty that provide both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs.

## BRIEF HISTORY OF PEDODONTICS IN INDIA

- In India, the first Dental College was started in the year 1920 by Dr Rafiuddin Ahmed in Calcutta. Hence, he is also known as "The Grand Old Man of Dentistry".
- The foundation of Pedodontics was laid down in 1950 in Amritsar, Punjab.
- Pedodontics did not exist as an independent specialty in the initial years of development of Dentistry but was included in the operative Dentistry Paper and later on in the Orthodontics paper.
- In the year 1988, as per DCI rules it got its due importance and was treated as a separate entity.

## Scope of Pedodontics

'The Scope of Pedodontics' pertinent to the range of activities considered in the practice of Pediatric Dentistry. Proper intake of nutritious diet is essential during growing phase of a child. A child stops eating, if his/her tooth hurts during mastication. Therefore, if caries is detected, the teeth should be immediately restored before any undesirable consequences develop.

In addition to be knowledgeable about the dental needs of the child patient, basics in the pediatric medicine, general and oral pathology, growth and development and child psychology, also need to be known. With the changing trends and the development there has been a tremendous increase in the scope of Pedodontics. Various factors responsible for this change are:

1. *Recognition of a child as patient:* Majority of the parent don't give importance to decaying or decayed primary tooth of children. They says 'Ohh', it's a milk tooth eventually it's going to fall off. This attitude of parent has been slowly changing nowadays with the help of print and electronic media and school dental health education program.
2. Public recognition of the dental health for general well being of the child.
3. Recognition of fluoride as the most effective health agent in the prevention of dental caries.
4. Improvement of various aesthetic agents in clinical use. Introduction of the system of the sophisticated plastics, i.e. composite, ionomer cement, pits and fissure sealant. It is also known as invisible or tooth colored filling.
5. Radical changes to control virulent infections in any clinical content or in the dental office.

**Pedodontics:** Pedodontics and preventive dentistry is a vast subject. Pedodontist acts as an orthodontist, an Oral Surgeon, an endodontist, periodontist, a child psychologist and prosthodontist, etc. at a time.

#### “Vastness of Pedodontics”

- Preventive Orthodontics
- Endodontic
- Periodontics
- Allied Health Sciences
- Special Care Dentistry
- Forensic Dental Science
- Material Science
- Oral Rehabilitation
- Oral Surgery
- Preventive Dentistry
- Cariology
- Dental Radiology
- Oral Medicine
- Restorative Dentistry
- Immunology
- Neonatology
- Child Psychology.

A significant portion of dental and oral disease is preventable. Oral diseases and conditions can begin at birth and result in pain, infection, tooth loss and other problems for a child. Early intervention may enable to experience optimal oral health and the life long benefits of a healthy mouth.

#### Procedures and Pictures

- Silver fillings (Fig. 1.1)



Fig. 1.1: Silver amalgam filling (Postoperative)

- Tooth colored fillings (Figs 1.2A and B)



Fig. 1.2A: Anterior tooth fracture (Preoperative)



Fig. 1.2B: Anterior composite resin restoration (Postoperative)

- Endodontic treatment (Root Canal Treatment) (Fig. 1.3)

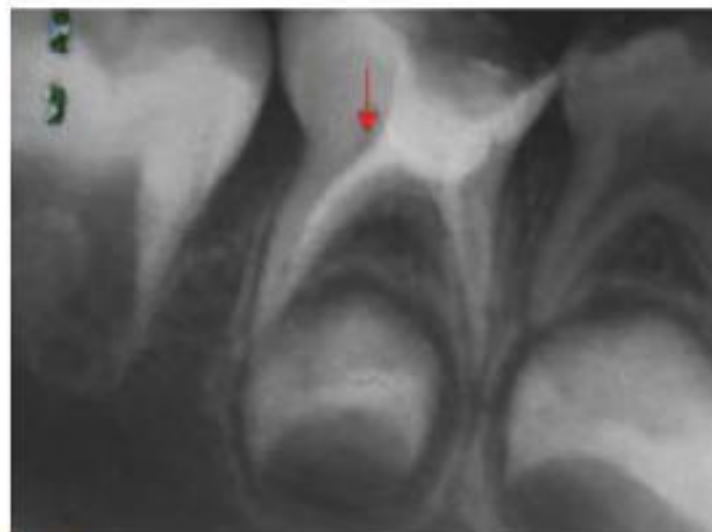


Fig. 1.3: IOPA- X-ray of endodontically treated primary tooth (arrow shows Dycal Obturation)

- Stainless steel crowns (Fig. 1.4)



**Fig. 1.4:** Stainless steel crown adaptation on right and left lower primary second molar

### Importance of Pedodontics

Pediatric dentists work towards the maintenance of the primary teeth until they are naturally lost. This is due to the importance they serve in permitting children to chew properly and therefore maintain good nutrition and health. Its role in speech development and the way it aid permanent teeth by saving space for them (Guiding Path).

“Previously, a Pediatric Dentist is a Dentist treating the teeth of children right from eruption to the ages of 12 to 14 years.” but nowadays, the pediatric age includes (adolescent) up to 19 years and even more in cases of handicapped condition.

The role of the pediatric dentist changes as children enter adolescence. Recognizing the growth importance of appearance and self-image in their clients, pediatric dentists work to ensure that adolescents’ dental needs are met.

In Pedodontics the service provided are as follows:

1. Preventive Dental Care
  - Risk assessment
  - Fluoride treatment
  - Water fluoride analysis.
2. Restorative Dental Care
  - Application of sealants
  - Treatment of dental injuries
  - Cosmetic dentistry: A very fast increase has been observed in this particular branch of dentistry, children have started becoming very conscious about their appearance.
  - Root canal treatment and restorations.

3. Pediatric Oral Surgery
  - Hospital dental care
  - Treatment of emotionally challenged child
  - Treatment of physically challenged child.
4. Preventive Orthodontics
  - Space Maintenance
  - Custom made athletic mouthguards: Can be made for children involving into heavy sports, such as boxing wrestling, martial arts and rugby, etc. where there are more chances of trauma or injury to the tooth.
  - Oral habit control.
5. Behavior Management
  - Treatment of Dental Phobia
6. TMJ Evaluation.
7. Diet counseling: The diet counseling is an important part of the pediatric dentistry to prevent incidence of dental disease or stop disease progression. The black cavity generally appears first on the upper anterior teeth or on the lower posterior teeth.

Black → Cavity → food → pain → swelling  
Spot formation lodgment

- The characteristic that differentiates the pediatric dentist from the other dentists is the fact that he/she provides comprehensive health in the total to the patient, prevents the onset of the disease right from the beginning while considering the psychological need of the child patient thus instills a positive attitude to the dental health in future years to come.
- In author opinion the importance of Pedodontics, should be spread at the community level by arranging school program and educating children about healthy teeth and its role and general health.

### CHALLENGES FOR PEDIATRIC DENTISTRY IN 21ST CENTURY

There will be six phenomenons that need to be a greater concern in the 21st century. These are as follows:

- Child abuse and neglect
- Children of poverty
- Informed consent and risk management
- Advance technology
- Health care delivery strategies/payment strategies
- Emergence of pediatric dentistry as a worldwide community.

## Infection Control in Pediatric Dental Clinic

### INTRODUCTION

The dentist and dental staff are always exposed to a wide variety of infectious organisms in the saliva and blood of their patient. These infectious organisms may include viruses like Hepatitis B virus, Herpes simplex, Chicken-pox, HIV-I, Cytomegalovirus, etc. Bacteria like *Mycobacterium tuberculosis*, *streptococci* sp., *staphylococci* sp. and fungi like *Candida albicans*. These microorganisms can infect the respiratory tract so it is necessary to use infection control procedure and prevention to avoid the spread of disease.

### Infection Control: Precaution and History

1. Before starting any orodental surgical procedure dental surgeon always asks thorough medical history, including question about present and past illness, medication, sudden weight loss, lymph adenopathy, oral soft tissue lesion or other infections.
2. Dental instrument cleaner should wash the reusable instruments in ultrasonic washer and wear heavy mask, gloves, protective clothing and eyewear to protect any puncture injuries and splashing.
3. *Sterilization of instrument:* Sterilize all those reusable orodental instruments that come into contact with oral tissues, saliva or blood. Metal instruments should be sterilized in steam autoclave or dry heat oven. Heat sensitive instruments are sterilized by chemical vapors like ethylene oxide or formalin gas. Heat sensitive instrument may require up to 10 hr. for sterilization in liquid chemical agent. Spore test or chemical indicator test should be weekly done to check the sterility of the instrument or sterilizer.

### STERILIZATION OF ENDODONTIC INSTRUMENT

1. After applying rubber dam, isolated tooth should be washed with Povidone-iodine or 99 percent isopropyl alcohol.
2. Burs used for the opening of pulp chamber should be sterilized by autoclave or dry heat or a bur dipped in 99 percent alcohol and then passes over the blue flame of spirit lamp.
3. Endodontic instruments are cleaned with 2" × 2" gauge moistened with H<sub>2</sub>O<sub>2</sub> or 99 percent alcohol. Absorbent points, broaches, files, reamers and other root canal instrument should be sterilized immediately before use in glass bead or hot salt sterilizer.

In hot salt sterilizer a table salt mixed with 1 percent Sodium silicoaluminate, magnesium carbonate and sodium carbonate is kept in a cup having temperature of 218° to 246°C and a suitable thermometer kept in salt to check the temperature. Sodium silicoaluminate, magnesium carbonate and sodium carbonate acts as anti-agglutination agent for the endodontic instrument. At this temperature root canal instrument such as broaches, files, reamers may be sterilized in 5 seconds and absorbent point and cotton pellets in 10 seconds.

The salt should be changed weekly or more often depending on the degree of humidity. In glass bead sterilizer (Fig. 2.1) less than 1.0 mm diameter glass beads are used in place of table salt because glass beads does not clog with files or reamer. The temperature ranges between 218°C and 246°C. The hottest part of the glass bead sterilizer is along its outer rim starting at the bottom



**Fig. 2.1:** Glass bead sterilizers  
(Arrow shows cup of glass bead)

layer of salt and temperature is lowest in the center of the surface layer of glass beads that's why it is always advisable that endodontic instrument be immerse at peripheral area of glass bead sterilizer. After sterilization of the endodontic files and reamer, it should be kept in cold disinfectant solution to maintain the sterilization of the instrument.

**AUTOCLAVE (FIGS 2.2 AND 2.3)**



**Fig. 2.2:** Modern autoclave machine  
(Arrow shows safety valve)

All other instrument like long handle instrument, extraction forceps, cotton gauge piece, tray, cloth, etc. are sterilized by autoclaving procedure. In autoclave, sterilization is accomplished when the instrument are kept at 15 lbs pressure at 120°C for at least 15 minutes.

**Sterilization of Gutta-percha**

Gutta-percha can be sterilized by immersing it into 5.2 percent sodium hypochlorite for 1 minute then rinse the cone with H<sub>2</sub>O<sub>2</sub>. Frank and Pellieu have shown that 5.2 percent sodium hypochlorite is 5 times more effective than sporicidine.

**Sterilization of Silver Cone**

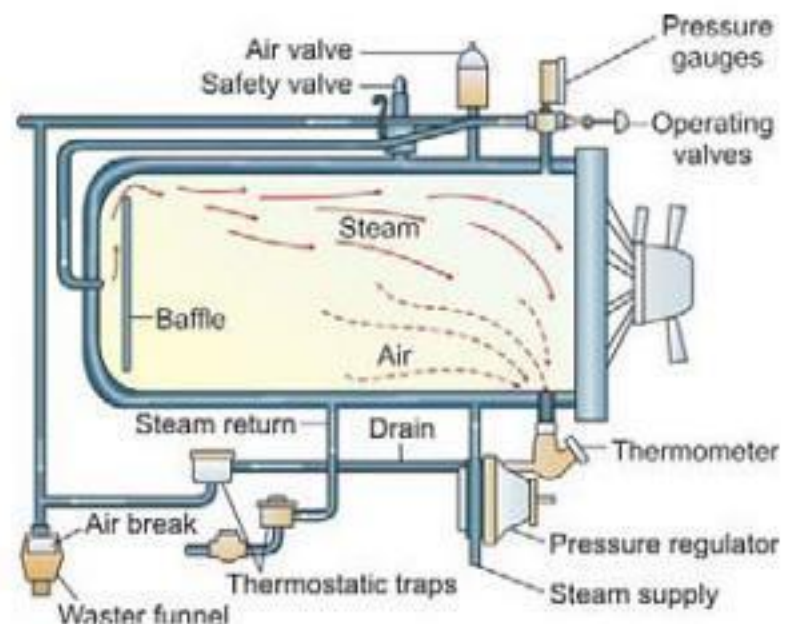
It can be done by putting cone in hot salt sterilizer for 5 seconds or by passing-silver cone dipped in alcohol over Bunsen burner.

**Sterilization of Glass Slab or Dappen Dishes**

Glass slab or dampen dishes can be sterilized by swabbing the surface with tincture of thimersal followed by double swabbing with alcohol.

**Sterilization by Formalin Gas Chamber**

It is recommended that only wet instrument be kept in formalin gas chamber because formalin gas must be in water solution form to enter into the protoplasm of microorganism for effective sterilization. Formalin gas thus, acts as poison for protoplasm.



**Fig. 2.3:** Internal design of modern autoclave

### Laser Beam Sterilization

Hooks, et al have found that exposure of infected endodontic instrument for 3 seconds to a laser beam is sufficient to destroy microbiota including spores.

### Infection Control to the Dental Staff

1. Chairperson of the dental office should insist that their dental staff to wear gloves during all patient treatment procedure and when touching items contaminated with blood or saliva.
2. Dental staff should wear surgical mask, protective eyeglasses, gowns and use protective cover such as clear plastic wrap to protect operative surface that is difficult to disinfect.
3. During dental procedure, use of rubber dam should be done whenever possible along with high speed evacuation to reduce splatters and aerosols.
4. Dental team should be vaccinated against hepatitis B (including the dentist). Blood test should be done to confirm the response of the vaccination.
5. Antimicrobial surgical hand scrub technique should be performed before gloving for assisting any surgical procedure. Handwashing with antimicrobial or liquid soap is appropriate for examination and nonsurgical procedure.

### Infection Control to the Patient

- a. *By draping:* The aim of the draping is to isolate the surgical areas from other part of the body that have not been prepared for surgery and also from non-sterile operating room equipment and surgical staff. The most effective methods of isolating the mouth from the surgical site are by using a clear plastic adhesive barrier to microorganism. The adhesive is pressed tightly around the lower face and lower lip, preventing saliva from flowing into the surgical site.
- b. *By the surgical part preparation:* The purpose of surgical part preparation is to reduce contamination by patient's own normal oral flora and resistant bacteria acquired from the hospital environment. The surgical site cannot be sterilized with this part preparation but the gross cleansing action from center of the surgical site to away from the surgical center, does significantly reduce the incidence of post-

operative infection. A circumoral part-preparation should precede intraoral surgical procedure to prevent transfer of the resistant skin microorganism to the intraoral wound. The skin preparation for surgery should be done for 5 min. The following solutions are used for surgical part preparation.

- |  |  |
|--|--|
| i. Iodophor compound   | For skin preparation                   |
| ii. Hexachlorophene solutions  |  |
| iii. Chlorhexidine 0.2 percent solution  | As intraoral surgical part preparation |
| iv. Phenol-Alcohol mouth rinse   |  |
| v. Betadine oral rinse   |  |
| c. Infection control by prophylactic and therapeutic medicine (Tables 2.1 to 2.3). |  |

### Infection Control in Diabetic Dental Patient

The diabetic patient requires special precaution before dental procedure. If the dentist detects intraoral sign of undiagnosed or poorly controlled diabetes, a thorough history is indicated. If a patient is suspected of having undiagnosed diabetes the following procedure should be performed.

- i. Consult the Physician
- ii. Lab test recommended
- iii. Rule out acute orofacial infection or severe dental infection and provide emergency care only until diagnosis is established.

Patient with relatively well controlled diabetes usually respond in a manner similar to non-diabetic individual. Prophylactic antibiotic (penicillin group) should be started two days prior to the dental procedure and continued postoperatively for one week in diabetic patient.

### DISINFECTION OF OPERATORY SURFACE AND DENTAL APPLIANCES

Clean and disinfect operatory surface (dental chair) between each operated patient by wipe down the surface with absorbent towel and disinfect with 1:10 dilution of house-hold bleach. Clean and disinfect impression and intraoral appliances before handling or adjusting or sending them to the dental laboratory. Appliances should also be cleaned and disinfected when they are received from the dental laboratory and before placement in the mouth.

Table 2.1: Infection control in the dental bacterial endocarditis patient by prophylactic and therapeutic medicine

Situation	agent	regimen
Standard general prophylaxis	Amoxicillin	<b>Adult:</b> 2 g orally one hour before procedure. <b>Children:</b> 50 mg/kg orally one hour before procedure.
When patient unable to take oral medication	Ampicillin	<b>Adult:</b> 2 g IM or IV within 30 min before procedure. <b>Children:</b> 50 mg/kg orally IM or IV within 30 minutes before procedure.
When patient allergic to penicillin	Cephalexine or Cephadroxyll Azithromycine or clarithromycine	<b>Adult:</b> 2 g orally one hour before procedure. <b>Children:</b> 50 mg/kg orally one hour before procedure. <b>Adult:</b> 500 mg orally one hour before procedure. <b>Children:</b> 15 mg/kg orally one hour before procedure.
When patient allergic to penicillin and unable to take oral medication	Clindamycine Or cefazoline	<b>Adult:</b> 600 mg IV within 30 minutes before procedure. <b>Children:</b> 20 mg/kg IV within 30 minutes before procedure. <b>Adult:</b> 1 g IM or IV within 30 minutes before procedure. <b>Children:</b> 25 mg/kg IM or IV within 30 minutes before procedure.

Total children dose should not exceed adult dose.

Note: Cephalosporin's should not be used in individuals with immediate type hypersensitivity reaction (Urticaria, Angioedema, or anaphylaxis) to penicillin.

Table 2.2: The newest guideline for endocarditis prevention in dental patient

S.No.	Change from old guidelines
1.	Oral initial dosing has been reduced to 2 g
2.	Follow-up antibiotic dose is no longer recommended
3.	Erythromycin is no longer recommended for penicillin allergic patient.
4.	Clindamycin and other alternatives have been recommended to replace the Erythromycin regimens.
5.	Clearer guidelines for prophylaxis decisions for patient with mitral valve prolapsed have been developed.

Table 2.3: Antibiotic regimes for patient with prosthetic implants

Patient not allergic to penicillin	Cephalexine, cephradine or amoxicillin	2 g orally one hour prior to the procedure
When patient not allergic to penicillin and unable to take oral indications	Cephazolin Or Ampicillin	1 g IM or IV one hour prior to procedure. 2 g IM or IV one hour prior to procedure
When patient allergic to penicillin	Clindamycin	600 mg orally one hour prior to dental procedure.
When patient allergic to penicillin and unable to take orally	Clindamycin	600 mg IV one hour prior to the procedure.

### CAREFUL HANDLING OF BIOPSY SPECIMEN

Before transferring the biopsy specimen, it should be placed in a tight-lid container containing 40 percent liquid formalin as a fixing solution and care should be taken not to leak during transport from dental clinic to pathologic laboratory. The volume of the fixative solution should be approximately 20 times more than the volume

of the tissues specimen. The minimum time required for fixation is 8 hours for smaller piece and proportionally the larger tissues take longer.

If the biopsy specimen is too thick, only the peripheral portion of the tissues will be completely infiltrated with fixative solution while the central areas undergoes degenerative changes. So the larger biopsy specimen

should be cut in several sections before being immersed. Care should be taken not to contaminate outer surface of the transferring biopsy container.

The specimen bottle should be properly labeled to indicate whether the tissues specimen is soft tissues or it contains bone. It is a good practice to keep soft tissues and bone specimens in separate marked bottles whenever possible. A brief history should accompany the specimen. This should include the name, age, sex of the patient and the location and gross description of the lesion, its duration, rate of growth or change in growth rate and method used in obtaining the specimen.

### INFECTIONS CONTROL THROUGH HOSPITAL WASTE DISPOSAL

Infection control through hospital waste-disposal is an issue that is often ignored by many dental and medical hospitals. In developed countries the quantity of waste produced today has decreased in the hospital sector. The quantity of waste produced per day per bed and per dental chair differs greatly from hospital to another hospital/dental clinic.

Among hospital waste 85 percent are general refuse and 15 percent waste contaminated with infectious agent, i.e. microbiological cultures, blood and blood products, body fluids, isolation waste from patient with communicable diseases pathological specimens and sharps.

Hospital waste is disposed off by selectively separating it into various groups. Group separation made it possible for regulations and laws, for single type of waste; governing their collection, transport, storage, reutilization and final treatment.

#### Classification of Waste

Waste is classified into following groups:

1. General refuse waste
2. Waste from the medical/dental environment
3. Hazardous waste
4. Radioactive waste
5. Others waste.

#### General Refuse Waste

Waste that can be treated or recycled. Example:- Household garbage, paper, glass, and textiles, plastic.

#### Waste from Medical/Dental Environment

Waste that may present a risk of infection in a medical/dental environment but need not be handled as hazardous waste. Ex. Plaster caste, dental caste, bandages, drip bags, disposable clothing and, gutta-percha, etc.

#### Hazardous Waste

Waste that represents a hazardous in the medical environment and elsewhere and requires special handling Ex. waste that is tainted with hazardous pathogens blood and body fluids of human or animal origin, parts of the bodies, aborted, stillborn of fetus and sharps, reamers files, etc.

#### Radioactive Waste

It includes any substance regulated and licensed under the Nuclear Regulatory Commission which, should be disposed off in accordance with the rules and regulations of the Nuclear Regulatory Commission.

#### Other Waste

Other waste occurring in the medical field such as disinfectants, photochemical, waste containing mercury (dental amalgam), laboratory chemicals and general anesthesia, etc.

#### Infectious Waste

Infectious waste can be defined as the waste that is tainted with pathogenic agent and due to the presence of diseases which according to the current state of knowledge, may lead to such type of waste. The estimated amount of unregulated infectious waste per day per bed varies between 8000 to 1100 gm, if regulated, would vary between 50 gm and 1500 gm.

The infectious waste should be dealt with separately and undergo controlled disposal. This prevents diseases and epidemics from spreading. The definition of what waste is infectious differs from one country to another and even from one hospital to another, depending upon how well informed and trained the personnel are.

#### Waste Management

The following steps are important in the medical/dental waste management:



- i. Segregation
- ii. Packaging
- iii. Labeling
- iv. Tracking.

### Segregation

Infectious waste must be segregated from other waste at the point of origin. This separation should not entail additional labor for the health facility personnel. Infectious waste storage for one or two days may be possible in special sealed cooled rooms, if available in the hospital.

### Packaging and Labeling

Separate infectious waste from the rest in specially marked waste containers, right at the point of origin, where the waste is produced. Container is labeled and marked, and infectious waste containers must have the universal biological hazard symbol on them. Color coded double lined plastic bags must be used in all regulated medical waste containers. A puncture proof container should be used for sharps.

Previous practice of recapping or chopping needles is no longer prevalent because of the potential injuries to corks and because of the aerosolization of the microorganism during the chopping procedure. Infectious waste storage areas should be disinfected regularly and are maintained at appropriate temperature, particularly if waste is being stored prior to treatment. Packaging should be rodent and vermin proof. The radioactive waste cannot be treated, destroyed or immobilized by any method. Containers of radioactive waste area are isolated in temporary collection area, with minimum exposure to individuals, until the waste has decayed to the point that it can be disposed off in a designated labeled container. Items used in handling radioactive materials are segregated in labeled containers.

### Collection of Waste

Collected waste must be transferred from the point of origin to the collection points for processing and appropriate disposal. Waste should be collected in rigid or semi-rigid and leak proof containers. Hospital wastes are collected in one of three ways:

- i. Gravity chutes (chutes – A sloping channel for moving things to a lower level)

- ii. Carts
- iii. Pneumatic tubes

1. *Chutes*: Use-vertical transport.  
Risk contaminants can be exhausted into hallways, if the door is left open during use. This can be avoided by maintaining higher pressure in the hallways or using self closing doors.  
Disadvantage: Waste containers can get jammed.
2. *Carts*: Use-horizontal transports of bagged or containerized wastes.  
Risk: Bags can break or tear during transport, exposing the workers to the waste.
3. *Pneumatic Tubes*: Use-transport waste in a large facility.  
Advantage:
  - High speed movement.
  - Movement in any direction.
  - Minimal intermediate storage of untreated waste in pneumatic tube.

### Waste Disposal

Waste disposal is carried out using one of the following technologies:

- Sterilization with steam, hot water or partly with microwaves.
- Incineration.

*Sterilization*: Wastes are kept at the temperatures which can kills all the disease producing agents including spores.

*Step-I*: Disinfection chamber: Waste is treated with steam and reduced in size by means of slitting roller.

*Step-II*: IInd Disinfection chamber: Above mentioned process is continued.

*Step III*: Treated waste is disposed of with normal household waste.

### Microwaves Sterilization

Used for the waste which have sufficient high moisture content. The air and moisture emitted from the microwave must be made safe by passing it over on activated carbon filter.

### Incineration

This method is used for disposing infectious wastes. If the waste does not undergo immediate incineration in

Categories of biomedical wastes, container's color codes (Fig. 2.4)

Category	Class	Waste description	Type of container	Color coding
1.	Human, anatomical wastes blood and body fluids	Waste consisting of human organs, body parts, body fluids, blood and blood products, and items saturated or dripping with blood and body fluids removed during or after treatment, surgery or autopsy or other medical dental procedures.	Single use containers or plastic disposable bags	Red
2.	Animal waste	Waste consisting of animal tissues, organs, body parts, bedding, body fluid and blood products, items contaminated with blood and fluids, wastes from surgery, treatment, autopsy and wastes of experimental animals used in research, waste generated by veterinary hospital, colleges and animal houses.	Single use container or plastic disposable bags	Orange
3.	Microbiology	Waste from laboratory cultures, stocks or specimens of microorganism live or attenuated vaccines, human and animal cell cultures used in research, infectious agents from research and industrial laboratories waste from the production of biological toxins, dishes and devices used to transfer cultures.	Single use container or plastic disposable bags	Light blue or yellow
4.	Waste sharps (Dental)	Waste consisting of used and unused sharps such as needles, syringe, scalpels, blades, glass. Dental disposable/undisposable sharps instrument, etc. that are capable of causing puncture and cuts.	Sturdy cardboard glass or plastic container.	Yellow with black stripes
5.	Highly infectious waste	Wastes containing highly infectious living and nonliving pathogens, exposure to which could cause disease.	Single use containers or plastic disposable bags	Yellow
6.	Isolated waste	Biological waste from discarded materials contaminated with blood, excretion exudes or secretions from humans or animal isolated due to communicable disease.	Single use containers plastic disposable bags	Yellow or yellow with black strips
7.	Discarded medicines	Waste comprising outdated, contaminated and discarded medicines.	Reusable sturdy cardboard, glass or plastic container	Yellow or yellow with black strips

Contd...

Contd....

Category	Class	Waste description	Type of container	Color coding
8.	Discarded glassware	Wastes generated from glassware and equipment used.	Reusable sturdy cardboard, glass or plastic container	Black
9.	Solid waste	Waste generated from soiled cotton, dressings, plaster casts, linen, beddings, including packaging materials.	Single use container or plastic disposable bags	Yellow
10.	Disposable	Waste generated from disposable items other than waste sharps.	Reusable sturdy cardboard, glass or plastic container, or plastic bag	Yellow, light blue or yellow with black stripes
11.	Liquid waste	Waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities.	Not applicable (NA)	NA
12.	Biotechnology waste	Wastes generated from activities involving genetically engineered organisms or products and their cultures, which have been declared safe.	Single use containers or plastic disposable bags	Yellow, light, blue or yellow with black stripes.
13.	Slaughter house waste	Waste generated in the form of animal tissues, blood and body fluids.	Disposable plastic bags	Orange
14.	Incineration ash	Ash from the incineration of any biomedical waste.	Disposable plastic bags	Yellow with black stripes
15.	Chemical waste	Chemical used in the production of biological and chemicals used in disinfections, such as insecticides, etc.	Sturdy containers, plastic holding bags	Yellow or Yellow with black stripes.



**Fig. 2.4:** Red, gray, yellow, red-yellow transparent containers are used for human, anatomical wastes blood and body fluids, Gray Reusable Pathological Waste Container, Yellow Reusable Chemotherapy Medical Waste, yellow disposable sharps container respectively

a waste incineration plant there is a risk of its starting to decompose at room temperature. Modern facility of this type are available in all sizes from small plants with a daily capacity of about a 100 kilos for small hospitals, up to large plants with daily capacities of several tons for waste disposal centers.

### Facility Option

- i. Single in house facility
- ii. Joint faculty serving several hospitals together.
- iii. Delegating the tasks to an independent collection service.

#### 1. Single in House Facility

##### Disadvantages

- Requirement leads to an initial high investment.
- The plant is utilized only under certain conditions.

##### Advantages

- Independence of operation (waste disposal) is assured and correctly dealt with.
- Daily disposal is possible.

#### 2. Joint Facilities Serving Several Hospitals

##### Disadvantages

- Cooled storage rooms are necessary.
- Dependence on external organization may leads to problem.

##### Advantages

- Better utilization of the plant is ensured.
- Lower investment is required.

#### 3. Delegating the Task to an Independent Collection Service

##### Disadvantages

- The waste is not under the hospitals control right up to the time of disposal.
- There is the risk of arbitrating pricing.
- Cooled storage rooms are necessary.

##### Advantages

- No investment in incineration is required.
- The Cost can be kept under control by proper selection of the waste.
- Waste disposal is not a part of the functions of a hospital.

#### Waste Treatment

**Loading of waste:** Small plants with a daily capacity of up to about 500 kilos are often loaded by hand. The combustion chamber is filled with waste and tapped up once or twice. The larger plants are loaded discontinuously for about eight hours by means of a mechanical loading system. In this way waste is burned in the combustion chamber every 10-15 minutes.

#### Combustion Chamber (Low Temperature Carbonization)

In this chamber, the waste is dried and broken down. The quantity of air introduced inside the combustion chamber is just sufficient for the drying process for the waste and the production of low temperature carbonization gas consequent to the breakdown takes place without added energy.

### Reheating Chamber

It is in a state of constant depression. The low temperature carbonization gases contain a large volume of combustible energy rich gases. In the mixing area, these are turned into an inflammable gas by adding fresh air. This mixture of gases is then burned in the ignition and burning area, with the addition of more fresh air. In order to achieve complete burnout, the necessary quantity of fresh air is monitored using oxygen probe. The temperature between 400°C (at the start of the process) and about 800°C (at the end of process) are reached in the combustion chambers. On completion of the combustion process any unburnable residues become sterile depending on local legislation, processing in the reheating chamber takes place at temperature ranging from 850 to 1200°C.

### Heat Exchangers

The energy contained in the flue gases or waste gases can be utilized for the production of warm water or hot water, in the larger plants. This energy is available for the duration of the loading period and during the burning out phase of the carbon.

*Purification of the flue gases:* There are new regulations pertaining to the maximum permissible emission limits from incineration plants. The gases scrubbing facility is required to comply with these limits and are divided up into several stages of scrubbing.

- a. *Dry flue gas cleaning:* The dust content in the air emitted is reduced by means of a film; additives such as lime can also precipitate certain harmful acid components.
- b. *Wet purification system:* Stage-I Harmful gases are quenched and brought down to a temperature of about 80°C.  
Stage-II: Fine dust and aerosols are separated and often washed by ionization. This leads to broken down of harmful components into dioxin and furan. The 1st small plants for hospital waste in which dioxin and furan originating from the flue gases are limited to a maximum value of 0.1 ngr/Nm<sup>3</sup>.

### Advantages of Incineration

- The temperature in the combustion chamber guarantees that the residues are sterile.
- The waste is reduced to about 3 percent of its original volume depending on the amount of incombustible waste loaded.
- The residue requires no further treatment and can be handed over to a controlled final place of storage.
- The process works regardless of the composition of the waste, and does not require special monitoring.
- The service personnel never come into contact with the waste and therefore, it is universally acceptable from an ethical point of view. Even in the event of a possible breakdown of various component of the plant, the personnel do not come into contact with the waste during the trouble shooting period.
- The processes comply with even today's very strict environmental protection limits.
- Implementation of this technology is possible not only in industrialized countries, but it is particularly suitable for third world countries like India.
- Presently, a large number of indigenous as well as multinational companies are providing equipment and solution for hospital waste. While deciding on the equipment to handle hospital waste, it is advisable to keep the following points in mind:
  - a. The quantity and type of waste to be handled by the equipment.
  - b. Whether the equipment meets the current regulatory standards.
  - c. Can it be upgraded to meet future regulatory norms?
  - d. Will the equipment be supported with maintenance services and spares for the next 10 years?

### Waste Minimization Options

Waste minimization include many source reduction or recycling activities by the generator that's results in reducing either the quantity or toxicity of the hazardous waste, consistent with the goal of minimizing present and future threats to health and the environment.

### Source Reduction

It can be achieved by process modification and by the implementation of policies and procedures that will reduce waste. The key operating practices that can be utilized to effect waste minimization are as follows:

- Waste segregation
- Controlling inventories with "just in time" purchasing.

- Providing an area where chemical and liquid wastes cannot drain to the sewer in the event of an accident.
- Buying drugs in containers sizes that permit formulations of daily doses, with the least quantity of excess product leftover.
- Centralized purchasing and dispensing of drugs and other hazardous chemical.
- Requesting suppliers for recyclable containers whenever possible to reduce chemical drum waste and disposal cost.
- Using 1st in and 1st-out policy for dispensing drugs and chemicals in order to minimize the waste generated, because of extended self life. New supplies should be entered in inventory book and dispensed drugs and chemical also entered in stock dispensing book.
- Minimizing acceptance of free sample that are likely to become hazardous waste.
- Avoiding mixing waste, such as xylene with alcohol, chromic acid (glassware cleaner) with water.
- Determined dilution rates of alcohol that can be discharged to the sanitary sewer system.
- Reducing photographic waste from imaging equipment. Such as waste water containing photographic chemicals and silver from film. Use of Ammonium thiosulphate for extending the life of fixing solution of X-ray and addition of acetic acid to fixing bath to keep the pH level of the bath optimally low and avoid mixing of used X-ray fixer and developer.
- Collecting and storing waste in a closed plastic container, labeled hazardous waste, used fixer, with the date indicating when the fixer was 1st added.
- Contacting a recycling service when enough fixer has accumulated (Usually 20 to 40 gallons).
- Trained employee should be employed for hazardous material management and waste minimization.
- Using electric devices for measuring temperature and blood pressure is the most effective way of eliminating mercury from waste streams.

### Recycling and Reclamation

- Spent solvent are generated by the laboratory, pathology, histology and maintenance departments.
- Aqueous based cleaner can be used instead of hazardous solvent.
- Many solvent can be recovered by on site distillation and recycled.
- Dialysis units generate a spent solution that contains 3 to 4 percent formaldehyde in water. Some user reportedly use reverse osmosis to recover formaldehyde.
- A spent fixer solution, used in radiography department contains high concentration of silver which is economically valuable and can be recovered easily.
- After controlling processing temperature very closely, to improve image quality, it also greatly extended the useful life of processing chemicals, reducing the quantity sent for disposal.

### CONCLUSION

- The population of India is endangered, as no controlled waste disposal is taking place.
- In many countries necessary laws and guidelines have been introduced for allowing environment friendly waste disposal.
- There is an urgent need for educating and informing everyone concerned with hospitals and the populations at large.

## Set-up of Pediatric Dental Clinic

### INTRODUCTION

Good business practices are essential to a profession as they are to other enterprises. So, there is no reason why a dentist with personality and skill should find himself incompetent in practice management. Being a good dentist is not the only thing required to keep the appointment book full, change has finally and irrevocably caught up with the private practice of dentistry.

- We have to study the changing dental scene and adapt our practices to meet the new challenges of today. Within this population there is decreased demand due to better preventive care in the form of more sound diets. The widespread use of fluorides, better quantity dentistry and longer lasting restoration. A more consumers, conscious, educated society is beginning to shop around the health care at an ever-increasing variety of treatment facility.
  - Today is the age of consumerism and they want as much information as possible. Before starting a new practice various aspects must be considered, because marketing a professional practice is very hard. So, before setting up a Pedodontics clinic following points should be kept in mind:
1. **Location:** Selecting a location is the first and foremost point to consider before establishing a clinic. There are many factors that should be considered in locating a dental office for the type of practice one wish to establish.
    - *Check social and economic status of residing people:* Our office location should ideally reflect the target population pattern and the dentist to population ratio in that area. It is easy to start

the practice where need exist, than carve out a share of already overcrowded market. It is important to know that social and economic status of the people residing in that particular area.

- *Easy access to school:* If possible, dental office should be near to the well-established neighborhood school.
  - *Transportation and parking facility:* A dental office should be in high visibility, high traffic location and near well-recognized, famous area so that every time patients can reach easily. With busy schedule and the increasing cost of driving, patients do not want to travel long distance for their dental care so proper transportation facility should be available. Every pediatric clinic should have proper space available for parking.
2. **Office decoration or organization:** Once the location is selected, the type of office decoration must be considered. If one is to limit one's practices to children, the entire office from the reception room through the treatment room can have a definite modification.
    - *The reception area (Fig. 3.1):* The reception area is designed to be patient and parent oriented not dentist centered. An attractive and comfortable environment should be designed for both children and parent. The interest of patients of preschool age through the late teenage period needs to be considered as well as the interests of adults. The decor of the reception area deserves careful planning with these various age groups in mind before the dentist turns the decoration of the reception area over completely on interior



**Fig. 3.1:** Pediatric dental office's waiting area with toys, etc.



**Fig. 3.2:** A TV set must be kept in one corner of the room for the entertainment. Some cartoon channel Ex. (POGO, Cartoon network) must be available

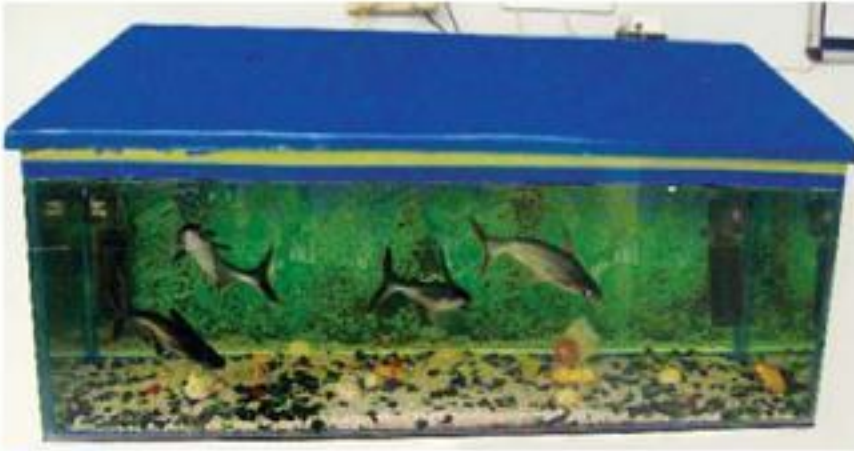
decorator, thought should be given to the excessively stimulating, excitable atmosphere that may be universally created by the use of many bright color and design.

- *Waiting room:* Waiting room is an important part of reception area. It should be well lighted. Preferable with ceiling or well attached handicraft fixtures. Waiting room can also be used to present dental health material. Fantasy characters on the wall and color of the room. Bright color and design make the room excitable and stimulating. Neutral color such as light green or blue for wall decor promote a tranquiller feeling and permit the use of attractive color accessories such as pictures, wallpaper murals magazine holder. Fantasy character on the wall make the environment more familiar and friendly for children, it amuses the children a lot. Various decoration themes could be created by means of maps and pictures of foreign countries. Other themes may be related to education history, transportations, science, and animal's picture in the natural habitat, season or holidays.
- *Children chair and table:* Children chair and table should be available with cartoon character made on it where they can sit and read.
- *Small library:* A beautiful and small library should be made in the waiting room. Reading material, magazine, publication must be kept there for

various age group and it should include a wide range of topics. Usually children visit dental clinic with their parent, mother. Cookbooks afford busy mothers interesting reading. A pad and pencil can be placed alongside the cookbooks for the mother to copy any recipes. Thus, an interesting and productive waiting period is provided to the mother while the child is in the treatment room.

- *Soothing music:* Soothing and muffled music in the reception room have a comforting effect on both parent and patient and dispel coldness often felt in a silent room. A handy record player with well chosen record or a tape recorder and amplification system will provide comfort to frighten fearful and tearful children.
- *Television (Fig. 3.2):* A TV set must be kept in one corner of the room for the entertainment. Some cartoon channel Ex. (POGO, Cartoon network) must be available.
- *An aquarium (Fig. 3.3):* An aquarium is always a source of entertainment and may be placed either in the reception room or in the treatment room where it is visible to the child. It helps in behavior modification.
- *Appointment cards:* Appointment cards and appointment announcement should be made educative and so, that it helps in behavior modification of children. So, the child feels that these are addressed to him. A sketch of some





**Fig. 3.3:** An aquarium is a source of entertainment and helps in behavior modification of a child in the dental office

character of fantasy on the cards will help in doing this.

- **Refreshments:** An investment of few hundred rupees in decorating the reception room can make a big difference in practice. Coffee, tea, juice and fresh fruits are very inexpensive but are nice touches that may create a warm and friendly atmosphere.
- **Play room (Fig. 3.4):** A small play room should be made near to waiting room. Different shape, size and colored toys can promote a child's interest in providing a home like atmosphere and indirectly convey to the child that the staff is interested in him or her. Selected toys preferably of large size, including building blocks and wall attached activity center have proved to be main attraction of children of all ages.
- **Operating room (Fig. 3.5):** The operating room may be made well appealing to the child if good animal pictures in their habitat are present on the wall and are suggestive of children at play or a portrait of a carefree and laughing child is always good. A TV can be fixed to ceiling or near the dental chair at eye level, it serves as a distraction. All the equipment must be placed in such places, where it is not much visible to the child.
- **Dental personnel:** The dentist should realize the limitation of his allotted working time and should employ personal or attendant dental staff to permit him more time for those tasks that cannot be delegated to others.
- **Receptionist:** Each time a child visits the dental clinic, the receptionist will transfer the child and the parent from the reception room to the dental



**Fig. 3.4:** Play area with different shape, size and colored toys can promote a child interest providing a home like atmosphere and indirectly convey to the child that the staff is interested in him or her



**Fig. 3.5:** Operating room should be colorful, animal pictures in their habitat present on the wall. They are suggestive of children at play and helps in the development of positive attitude for future dental treatment

health education and prevention area. Receptionist is the people who first interacts with the parents and child patient. So, they should complete the basic information and health history forms

efficiently and cautiously. Receptionist should give the best-suited appointment to the patient according to their own choice.

- *Hygienist:* The hygienist can make an important contribution to dental care of a child. The efficient utilization of a chair side assistance is extremely important in a Pedodontics practice because:-
  - a. It decreases the length of dental appointment thus aiding in child management.
  - b. It decreases the number of steps and movement necessary, resulting in less fatigue to pediatric dentist.
  - c. To get more efficient chair side assistant, modern equipments are required. Contoured chair have been found most effective in children practice. The patient rest in a supine position with his body parallel to the floor and feet slightly elevated. The dentist operates in a sitting position on a comfortable contoured stool. All equipments are conveniently located near the assistant such as high and low speed suction, airtor hand piece and water syringes are mounted on a bracket extending partially over the chair.
  - d. Well integrated instructions make it possible for these instruments to be handed to the dentist as needed. The assistant has everything needed for any specific procedure within easy reach without leaving the chair.

The amalgamator and all needed general supply and drugs should be available in a portable cabinet and it should be present along side of the assistant.

### How to Communicate with the Child in Dental Operatory

- Communication is a complex, multisensory process. It includes transmitter, a medium and a receiver. The dentist in dental health team is the transmitter, the spoken word frequently is the medium and the child patient is the receiver.
- For pediatric dentistry, word substitutes are like a second language for the child patient. It is important to be careful in selecting words and phrases. With new child patient the following are example of word substitutes (Euphemism) that can be used to explain procedures to children.

Dental terminology	Euphemism or Word substitute
Rubber dam	Rubber raincoat
Rubber dam frame	Coat rack
Water syringe	Water gun
Suction	Low speed vacuum cleaner
Topical fluoride gel	Cavity fighter
Alginate	Pudding
Air syringe	Wind gun
Sealant	Tooth paint

### Record Keeping

- Since, the complete value of child dentist care may not become clear until several years after treatment, so accurate, complete and legible records are essential.
- Uniform and understandable records are necessary if summarize of finding and treatment are to be written in the future. Thorough record keeping by the entire office staff is a critical requirement for fulfilling the practitioner's obligation to analyze accurately the success or failure of individual and over all treatment procedure.
- Routine record keeping requires updating a child's health history at each appointment. The patient's health history form should be revised at each recall visit.

### Health Education Room

- Space should be allocated in the dental office where the child and parent can be given proper instruction about preventive procedures. Although this information can be presented in any area of the dental office, a separate room away from possible area of stress to the patient is most desirable.
- Instruction in oral hygiene procedure should be explained fully and participation by the child should be made mandatory until toothbrushing and flossing become an established habit pattern. This may require observing the patient go through routine number of times.
- There are many adjuncts available recently in kit form, to teach the children and attendant or parent. Educating the parent is desirable to supervise the child while performing these duties at home. Slides, films strips, records, films, pamphlets, charts and models are available from number of sources.
- Predicate dentist should emphasize plaque control regime. Plaque removal must be an integral part of

the educational program. Technique such as plaque staining and the phase microscope to demonstrate viable microorganism are valuable teaching aids to convince both the parent and patient. A well illuminated mirror before which children can practice and perfect their toothbrushing and flossing technique will be of great benefit. Caries activity test can also be used as an educational tool.

- *Nitrous oxide OT*: A different operator should be made in the pedodontics clinic for the procedure to be undergone under general anesthesia. Proper position of personnel and equipment should be given in operating room.

### Modification of Clinic for Disabled Child

A disabled child is one who has mental physical or social condition that prevent the child from achieving full potential when compared to other children of the same age.

- Disabled children present challenges that require special preparation before the dentist and office staff can provide acceptable care. In addition parental anxiety concerning the problems associated with a disabled child frequently delay dental care until significant oral disease has developed. Some dentist feel uncomfortable providing treatment for disabled children to feeling may result in loss of greatly needed service.

### Dental Office Access

The rapidly expanding elderly population, the presence of disabled children and the emergence of progressive legislation for people with disabling condition of all ages are three important factor that should prompt dentists to address cost efficient way to make their office facilities and operatory area accessible for person with disabling condition.

- In the dental operatory a 4 feet wide width should be used in the doorways. In the dental suite where floor circulation is at premium aisle passage in the operatory area should be planned.
- Wheelchair turning (Fig. 3.6) space and top space under furniture and fixtures may be more readily accommodated if one operatory is specifically designed with a movable dental chair, instrument control unit and suction system.



**Fig. 3.6:** Wheelchair should be readily available for handicapped children in the dental office

- Movable equipment and dental chair should enhance the opportunity to back the patient into the operatory. Thus, enhancing the need for more wheelchairs turning space. If possible a wider turning rod would be desirable to accommodate wheelchair extensions and adaptation that are required by some persons.
- Dental chair should be adjustable according to height of different wheelchair design. If patient cooperation cannot be obtained the dentist must use alternative instruments and methods such as physical restraint and sedation. Following are some commonly used physical restraints in pediatric dental clinic.

Physical restraining device	
Body	<ul style="list-style-type: none"> <li>• Papoose board</li> <li>• Triangular sheet</li> <li>• Pedi wrap</li> <li>• Bean bag</li> <li>• Safety belt or Extra-assistant</li> </ul>
Extremities	<ul style="list-style-type: none"> <li>• Velcro strap</li> <li>• Towel and tape</li> </ul>
Head	<ul style="list-style-type: none"> <li>• Extra-assistant</li> <li>• Fore arm body support</li> <li>• Head positioners</li> <li>• Plastic bowl</li> </ul>

## Child Examination, Diagnosis and Treatment Planning

Dental care for children is best achieved after a thorough orofacial examination, thoughtful and truthful diagnosis and formulation of a proper treatment plan. The manner in which these can be accomplished during the child's 1st visit to the dental office; it enables the good relationship between the dentist, the child and the parent. The child and the caretaker (parent) can be properly prepared for any dental care as follows:

1. A warm friendly approach and giving regards to the child by dentist or dental staff, quickly makes a friend of the apprehensive child and an interest in the active listening of parental voice.
2. The dentist question and statements should be in easy and understandable language.
3. The orofacial examination should be done with easy movements, utilizing a minimum of instrument to avoid alarming the child.

### AIM AND OBJECTIVE OF CHILDS OROFACIAL EXAMINATION

The child's orofacial examination centers around four major objectives:

- i. Introduction to the pediatric dentistry.
- ii. Risk assessment and oral examination.
- iii. Prevention of dental diseases.
- iv. Treatment of dental disease.

### Introduction to the Pediatric Dentistry

The initial orofacial examination should provide foundation for the development of a positive attitude towards dentistry. The method of examining child as well as the recommended environment can provide a

pleasant, non-threatening and truthful introduction to the dentistry for the child and the parents.

### Risk Assessment and Orofacial Examination

Medical history, history of current feeding and oral hygiene practices, clinical findings, the child's socio-economical status and physical environment can provide the basis for an estimate of the child's risk for developing dental diseases. Orofacial examinations begins with an evaluation of the head and neck region and an inspection, palpation of the oral cavity to detect any pathologic process or the early evidence of orodontal diseases, leading to an assessment of the child's oral development.

### Prevention

A major emphasis during child's initial visit to the dental clinic should center on the counseling of parent regarding their roll in prevention of dental diseases. Preventive counseling should include dietary counseling with respect to feeding practice and snacking pattern in between meals, proper oral hygiene procedure, fluoride assessment and application, resulting in the development of an appropriate prevention program.

### Steps of the Examination

#### *Initial Parental Contact with Dental Clinic or Hospital (Table 4.1)*

The parent usually makes the 1st contact with the dental clinic or hospital by telephone. The initial conversation between the parent and the dentist is very important.

Table 4.1: New patient (preappointment) telephone interview chart

• Date of Call .....	
• Taken by (Receptionist/Dental Personnel).....	
• Appointment (Day/Time/Month/Year) .....	
• Call for earlier appointment .....	
• Patient name.....	Sex.....
• Age of Patient .....	
• Ph. No.....	Mobile No. .... E mail.....
• Permanent Address:	
• Other Family member who are patient.....	
• Name/occupation of referential (if any) .....	
• Its Dental visit .....	Yes..... No.....
If no, are there current X-ray to be requested from another office .....	
No..... Yes.....	
If Yes,	
– Name of the Dentist	
– Address	
– Phone	
– Date called	
– Date received	
• Special Dental Concern	
• Special Medical Concern	
• Emergency (a) Last filling (Date of filling and date of last filling) (b) Bumped tooth/# tooth/knocked out tooth (c) Tooth Ache Type/Duration of pain.	
• Other Symptom:	
– Sensitive to hot/cold/sweet, Bleeding from gum, constant pain, swelling, apprehension, aware at night, other.	
• Dental Insurance:	
Yes No or other coverage.	
• .....Patient informed that fee for Fist visit is due at the time of examination.	
• .....Patient informed will be happy to file insurance for subsequent visit.	
• Special Comment.	
Date and Time	Signature of Interviewer

It provides the 1st opportunity to attend to parents concern by pleasantly, friendly responding to questions and by offering a clinical or hospital appointment according to the patient's need or patient's own wish. There are three types of examination appointments which are common:

- i. Emergency
- ii. Recall visit
- iii. Postoperative examinations or complete.
  - i. *Emergency examination:* Emergency examination provided at the site of injury and is basically designed

to make an immediate diagnosis and providing emergency treatment and elimination of the chief complaint.

- ii. *Recall visit:* It is a thorough follow-up after an initial complete examination. Its main objective is to measure the changes that have occurred since the completion of the treatment. The periodic examination is done in most cases, every 3 to 6 months.
- iii. *Complete examination:* The information recorded during this conversation, constitutes the initial dental record of the patient. The following information must

be recorded in the form of chart which is the most convenient and commonly used method.

### Interview and Counseling

The interview and counseling portion of the dental visit is completed prior to the examination of the child.

- i. Special concerns of the parent are identified so that it can be used during the examination of the child.
- ii. If the child displays unnecessary excitement, activity or interest during the examination the parent predictably will direct their attention towards the child during the discussion that follows and not towards dentist therefore, the child can be occupied with toys in a non-threatening manner prior to the examination. So, the parent can direct their attention towards the discussion.

Once preappointment information has been checked, the Pedodontist greets the child and parent both and discusses the parental concerns, reason for seeking care and any information from the preappointment chart that requires further classification based on recent information chart and appropriate recommendation can be made regarding each aspects of an overall orofacial disease prevention program.

### The Child's Position During Dental Treatment

#### *For Infants (Lap to Lap Position)*

The Pedodontist and the parent or caretaker are seated face-to-face with their knee touching. The dentist's upper leg forms the 'Examination Table' for the child. The child's legs present in the lap on the parent allowing the parent to restrain the child's legs and hands. A dental assistant is present to record the dentist examination findings as they are dictated and to help in restraining the child if required. If primary molars have erupted, the pediatric dentist will need an explorer and mini torch associated mouth mirror to complete the oral examination. If the parents are more concerned about the appearance of certain orofacial tissues, the dentist will prefer to conduct the examination on the dental chair where hand instrument can be transferred efficiently, effectively and safely and where light can be easily adjusted and modified.

#### *Position of Dental Assistant*

The dental assistant seated slightly higher to the level of dentist to permit good visibility and to better anticipate the dentist needs. The assistant is also in good position to hear and records the dentist findings.

The parent or dental assistant also help in restraining the child's arm, legs and the child's hand is positioned in the bends of the parent's arm. The dentist establishes a chair side position so that not only the dentist's hand but also the lower arm and chest may be available for the support of the child's head if required.

#### *Complete Examination*

The child's examination should be done under following major headings.

- i. Case History (Medical/Dental)
  - Patient chief complain
  - Prenatal/Postnatal/ Infancy history.
- ii. Clinical Examination:
  - General appraisal of the patient
  - Detailed orofacial examination
  - Supplementary examination and special laboratory test.
- iii. Diagnosis: Diagnosis can be made by thorough case history and clinical examination with specific radiographic and laboratory test.

#### **Case History**

A thorough case history of child dental patient is essential in order to:

- a. To establish a good contact with the child and parent or caretaker.
- b. Essentiality of radiograph or any specific laboratory test depends upon the pathognomic symptom or sign given by the patient at the time of thorough history and clinical examinations.

So, case history is essential for diagnosis of disease and subsequent treatment plan. The recorded history of a child patient can be divided into following categories:

- i. Vital statistics
- ii. Parental or caretaker history
- iii. Prenatal and natal history
- iv. Postnatal and infancy history.

**Vital Statistics (Table 4.2)**

This is essential for office records, through this records, Pedodontist obtained some information about the socioeconomic status of the family. The child’s physician should be concerned in case of future emergency or if additional medical information is required. The chief complain should be recorded in the mother’s tongue or child’s own words either child may be in acute problem or merely desire for routine care.

**Parental of Caretaker History (Table 4.3)**

It provides information about hereditary pattern of disease or development through their forefather. It is also designed to provide information about the dentist value and importance from parent’s point of view. Since, the attitude of the parents towards dentistry may be reflected in the apprehensiveness of the child and the desire of the parent’s as regards his dental care.

**Prenatal and Natal History (Table 4.4)**

It often provides important information about abnormal colors, shapes and structure of deciduous and its succedaneus teeth. Pedodontist also emphasizes the effect of drugs and metabolic disturbances, which occurs during the formative stage of tooth development.

**Postnatal and Infancy History (Table 4.5)**

Review the vital system of the child patient. It also provides such important information about previous preventive treatment for dental caries, developmental disturbances of dental significance, allergies, oral habits and the child behavior and his/her attitude towards their environment.

The length and direction of history depends on the circumstances surrounding each case. In emergency situations, the history is usually limited to essentials regarding the offending lesion or condition and the

Table 4.2: Format of history recording of vital statistics

- Date..... Time.....
- Name of child .....
- Date of Birth.....
- Race and Sex.....
- Name of Caretaker (supplying the information).....
- Relationship: Mother/Father/Others.....
- Occupation of father and Mother.....
- Home address of Child.....
- Phone..... E mail.....
- With whom does the child live.....
- Child present physician.....Phone.....  
Address.....
- Who referred child.....
- Child’s chief complaint.....

Table 4.3: Parental history

- Are you denture wearer yes/no
- Is your spouse wearing denture yes/no
- If above yes at what age were your teeth removed..... and your spouse.....
- Why yours/teeth and yours spouse teeth gray, yellow, green or brownish in color? If yes explain.....
- Did your teeth wear down excessively (due to Bruxism/Diet Habit..... and Your Spouse.....
- Are you/your spouse frightened of a dental appointment

Table 4.4: Prenatal history and natal history

**Prenatal History**

- Illness during this pregnancy? .....
- If yes. (I, II, III Trimester duration).....
- Were you on drug, doses and duration of drug therapy.....
- Were you on high vitamin/calcium diet during pregnancy...
- Rh factor incompatibility between you and your spouse.
- Was there fluoride content in drinking water.....
- Where you lived during pregnancy.

**Natal History**

- Full term/premature Baby .....
- Was he/she jaundiced at Birth ? 

Yes	No
-----	----
- If yes, physiological/infections jaundice.
- Was he/she given transfusion of blood? .....
- Was he/she is a blue baby ?.....

Table 4.5: Postnatal and Infancy history

**Postnatal and Infancy History**

- Did he have any convulsion during infancy .....
- If yes, time, duration and type of drug therapy given.....
- Was he/she breastfed/bottle fed
- If yes – for how long?
- Any diet supplement given during infancy (fluoride/ vitamins/calcium/iron, etc.)
- Drugs given in the form of syrup or drops .....
- If yes, it is cariogenic or noncariogenic .....
- And for how long period of time was it given.....
- Did he suck a Sugar teat? .....
- Did your child have any childhood disease during infancy ..... if yes, name the disease and drug therapy given.....
- Did he have Rheumatic fever/diabetes/cardiac problem or blood anemia/bone # and frequency of #.
- Does he fails to perspire during hot season – Yes/No
- Does he have any mental/physical disability – Yes/No
- If Yes, explain it.....
- Does your child eat snacks between meals – Yes/No
- Does he/she suffer from frequent toothache/gum bleed/# of Ant teeth?
- Is he/she allergic to any food/L.A./drug
- Is there difficulty in stopping bleeding when he cut himself? .....
- Is the child hemophilic? ..... Yes / No
- Habit history – Thumb sucking/Mouth breather.
- Does he have difficulty keeping up with his school.....
- Does he/she fear the dentist? ..... Yes/No
- If yes, do you know why?



presence or absence of systemic disease. In most cases a self noted history questionnaire may be of great value.

## 2. CLINICAL EXAMINATION OF CHILD

### A. General Survey of Child

- i. *Stature of child:* General survey of a child done quickly as the child enters the reception room or dental operatory. The 1st observation is whether the child is overall tall or short for his particular age. The child can be classified in following categories:
  - Normal height for his age.
  - Too short height for his age.
  - Too tall height for his age.

Suspected variation can be measured by a long-term records of the child's growth to determine whether the present stature is the result of constant growth pattern or whether it is a growth change occurring at some definite point in the child's development or growth spurts.

- ii. *Gait of child:* As child walks into the dental operatory, Pedodontist can quickly ascertain whether the gait (manner of walking) is normal or affected. Abnormal gait is usually seen with sick child walking with unsteady gait of weakness.

#### Types of Gait

- i. Waddling (walk with short step)
- ii. Equinus (walking like a horse)
- iii. Scissor (two legs move like a pair of scissor)
- iv. Hemiplegic's walking
- v. Shuffling walking

- vi. Wobbly walking (move unsteadily from side to side due do illness, tiredness or anxiety).
- vii. Staggering gait (walk unsteadily as if about to fall)
- viii. Ataxic gait (ataxic walking)

- iii. *Speech development (Fig. 4.1):* One of the most important achievements of the human being is development of speech, a significant form of communication among persons. Infants with severe hearing problems may have abnormally slow language development.

For speech or language development the child's hearing capability and visual system must develop and function normally. So children are able to proceed along a normal course of language development only where there neuroanatomic mechanism are sufficiently mature. Language acquisition must be proceeding by the evolution of the child's cognitive power from concrete to abstract conceptualization.

#### Level 1

Level 1 showed the 1st 3 months of age during which there is a gross reception of stimuli and vestigial discrimination and localization of sound. At this level child will stop activity with or turn toward the sound of human voice.

#### Level 2

Showed 4 to 11 months of child, during which he/she develops the ability to integrate sensory stimuli (Audible) into pattern and to differentiate intricate stimuli. This can be represented by the child's babbling sound

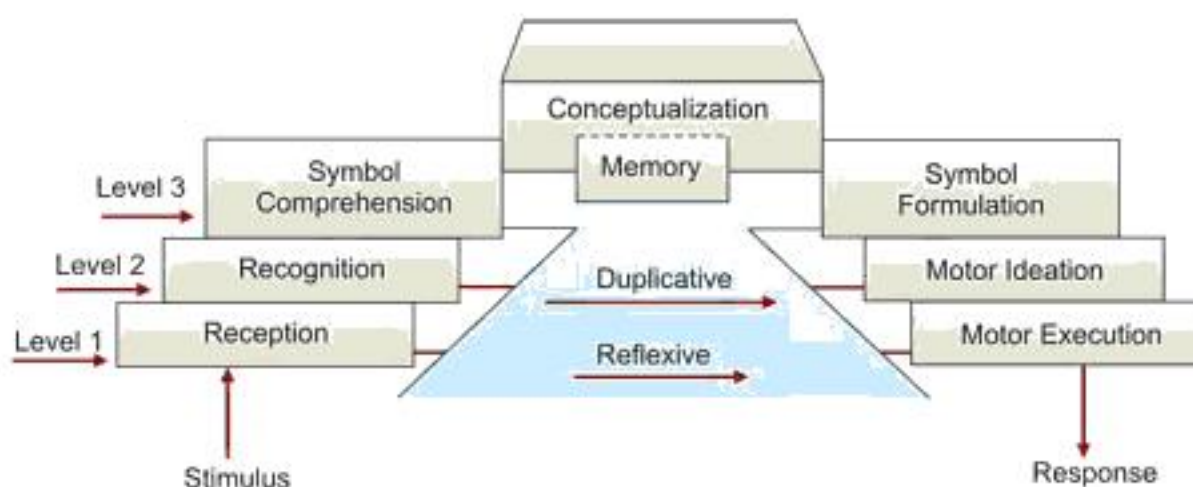


Fig. 4.1: Complex development process of language development

(Vocal play, with random production of different speech sound).

At level 2, child can discriminate various speech sound patterns and develop sufficient motor control of the physical mechanism to accurately imitate these sound patterns. The children also react appropriately to gestures and can respond to words such as Tata and bye-bye. The child is also able to stop an activity when said 'no'.

### Level 3

Represent by the age of 12 to 18 months. At this level the child can comprehend and follow simple commands. Child will develop a vocabulary of up to 50 single words before being able to put words together.

Each three level of development, memory appears to play an integral part in the dynamic interplay associated with language learning.

## CHILD-LANGUAGE DEVELOPMENT

1. *At 18 months of age:* Child will begin to put two word sentences together and Vocabulary increases up to 272 words.
2. *At 24 to 30 months of age:* Child will begin to put three word sentences.
3. *At 3 years of age:* The basic grammar of language has been learned and the child can use simple single clause statements, questions and commands.
4. *At 3 to 3½ years of age:* The child begins to evolve more complex sentences structure containing more than one clause and conforming to the basic patterns of sentence orders.
5. *At 3½ to 4½ years of age:* A passive grammatical structure begins to develop around 4 years of age vocabulary increases about 1450 words and at 5 years of age Vocabulary about 2000 words.
6. *At 5 years of age:* During this time the child becomes more aware that similar words may not have the same meaning and that phrases may have a meaning other than its literal one.
7. *At 6 years of age:* Vocabulary increases up to 2562 words. The child begins to express abstract ideas and nuances of meaning in speech and continues to develop this ability until puberty.

The following types of speech disorders should be considered:

- i. Aphasia
- ii. Delayed speech.

- iii. Stuttering (Repetitive speech)
- iv. Articulatory speech disorder.

### Motor Aphasia

It is a rare condition and usually denotes loss of speech secondary to CNS disorder.

### Delayed Speech

Speech retardation can be considered if the child does not talk by the age of three year. Common causes of delayed speech are as follows:

- Hearing loss.
- General developmental disorder
- Intellectual retardation
- Sensory defect
- Severe prolong illness
- Lack of motivation
- Poor environmental stimulation
- Neurological injured child.

### Repetitive Speech or Stuttering

It occurs in almost all children at sometime during the preschool period. Parents are advised not to over concern and show apprehension about repetitive speaking. It may block the normal flow of Speech.

Repetitive Speech or stuttering is more common in boys than girls. Psychological stresses play an important role in the development and persistence of repetitive speech. Cluttering is an unusual type of speech disorder characterized by repetition of words or phrases, false start, changes in context in the middle of the sentence and general verbal confusion.

### Articulatory Speech

The articulators include the lips, tongue, teeth and palate and the vocal folds. Articulatory speech or sound formation is being positioned appropriately for the correct production of a sound or group of sounds. Speech clinicians have categorized phonetics disorder into three main acoustic symptoms.

- i. A substitution of one sound for another, example: 'Th' sound for 'S' sound.
- ii. Distortion of a sound wherein that produced resemblance the correct sound but it is defective in nature.
- iii. *Omission of a sound:* Some articulatory defect occurs within the limits of normal development,

although children with cerebral palsy or CNS damage, cleft palate or malocclusion often have articulatory defect. Paralysis of laryngeal and pharyngeal muscles, cerebral palsy, may alters the quality of speech and produces a voice with nasal twang.

Speech articulation errors of interest to Pedodontist encompass a number of location and functional patterns in the oral cavity and pharynx. For purpose of clarity and continuity, the discussion to follow will focus on anatomic areas beginning at the lips and ending at the adenoid mass.

Pedodontist should not be expected to construct an appliance for speech, speech therapist that will ensure normal |S| sound production although dental appliance therapy may help speech patterning, but Pedodontist should use caution in assuming responsibility for speech or encouraging the parent or child that speech will improve from any dental therapy.

Pedodontist can play an important role in counseling the family and suggesting appropriate resources when significant non-fluencies are noted in child's speech. The following guidelines are advised:

- i. Do not discuss the speech symptoms directly with the child.
- ii. Ask the Parent/caretaker general question about the child speech as to the ease of talking.
- iii. Contact a speech therapist and report the symptom observed.
- iv. During dialog with child, attempt to maintain eye contact during non fluencies of speech and avoid completing words that the child block on.

### Hands

By taking the child's hand in the dentist hand or putting his hands on the shoulder of child. The dentist not only establishes a warm communication and faith but also is afforded an opportunity to further appraise the general health. In most cases the hands will feel normal, but occasionally there will be a feeling of increased temperature or moisture or dryness.

- All primary and secondary skin lesions can be seen on the hand (vesicle, ulceration, scale, etc.).
- The shape, number and size of the figure should be evaluated.

- The nails of hand should be inspected bitten short that showed anxiety tension.

### Temperature of Body

Elevation in body temperature at rest is one of the common symptom experiences by the children. There may be increase in body temperature after eating or exercise or when the environment is not conducive to body cooling (Ex. Moist and Hot environment).

- Dental abscess or acute gingival disease and numerous other oral and respiratory infections may resulting in a febrile condition in children.
- Degree of fever, its pattern and the child response are often factors indicative of certain pathosis.

### EXAMINATION OF HEAD AND NECK

- i. *Size and shape of head:* The following types of child heads are usually seen.
  - A. Macrocephaly: It is an enlarged head. It frequently occurs due to developmental or early traumatic disturbances.
  - B. Microcephaly: It is a smaller head than normal size. It may occur due to the growth disturbance, disease or trauma affecting the central nervous system (CNS).
    - Abnormal head shaped may be caused by premature closure of the skull sutures or interference in the growth of cranial bones or abnormal pressure within the skull.
- ii. *Hair and skin:* Hair and skin should be examined for following region.
  - Alopecia or loss of hair may occasionally be seen in young patient.
  - A common baldness is a small, discrete, round area characterized by a raised indurated, inflamed line suggesting the ringworm disease or fungal infection.
  - Those children who are suffering from congenital ectodermal dysplasia, his/her hair is characterized by scanty, fine and light in color or may be absent. This disease is often seen in boys than girls.
  - Certain other hormonal imbalances may cause hair losses, while the addition hormonal medication may be cause hirsutism or excessive growth of hair.

- Face skin should be observed for the sign of disease. A number of primary and secondary skin lesions may be found on the face.
- iii. *Facial swelling and asymmetry:* Slight facial asymmetry considered as normal.
    - Asymmetry of the face can be psychological or pathological.
    - Infant sleeping habit particularly in children born at less than full term and within 24 hours of delivery, have been shown to affect the shape of the face permanently.
    - Pathological facial asymmetry may be produced by abnormal intrauterine pressure, cranial nerve paralysis, fibrous dysplasia of bone and familial hereditary disturbances.
    - Infections like bacterial, viral and trauma are the principal cause of facial asymmetry in child.
  - iv. *Ears:* Pedodontist should be aware of any deficiency of hearing in the child patient and examine external auditory meatus for pus discharge. Pedodontist also determine whether the referred pain from the dentition is the possible cause of earache. If palpation of external ear and mastoid process reveals some tenderness and hot in touch, it indicates that the inflammation exists within the ear itself.
  - v. *Eyes:* Pedodontist should observe the child's eye for following region:
    - i. Swelling or Puffing around the eye.
    - ii. Presence or absence of conjunctivitis.
    - iii. Any defect in the iris.
    - iv. Presence or absence of any crusting or lesion on the eyelids.
    - v. Any abnormal lacrymation
    - vi. Any difficulty in child's vision/or wears power glasses.
    - vii. Presence or absence of inflammation in child's eye.
    - viii. Action of the eyelids.
      - Inflammation associated with maxillary teeth may extend to the orbital region causing swelling to the eyelids and conjunctivitis.
      - Children with upper respiratory tract infection like chronic sinusitis and allergy have puffiness of the eyelids and periorbital tissues.
  - vi. *Nose:* Nose is examined for any abnormality in the size, shape or colors. Pedodontist should check nasal drainage for any upper respiratory tract. If scars observed on the nose, it is indicative of surgical repair of developmental anomaly or trauma. The extension of inflammation via the maxilla may alter the size, shape, and color of the nose, because of close proximity of the nose to the oral cavity. The extension of cyst or tumor from within the oral cavity, usually the maxilla may encroach up to the nasal passages.
  - vii. *TMJ Examination (Figs 4.2 and 4.3):*
    - Measurement of maximal jaws opening capacity and individual vertical overbite should be included



**Fig. 4.2:** Closed mouth TMJ examination (see the location of index and middle finger)



**Fig. 4.3:** Open mouth TMJ examination (see the location of index finger and middle finger)

in a functional examination of the masticatory system.

- TMJ should be examined for any restricted movement, subluxation, dislocation, mandible deviation, pain or any clicking sound.

### Method

Pedodontist stands as nearly as possible, in front of the child as the dental chair will permit, he may place his hands lightly on the child's cheek in the area of TMJ. Ask the child open and close his mouth slowly, then from closed centric, have him move into the lateral excursions by asking him to chew slowly on his posterior teeth. The lateral aspects of the TMJ are palpated bilaterally while the patient performs two or three maximal jaw openings. Pain on palpation, Pain during opening, irregular jaw movement as well as TMJ sounds are recorded (Stethoscope is used to hear the TMJ Sound). Palpation of the jaw muscles should be limited to Masseter and Temporalis muscles for TMJ disorder.

viii. *Neck examination:* Neck is examined by both observation and palpation. Skin of the neck is examined for presence or absence of primary or secondary skin lesion and scars of surgical repairs. In the course of examination, Pedodontist should stand in back of the child patient and gradually passes the flat surface of his fingers over the parotid region, down under the body of the mandible to the submaxillary and sublingual regions and thence palpate the Triangles of the neck.

- Pedodontist should check for any external swelling on the neck that may represent enlargement of major salivary glands. A significantly enlarged parotid gland will alter the facial contour and may lift the ear lobe. To evaluate parotid gland function, dry the cheek mucosa around the orifice of each parotid gland duct and massage the gland externally and observed the nature of excreted material. In normal gland clear and free flowing secretions will be readily seen. A restricted flow of parotid secretions and viscous, cloudy and purulent discharge indicate the infections of parotid gland and needs additional evaluation of the parotid glands.
- For the submandibular and sublingual glands, use bimanual palpation. (Insert the gloved index finger besides the tongue on the floor of the mouth and

locate the two salivary glands and any enlarged submandibular lymph node using a second finger placed externally). Check the location, texture, size of gland and any tenderness or nodules.

- Neck examinations also includes examination of submandibular and cervical lymph nodes (Drainage of the oropharynx and other tissues of the head and neck and anastomosing with lymphatic from the abdomen, thorax, breast and arm, the midline structure (Ex. Hyoid bone, Cricoids and Thyroid Cartilages, Trachea and Thyroid gland).
- Ask the child to extend their neck and check the clavicle, sternomastoid and trapezius muscles, which define the anterior and posterior triangles of the neck.
- Palpate the hyoid bone, thyroid, cricoids cartilage and trachea, observe any displacement or tenderness.
- Examine the external jugular vein as it crosses the sternomastoid muscle.
- Palpate anterior to the tragus of ear for preauricular nodes, at the mastoid and base of the skull for posterior auricular and occipital nodes, under the chin for submental nodes and further posterior for submandibular and lingual nodes.
- The superior cervical lymph nodes lie above the sternomastoid muscle, the deep cervical lymph node lie between the sternomastoid and cervical fascia. To examine the deep cervical lymph node, ask the patient to sit erect and to turn his/her head to one side and to relax the sternomastoid muscle, use thumb and fingers to palpate under the anterior and posteriors border of relaxed muscles and repeat the procedure on opposite site and also palpate the posterior cervical lymph node in the posterior triangle close to the anterior border of the trapezius muscle. Finally examined for supraclavicular lymph node just above the clavicle, lateral to the attachment of the sternomastoid muscle.

ix. *Intraoral Examination* (Figs 4.4 to 4.6):

Pedodontist should use simple intraoral examination procedure to accustom the child to manipulations with mirror, probe and other instrument in the oral cavity. The child oral cavity should be thoroughly examined in a systemic way in order to avoid omission of important sign and symptom.

**Breath:** The breath of a healthy child is usually pleasant and even sweet. Bad breath or 'HALITOSIS' may be attributable to either local or systemic factors.



Fig. 4.4: Intraoral examination with acrylic finger guard



Fig. 4.6: Lap to Lap position, during intraoral examination of the child



Fig. 4.5: Intraoral examination of a child (see the position of child, dentist and assistant)

- a. Local factor of mouthbreathing are poor oral hygiene, food lodgment in the mouth due to malposed—teeth/appliance/periodontitis/dehydration of gums in mouth breather strong smelling volatile food, etc.
- b. Systemic Factor for Halitosis
  - i. Sinusitis
  - ii. Liver disease
  - iii. Diabetes
  - iv. Malignancies of upper elementary tract
  - v. Typhoid fever
  - vi. Hypertrophy and infections of adenoid tissues
  - vii. GIT obstruction and infection.

### Oral Mucosa

Oral mucosa should be examined properly and if necessary wiped off the mucosa starting from the inner surface of the lips and continuing to the mucosa on the inside of the cheeks including the upper and lower alveolar sulci. The lips should be checked for size, shape, colors and surface texture, and be palpated using thumb and forefinger. The palatal mucosa is examined with the help of mirror under adequate light.

- The mucosa of tongue and floor of the mouth are examined after careful retraction of the tongue with the help of mouth mirror or tongue blade, which may include palpation, inspection, and ulceration, changes in color of surface, swelling or fistulae are observed and noted on the case sheet.
- During alveolar process examination, a special attention should be given to any minor swelling or retraction of the gingiva which should be a sign of periapical or inter radicular pathological process.

### Saliva

Saliva should be examined for rate of flow, consistency, color and quantity and quality. The quality of saliva may be very thin, normal or extremely viscous in nature, the excess secretions or purulent discharge from the salivary duct is indicative of infections of the salivary glands.

### Gingiva

Gingiva should be examined for its size, color consistency, capillary fragility, contour, surface texture, and bleeding tendency or any lesion present on the gingiva. The gingiva should be dried before examination can be made. In addition to visual examination and exploration with instrument, firm but gentle palpation should be used for detecting pathological changes in normal resiliency and locating area of pus formation and discharge. The distribution of gingival disease and its acuteness or chronic condition should also be noted on the case sheet.

### Examination of Tongue and Sublingual Space (Fig. 4.7)

The child should be asked to extend the tongue to note its size, shape, color, texture and movement pattern. Pathological enlargement of the tongue may be associated with cretinism or mongolism, cyst, neoplasm of the tongue tissues, etc.

- Tongue surface mucosa is examined for desquamation of the papillae, changes in color and tenderness which may be associated with certain avitaminosis, anemia or stress disorder.
- Abnormally short lingual frenum may hamper the tip movement of tongue. Such frenum can be responsible for certain speech defect (frenectomy can be done).
- To examine the dorsum of the tongue\tip of the tongue should be grasped with a cotton gauge square



Fig. 4.7: Finger palpation of sublingual and submandibular space

between thumb and forefinger and gently elevate the tongue. Any lesions are examined bidigitally for its size, shape and consistency.

- Dryness of the tongue may be due to dehydration caused by mouthbreathing habit or xerostomia in case of agenesis of salivary gland.
- The floor of the mouth and underside of the tongue should be examined for cyst, ranula or ulcerations, swelling in the floor of the mouth may cause the tongue to be elevated and affect the speech and tongue movement of the child. The opening of the sublingual and submaxillary salivary glands may become clogged, causing a mucous retention cyst or ranula.

### Examination of Palate

- The child's head should be tipped back slightly for correct observation and examination of palate's shape, color, size and presence or absence of any lesion.
- The consistency of deformities swelling should be investigated carefully by palpation. Scar on palate may be evidence of past trauma or surgical repair of developmental anomalies like cleft lip and cleft palate. Mucosal color of the palate may be changed by neoplasm, infections or systemic disease, trauma or chemical agents.

### Pharynx and Tonsil's Examination

To examine the pharynx and tonsil area the Pedodontist must depress the tongue with either a mouth mirror or a tongue blade to note any color changes, ulcerations or swelling. The proliferation of the laryngeal tonsil may be so extensive that minor space exists in the throat for the passage of food, water and air.

### Examination of Dentition

Both dentition (Primary and permanent) examined for number, of teeth, its color, size, shape occlusion and malformation.

#### A. Number of Teeth

- Anodontia (Absence of teeth) is a rare condition. Partial anodontia or oligodontia is a more common in comparison to anodontia.

- Missing single teeth are more important in the permanent dentition than in the primary dentition. Mandibular second premolar and maxillary lateral incisors are the teeth most often missing.
- Supernumerary teeth are most often seen in the midline of the maxilla but may occur anywhere in either arch (Example- Mesiodens and Paramolar).

### B. Size of Teeth

True macrodontia or microdontia is a rare condition. However, single teeth may be judged small in case of Peg laterals or may appear large in case of gemination or fusion.

### C. Color of Teeth

Abnormal staining of children teeth may be divided into following type:

- Extrinsic staining.
- Intrinsic staining.
  - Extrinsic stain can be caused by chromogenic bacteria, colored food, material alba, producing various colors on children's teeth including black and green stain.
  - Intrinsic stain can be caused by blood dyscrasias, amelogenesis imperfecta, internal resorption and drug such as tetracycline group.

### D. Occlusion of Teeth

The occlusion of the child is examined by asking the child to bite down on his posterior teeth. As the child closes down, Pedodontist guide the mandible gently but firmly into the most retruded comfortable position of the condyle (Centric Relation). The molar and cuspid interdigitation should be checked bilaterally.

### E. Malformation of Teeth

Physical injuries and enamel hypoplasia is the most common cause of malformed teeth. In addition teeth may be dilacerated, microdontia, geminated, fused, notched, Peg shaped from various systemic or developmental disturbances.

### F. Caries Detection

Certain anatomical differences in primary teeth such as extremely large pulp chambers, prominent pulp horns

and their proximity to external surface of tooth can be evaluated radiographically that makes it vulnerable to caries development. It should be examined early and treated promptly.

- Detection of the incipient carious lesion in teeth can be approached by several methods.
  - With mirror and sharp explorer. Pit and fissure caries and cervical caries can be detected.
  - Bitewing radiographs are essential for the detection of interproximal lesion, especially those between the wide contacts of primary molars.
- Caries activity test may be performed for early detection of caries development. Those tests are as follows:
  - Lactobacillus counts test
  - Snyder test
  - Alban's test
  - Salivary viscosity test
  - Salivary reductase test
  - Salivary flow test
  - Enamel solubility test.

### Uniform Dental Recording

Most commonly used tooth numbering system is as follows:

- Universal system
- Federation Dentaire International (FDI System).

#### Universal System

This system of numbering permanent teeth from 1 no. to 32, beginning with the upper right 3rd Molar (numbered 1) and progressing around the arch to the Upper left 3rd molar (numbered 16), down to the lower left 3rd molar (numbered 17) and around the arch to the lower right 3rd Molar (32). The Primary teeth are identified in the Universal system by the First 20 letters of Alphabet, A through T.

1 2 3 4 5 7 8	9 10 11 12 13 14 15 16
32,31,30,29,28,27,26,25	24,23,22,21,20,19,18,17

Permanent Dentition (Universal System)

A B C D E	F G H I J
T S R Q P	O N M L K

Primary Dentition (Universal System)



**Federation Dentaire Internationale (FDI System)**

According to this system, the 1st digit indicates the quadrant and the second digit showed the type of teeth within the quadrant. Quadrants are allotted the digit 1 to 4 for the permanent teeth and 5 to 8 for the primary teeth in a clockwise sequence; starting at the upper right side, teeth within the same quadrant are allotted the digit 1 to 8 (and Primary teeth 1 to 5) for permanent teeth from the midline backward.

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

(FDI System, Permanent Dentition)

55	54	53	51	61	62	63	64	65
85	84	83	81	71	72	73	74	75

(FDI System, Primary Dentition)

**OTHER DIAGNOSTIC AIDS**

- Auscultation (Stethoscope in Dentistry):** Stethoscope is used for the auscultation of the TMJ sound, which amplifies the joint sound for both the patient and Pedodontist. It can reveal noises diagnostic for numerous conditions. The intensity and nature of sounds (clicks, pop, and crepitus) should be recorded accurately. Stethoscope is also used for detecting any abnormal occlusal movements by recording grinding, grating or any rubbing sound.
- Percussion:** Percussion test of a tooth makes it possible to evaluate the status of the periodontium surrounding the tooth. The tooth is struck a quick and moderate blow, initially with low intensity by the fingers then by increasing intensity by using the handle of mirror or blunt instrument on each cusp of teeth and each surface of teeth to determine whether the tooth is tender or not, if tender which root/surface is involved.
- Palpation:** The test is done with finger tip using light pressure to examine tissues consistency and pain response. Its value lies in locating the swelling over an involved tooth and determines the following:
  - Whether the tissues are fluctuate and enlarged sufficiently for incision and drainage.
  - To find out exact location of pain and its intensity.
  - To find out location of adenopathy.

- To find out bone Crepitus in case of fracture of alveolar or facial bone.

4. **Radiographs:** Radiograph is a useful diagnostic aid in the orofacial examination of the child. Radiograph should be performed when the patient history, sign and symptom leads to the conclusion that further useful information may be necessary to get the diagnosis.

**Indication for Radiograph in Children and Adolescence**

- Detection of the carious lesion in primary, mixed and permanent dentition with a proximal contact area.
- Injury to the tooth and supporting tissues.
- Disturbances in tooth development and growth.
- Examination of pathological condition.

Radiograph provides following important information about:

- Presence/absence of incipient carious lesion.
- Anomalies of teeth.
- Alterations in calcification of teeth.
- Alterations in growth and development.
- Alteration in the integrity of Periodontal Membrane.
- Alteration in supporting bone change in trabecular pattern and bone density).
- Changes in the integrity of teeth.
- Pulpal evaluation.
  - Two types of pediatric dental films are available:
    - Intraoral X-ray film
    - Extraoral X-ray film

**PULP VITALITY TEST**

These tests are used for checking the vitality of the pulp. The following methods are employed:

**Electric Pulp Testing**

The objective of the electric pulp test is to stimulate the pulpal response by subjecting the tooth to an increasing degree of electric current.

**Method**

After drying the crown portion of teeth an electrolyte is applied on the tooth. One electrode placed against the electrolyte applied enamel of the crown occlusobuccally or incisolabial surface. The patient cheek

is retracted with free hand of the dentist. This hand contact with patient cheek completes the electrical current (One electrode contact with tooth surface and other electrode have a contact with dentist hand). The current is increased slowly and pain sensation is recorded. A positive response is an indication of vitality of pulp and helps in determining the normality or abnormality of pulp. This test is not reliable for Primary dentition.

### Thermal Testing

This test involves the application of cold and heat to a tooth to determine pulp sensitivity to thermal changes.

- a. *Heat testing:* The area to be tested is isolated and dried, warm air or hot gutta-percha is directed to the exposed surface of tooth and patient response is noted. If a higher temperature is required to get a response, usually indicates the presence of a pulpal or periapical disorder, requiring endodontic treatment. Hot water or hot gutta-percha, hot burnisher or hot compounds are used to deliver a controlled temperature to the tooth.
- b. *Cold testing:* Cold can be applied on the tooth surface in several different ways.
  1. A stream of cold air can be directed against the crown of previously dried tooth and also at gingival margin.
  2. Frosted ice of refrigerator packed in the open ended (without needle) syringe can be applied over the isolated dried tooth surface.
  3. Tooth can be isolated under rubber dam and sprayed with ethyl chloride.
  4. CO<sub>2</sub> snow has also been used for application of cold to teeth.
  5. A response to cold indicate a vital pulp regardless of whether that pulp is normal or abnormal.

### Laser Doppler Flowmetry

Laser Doppler flowmetry measures the velocity of RBCs in pulp capillaries. It is a noninvasive and painless alternative to traditional neural stimulation methods, so it is a promising pulpal test for young children (for primary dentition).

The flowmetry produces regular signal fluctuation for vital teeth. A nonviable tooth shows no synchronous signals but produces irregular fluctuations or very steep spike trace that was attributed to a movement artifact.



Fig. 4.8: Pulse oximetry with dental lead

### Pulse Oximetry in Evaluation of Pulp Vitality (Fig. 4.8)

It is a completely objective test requiring no subjective response from the patient that directly measures blood oxygenation saturation level. To determine oxygen saturation, the pulse oximetry measures and compare amplitude of the ratio of transmitted infrared with red light. This ratio varies with relative fraction of oxygen saturated to unsaturated hemoglobin and hence used to calculate oxygen saturation.

These characteristic infers that the pulse oximetry is also capable of evaluating the blood vascularity status within a tooth and therefore pulp vitality. The dependence on a pulsatile blood flow appears to be a disadvantage of the use of the pulse oximetry.

### Fiberoptic Transillumination Test for Teeth

It is used to identify, proximal surface caries in anterior teeth. Transillumination is accomplished by placing light source on the lingual side of the anterior teeth and directing the light through the teeth. Proximal surface caries (except incipient lesion) appears as a dark area along the marginal ridge when light directed through the tooth. It is also used to detect color changes of tooth that may indicate loss of vitality.

### Study Casts

Study models are accurate plaster replicas of the teeth and their surrounding soft tissues. It is an essential diagnostic aid that enables to study the arrangement of teeth and occlusion from all direction.

Study models used for following purpose:

- i. Study of occlusion from all aspects.
- ii. Accurate measurement can be made in dental arch, (with help of study cast only).



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Table 4.6: Common diseases, their investigations and treatment chart

S.No.	Disease	Investigations	Treatment
1.	Diabetes	<ol style="list-style-type: none"> <li>Blood sugar level <ul style="list-style-type: none"> <li>Fasting blood sugar</li> <li>Postprandial blood sugar</li> <li>Random blood sugar.</li> </ul> </li> <li>Oral glucose tolerance test.</li> <li>Urine test for ketone bodies</li> </ol>	<ol style="list-style-type: none"> <li>Dietary management</li> <li>Oral hypoglycemic agent</li> <li>Insulin therapy</li> </ol>
2.	Viral hepatitis	<ol style="list-style-type: none"> <li>SGOT and SGPT level</li> <li>Serum bilirubin</li> <li>Prothrombin time</li> <li>Serum alkaline phosphates</li> <li>Urine urobilinogen</li> </ol>	<p>Bedrest</p> <p>Light diet in the form of fruit, juices, soft drink and glucose and good amount of protein.</p>
3.	Rheumatic	<ol style="list-style-type: none"> <li>Blood examination <ul style="list-style-type: none"> <li>Shows leukocytosis</li> <li>Raised ESR</li> <li>Raised C-reactive protein</li> </ul> </li> <li>Anti-streptolysin antibodies titer</li> <li>Throat swab culture for group A-<math>\beta</math> hemolytic <i>Streptococcus</i></li> <li>Chest X-ray</li> <li>ECG and cardiograph</li> </ol>	<ol style="list-style-type: none"> <li>Salicylate</li> <li>Corticosteroid therapy</li> <li>Antibiotics- procaine penicillin</li> </ol>
4.	Infective endocarditis	<ol style="list-style-type: none"> <li>Blood culture and examination <ul style="list-style-type: none"> <li>ESR raised</li> <li>Leukocytosis</li> <li>Normocytic, normochromic anemia.</li> </ul> </li> <li>Increased serum C<sub>3</sub> level</li> <li>Urine examination and ECG</li> </ol>	<p>Antibiotics</p> <ol style="list-style-type: none"> <li>Penicillin</li> <li>Cefazolin</li> <li>Vancomycin</li> <li>Tetracycline</li> </ol>
5.	Anemia	<ol style="list-style-type: none"> <li>Blood Hb level, RBC count</li> <li>Mean cell volume WBC count</li> <li>Reticulocyte counts, platelets count</li> <li>Peripheral blood film and serum iron level</li> </ol>	<ol style="list-style-type: none"> <li>Iron supplement</li> <li>Vitamins supplements</li> <li>Blood transfusion</li> </ol>
6.	Hemophilia	<ul style="list-style-type: none"> <li>Bleeding time, Platelet counts</li> <li>Level of factor VIII</li> <li>Level of von Willebrand's factor</li> </ul>	<ol style="list-style-type: none"> <li>Intravenous infusion of factor VIII (plasma concentrate)</li> <li>Blood transfusion</li> </ol>
7.	Leukemia	<ul style="list-style-type: none"> <li>Blood Hb level, platelet count</li> <li>WBC and reticulocyte count</li> <li>Bone marrow examination</li> <li>Peripheral blood film shows blast cells</li> </ul>	<ol style="list-style-type: none"> <li>Specific drug therapy <ul style="list-style-type: none"> <li>Intrathecal drug therapy</li> <li>Hydroxyl urea and mercaptopurine</li> </ul> </li> <li>Supportive treatment <ul style="list-style-type: none"> <li>Anemia, bleeding due to thrombocytopenia</li> <li>Antibiotics for infection control</li> </ul> </li> <li>Bone marrow transplantation</li> </ol>
8.	Tuberculosis	<ul style="list-style-type: none"> <li>Mantoux test</li> <li>Sputum examination</li> <li>Chest X-ray</li> <li>Blood examination</li> </ul>	<p>Antitubercular drug therapy</p> <ul style="list-style-type: none"> <li>Rifampicine</li> <li>Isoniazid</li> <li>Pyrazinamide</li> <li>Ethambutol</li> <li>Streptomycin</li> </ul>

### Periodontal Probe

Periodontal probe are used to measure the depth of pockets and to determine their configuration. The typical probe is tapered instrument calibrated in millimeter, with a blunt rounded tip.

### Types of Periodontal Probe

- The Marquise color coded probe
- The UNC 15 probe
- The University of Michigan 'O' Probe with Williams marking at 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 mm.
- The Michigan 'O' probe with marking at 3, 6 and 8 mm.
  - i. *The WHO Probe (Fig. 4.8)*: 0.5 mm at ball tip and mm marking at 3.5, 8.5 and 11.5 mm with color coding from 3.5-5.5 mm.
  - ii. *Other advanced diagnostic aids*:
    - a. *Xeroradiography*: It is an X-ray imaging system that uses the xerographic copying process to record images. The main advantages of xeroradiography over conventional radiography are enhanced edge image and sharper picture. No use of developer or fixer solution.
    - b. *Use of computers in dental office*: Computers help us by retention of thousands of patient records in small disk or hard disk and whenever it is required can be seen easily. It also helps in comparative digital study of radiograph or cephalograms.
    - c. *Ultrasonic*: The fundamental use of high sonic vibrations is to define areas of differing physical properties by reflection of waves from the surface

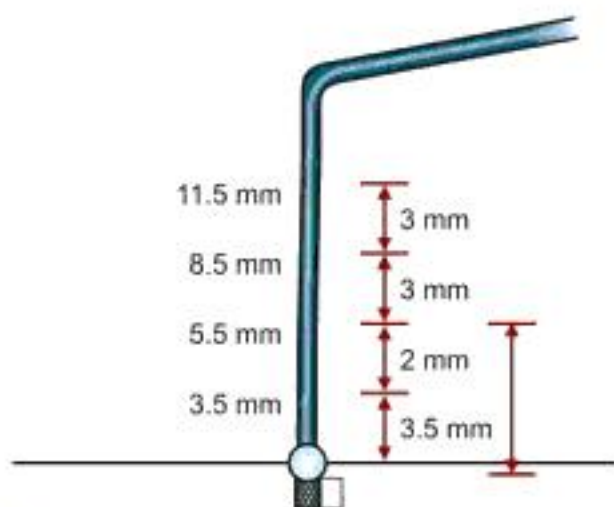


Fig. 4.9: Sketch diagram of the WHO periodontal probe

of adjacent areas of tissues it also helps in defining the:

- i. Pulp anatomy
  - ii. Shape of soft tissues
  - iii. Neoplasm.
- d. *CADIA (Computer Assisted Densitometry Image Analysis System)*: In this system, a video camera measures the light transmitted through a radiograph and signals from the camera is received by image processor of the computer that allows storage and manipulation and the images.

## DIAGNOSIS

### Collection of Important Information

- It should be collected and noted. Certain pathognomic sign may lead to an early diagnostic decision. All historical facts about the child should be systematically collected and correlated.
- It is often necessary for the dentist to make a diagnosis before all the facts have been collected to prevent the disease process from progression (Ex. ANUG). In some cases a period of observation may be necessary before the final diagnosis and their respective therapy.

### Evaluation of Patient Record

There must be critical evaluation of collected facts in relation of the overall picture and the chief complaint. Not infrequently parents are poor historians. The clinical signs, symptoms noted by the dentist may differ from parent given history/facts.

### Making the Diagnosis

The history, clinical examination and laboratory investigation results are important in making the diagnosis through the information collected; several disease processes might be suggested. There is always the possibility that more than one disease may be present at the same time. In few cases consultation with super specialist is necessary before to reach final diagnosis and treatment plan.

## TREATMENT PLANNING

- A. *Medical treatment*: When the history and Examination suggest a medical problem, Pedodontist should



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Types of dental radiograph		
Intraoral	Extraoral	Specialized
IOPA	Lateral Oblique jaw • Lateral ramus • Condyle	Panoramic
Bite Wing	Skull Projections Lateral skull projection • PA view • Projections of max. sinus • Tangential zygomatic Projection	Sialography
Occlusal radiograph	TMJ Projections • Lateral TMJ articulation • Transcranial articulation • Anteroposterior articulation	Xeroradiography and Radiovisiography

## RADIOGRAPHIC TECHNIQUES IN DENTISTRY

### Intraoral Radiography (Fig. 5.2)

They are the backbone of dental radiography. There are three categories of intraoral radiography:

1. Periapical; Used to show a tooth and its surrounding bone and associated structure.
2. Bitewing
3. Occlusal.



Fig. 5.2: IOPA X-ray of maxillary anterior region

Two Projection techniques are followed for IOPA X-ray



### Paralleling Technique (Fig. 5.3)

- It is also called right angle or long cone technique. X-ray film and tooth are parallel to each other, and X-ray passes at right angle to them. To achieve this, the film is placed farther away from the object, particularly the maxilla. This will tend to magnify the image. This undesirable effect can be reduced by using longer cone.

### Bisecting Angle Technique (Fig. 5.4)

It is based on Cieszynski's rule of isometry. It advocates that two triangles are equal if they have two equal angles and a common side. In dentistry, the film is placed close to lingual surface of the teeth, resting on the palate or in the floor of the mouth. The plane of the film and the long axis of teeth form an angle, with its apex at the point where the film is in contact with the teeth. When this angle is bisected by imaginary line or plane, two congruent angles, with a common side is formed. Central beam of X-ray will complete the third side when directed perpendicular to the bisecting line. The two triangles will be right angle triangles and congruent with the corresponding equal sides. As a result, the image cast on the film will be of the same length as of tooth.

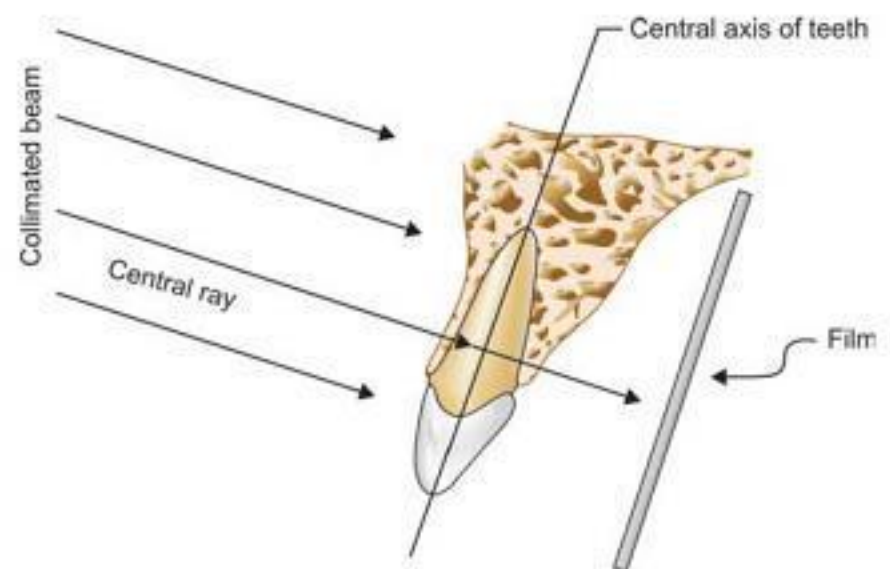


Fig. 5.3: Sketch diagram of paralleling technique of dental X-ray. See the position of X-ray film, long axis of tooth and central beam of X-ray



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**Fig. 5.9:** Head position for PA view of skull. See the position of tip of the nose, forehead and X-ray plate

The long axis of the film, also perpendicular to the floor, rest on the patient's shoulder and against the face. The patient is asked to rotate the head toward the film until the nose rests against it. The cone is positioned that the central X-ray beam enters at a point half an inch behind and below the angle of the mandible on side opposite to the film. The central beam is perpendicular to the horizontal plane of the film.

*Exposure parameters:* 75-80 KvP depends upon X-ray machine and film.

#### *Sub-mentovertex Projections (Fig. 5.11)*

It is also called base or full axial projections

*Indication:* It is used to examine:

- Base of the skull
- Condyle
- Sphenoid sinus
- Curvature of mandible
- Lateral wall of maxillary sinus
- Fractured zygomatic arch.

*Head position:* Patient head and neck are hyper-extended and vertex of the skull is placed at centre of cassette. The film is placed vertically.



**Fig. 5.10:** Head position for lateral cephalograms, The X-ray cone is positioned that the central X-ray beam enters at a point a half inch behind and below the angle of the mandible on side opposite the film. The central beam is perpendicular to the horizontal plane of the film



**Fig. 5.11:** Position of head and neck during submento-vertex radiography. X-ray plate adheres base of skull



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# Normal Child Development

## INTRODUCTION

Study of child development provides us an opportunity for integration of various biological, psychoanalytical, learning, psychosocial and interactive theories into one coherent view. This study is especially important for Psychiatrist and Pedodontist who are trying to understand the period from conception to adolescents when development is most substantial, dramatically, and fundamentally important. The developmental features of child are:

1. Development as inherent in nature; genetic predisposition.
2. Development as transactional in nature; the transactional quality of development which is interplay of nature (environment) and nature (child's nature) forms the basis of most current thinking and research. Developmental tutoring recognizes that children interact with their environment even before birth in ways that significantly stimulate or inhibit potential. For example- A mother who ingested folic acid helps her fetus to avoid the risk of spina bifida.

Normality in developments; usually, normality means freedom from pathology. In this context (not without opposition), labeling a child as normal with respect to developmental maturity is a common practice. In child's psychiatry normality conveys a continuum (series of similar item in which each is almost same as the one next to it but the last is very different from the first) with various period of rapid change. This concept of normalcy is important for understanding a critical, transactional principle; a child's development operates as a two way street of regression and progression. Typically occurring

before growth spurt, environmental or internal change can create a street that causes developmental skills in particular areas to be lost. This phenomenon is called as regression.

- Neurotic regression of a child pertaining to the self perpetuating psychosocial isolation means break between individuals and their environments- that hamper further development in other areas. Example- a neglected 3 to 5 year old child who is emotionally regressed will have trouble developing social empathy, applying temperamentally assertive skills, and cognitively refining problem solving tools.
3. Distinct area of development; to study child's development, growth is often differentiated into distinct developmental areas. Each area is considered to mature independently, yet they interact in ways that ultimately change the outcome of each separate event. A child's development has seven significant areas to be considered.
    1. Physical development (Table 6.1)
    2. Temperamental development (Table 6.2)
    3. Cognitive (means mental processes of understanding) development
    4. Social development
    5. Emotional development
    6. Moral development
    7. Psychosexual development.

## Clinical Significance of Developmental Theories

Developmental theories help both Psychiatrist and Pedodontist to understand how a single cell grows into a complex child who has all the skills necessary to enter



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**Table 6.4: developmental social mile stone with age**

Age	Developmental Social milestone
2 months	Social smile
3 months	Recognizing mother
6 months	Smiles at mirror image
9 months	Wave bye-bye
12 months	Plays a simple ball game
36 months	Knows gender

formation, substitution, rationalization, compensation and escape.

**Emotional maturation:** Predicted upon genetic predispositions, environmental exposures and behavioral repetitions occur through the development of complex interactive pathways within a child’s brain. Example–persistent and pervasive anxiety of children who are neglected or abused as infant, stem from enormous stimulation and subsequent high degree of development of those, particularly brain synapses.

**Psychosexual development:** Psychosexual development involves the process of infants and

children learning to view themselves and other in terms of gender. It includes aspects of sexual, physical maturation. There are three stages describes psychosexual maturation. From infancy onwards, most psychosexual maturation focuses upon the psychological stages of sexual development.

Stage 1: Gender identity; A child’s perception of self as either male or female begins at 3 to 4 years. 2/3rd of 3 to 7 years old children know their own sex, based upon cues such as clothing and hair.

Stage 2: Gender roles: The formation of a concept of behavior related to their own gender identity.

Stage 3: Gender relationship: The formation of children’s attractions to a particular gender in others.

**Freudian theory of psychosexual development:**

His theory however, has both historical significance and relevance for social, emotional, and moral development. The basis of Freud’s schema is that children move through a series of stages during which a conflict between their biological drives and social expectations is confronted. Inherent in this theory is the concept of the critical role that ages 0-5 play in personality development. Freud’s

**Table 6.5: Children showing emotional skills and developing emotional behavior at different age group**

Age	Emotional skill	Developing emotional behavior
0 to 2 months	Love evoked by touching Fear evoked by loud sound Rage evoked by body restriction Brain pathways for emotion forming	Social smile and joy shown responds to emotions of others
3 to 4 months	Self regulations of emotion starts Brain pathway of emotions growing	Laughter possible and more control over smile, anger shown
7 to 12 months	Self regulation of emotion grows	Able to elicited more responsiveness Denies to cope with stress
1 to 2 years	Increase intensity of basic three Same, pride appear, envy, embarrassment appear, displaces on to other children	Some indications of empathy, starting expression of feeling, like attention and approval; enjoy play alone.
2 to 5 years	Can understand cause of many emotions.	Empathy increases with understanding, more response and less reaction; self regulation Aggression become competition by age 5. Shows sensitivity to criticism and care about feeling of others
5 to 11 years	Can begin to find ways for regulating emotions and for expressing them identified with adult to cope Can react to the feeling of others More aware of others feeling	Ego rules until age 6 empathy become altruism Super ego dominates



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can lead to characteristic maladaptive behavior in their children.

- a. **Overprotective attitude:** These parents do not allow their children opportunity to experience and learn to cope with the problems and anxieties of life. As a result, they are frequently very shy, fearful of new situations, and lacking in self confidence. Parent may harbor anxieties about dentistry because of previous personal experience and well impart these anxieties to their children. Over protective parents cling to their children in the waiting room and may insist on accompanying them to the operatory, regardless of their ages.
- b. **Overindulgent attitude (Tending to allow doing whatever child want):** Children of over indulgent parent often develop distorted view of their position in society. They learn to manipulate their parent into satisfying all of their wants and tend to act superior, bossy, and demanding. Typically, they present the same type of behavior when confronted by the dental situation and often classified as the defiant or spoiled child.
- c. **Overauthoritative attitude:** These dominating parent expect behavior from their children that is incompatible with their ages. They are not supportive of their anxieties but rather constantly criticize them. They may compare them with older siblings and demand the same behavior. These children will often be afraid of overtly resisting the dentist but will commonly use delaying tactics in an attempt to avoid the dental procedures. These children can grow to resent their parent and other authoritative figures.
- d. **Rejecting/under affectionate attitude:** This group includes a variety of parental behavior that range from mild, lack of interest to rejection or physical abuse. Parental lack of affection or attention that they show to their children may be a result of heavy workload or other interest or caused by severe emotional problems. Children in these homes develop very poor self images and may present with a variety of behaviors. The physically abused child is often stoic and non responsive to painful procedures. The abused child might also be loud and aggressive, seeking the attention that is missing at home.

**2. Medical history:** There is a general agreement that child who view medical experiences positively are more likely to be cooperative for the dentist. Few studies have shown that previous surgical experiences adversely influences behavior at the 1st dental visit, but this was not the case in subsequent visit.

**3. Awareness of dental problem:** Few children may approach dental office knowing that they have a dental problem. The problem may be as serious as a chronic dental abscess or as simple as extrinsic staining of the dentition. However, there is a tendency towards negative behavior at the 1st dental visit when the child believes that dental problems exist. The finding may be the results of anxiety or apprehension transmitted to the child by a parent.

**Child behavior pattern in the dental office/ clinic:** The key to successful management of children presenting with disruptive behavior is to accurately diagnose the offending behavior. Once recognized, the Pedodontist can utilize an appropriate behavior management technique to control it. Wright classified behavior of children in to three categories:

1. Cooperative.
2. Lacking in cooperative ability.
3. Potentially cooperative.

#### *Cooperative Behavior*

Most children seen in the dental office are cooperative in behavior. Cooperative children are reasonably relaxed. They have minimal apprehension. They may be enthusiastic. They can be treated by straight forward behavior shaping approach and they perform within the frame work provided.

#### *Lacking in Cooperative Ability*

This category of classification includes very young children with whom communication can not be established and comprehension can not be expected, because of their age, they lack cooperative abilities. This category also includes specific disabling condition that severely limits their communication skills. Management of such cases is often best accomplished through the use of pharmacologic agents for sedation or general anesthesia.



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**Fig. 7.5:** Small child is seeing the dental work in the mouth of other patients. This technique will help child to develop positive attitude towards future dentistry. This technique is known as modeling

to these interruptions. Thus, the Pedodontist should calmly but firmly proceed. The child may cry during the injection procedure, but once it is completed he will usually cooperate fully.

**Modeling (Fig. 7.5):** Modeling is a type of behavior modification technique where a young patient can learn about the dental experience by viewing other children receiving treatment. Several scientists have reported that this technique seems to improve the behavior of apprehensive patient who have no previous dental experience.

One simple method of modeling is to allow the child to come in and observe the treatment of older sibling. Several Pedodontist employ modeling by utilizing open bay operator, so that treatment of several children is visible from any dental chair. Another modeling technique that has been shown to be effective in gaining cooperative behavior involves showing a video tape of a child undergoing treatment. Video tape equipment is now readily available at a reasonable cost, thus this technique has great clinical practicality for use as a modeling system in the private dental office.

**Desensitization (Fig. 7.6):** This is also a type of behavior modification technique. It is used to retrain a child who present with prestablished fear and



**Fig. 7.6:** Desensitization of three-way syringe fear by directing light air pressure on the skin of the child's hand

uncooperative behavior. The fear may be the result of an unpleasant dental experience or negative comments about dentistry by the child's parents, siblings, or peers. To begin desensitizing a child, it is extremely helpful to learn the source of fear.

The dentist can then begin a program of behavior shaping using TSD technique to teach the child new and more pleasant associations with the anxiety provoking stimuli. Example – A 3 years old child may be fearful of an oral prophylaxis because of a story told by a play mate or the design or sound of three way syringes. Applying desensitization technique would involve allowing the child to touch and hold the hand piece with a prophylaxis angle accompanied by an explanation such as following “ Yash! This is your tooth polisher and this little rubber cup makes your teeth shine. It also shines your finger nails, however, so let's polish one of yours teeth so you can see how it feels”. As child discovers that anticipated pain does not occurs, his previous fears are extinguished and he begins to trust the dentist.

**Flooding technique:** Flooding is described as a behavior modification technique that eliminates a child's attempts to avoid experiences that he perceives to be undesirable, by preventing his avoidance or escape. Once the child is exposed to the perceived undesirable experience, he appropriately learns that there was no reason for him to attempt to avoid the situations. Two



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## PROTEINS

Proteins are complex organic nitrogenous compounds. They are composed of carbon, hydrogen, oxygen, nitrogen and sulphur in varying amounts. Some proteins also contain phosphorus and iron and sometimes other elements. Proteins differ from carbohydrates and fats in that they contain nitrogen, this usually amounting to about 16 percent. Proteins constitute about 20 percent of the body weight in an adult.

### Functions of Proteins in the Body

- Body building—This component is small compared with the maintenance component, except in the very young child and infant.
- Repair and maintenance of body tissues.
- Maintenance of osmotic pressure.
- Synthesis of certain substances like antibodies, plasma proteins, hemoglobin, enzymes, hormones and coagulation factors.

Proteins are connected with the immune mechanism of the body. The cell mediated immune response and the bactericidal activity of leucocytes has been found to be lowered in severe forms of protein energy malnutrition. Proteins can also supply energy (4 kcal/gram) when the calorie intake is inadequate, but this is not their primary function.

### Sources of Proteins

Humans obtain protein from two main dietary sources:

- Animal sources:* Proteins of animal origin are found in milk, meat, eggs, cheese, and fish. Egg proteins are considered to be the best among food proteins because of their high biological value and digestibility. It is used in nutritional studies as a "reference protein".
- Vegetable sources:* Vegetable proteins are found in pulses (legumes), cereals, beans, nuts, oil etc. In developing countries like as India, cereals and pulses are the main sources of dietary protein because they are cheap, easily available and consumed in bulk.

## FATS

Fats and oils are concentrated sources of energy. They can be classified as:

- Simple lipids, e.g. triglycerides.
- Compound lipids, e.g. phospholipids.
- Derived lipids, e.g. cholesterol.

The human body can synthesize triglycerides and cholesterol endogenously. 99 percent body fat is available within the adipose tissue in the form of triglycerides. In normal human being, adipose tissue constitutes about 10 to 15 percent of body weight.

### Fatty Acids

- Hydrolysis of fat yields fatty acids and glycerol. Fatty acids are divided into saturated fatty acids such as lauric, palmitic and stearic acids, and unsaturated fatty acids which are further classified into mono-unsaturated and polyunsaturated fatty acids.
- The polyunsaturated fatty acids are mostly found in vegetable oils, and the saturated fatty acids mainly in animal fats. However, there are exceptions, as for example, coconut and palm oils, although vegetable oils, have an extremely high percentage of saturated fatty acids. On the other hand, fish oils, although they are not vegetable oils, contain poly and mono-unsaturated fatty acids.

Essential fatty acids are those that cannot be synthesized by humans. They can be derived only from food.

1. Linolenic acids
2. Arachidonic acids.

Not all polyunsaturated fatty acids are essential fatty acids. Linoleic acid is abundantly found in vegetable oils.

### Sources

- Animal fats
- Vegetable fats
- Other sources.

### Functions

- They are high energy foods, providing as much as 9 kcal/gram.
- Fats serve as vehicles for fat-soluble vitamins. Fats in the body support viscera such as heart, kidney and intestine and fat beneath the skin provides insulation against cold. Without fat, food is limited in palatability.
- Vegetable fats are rich sources of essential fatty acids which are needed by the body for growth, for structural integrity of the cell membrane and decreased platelets adhesiveness.
- Polyunsaturated fatty acids are precursors of prostaglandins.



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## Eruption of Teeth, its Disturbances and their Management

### TEETHING PROCESS

Eruption of the deciduous teeth usually begins in the 6th month of the child. Eruption of the deciduous teeth is usually preceded by salivation and child likes to put the fingers or toys into the mouth and try to crush it. This symptom indicates that the teeth will soon erupt. In most cases, eruption of deciduous teeth causes no distress to the child, or parents but sometime process causes local irritation which may interfere with the child's sleep. The small deciduous incisor usually erupts without difficulty, but difficult teething is commonly associated with larger teeth.

### SIGNS AND SYMPTOMS OF TEETHING

#### Local signs

1. Swelling of the gingival mucosa over the erupting teeth.
2. Small patches of erythema on the cheek.
3. Inflammation of the gingival tissues before complete emergence of the crown, may cause a temporary painful condition, which may be relieved spontaneously after few days.

#### Systemic Signs

1. General irritability and crying
2. Loss of appetite
3. Sleeplessness and restlessness
4. Increased drooling of saliva
5. Increased thirst
6. Circumoral rash.

### Teething And Associated Problems

The following symptom may be associated with teething process.

*Systemic:* Systemic problems are associated with types of infection which occur due to putting dirty object into the mouth during eruption of teeth.

1. Fever
2. Diarrhea
3. Convulsion
4. Vomiting
5. Cholera
6. Infantile paralysis.

#### Local

1. Eruption hematoma
2. Eruption sequestrum
3. Ectopic eruption
4. Transposition
5. Eruption cyst
6. Transmigration.

### Management of Teething

Since, it is a physiological phenomenon so only symptomatic treatment and those special supporting treatment is considered which may hastened or facilitate the teething process.

#### Local Treatment

1. **Teething Toys:** A child uses their hands and mouth to explore unfamiliar objects. Various types of teething rings, keys and other toys in different shades are



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### Anomalies of Tooth Form

**Double teeth:** A double tooth occurs most frequently in incisor and canine regions and more common in deciduous dentition than permanent dentition. Double teeth may be characterized by notching of incisal edge or by a longitudinal groove in the crown or by partial or complete separation of the root.

Double teeth are formed by fusion of two developing tooth germ. If fusion occurs between two teeth of normal dentition, one tooth appears to be missing from the dentition. The pulp chambers and root canals of double teeth may be united or separated, that depends on the nature, time and stage of dental development at which fusion occurs.

### Management of Double Teeth

1. Requires no treatment, if primary double teeth.
2. In permanent dentition double teeth needs to be treated to improve their esthetics. Ideally separation of double teeth should be delayed until the child reaches at the age of adolescent or adulthood to allow some recession of pulp horn to occurs, thus reducing the risk of pulp exposure. If patient wants early (before 11 years of age) aesthetic improvement, then double teeth may be treated by pulpotomy or pulpectomy/RCT and post crown considered for one or both part of double teeth.

If there is a single pulp chamber in double teeth and division of crown by disc is not possible then some improvement of appearance may be obtained by accentuating the longitudinal groove in the crown to simulate two separate teeth.

### Peg Shaped Lateral Incisors (Fig. 9.1)

Peg shaped lateral incisor resembles with conical supernumerary tooth. Peg shaped lateral incisor may occur unilaterally or bilaterally. Palatal pits are usually associated with lateral incisors. Sometimes, the pit is deep and leads to a chamber formed by invagination of developing tooth germs. This is known as **dens in dente**; caries may develop in the depth of pits and quickly involve the pulp.

### Treatment

1. If the dental arch is overcrowded the peg shaped lateral incisors may be extracted as a part of orthodontic therapy.



**Fig. 9.1:** Left upper peg lateral tooth and it was reformed through esthetic composite with the help of strip crown

2. **Porcelain thimble crown:** A normal shape of crown can be produced by porcelain thimble crown. No tooth preparation is required in peg lateral incisor for crowning. The entire enamel surface of tooth is acid etched and crown are bonded to it with composite resins cement.
3. **Resin crown with help of modifying cellulose acetate crown:** The appearance of peg shaped lateral incisor can be improved by using composite resin in a cellulose acetate crown form. A problem arises during adaptation of cellulose crown form, to the narrow neck of peg tooth. This may be overcome by making a longitudinal cut in palatal part of the cellulose acetate crown form overlapping the two sides and sticking with photographic film adhesive as shown in above diagram.

### Tooth within a Tooth (Dens in Dente)

It is also known as evaginated odontome. A den in dente is a tooth in which an invagination of enamel and dentine appear as a tubercle on the occlusal or lingual surface. This condition occurs both in primary and permanent teeth. It is most commonly found in permanent maxillary central, lateral incisor and premolar. The diagnosis of dens in dente can be verified by dental roentgenograph.

Anterior teeth with dens in dente usually appear in normal size and shape. Tooth within a tooth characterized by an invagination lined with enamel and foramen cecum with probability of communication between pulp chamber and invagination cavity.

### Management of Dens in Dente

1. If invagination causes no occlusal interference application of sealant or a restoration in the opening of the invagination are recommended.
2. If it causes occlusal interference, reduce the interfering enamel and restore with composite.



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molars will be expected to be similarly affected and there is no advantage to be gained by extracting the first molars, except if extensive restorative treatment is required to maintain the teeth.

- **At 18 years of age:** Cast veneer crown is fabricated for permanent hypoplastic first molar.

#### FOR PERMANENT HYPOPLASTIC AND HYPOMINERALIZED INCISORS

- *At 6 years of age:* Composite resin, GIC cement, composite veneer or porcelain veneer is recommended.
- *At 18 years of age:* Porcelain veneer or jacket crown.

#### FOR HYPOPLASTIC CANINE AND PREMOLARS

- *At 12 years of age:* GIC cement/composite resin.
- *At 18 years of age:* Porcelain/cast crown/full cast veneer.

#### Enamel hypoplasia vs Nursing caries

Enamel hypoplasia	Nursing caries
<p><b>Caries pattern:</b> Max. incisors, second primary molar</p> <p><b>Surface involved:</b></p> <ul style="list-style-type: none"> <li>• <b>Incisor:</b> Circular pattern on incisal edge</li> <li>• <b>Molar:</b> Circular pattern along developmental line.</li> </ul> <p><b>Symmetry of lesion:</b></p> <ul style="list-style-type: none"> <li>• Usually bilateral symmetric lesion</li> </ul> <p><b>Child age when notice lesion</b></p> <ul style="list-style-type: none"> <li>• At the time of eruption of teeth.</li> <li>• Medical condition associated with dental lesion, cerebral palsy or premature birth.</li> </ul>	<p>Maxillary incisors and first primary molar</p> <ul style="list-style-type: none"> <li>• Commonly involved lingual, facial and proximal surface. Minimal or no involvement of incisal edge.</li> <li>• May be symmetric or asymmetric</li> </ul> <p>Average 20 months of child of teeth.</p> <ul style="list-style-type: none"> <li>• None</li> </ul>

#### Dentinogenesis Imperfecta

It is a hereditary dentinal defect that may or may not be associated with osteogenesis imperfecta. The color of the teeth in dentinogenesis imperfecta varies from gray to brownish blue. The crown is bulbous and constricted cervically. The enamel is normal and poorly supported by defective dentine. High attrition occurs in exposed dentinal surface. Radiographs showed that teeth have short thin root and obliterated pulp chambers and root canals. All teeth of both dentitions are affected.

#### Treatment

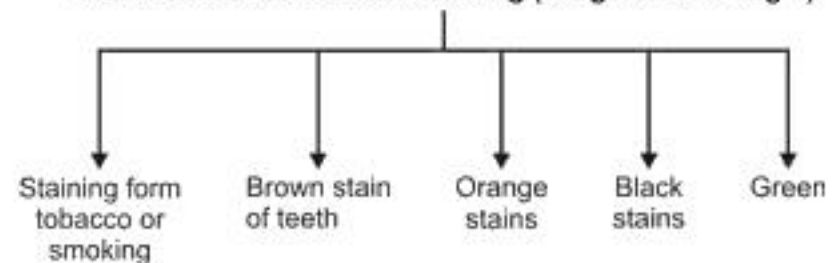
1. Stainless steel crown for both primary and permanent molars showing dentinogenesis imperfecta
2. Acrylic crown may be made for anterior teeth having dentinogenesis imperfecta.

A specific problem associated with dentinogenesis imperfecta is that the teeth are often unsuitable for crowning because they are poorly supported by short thin roots and defective dentine. An assessment must be made of their suitability for crowning, but eventually it may become necessary to extract the teeth and provide normal denture.

#### Staining of Teeth

Teeth may become discolored by variety of intrinsic and extrinsic stains. Those stains which are incorporated into tooth structure are known as intrinsic tooth stain. Example- Porphyria, tetracycline and erythroblastosis fetalis. The exogenous substance may stain teeth known as extrinsic staining.

#### Classification of extrinsic staining (exogenous in origin)



- a. *Stains from tobacco smoking:* On the teeth of children and adolescence, who smokes stain very often occur as yellowish brown to black deposits, as a result of collection of tobacco tars and resins. The deposit is harmless to the teeth although it should be removed because of unesthetic appearance and acts as a nidus for calculus deposition.
- b. *Brown stains:* A delicate dental plaque known as 'mesenteric line' was termed by Pickerill and appears to be plaque of brown or black dots which may mingle to form a thin dark line and the enamel at the cervical margin of the tooth.
- c. *Black stains:* The black stains are caused by bacteria *actinomyces sp.* in the plaque.
- d. *Green stains:* Heavy gray green stains frequently have been seen on the gingival 3rd of maxillary anterior teeth in children and adolescence and rarely in adult. This stain is soft or furry in nature and is difficult to



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- This change in shape is possible because at birth, relatively large unclassified fontanelles are present between the flat bones of brain case. As the head compressed within the birth canal, the calvarium can increase in length and decrease in width, assuming the required tubular form and easing delivery of infant through birth canal. The lack of mandibular growth prenatally also makes birth easier.
- After birth; for a short period, growth decreases and there may be a small decrease in weight during the 1st 7 to 10 days. Such an interruption in growth pattern produces a physical effect in both bony and dental tissues. This can be evident by developmental line in dental (neonatal line) tissues.
- Permanent as well as primary teeth can be affected by illness during infancy and early childhood.

### Gum Pad (Figs 10.1A to B)

The alveolar process at the time of birth are known as gum pads. They are pink, firm and covered by dense layer of fibrous periosteum and gingiva.

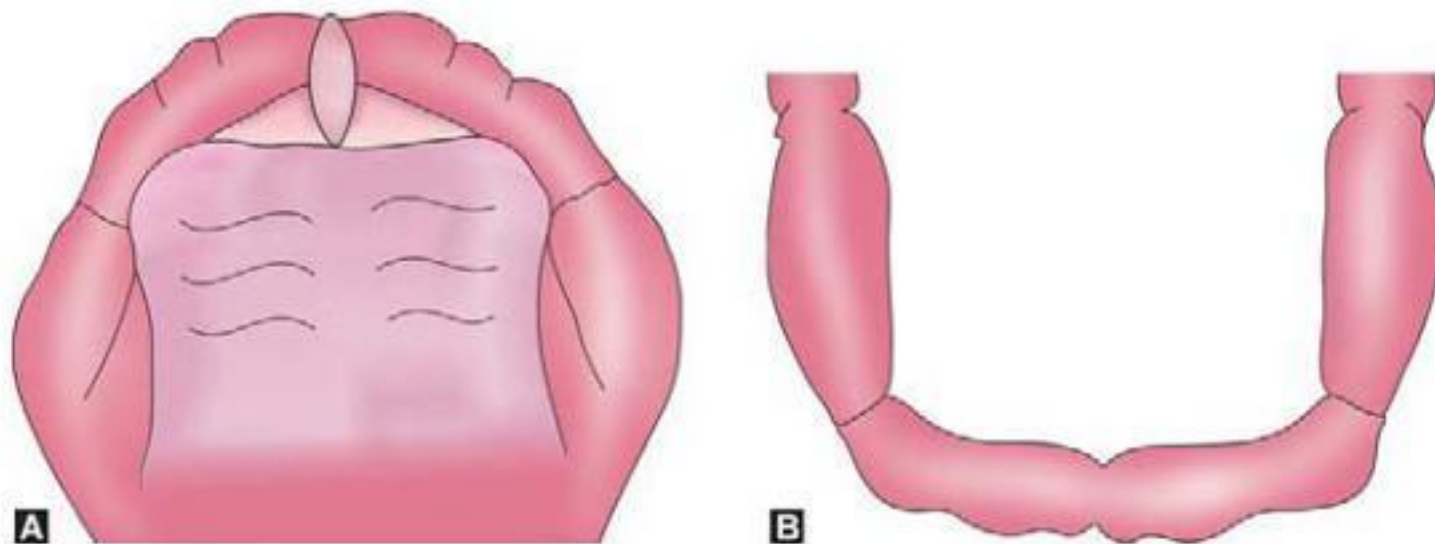
*They are horse-shoe shaped and developed in two parts:*

- Labiobuccal position
  - Lingual position.
1. The two parts are separated from each other by a groove known as dental groove. Each gum pad is divided into ten segments by transverse grooves. Each of these segments consists of one developing primary tooth sac. The initiation of primary tooth buds occurs during the first 6 weeks of intrauterine life.

2. The gingival groove separates the gum pad from the palate and floor of the mouth by a transverse groove between the canine and first deciduous molar segment is known as lateral sulcus.
3. The lateral sulcus in 70 percent of newborn of the mandibular arch is more distal to that of maxillary arch.
4. The upper and lower gum pads are almost similar to each other except the maxillary gum pad is slightly wider and longer than the mandibular gum pad. Thus, when the upper and lower gum pads are approximated. There is a complete overjet all around.
5. Contacts occur between the upper and lower gum pads in the posterior region and space exists between upper and lower arch in the anterior region.
6. The infantile open bite is considered to be normal for certain period and it helps in sucking.
7. First primary tooth erupts at 6-7 months after birth. Eruption of primary teeth is completed by 2½-3 years of age.

### Eruption of the Primary Teeth (Table 10.2)

The 1st primary teeth usually erupt after 6 months of age. Occasionally a natal tooth may present at the time of birth. The timing and sequence of eruption of primary teeth are shown at above table. Spacing is normal throughout the anterior part of the primary dentition but it is significant in two locations, known as primate space (Fig. 10.3). In maxillary arch, the primate space is located between the lateral incisors and canine, where



**Figs 10.1A and B:** (A) Maxillary gum pad, (B) Mandibular gum pad



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## Growth and Development of Nasomaxillary Complex and Mandible

Term growth usually refers to an increase in size or number. It is largely an anatomic phenomenon, whereas development denotes physiologic and behavioral complexity.

### Theories of Growth Control

Three theories in recent year has been attempted to explain the determinants of craniofacial growth.

1. Bone is the primary determinant of its own growth.
2. Cartilage is the primary determinant of skeletal growth, while bone responses secondarily and passively.
3. The soft tissues matrix in which the skeletal tissues are embedded is the primary determinant of growth, and both bone and cartilage are secondary followers.
  1. *Level of growth control: Site Vs center of growth theory (discarded theory)*
  2. *Cartilage as a determinant of craniofacial growth:* Mandibular condyle can be compared with diaphysis of long bone, bent into horse shoe with epiphyses removed. If this were the true situation, then indeed the cartilage at the mandibular condyle should acts as a growth center, representing epiphyseal growth cartilage.

Growth of maxilla; Since there is no cartilage in the maxilla itself, but there is cartilage in the nasal septum, and nasomaxillary complex grows as a unit. Cartilage theory hypothesizes that cartilaginous nasal septum serve as a key point for other aspect of maxillary growth. If sutures of the maxilla acts as growth center, as they seems to do, then they would response to this translation

by forming new bone when the sutures were pulled apart by forces from the growing nasomaxillary cartilage.

3. *Functional matrix theory of growth:* This is most accepted theory of growth control. Neither bone nor cartilage was the determinant of growth of craniofacial skeleton but it would appear that the control would have to lie in the surrounding soft tissues. This view was given by Moss in 1960s. He theorizes that growth of the face occurs as a response to functional needs and is mediated by the surrounding soft tissues in which the jaws are embedded. In other words, it can be summarized that soft tissues grow, and embedded bone and cartilage react. Moss theorizes that main determinant of growth of maxilla and mandible is the enlargement of nasal and oral cavities, which grow in response to functional requirement. But this theory fails to explain how functional requirement are transmitted to the tissues around the mouth and nose. This theory predict that the cartilage of the nasal septum and mandibular condyle are not important determinant of growth, since loss of septum and condylar cartilage would have little effect on growth, if proper function could be obtained.

### Growth of Maxilla (Figs 11.1 and 11.2)

The maxilla develops entirely by intramembranous ossification. Maxilla grows by two ways:

1. By apposition of bone at the suture that are directly attached to the cranium and cranial base.
2. By surface remodeling.



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## Use of Preventive and Interceptive Orthodontics in Pediatric Dentistry

Term preventive orthodontics refers to the action taken to preserve the integrity of what appears to be normal occlusion at a specific period. Interceptive orthodontic, may be defined as that phase of science and art of orthodontics employed to recognize and remove potential irregularities and malpositions of tooth in the developing dentofacial complex.

### Concepts of Preventive Orthodontics

The concepts of prevention/or early interception is based on a belief that some, if not many, minor dental developmental problems in the younger age groups become major orthodontic needs as age advances. The concept includes a belief that early treatment will often be all that is required, that early treatment may reduce the severity of a malocclusion that will not be fully treated later or that early treatment may reduce the severity of a malocclusion that will be fully treated later reducing the time and possibly the treatment cost. The concepts of preventive orthodontics also includes the belief that such early examinations of child patient development of longitudinal records, and early interventions in many cases by general dentist or specialist will provide an experience and clinical data base from which society and our profession will benefit.

The development of malocclusion depends on the growth factors like, genetic size and shape differences, and dental patterns resulting from heredity, congenital occurrences, and the extraoral and intraoral environment, it should be apparent that some aspects could have been prevented, could have been reduced in severity or fully corrected much earlier. The fully developed malocclusion can be seen in those cases

where unattended premature loss of tooth in young children, unattended oral habits pattern, unattended ectopic eruption or unattended occlusal disharmonies etc. It is an established fact that early preventive treatment to many problem in dental development of children can be helpful in reducing the severity of malocclusions.

### Use of Preventive Orthodontics

The successful use of preventive orthodontics depends upon the following steps:

1. Preparation
2. Having knowledge of possibilities and limitations
3. Avoiding drawback.

*Preparation:* Preparation involves a working knowledge of at least five basic subjects. These are as follows:

1. Growth and development
2. Etiology
3. Records and examinations
4. Classifications
5. Specific preventive measures.

### Growth and Development

Pedodontist must have the knowledge of growth and development at a specific age. The knowledge of growth and development implies the discretionary awareness of the expectation of normal occlusion at a specific age. For example, majority of primary molars are ends in a straight terminal plane (Fig. 12.1).

At the age of 8 to 9 years, the ugly duckling stage with diastemas between the incisors are the self correcting anomalies (Fig. 12.2).



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5. Removable acrylic plate with Z spring can be used to correct the anterior cross bite. The Z spring is gradually adjusted to follow the tooth as it moves labially. An acrylic plate extension over the occlusal portion of the posterior teeth will disocclude the anterior teeth for movement.
6. By use of fixed appliances, such as lingual arch, labial arch or bands on upper and lower incisors with color coded cross bite elastic.

#### *Class 1, Type IV Malocclusion*

Class 1, type IV malocclusion represents the posterior cross bite involving single or more teeth in the arch. The midline may or may not be shifted. Study showed that more than 7 percent of children have a posterior crossbite. Posterior crossbite in primary dentition leads to posterior crossbite in mixed dentition. Crossbite, if corrected in the mixed dentition period leads to normal buccolingual relationship in the permanent dentition.

If a maxillary and mandibular molar both contribute to crossbite, color coded elastic usually may be used to treat it. A molar band with lingually placed hook seated onto the upper molar and another molar band with buccal hook seated onto the mandibular molar. Color coded cross elastic is placed onto the hooks. The teeth in crossbite are tipped into correct buccolingual relationship, and occlusal forces have tendency to upright them.

Posterior crossbite may be the faulty position of one molar only. In this case, fixed or removable appliances can be used to reinforce the anchorage in the opposite arch. The mandibular path of closure is important in Class 1, type IV malocclusion because patient may demonstrate a lateral shift. At initial occlusal contact however, the buccal cusp upper and lower arch are in an end-to-end relationship. Such cases are treated by bilateral expansion of upper arch with fixed or removable appliances.

#### *Class 1, Type V Malocclusion*

Class 1, Type V malocclusion showed posterior crowding. A typical Class 1, Type V case will showed the lower second premolar slanting lingually without sufficient space. There is a theory behind it that initially there was a space but early loss of primary posterior teeth has led

to drift. If early loss takes place in the mandible there is a tendency for the anterior teeth to drift distally and lingually. If early loss takes place in maxilla, there is a tendency for maxillary 1st permanent molar to drift mesially.

Space maintainers are used to maintain the space, created by the early loss of primary tooth. If there is a loss of space at this stage active appliance can be used to regain the space either by distal movement of a lower 1st premolar or mesial movement of an upper 1st molar.

Early loss of primary anterior teeth may leads to impaction, crowding, or ectopic eruption of permanent central incisors. The insertion of a space maintainer which allows for possible physiologic widening of the arch will prevent expensive and time consuming orthodontic treatment.

#### **Clinical Preventive Procedure**

The following are some of the procedure undertaken in preventive orthodontics which helps in correction or reducing the severity of malocclusion:

1. Predental procedure
2. Care of primary dentition
3. Preventive education program
4. Management of supernumerary teeth
5. Management of early loss of primary teeth
6. Management of retained primary/ ankylosed teeth
7. Maintenance of quadrant wise tooth shedding time table
8. Check up for oral habits and habit breaking appliances if necessary
9. Occlusal balancing in case of any occlusal prematurities
10. Use of space maintainers
11. Management of abnormal frenal attachment.

#### *Note:*

1. Diastemas closure by means of rubber band, wrapped directly around the teeth may leads to tipping of the central incisors. A safer way in the diastemas closure is to have a tract on which the teeth can control slide by means of a rubber band over a wire secured to bands.
2. Patients may lose their confidence during treatment. Often the preventive measures we use are not enough and complete treatment with full appliances



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space about 1 to 2 mm from the lingual surface of the anterior teeth, thus avoiding unnecessary movement of erupting teeth.

3. *Attachment of clasp and cribs:* It is usually unnecessary to attach clasps and cribs for stabilizing the appliance in cases where there are teeth present on the distal end of the edentulous saddle. A case where there is no tooth, exists on the distal end or where there is unilateral loss of the primary molars, it is better to enhance the stability of the appliance by bow design or simple clasps such as the adam's clasp on the molars.

### Complete Denture

It is occasionally necessary to recommend the extraction of all the primary teeth of a preschool child. Although, this procedure is indicated only when all methods of primary tooth prevention have been failed. Preschool children can wear complete dentures successfully before the eruption of permanent teeth.

The fabrication of dentures will result in an improved esthetic appearance, restored function and may be effective to some degree in guiding the first permanent molars into their correct position. The technique, though similar to that of complete denture fabrication for adults, is somewhat less complicated. A non-pressure alginate impression technique is recommended for complete denture fabrication in children. Casts is poured and mounted after centric relationship has been obtained. Primary maxillary anterior teeth and posterior teeth are fabricated for partial or complete dentures. Lower anterior denture teeth may be prepared from a set of small acrylic permanent teeth. The posterior border of the denture should be carried to an area approximating the mesial surface of the unerupted first permanent molar. The denture will have to be adjusted by a portion of it cut away as the permanent incisors erupt, and the posterior border contoured to guide the first permanent molars in to correct position. When the permanent incisors and first permanent molars have erupted, a partial denture space maintainer or a lingual arch can be constructed to, serve until the remaining permanent teeth erupt.

### Removable Distal Shoe Space Maintainer

An immediate acrylic partial denture with an acrylic distal shoe extension has been used successfully to guide the

first permanent molars into position when the primary second molar is lost shortly before the eruption of the first permanent molar. Impression is taken with the alginate and stone model are fabricated. After radiographic analysis, a depression is cut near the mesial surface of the erupting 1st permanent molar up to the level of mesial contact area. The acrylic extension has two bars vertical and horizontal. The end of the vertical bar should contact in the mesial contact area of the erupting tooth. The extension may be removed after eruption of permanent tooth.

### Fixed Space Maintainer

Space maintainer which are fixed or fitted on to the tooth and cannot be removed by the patient himself are called fixed space maintainer.

### Advantage of Fixed Space Maintainer

1. Bands and crowns are used which require minimum or no tooth preparation.
2. They do not interfere with passive eruption of abutment teeth.
3. Jaw growth is not hampered.
4. The succedaneus permanent teeth are free to erupt into the oral cavity.
5. They can be used in uncooperative patients.
6. Masticatory function is restored if pontics are placed.

### Disadvantage of Fixed Space Maintainer

1. Elaborate instrumentation with expert skill is required in fabrication of fixed space maintainer.
2. There may be decalcification of tooth material under the bands so fluoride application and careful oral hygiene is needed.
3. Supra eruption of opposing teeth can take place if pontics are not used.
4. If pontics are used it can interfere with vertical eruption of the abutment tooth and may prevent eruption of replacing permanent teeth if the patient fails to report.

### Crown and Loop Space Maintainer (Fig. 13.1)

Crown loop space maintainer consist of a loop made from a metal wire (0.9 mm) that is soldered to a primary metal crown to maintain the space which has been lost because of early loss of a primary molar tooth. The bow



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the opposing tooth. The distal shoe is then soldered to the stainless steel crown and is polished and finished in the usual manner.

### Placement

At the next visit, the second primary molar is extracted and the hemostasis is controlled by pressure. Then the crown distal shoe, which has already been disinfected, is tried in the mouth. A radiograph should be taken to confirm the right location of the distal shoe in relation to the developing first permanent molar. Finally, the shoe is cemented onto the first primary molar in the correct position.

### Band and Bar Type Space Maintainer (Fig. 13.7)

This is a fixed space maintainer in which the abutment teeth on either side of the extraction space are banded and connected to each other by a bar. Alternatively stainless steel crowns can be used on the abutments. This type of space maintainer is called as crown and bar space maintainer or band and bar type space maintainer.

### Esthetic Anterior Space Maintainer

It was described by Steffen, Miller and Johnson in 1971. Its method of construction is simple and also provide esthetic component. The Space Maintainer consists of a plastic tooth fixed on a lingual arch which in turn, is attached to Molar Band.

### Gerber Space Maintainer (Fig. 13.8)

This type of appliance may be fabricated directly in the mouth during one relatively short appointment and requires no laboratory work. A seamless orthodontic band or crown is selected for the abutment tooth and fitted, and the mesial surface of the band or crown is marked for placement of "U" tube, which may be welded or soldered in place with silver solder and fluoride flux.

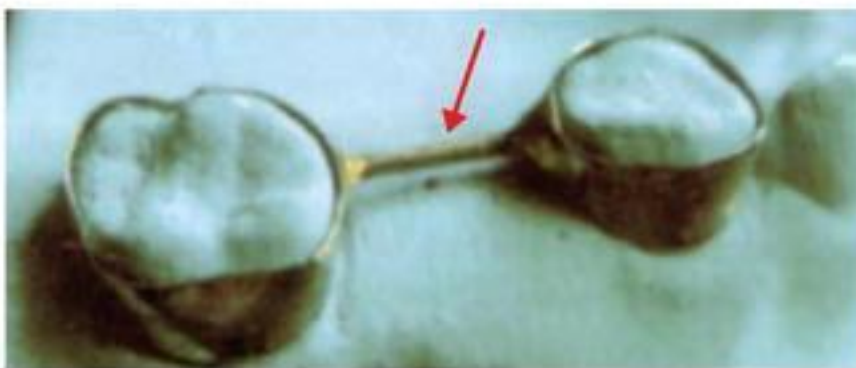


Fig. 13.7: Band and bar type SM, arrow shows horizontal bar and metallic band surrounds the teeth



Fig. 13.8: Gerber space regainer in active form and it acts as maintainer in passive form

The wire "U" section is fitted within the tube, the appliance placed and wire section extended to contact the tooth mesial to the edentulous area. A marking file or pencil is used to establish proper position on the wire. The device is removed and welded or soldered at this point. Occlusal rest may be added to wire section or U wire to reduce cantilever effect.

### Mayne Space Maintainer (Fig. 13.9)

This is a nonfunctional type of space maintainer that permits minor adjustments for space control, while the tooth is partially erupted. Using either an orthodontic band or a full metal crown for the 1st permanent molar, a 0.036 inch mesially extending cantilever arm initially engages the 1st primary molar. When it is lost, it can



Fig. 13.9: Design of Mayne space maintainer. See the half loop unilateral bar (Arrow)



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passage, flaccid lips with the upper lip being short with dolico-facial skeleton pattern. The nose is tipped superiorly in front so clinician can see directly into the nostrils. The long, narrow face is somewhat expressionless.

### Clinical Feature

- A. Oral soft tissue imbalance
  1. Mouth breather holds the tongue low and forward to keep the oral airway open (open mouth during sleep).
  2. Cheek exerts a pressure against the buccal surface of the maxillary posterior teeth that is not balanced by the pressure of the tongue in the palatal area.
  3. The lack of tonicity in the lips and the possibility of short upper lip decreases labial support to the maxillary anterior teeth.
- B. Dentoalveolar imbalance
  1. Narrow maxillary arch
  2. Labial flaring of the maxillary incisors
  3. Open bite
  4. Mouth breathing may develop into a Class II molar relationship
  5. Dry mouth: dryness of mouth may cause mouth breathing gingivitis and high dental caries risk.

### Treatment (Fig. 14.1)

1. Elimination of underlying pathological condition.
2. Appliance therapy-oral screen
3. Tapping of lips.



**Fig. 14.1:** Simple design of oral screen on model cast

### Tongue Thrust Habit

It is a deleterious oral habit in which tongue makes contact with any anterior teeth or premolars during swallowing. This habit is clinically characterized by anterior open bite and anterior teeth proclination.

### Classification of Tongue Thrust

1. Braner and Holt Classification
  - Type I: Non deformity tongue thrust
  - Type II: Deformity tongue thrust.
    - Subgroup I: Anterior open bite
    - Subgroup II: Procumbency of incisors
    - Subgroup III: Associated with posterior crossbite.
  - Type III: Lateral tongue thrust deformity
    - Subgroup I: Posterior open bite
    - Subgroup II: Posterior crossbite
    - Subgroup III: Deep overbite.
  - Type IV: Anterior and lateral tongue thrust deformity
    - Subgroup I: Anterior and posterior open bite
    - Subgroup II: Associated procumbency of anterior teeth.
    - Subgroup III: Associated posterior cross bite.
2. Moyer's classification:
  - a. Normal infantile swallow
  - b. Normal mature swallow
  - c. Retained infantile swallow
  - d. Simple tongue thrust swallow
  - e. Complex tongue thrust swallow.

*Note:* A careful differential diagnosis must be made among the following thrust.

1. Simple tongue thrust
2. Complex tongue thrust
3. Fatty posture of tongue
4. Retention of infantile swallowing patterns.

Simple tongue thrust (Figs 14.2A and B): It is defined as tongue thrust with teeth together, when child swallows. It is characterized by open bite in the anterior region with no cuspal interference in posterior segment of teeth and presence of perfect occlusion in posterior segment. Intercuspal relationship is firm but anteroposterior relationship is not necessarily correct.

The simple tongue thrust is associated with abnormal functioning of circumoral facial muscles. As the patient swallows anterior lip seal is made partly with the teeth and partly with lips. The teeth are in contact prior to and throughout swallowing. The prognosis of simple tongue thrust is excellent.



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## Gingival Health Considerations in Children and Adolescents

### NORMAL PERIODONTIUM (FIG. 15.1)

The periodontium is made up of gingiva, periodontal ligament or membrane, cementum of teeth, and the alveolar bone. Gingiva is a part of oral mucosa (Fig. 15.2) that is keratinized and covers the alveolar process and teeth. The gingival tissues are usually light pink in color but color may be varying in relation to complexion of the person, thickness of gingival tissues and degree of keratinization. Gingival surface has a stippled appearance. Stippled surface of gingiva may vary from fine to coarsely grain.

- Gingiva may be divided in to two parts. First from gingival margin to free gingival groove and free gingiva comprises the lingual and buccal gingiva and interdental papilla. The shape of interdental papilla is determined by the contact relationship between two adjacent teeth and morphology of teeth in the

same arch. If the spaces found between the teeth, the papilla has become a saddle shaped and is more keratinized. When milk teeth are in contact, the interdental papilla completely occupies the interdental space.

- The attached gingiva is a band of gingiva extending from the free gingival groove to the lining mucosa, being firmly attached to the under laying alveolar bone and cementum of the root by connective tissues fibers. The cementum of the root provides surface for the attachment of the periodontal ligaments. The periodontal ligament is composed of connective tissues fibers that surrounds the root and are attached to the alveolar bone and on the cementum of root.
- The normal distance between alveolar crest and cemento-enamel junction is  $1\text{ mm} \pm 0.5$  and  $1\text{ mm}$  or  $2\text{ mm}$ , in primary dentition and permanent dentition respectively.

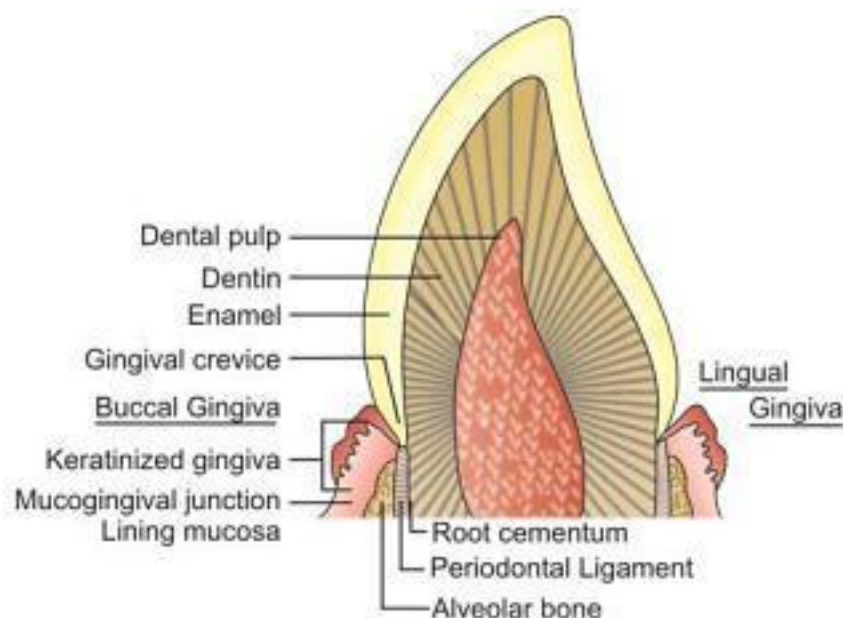


Fig. 15.1: Sketch diagram of dentogingival unit

### Effect of Growth and Development on Periodontium

Growth and development significantly influenced the periodontium. The following characteristics of periodontium are changed by growth and development.

1. *Gingival color*: The relative amount of blood vessels and connective tissues in gingiva changed as age advances. The blood vessels decreases as age advances; therefore the normal color of the gingival tissues changed from red pink (younger age) to dark pink (older age), because melanocytes which are responsible for the production of melanin, are normally present in oral epithelium of black patient.



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- Quick surgery
- Minimum postoperative discomfort.

#### Disadvantages of Laser Surgery

- Cost and size of the equipment
- Patient hospitalization is necessary
- Potential for delayed healing
- Required greater expertise for laser surgery.
- Loss of tactile feed back and eye protection is required.
- Ability of laser to ignite the plastic or rubber endotracheal tube and need to cover non surgical field with moist water sponge shield.

*Note:* Therefore the choice of surgical procedure must be left to the operator based on patient cooperation and compliance. After surgery some patient of drug induced gingival over-growth showed recurrence of fibrous tissues. In such cases a pressure appliance for phentoin induced gingival overgrowth is given immediately after the surgical removal of hyper-plastic tissues, an impression was taken and positive pressure splint was fabricated. Periodontal dressing was removed after one week of surgery and the positive pressure appliance was inserted. The pressure appliance wears usually at night only.

#### Periodontitis and Loss of Tooth in Young Children

Periodontitis is rare in young children. By bitewing radiograph, few investigators have found that 7.6 percent

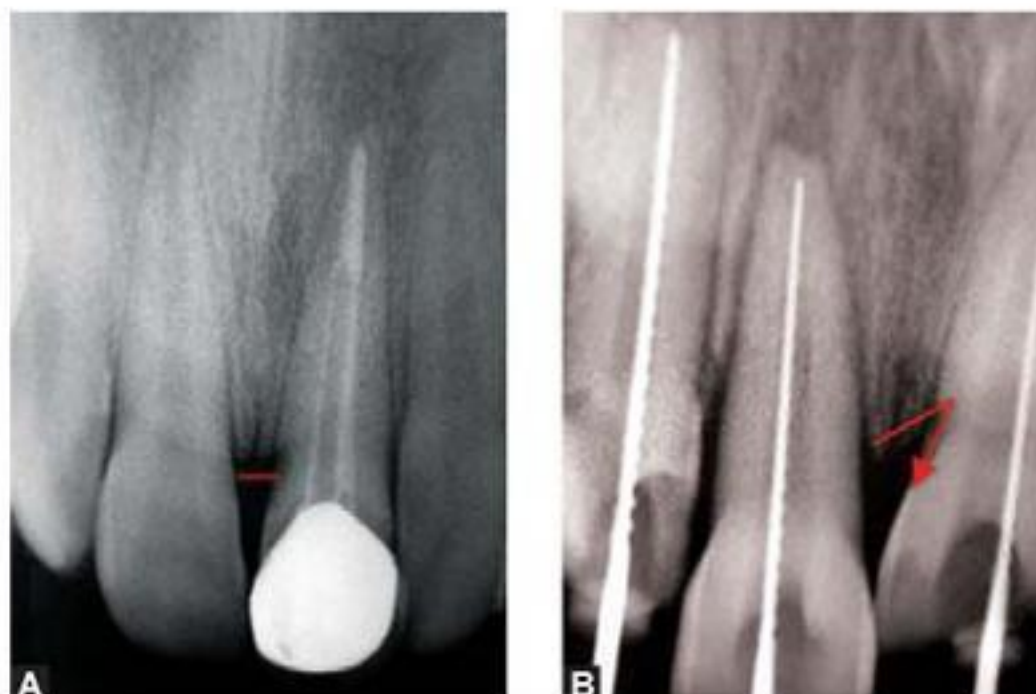
of 4 years old child and 5.9 percent of 5 years old child showed periodontitis and bone loss. In most cases, periodontitis in preschool children is not clinically diagnosed except by probing for attachment loss. In young children periodontitis, recession, erythema of gingiva, and gingival edema usually not found except in neutropenic patient. Bitewing radiograph are useful for detecting alveolar bone loss and dental decay. The alveolar bone loss is most pronounced between the 1st and 2nd deciduous molars.

On bitewing radiograph, the height of alveolar bone can be measured from CEJ.

- If distance from CEJ to height of alveolar bone is 2-3 mm; questionable bone loss.
  - If it is 3 mm or more; definitive bone loss.
- Periodontal bone loss can be classified:
- According to location
    1. Localized
    2. Generalized.
  - According to the pattern of bone loss (Fig. 15.4A and B)
    1. Horizontal
    2. Vertical.

#### Prepubertal Periodontitis

Prepubertal periodontitis in primary dentition occurs usually in generalized form and rarely in localized form. The radiographic appearance of bone loss usually appeared around or before the age of 4 years.



**Figs 15.4A and B:** IOPA X-ray of maxillary anterior region shows; (A) horizontal and (B) vertical bone loss respectively



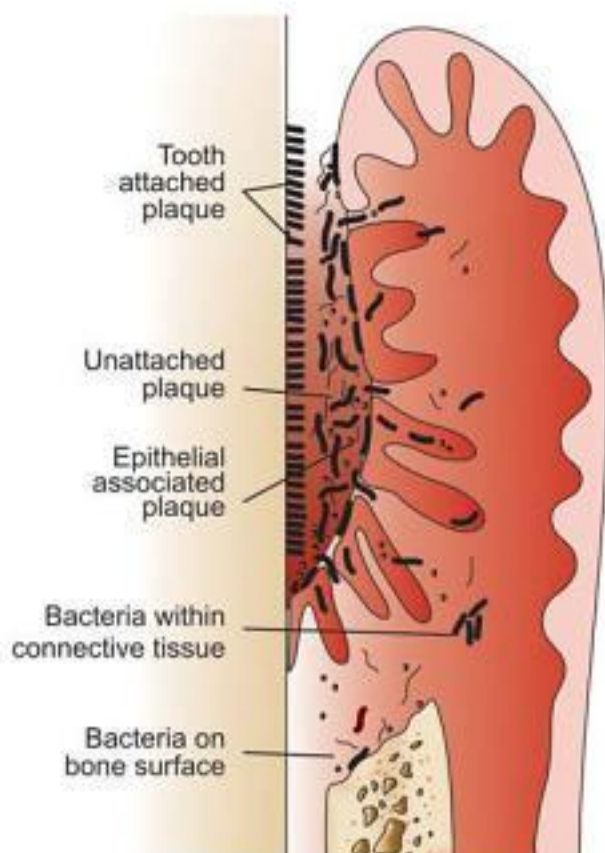
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**Fig. 16.1:** Plaque bacteria association with tooth surface and periodontal tissues

- The term *materia alba* describes the bacterial aggregations, leukocyte, and desquamated epithelial cells accumulating at the surfaces of teeth. It is devoid of internal structure, which is usually observed in dental plaque.

### Supragingival Plaque

Supragingival plaque (Fig. 16.2) can be detected clinically by use of disclosing solutions. The rate of dental plaque formation and location vary among individuals, on different teeth within mouth of same individual, and on different area of same teeth and are influenced by diet,



**Fig. 16.2:** Disclosed supragingival plaque with disclosing solution.

salivary factor, age, tooth alignment, oral hygiene, host defense, etc. Dental plaque primarily made up of proliferating microorganisms, along with scattering of epithelial cells, leukocytes, and macrophages in an adherent intercellular matrix.

- Bacteria make up about 70 to 80 percent of dental plaque.
- 1 mg of dental plaque contains more than  $10^8$  bacteria.
- Dental plaque also contains other microorganism like, mycoplasma, yeast, protozoa and viruses.
- Interbacterial matrix (non-bacterial portion of plaque) makes up about 20 to 30 percent of plaque volume. The composition of interbacterial matrix are:
  1. Polysaccharides protein complex- 30 percent
  2. Lipid- 15 percent.
- The other components of dental plaque are extracellular product of plaque bacteria, remnants of cytoplasm, and cell membrane, food debris, and derivative of salivary glycoprotein.
- Dextran, is the chief carbohydrate present in the dental plaque. Another is mutan carbohydrate.
- The principal inorganic component of the supragingival plaque matrix are
  1. Calcium, phosphorus
  2.  $Mg^{++}$ ,  $K^+$ ,  $Na^+$

### Development of Supragingival Plaque (Plaque Maturation)

Pellicle formation is the prerequisite for the development of plaque. It is an organic structure mainly formed by salivary glycoprotein. Salivary glycoprotein adhere with tooth surface by electrostatic ion interactions of  $Ca^{++}$  and  $PO_4^{--}$  in the enamel surface and oppositely charged salivary macromolecules.

- The transition from pellicle to dental plaque is extremely rapid. The 1st bacteria colonizes on the pellicle are mainly cocci. They form monolayer of bacterial cells over the pellicle, with time other types of microorganism colonizes and giving rise to different microcolonies. Mature dental plaque is characterized by its complexity. In the development of dental plaque two adhesive processes are required:
  1. Bacteria must adhere to the pellicle surface and become sufficiently attached to resist the oral cleansing forces.
  2. They must grow and adhere to each other to allow plaque accumulation.



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## Dentifrices

According to American Dental Association Council of Dental Therapeutics—A dentifrice is a substance used with a tooth brush for cleaning purpose and cleaning the accessible surface of teeth.

*Webster-* described the term dentifrices as derived from dense (tooth) and fricare (to rub). These are aids for cleaning and polishing the tooth surfaces. It may contain the following:

1. The therapeutic agent such as fluoride to inhibit dental caries.
2. Antimicrobial agent, such as chlorhexidine, centrimide to reduce microorganism.
3. An anti calculus agent such as ZnCl to dissolve calculus.

### Composition of Dentifrices

A dentifrice contains a number of ingredient that serve a definite purpose in providing adequate plaque control thus preventing caries and periodontal diseases. The common ingredients of toothpaste are:

1. Polishing and abrasive agent:- calcium carbonate, dicalcium phosphate dihydrate, alumina and silica.  
*Functions:* These agents have a mild abrasive action, which aids in eliminating plaque from the tooth surface. They remove stained pellicle from the tooth surface and also enhance enamel whiteness.
2. Binding/thickening agent is water soluble alginate.
3. Water insoluble agent is colloidal silica and sodium magnesium silicate.  
*Functions:* It controls stability and consistency of a toothpaste. It affects ease of dispersion of paste in the mouth.

4. Detergents and surfactants: Sodium lauryl sulphate is used as detergents. It produces foam which aids in the removal of food debris and also dispensing, of the product within the mouth.
5. Sorbitol, glycerin and polyethylene glycol are aids in reducing the loss of moisture from the tooth paste.
6. Flavoring agents are peppermint oil, oil of wintergreen. They render the product pleasant to use and leaves a fresh taste in the mouth after its use.
7. Sweetener is saccharine
8. Antibacterial agents are triclosan, metallic ions and zinc citrate trihydrate.
9. Anticaries agent: Sodium monofluorophosphate, stannous fluoride, sodium fluoride.
10. Anti-calculus agents are mostly designed to inhibit the mineralization of plaque. They are also known as crystal growth inhibitors.
  - A. Pyrophosphate
  - B. Zinc citrate
  - C. Zinc chloride.

Desensitizing agents are sodium fluoride and potassium nitrate.

### Recent Development in Dentifrices

1. Toothpaste for children
2. Herbal toothpaste
3. Whitening tooth paste: not recommended for regular use.
4. Sodium bicarbonate tooth paste: Some products contains peroxidase enzyme which irritate the gingiva and oral tissues.



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Fig. 18.5: Horizontal scrub technique of brushing

supervision. Parents provide assistance only when child feels difficulties in flossing or brushing in certain area. One useful adjunct for the parents to inspect the child's teeth is the use of disclosing agents.

- At this age, the children can expectorate well, thus the use of fluoridated dentifrices is essential, however, fluoridated gels and rinses can be reserved for those children at risk for caries.
- *Methods of brushing:* In this age group, the most commonly used technique is horizontal scrub technique (Fig. 18.5). The bristles of the tooth brush are placed perpendicular to the crown of the tooth. The brush is moved back and forth in horizontal movements on all the surfaces of teeth.

#### Advantage

1. Most convenient and effective for small children with primary teeth.

#### Disadvantages

1. Interdental spaces of permanent teeth of adults are not properly cleaned.
2. Cervical abrasion on lingual and buccal surfaces takes place in aged patients.

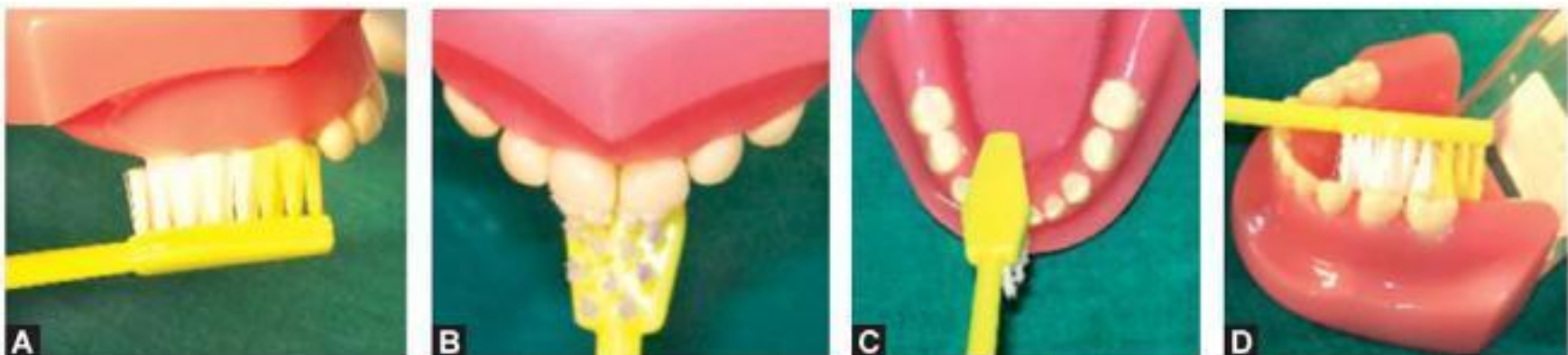
**For Adolescents (12 to 19 years):** Although the adolescent patient usually has developed the skills for adequate oral hygiene procedure, compliance is a major problem during this age group. At this stage, parents should be mentally prepared to adopt their child's changing personality and continue to reinforce the need for oral health care and hygiene. Therefore, it is important for the dentist and parent to continually help and guide the adolescent as they progress through this difficult stage.

*Method of brushing:* The most commonly used technique is Bass method. The bristles of the tooth brush which are soft in nature are positioned in the gingival sulcus at 45° to the long axis of tooth. The bristles are then gently pressed, so few bristles to enter inside the sulcus.

A vibratory motion, short back and forth horizontal with bristle ends remain inside the sulcus. This position of bristle and motion enables the sulcus clean along with interdental and buccal surfaces of teeth. Ten such strokes are advocated for each area including the interdental area. (Figs 18.6A to D).

#### Advantages

- Effective method for plaque removal adjacent to and directly beneath the gingival margin, cervical areas and sulcus.
- Provides gingival stimulation
- Easy to learn.



Figs 18.6A to D: Bass methods of toothbrushing at different quadrant of maxillary and mandibular teeth



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4. **Crossbite:** Activator is used in early treatment of unilateral cross bites. The maxillary teeth in cross bite are moved labially and the mandibular teeth moved lingually with separate wire loops on each tooth. The fabrication of bite registration is taken so that there is at least a 6 mm clearance in the molar region for cross bite correction.
5. **Class III malocclusion:** The results are best in pseudo class III malocclusions. The bite registration for class III is taken in most retruded position with the Incisal edges 2 mm or 3 mm apart. A mandibular labial bow is used to guide the mandible distally as the teeth occlude. The maxillary labial low is kept at a slight distance away from the labial surface to relieve any lip pressure.
6. Growing patient
7. Class I deep bite cases
8. Retrognathic mandible.

### CONTRAINDICATIONS

- Severe crowding
- Class II with severe maxillary prognathism
- High angle cases
- Uncooperative patients
- Increased lower facial height
- Skeletal open bites
- Adult patients
- Abnormal Perioral muscular contractions.

### Limitations of Functional Appliances

1. Individual tooth movements are difficult with activator
2. 100 percent patient cooperation is needed.
3. These appliances are of very limited use in the correction of anteroposterior jaws discrepancy.

### MODIFICATIONS

#### Harvold Activator

Harvold designed the activator to prevent eruption of the upper teeth by maintaining the acrylic over the occlusal surfaces and in most cases only removing it in the lower posterior segment. By controlling the eruption of the maxillary posterior teeth and only allowing the mandibular molars and premolars free eruption, the differential eruption of teeth aids in the correction of the class II molar relationship.

**Herren Shaye Activator:** Ideal for treatment of class II Div. 2 malocclusion. In this the construction bite is taken

in strong mandibular protrusion, reaching the feasible maximum.

**The Bow Activator of AM Schwarz:** In this the upper and lower halves of the bow activator are connected with an elastic bow. The transverse mobility was thought by Schwarz to provide an additional stimulus. This appliance is especially suited for the treatment of Class II Div. I, malocclusions in the primary dentition.

**The reduced activator (cybernator of Schmuth):** The acrylic part of the appliance is reduced in a manner similar to that of the bionators. Saving time and labor is only one of the advantages of this fabrication. It can be combined with fixed appliances of different kinds that can be worn simultaneously. It has upper labial bow to hold the upper lips and protrusion wire loop for maxillary anterior teeth. Lower incisors are covered with acrylic extension to hold them in stable portion. Coffins spring may be incorporated in palatal portion.

**Karwetzky Modification:** It consists of maxillary and mandibular active plates joined by a U bow in the region of the first permanent molars. In addition to acrylic covering of the lingual tissue aspects, gingiva, and teeth, the plates also extend over the occlusal aspects of all teeth. The basic appliance action may be enhanced by combinations of different types of sagittal or transverse screws, labial wires, and springs.

**Bionators:** The bionators described by Baiters in 1960 is probably the most commonly used modification of the activator. It is less bulky than activator. The reduced bulk of the appliance and its ability to reposition the mandible and modifies dental eruption have been important in its ready acceptance by both the parents and dental surgeons. As with the activator, vertical control is present and bionators can be used for class II, class III, deep bite and open bite cases. This appliance has deep lingual flange to hold the appliance in proper position.

### Types of Bionators

1. **Standard bionator Appliance:** (a) It is used for the treatment of class II Division I condition in order to correct the backward position of the tongue and its consequences. (b) For the treatment of narrow dental arches of a class I malocclusion.
2. **Bionator for Class III cases:** It is used for the treatment of mandibular prognathism to compensate for the forward position of the tongue.



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of enamel, in early stage. Cervical caries is also a type of smooth surface caries. It is a “crescent shaped open cavity” and does not present the narrow point of penetration as in the cases of pit and fissure caries and proximal caries.

#### *Acute Dental Caries*

Acute dental caries are those form of dental caries that are rapid in progression and show early involvement of pulp.

#### **Clinical Features**

- Initial point is small.
- At DEJ, produces large internal excavation (Diffuse involvement of dentin at DEJ).
- Dentin is stained in light yellow color rather than darker brown color of dentin as in chronic caries.
- Early involvement of pulp and becomes painful, e.g. rampant caries (Nursing bottle caries and breast feeding caries).

#### *Chronic Dental Caries*

Chronic dental caries is characterized by slow progression of caries and much later involvement of the pulp than acute caries.

#### **Clinical Features**

- Large surface area are involved.
- Slow progression of lesion.
- Stained deep brown dentin.
- Shallow cavity and little or no undermining of enamel surface.
- Pain is not a common feature of chronic caries.

#### *Recurrent Caries*

This type of caries occurs at the margin of restorations due to inadequate finish of the restoration which favors retention of plaque. It also follows the pattern of primary caries or virgin caries.

#### *Arrested Caries*

Arrested caries are those caries in which progression is stopped or static or stationary and does not show any tendency for further progression. Both the dentition (primary and permanent) are affected by this disease.

#### **Clinical Features**

- Usually, associated with occlusal surface caries characterized by large open cavity and does not show food retention.
- Superficial softened and decalcified tissue is gradually burnished.
- Lesion appears as brown stained, hard and polished “eburnated dentin”.

#### *Pre-eruptive Caries*

Term preeruptive caries is given by “Muhler”. Sometimes a defect on the crown of permanent teeth is evident radio graphically while there is no carious lesion or infection found on the primary teeth. This lesions are very similar in caries lesion, if not restored, continuous demineralization occurs. In such cases the primary teeth are advised to extract and permanent tooth is restored with appropriate filling materials.

#### *Radiation Caries*

Salivary gland radiation therapy, usually associated with xerostomia. This condition facilitates the origin and initiation of caries, known as radiation caries.

*Clinical manifestation of caries process:*

- I. *Incipient caries:* The earliest stage of caries is the demineralization of enamel starting when the plaque pH decreases below critical pH. The amount of demineralization cannot be detected clinically and radiographically and, can only be detected by experimental laboratory technique. Histologically the lesion has an apparently intact surface layer overlaying subsurface demineralization. Most of these lesions undergoes remineralization and needs not to be restored.

#### **Chalky Whitespot Lesion**

The first visual clinical manifestation of caries is the chalky white spot lesion. When lesion progress to a depth of 350 micron to 500 micron white spot lesion becomes visible. The loss of subsurface enamel, results in the loss of enamel translucency.

This white spot lesion must be differentiated from developmental defect of enamel by their position (away from gingival margin) their shape and symmetry (unrelated to plaque accumulation, usually effecting contra lateral tooth respectively).





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Table 21.3: High caries risk vs low caries risk

High risk caries individual or child	Low risk caries individual or child
<p><i>Social history</i></p> <ul style="list-style-type: none"> <li>• Low social and economic status</li> <li>• High caries in siblings.</li> <li>• Dental awareness is low.</li> <li>• Patient low motivation level.</li> <li>• Irregular attainer.</li> </ul> <p><i>Medical history</i></p> <ul style="list-style-type: none"> <li>• Compromised immunity.</li> <li>• Xerostomia.</li> <li>• Long term cariogenic drug.</li> <li>• Physically or mentally handicapped.</li> </ul> <p><i>Dietary history and habits.</i></p> <ul style="list-style-type: none"> <li>• Frequent sugar intake habit and history.</li> <li>• Refined sugar intake like sucrose, glucose, etc. in the form of candies, cake.</li> <li>• Prolong breast or bottle feeding.</li> <li>• Very less or no detergent food.</li> </ul> <p><i>Saliva</i></p> <ul style="list-style-type: none"> <li>• Low flow rate.</li> <li>• Thick consistency.</li> <li>• Low buffering capacity.</li> <li>• High MS and <i>Lactobacillus</i> counts.</li> <li>• Low salivary IgA</li> <li>• MS count <math>&gt;10^5</math>, <i>Lactobacillus</i> <math>&lt;10,000/ml</math></li> </ul> <p><i>Use of fluoride</i></p> <ul style="list-style-type: none"> <li>• Very low or no fluoride zone or area.</li> <li>• No fluoride supplements in the form of toothpaste.</li> </ul> <p><i>Oral hygiene control</i></p> <ul style="list-style-type: none"> <li>• If ineffective methods of plaque control is used.</li> <li>• Poor oral hygiene.</li> </ul> <p><i>Clinical evidence</i></p> <ul style="list-style-type: none"> <li>• New lesion arises.</li> <li>• Premature extraction may be necessary.</li> <li>• No fissure sealant used.</li> <li>• Partial denture may be present inside oral cavity.</li> </ul>	<ul style="list-style-type: none"> <li>• Middle class, individual.</li> <li>• Low caries in sibling.</li> <li>• Very conscious about esthetic and dental health.</li> <li>• Patient high motivation level.</li> <li>• Regular attainer.</li> </ul> <ul style="list-style-type: none"> <li>• No medical problem.</li> <li>• No physical or mental problem.</li> <li>• No salivary deficiency.</li> <li>• No history of carcinogenic drug.</li> </ul> <ul style="list-style-type: none"> <li>• Low or no sugar intake habit.</li> <li>• Less intake of refined sugar.</li> </ul> <ul style="list-style-type: none"> <li>• No such history.</li> <li>• History of detergent food intake.</li> </ul> <ul style="list-style-type: none"> <li>• MS <math>&lt;10^5</math> count.</li> <li>• <i>Lactobacillus</i> <math>&lt;1000/ml</math>.</li> <li>• High flow rate.</li> <li>• Very dilute consistency.</li> <li>• Low MS and <i>Lactobacillus</i> counts.</li> <li>• High salivary IgA, high buffering capacity.</li> </ul> <ul style="list-style-type: none"> <li>• Optimum fluoride level in the zone or area.</li> <li>• Fluoride supplement used in the form of milk fluoridation or topical or in form of toothpaste (if required).</li> </ul> <ul style="list-style-type: none"> <li>• If effective cleaning method is used.</li> <li>• Good oral hygiene.</li> </ul> <ul style="list-style-type: none"> <li>• No new lesion develops.</li> <li>• No extraction for caries.</li> <li>• Frequent fissure sealant used.</li> <li>• No appliances used.</li> </ul>

1. Validity
2. Reliability
3. Feasibility
4. Sensitivity
5. Specificity.

Caries activity test should be simple, inexpensive, rapid and should accurately reflect the "component causes". Factors that may be used in evaluation of caries risk assessment are:

1. **Anatomy, structure and chemistry of the teeth:** Example- retentive area (presence of deep fissure), form, arrangement of teeth, number of teeth, occlusion, enamel solubility, content of fluoride and distribution.
2. **Biological factor (bacteria):** Example- composition of plaque and its location (mutans streptococci, lactobacilli, trace element, fluoride), amount of dental plaque, rate of plaque formation,





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**Fig. 21.7:** Mouth mirror, probe and twizzer are used to detect carious lesion by tactile and visual examination on tooth surface

#### Tactile Examination (Fig. 21.7)

A fine explorer has been used for tactile examination of the tooth.

#### By Radiographs (Fig. 21.8) (Conventional Method)

The most frequently used radiograph for caries detection are bitewing radiograph for proximal caries and IOPA (Intraoral periapical X-ray).

#### Xeroradiography

This method is different from conventional method because it does not need developing solutions for X-ray development, required less radiation and gives more edge enhancement.

#### By Radiovisiography (RVG)

It has following advantages over conventional radiography.

- i. Less image resolution.
- ii. Less radiation exposure.
- iii. The image is immediately available.



**Fig. 21.8:** IOPA Xray is most commonly used to detect carious lesion (arrow)

- iv. Can be electronically transferred.
- v. May be enhanced and stored.

#### Electrical Conductance Measurements

The 1st idea about electrical method of caries detection is given by Magitot in 1878. It is observed that sound tooth surface have a limited or no conductivity whereas carious or demineralized enamel surface have a measurable electrical conductivity. The electrical conductivity increases with increasing demineralization.

#### Method

Electrical conductance instrument measured the electrical conductance between tip of probe (electrode) placed in the fissure and a connector attached to the gingival or oral mucosa (High conductivity area). The sensitivity and specificity of the ECM was 0.78 and 0.80 for the diagnosis of occlusal dentinal caries and 0.65 and 0.73 for enamel caries.

#### Fiberoptic Transillumination (FOTI)

The basic idea of fiberoptic transillumination test for caries detection is based on different index of light transmission from demineralized and sound tooth. When fiber optic light passes through a caries or demineralized part, it has shown a lower index of light transmission than unmineralized or sound portion of tooth. The resultant changes in light distribution as light traverse the tooth is then recorded and analyze for caries detection and progression.



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to tooth enamel and contributes to bulk of dental plaque.

5. Mutans produces a large amount of acid during growth with terminal pH = 4. The lipoteichoic acid (LTA) play important role in pathogenesis of dental caries, e.g. It will bind directly to enamel surface of teeth. It forms a complex with mutans conferring a charge on Glucans charged ions, i.e. Bicarbonate would be enable to diffuse rapidly out of plaque. Uncharged substance (e.g. Sugar) could penetrate into plaque easily.
6. In normal circumstances IgA and IgG are found in saliva in concentration of  $19.4 \pm 5.37$  and  $1.44 \pm 0.9$  mg/100ml.  
IgA in saliva is usually a dimmer. It has a unique component linked to it, termed as secretary piece. It is resistant to proteolytic enzymes and extreme of pH and hence can function under influences.  
IgG class antibodies to oral microorganism may present in plaque fluid.
7. Type II pneumococcal polysaccharide induce antibodies that cross react with (1-6) Glucans and type IX pneumococcal induce antibodies reactive with (1-3) linked Glucans.  
Several other pneumococcal undoubtedly can induce antibodies that cross react with *S. mutans*. This approach is attractive because pneumococcal vaccines have been licensed for use in human being.
8. M.S count in saliva and plaque can be correlated with prevalence and incidence of caries in human being.

### **Mechanism of *Streptococcus mutans* Adherence to the Tooth Surface**

On fermentation of sucrose, glucans is formed by *Strep. mutans*. Glucans can help to attach the bacteria to solid surface of tooth by acting as carrier for other bacteria and forming the matrix.

In addition certain bacteria are involved in initial attachment of *Streptococcus mutans* to tooth surface. Once attachment takes place, a continuous and large acid is produced which commences the demineralization.

### **Systemic Active Immunization**

Gregory and Filler observed that ingestion of a vaccine containing killed *Streptococcus mutans* daily for ten consecutive days induced an increased level of specific secretary IgA antibodies to *Streptococcus mutans* cells. This resulted in reduction in number of viable *Streptococcus mutans* organism in dental plaque and whole saliva.

### **Systemic Passive Immunization**

Michalek, et al. used a multivalent vaccine consisting of whole cell antigen of *Streptococcus mutans* (serotype a, b, c, d, g), to hyperimmunize a group of pregnant cows. They observed low plaque scores decreased number of streptococci in plaque and decreased caries actually as compared to the control. Development of vaccine against tooth decay is still very far away but presence of salivary and serum immunoglobulin in the saliva and then reaction against cariogenic microorganism has proved that the immunization of teeth against decay is possible.





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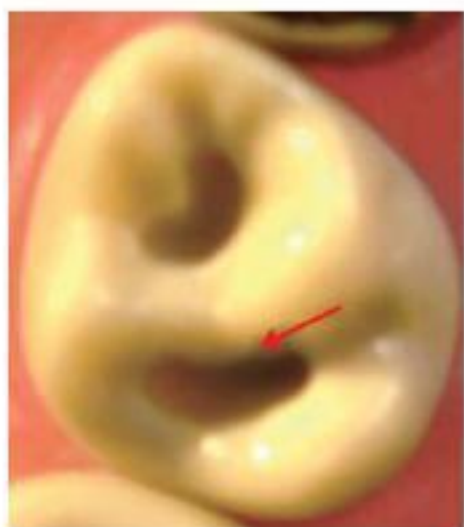
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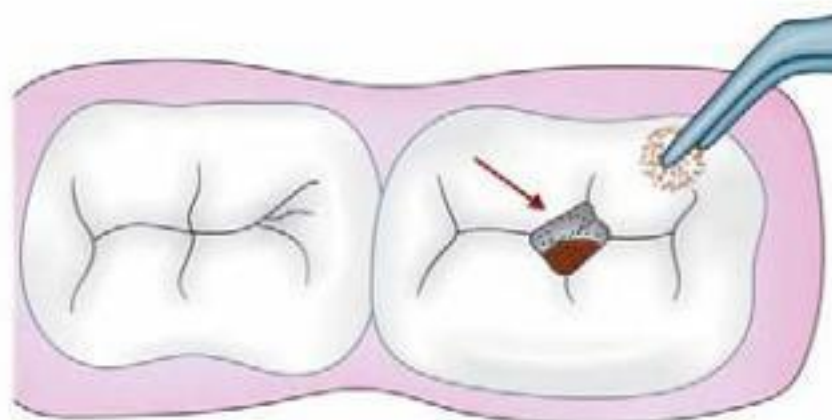
**Fig. 25.6:** Fracturing of unsupported enamel with a hatchet



**Fig. 25.8:** Circular scooping movements of the excavator during removal of soft carious part



**Fig. 25.7:** Completed cavity after removing unsupported enamel with hatchet



**Fig. 25.9:** Cleaning and conditioning of the tooth with cotton palette soaked in conditioner

- Depending on the size of the cavity use either the small or medium sized excavator to remove caries. Soft caries is removed by making circular scooping movements along the long axes of the instrument (Fig. 25.8). Remove caries at the dentin-enamel junction before removing caries from the floor of the cavity. Enamel that is unsupported by dentin can be broken away carefully by placing the hatchet on the enamel and pressing gently downward.

Thin, often decalcified, unsupported enamel is relatively easy to break off. The enamel and the dentin-enamel junction need to be thoroughly cleaned to prevent caries progression and to obtain a good seal of the coronal part of the restoration. All soft caries should be removed.

- Pulpal protection is required only for very deep cavities and is achieved by applying a setting calcium hydroxide paste to the deeper parts of the floor of the cavity. The cavity floor does not need to be covered completely because it will reduce the area available for adhesion of the filling material. Calcium hydroxide stimulates repair of dentin.
- Clean the occlusal surface using a wet cotton pellet (Fig. 25.9). All the pits and fissures should be clear of plaque and debris as much as possible. The remaining pits and fissures will be sealed with the same material used for filling the cavity.
- Conditioning of the cavity and occlusal surface should be done to improve the chemical bonding of GIC and the cavity walls. A dentin conditioner



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**Fig. 26.1:** OPG shows the maxillary and mandibular teeth anatomy and pulp anatomy of mixed dentition period. See the tooth sac with different stages of teeth developments

**Root canals of primary maxillary incisors:** Root canals of primary central and lateral incisors are almost rounded but slightly compressed. Usually these teeth have one canal without bifurcations. Accessory canals and lateral canals are rare but sometimes it may occur.

**Root canals of primary mandibular incisors:** The root canals of primary mandibular central and lateral incisors are flattened on mesial and distal surfaces and grooved pointing to an eventual division into two canals. 10 percent of mandibular incisors showed two canals in its root. Some time lateral and accessory canals are also observed.

**Root canals of maxillary and mandibular canines:** The root canals of maxillary and mandibular canines resembles to the external root shape, a rounded triangular shape with the base towards the facial surfaces. The primary canines have the simplest root canals system of all the primary teeth and offers least problems when being treated endodontically.

### Root Canals of Primary Molars

Usually primary molars have the same number and positions of roots as the corresponding permanent successors. The roots of the primary molars are long and slender compared with crown length and width, and they diverge to allow permanent tooth bud formation.

The deposition of secondary dentine in primary teeth has been reported. After completion of the primary roots, the basic morphologic pattern of root canals may change,

producing variations and alterations in the number and size of the root canals caused by the deposition of secondary dentine. Secondary dentine deposition begins in primary root canal system as soon as resorption begins. Accessory canals and apical canals are common in primary molars (10 to 20%).

### Root Canals of Maxillary 1st Primary Molars

Two to four canals are usually seen in maxillary 1st primary molars. It resembles to the external root form with much variations. The palatal root is often rounded; it is often longer than the facial roots. A bifurcation of the mesiofacial roots into two canals occurs in approximately 75 percent of maxillary 1st primary molars.

### Root Canals of Maxillary Second Molars

Two to five canals are usually seen in maxillary 2nd primary molars. It usually resembles the external root shape. Mesiofacial root normally contains two distinct canals (85 to 90%). Fusion of palatal and distofacial roots may occur and producing variations in the root canal systems.

### Root Canals of Mandibular 1st Primary Molars

Three canals are usually seen in mandibular 1st primary molars. It resembles to the external root anatomy, but it may have 2 to 4 canals. Mesial root contains 2 canals in 75 percent of the cases, where as only 25 percent of the distal root contains more than one canal.

### Root Canals of Mandibular 2nd Primary Molars

The mandibular 2nd primary molar may have 2 to 5 canals. Mesial root has two canals in 85 percent of mandibular 2nd primary molars while distal root contains more than one canal only in 25 percent cases.

### Pulp Diseases in Primary Teeth

Pulps of primary teeth are more sensitive to inflammatory changes of carious attack than permanent teeth. Inflammatory changes are soon irreversible and extend through out the coronal pulp of primary teeth. Symptom arising from pathological changes in primary teeth may not be severe until the later stages of necrosis and abscess formation.





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## Unconventional Local Anesthesia Techniques for Child and Adolescent

### LOCAL ANESTHETICS

They may be defined as drugs that block the generation and propagation of impulses in nervous tissue. When applied locally to the nerve tissue in appropriate concentrations, local anesthetics reversibly block the action potentials responsible for nerve conduction and impulse conduction along nerve axons and other excitable membranes that utilise sodium channels as the primary means of action potential generation.

- They act on any part of the nervous system and on every type of nerve fibre. Thus, a local anesthetic in contact with a nerve trunk can cause both sensory and motor paralysis in the associated area. This action can be used clinically to block pain sensation.
- The clinical advantage of the local anesthesia is its reversible action at appropriate concentration. Its use is followed by complete recovery in nerve function with no evidence of damage to nerve fibres or cells.
- Local anesthetics are prepared as hydrochloride salts dissolved in sterile water or normal saline because their free base forms are poorly soluble in aqueous solutions. The solution is acidified to a pH of 4.40-6.40 to favor existence of the water soluble, cationic, and quaternary amine form of the local anesthetic molecule. But this decreases the potency of the anesthetic, shortens the onset of action, and increases the duration of blockade.
- The potency of action of local anesthetic solution is increased by carbonation. The mechanism of action being a direct depressant effect of carbon dioxide on the axon, an increased conversion of the local anesthetic to the active cation form, at the site of action.

- In the axon, diffusion traps the anesthetic solution inside the axon, and/or direct modification of local anesthetic binding sites in the Na<sup>+</sup> channels. Local anesthetics containing epinephrine are acidified to inhibit oxidation of epinephrine. pH of drug without epinephrine is 5.5 to 7.0 while with epinephrine is 5. When this is injected buffering capacity of the tissue fluids raise the pH back to 7.4.
- Retardation of oxidation to increase the shelf life, is achieved by addition of anti-oxidants like sodium bisulphite in 0.05 to 0.1 percent concentrations.
- Paraben derivatives of parahydroxybenzoate, such as methylparaben, ethylparaben, and propylparaben are added for anti-fungal and anti-microbial activity but paraben derivatives are potent allergens and have been implicated in allergic reactions initially attributed to local anesthetic. Because of this, preservative containing local anesthetic are not used for intravenous use. Local anesthetic solution containing epinephrine and 2-chlorprocaine or procaine, may discolour by prolonged exposure to light.

#### Difference between general and local anesthesia

Features	General anesthesia	Local anesthesia
1. Site of action	CNS	Peripheral nerve
2. Body area involved	Whole body	Limited area
3. Consciousness	Lost	Unaltered
4. Care of vital functions	Essential	Not needed
5. Physiological trespass	High	Low
6. Poor health patient	Risky	Safer
7. Use in non-cooperative patient	Possible	Not possible
8. Major surgery	Preferred	Not preferred
9. Minor surgery	Not preferred	Preferred



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Different formulations of the same anesthetic drug need different concentrations to achieve a similar effect. For example, sprays require a higher concentration than patches. The transfer of the anesthetic through the mucosa is concentration dependent. Topical anesthesia belongs to ester group. The most common anesthetics used are Benzocaine, Amethocaine, and lidocaine.

### Duration of Application

Topical anesthetic agent should be applied for at least 2.5 to 5 minute to achieve desirable effect. The effectiveness of topical anesthesia varies in different parts of the mouth. The mandibular buccal fold is more susceptible than the corresponding area in the maxilla.

### Uses

- It is used prior to needle penetration of conventional techniques.
- There are reports of soft tissue surgery procedures performed in the mouth under topical anesthesia.

### Intraligamentary Injection (Fig. 27.14)

- It came into practice in 1912 to 1923, but from 1980s it gained popularity and maintains till today. It is also known as periodontal injection.

*Nerves anesthetized are:*

- Terminal nerve ending at site
- At apex of the root
- Areas anesthetized; Bone, soft tissue, apical and pulpal tissue at the site of injection.



Fig. 27.14: Site of Intraligamentary injection

### Indications

- Pulpal anesthesia of one or two teeth in a quadrant.
- Treatment of isolated teeth in two mandibular quadrants to avoid bilateral inferior alveolar block.
- Patients for whom residual soft tissue anesthesia is undesirable.
- Where regional block is contraindicated.
- As an aid in diagnosis of particular pulpal pain.

### Contraindications

- Infection
- Acute inflammation
- Primary teeth where permanent tooth bud is present.

### Advantages

- Anesthesia of the lips, tongue and other soft tissue does not occur.
- Minimal dose of local anesthetic is required approximately 0.2 ml per tooth.
- It can be used as an alternative to partially successful regional anesthesia.
- Rapid onset of action and profound pulpal anesthesia within 30 seconds.
- Less traumatic than conventional block injection.
- Well suited procedure in childrens extraction, periodontal, and endodontic procedure, single tooth procedure.

### Disadvantages

- Proper needle placement is difficult to achieve in some areas like distal of second or third molar.
- Special syringe is required.
- Leakage of solution in patient mouth gives unpleasant taste.
- Excessive pressure may break glass cartridges or may cause focal tissue damage.
- Post injection discomfort for several days.
- Potential for extrusion of tooth, if excessive pressures or volumes are employed.

### Technique

- 27 or 30 gauge needle is recommended.
- Area of insertion; in long axis of tooth on mesial or distal aspect of root interproximal for single as well as multi rooted tooth.
- Target area; needle tip is located at depth of gingival sulcus.





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- Lower aspiration rate
- Provide successful anesthesia in bifid canal
- When patient is unable to open mouth because of trauma, infection, trismus, etc.

#### Disadvantages

- Difficult to visualize the path of needle insertion
- No bony contact, depth of penetration is somewhat arbitrary.

#### Technique (Fig. 27.24)

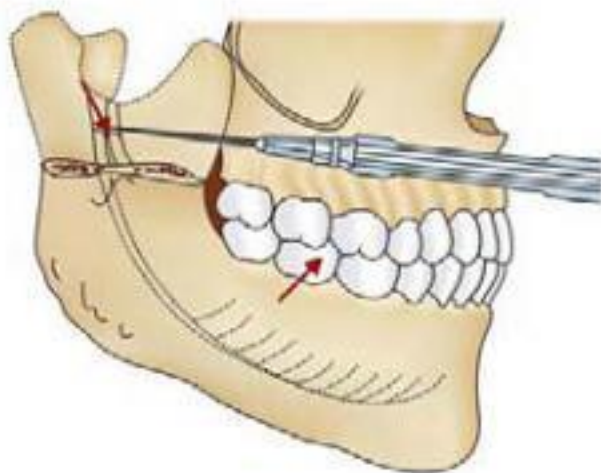
- 25 gauge needle is used.
- Area of insertion: Soft tissue overlying medial border of ramus of mandible directly adjacent to maxillary tuberosity at the height of mucogingival junction of maxillary 3rd molar.
- Target area: Soft tissue on medial border of ramus of mandible in the region of inferior alveolar, lingual and mylohyoid nerve as they run inferiorly from foramen ovale towards mandibular foramen.

#### Landmarks

- Mucogingival junction maxillary 2nd or 3rd molar.
- Maxillary tuberosity.
- Coronoid notch on ramus of mandible.

#### Procedure

- Administrator sits on 8 o'clock position for both right and left side block.
- Patient is made to sit in supine or semi supine position.
- Place index finger or thumb of left hand on coronoid notch reflecting the tissue which aids in visualization of injection site and look for landmarks of



**Fig. 27.24:** Sketch diagram of Akinosi technique used for dental anesthesia (teeth in occlusion and site of injection).

mucogingival junction of maxillary second and third molar and maxillary tuberosity.

- Prepare tissue for penetration, ask patient to bring his teeth in occlusion with cheek and muscles of mastication relaxed. Barrel of syringe is held parallel to occlusal plane with needle directed posteriorly and laterally so that it advances at a tangent to posterior maxillary alveolar process.
- Advance needle 25 to 30 mm in tissue in pterygomandibular space, close to mandibular nerve.
- Aspirate, if negative, deposit 1.5 to 1.8 ml approximately in 60 seconds.
- Onset time is 40 to 90 seconds.

#### Precautions

- Do not over insert the needle in smaller patient.

#### Complications

- Hematoma less than 10 percent.
- Trismus is very rare.
- Transient facial nerve paralysis may be caused due to over insertion.

#### Electronic Dental Anesthesia

Electrotherapy came into being from 46 A.D. when Scribonius Largus, physician to the emperor Claudius, used the torpedo fish to relieve the pains of gout.

Electroquackery also became popular during the late 1700s. In 1883, Erb et al wrote "At the present time we possess in the electrical current one of the most certain and brilliant remedies for neuralgia, although we must admit that much progress has not been made in our knowledge concerning its mode of action in these forms of disease."

In 1970, electroanesthesia equipment was developed as Desensor handpiece, a high speed device that carried low voltage electrical current through a bur directly onto the tooth being treated (Fig. 27.25).

In 1967, Shealy, et al reported that on direct stimulation of the dorsal column of the spinal cord, intractable pain could be suppressed without the need for an irreversible surgical procedure. In early 1970s, Shealy and Long, working with electrode pads placed on the patient's skin over the spinal cord, were able to eliminate pain without the need for implanting electrodes into cord.



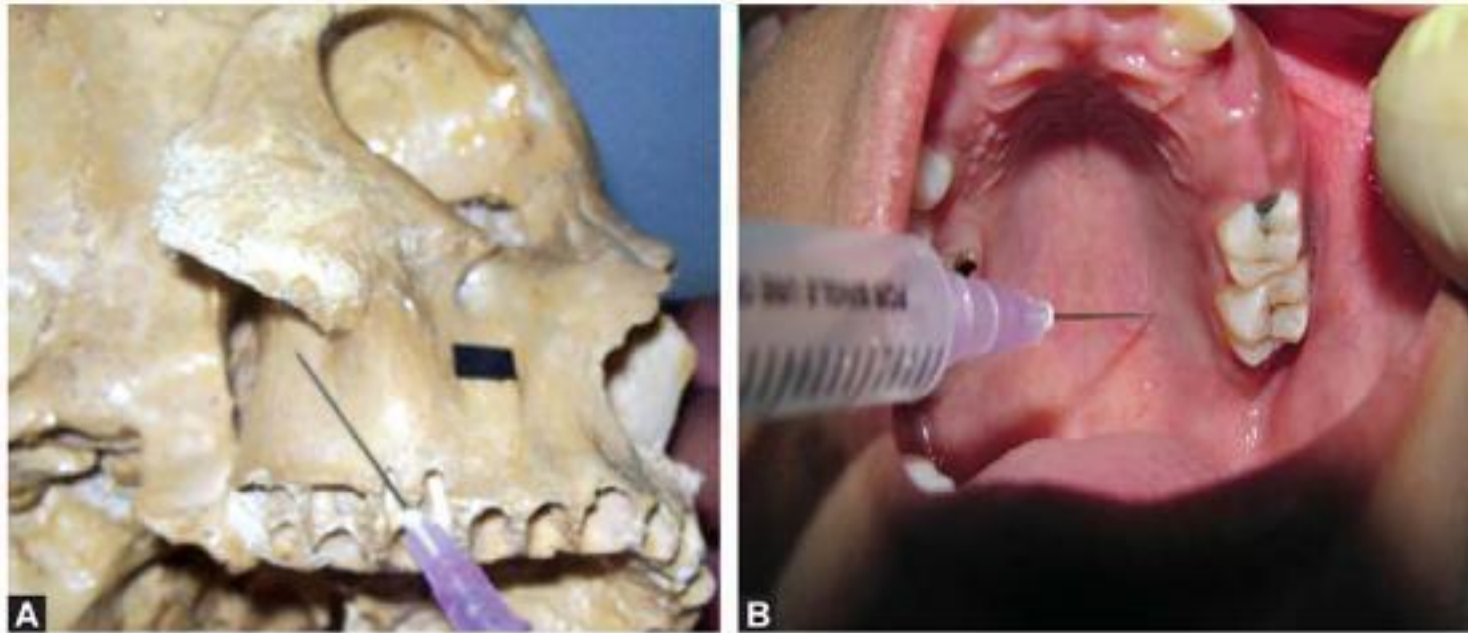
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**Figs 28.7A and B:** (A) The injection puncture point is in the mucobuccal folds above and distal to the distobuccal root of the 1st permanent molars. The injection inserted upward distally with needle bevel directed towards bone for posterior superior alveolar nerve block. This injection will be done in conjunction with greater palatine nerve block to obtain complete maxillary molar region anesthesia (Bony landmark), (B) Site for greater palatine nerve block

injection should be supplemented with second injection superior to the maxillary tuberosity area to block the posterior superior alveolar nerve.

- This second injection will help to compensate additional bone thickness in the tuberosity and posterior middle superior alveolar nerve plexus in the area of 2nd primary molars.
- To anesthetize the maxillary 1st and 2nd premolars, a single injection is made at the mucobuccal folds to deposit LA solution in the maxillary premolar area above the tooth apex.

#### Local Anesthesia for Maxillary Permanent Molars (Figs 28.7A and B)

- Ask child to partially close the mouth to allow the cheek and lips to be stretched laterally. The injection puncture point is in the mucobuccal folds above and distal to the distobuccal root of the 1st permanent molars. The injection inserted upward distally with needle bevel directed towards bone.
- To anesthetized maxillary 1st permanent molars; one more LA injection is required into the mucobuccal fold at the apex of mesiobuccal root of 1st maxillary permanent molars to compensate plexus formed by middle and post superior alveolar nerve.

#### Nasopalatine Nerve Block (Figs 28.8A and B)

- The path of insertion of needle is along the side of incisive papilla, just posterior to the maxillary central incisors. The needle is directed upward into the incisive canal. This is a very painful injection so usually avoid and it anesthetizes palatal tissues of maxillary anterior region.
- When anesthesia is required in the palatal area of canine region, it is necessary to inject a small amount of anesthetic solution into the gingival tissues adjacent to the palatal side of canine to anesthetize overlapping branches of greater palatine nerve.

#### Greater Palatine Nerve Block (Figs 28.9A and B)

- The greater palatine nerve block injection will anesthetize the mucoperiosteum of the palate from the tuberosity to the canine area. This block is used in conjunction with middle or posterior superior alveolar nerve block before surgical procedure.
- When only primary dentition is erupted, the injection should be made approximately 10 mm posterior to the distal surface of the second primary molars. A few drops of LA solution are enough for anesthetizing greater palatine nerve.





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Table 29.1: Normal vital sign with variations at different age groups

Age	Heart rate beats/min.	Blood pressure (Systolic)	Blood pressure (Diastolic)	Respiratory rate (Breath/min.)	Tidal volume (ml.)
3 years	101±10	100±20	67±20	24±5	112±5
5 years	90±10	94±15	55±10	23±5	270±7
12 years	70±15	109±15	58±10	19±5	480±5
Adult	77±5	122±30	75±20	12±3	575±10

± shows variations

**Note:** The effect and duration of drugs is much more variable for children. For agents that of more lipophilic there may be prolong retention, especially in children who may be obese. All these consideration of the differences between at different age level and adult lead one to the conclusion that doses is not simply an application of formula for derivation of a percentage of the adult dose of any agents. Drugs doses for children should be carefully individualized for each patient.

### Criteria of Patient Selection for Conscious Sedation

A thorough medical history is required to determine the suitability of patient for conscious sedation. This includes physical examination, constitute a risk assessment or physiologic status evaluation. This health evaluation should be utilized to place the patient in one of the categories set forth by the American society of anesthesiologist (ASA) (Table 29.2).

Table 29.2: ASA classification of conscious sedative patients

Class	ASA classification
Class 1	There is no organic, physiologic, biochemical or psychiatric disturbance. The pathologic process for which operation is to be performed is localized and is not a systemic disturbance.
Class 2	Mild to moderate systemic disturbance caused either by condition to be treated surgically or by other pathophysiologic process.
Class 3	Severe systemic disturbance or disease.
Class 4	Indicative of the patient with severe systemic disorders that are already life threatening.
Class 5	The moribund patient who has little chance of survival without the planned procedure.

**Note:**

1. ASA Class 1 and 2 are usually acceptable as candidates for conscious sedation.
2. Children in ASA Class 3 may be benefit from conscious sedation under the guidance of child's physician.
3. Generally patient in Class 3 and 4 are better managed in hospital setting.

**Informed consent:** The parents or caretaker must be agreeable to the use of conscious sedation for the child. Parents must be informed about the risk factor, benefits and alternative method available.

### Instructions to Parents before Conscious Sedation

#### A. Dietary instruction:

- I. No milk or solid food after midnight before the scheduled sedation procedure.
- II. Children ages 6 months to 3 years – clear liquid up to 4 hours before the procedure.
- III. Children ages 3 to 7 years – clear liquid up to 6 hours before the procedure.
- IV. Children ages 7 years or older – clear liquids up to 8 hours before the procedure.

**Note:** These dietary instructions are important because emesis during or immediately after a sedative procedure is a potential complication in that aspiration of stomach content can cause laryngospasm or severe airway obstruction which ultimately leads to aspiration pneumonia or even death. Since most conscious sedative agents are administered by the oral route, drug uptake is maximized when the stomach is empty. After treatment the child should first be offered clear liquids and may advance to solid foods as tolerated.

**B. Transportation instruction:** A third person should accompany the parent, so that person caring for the child may be free to attend to the child's needs during the trip home.

### Discharge Criteria

The patient should not be discharge until the pre-sedation levels of consciousness have been achieved. At the time of discharge following condition of patient should be noted.

1. Airway patency uncompromised and satisfactory.
2. Patient easily arousable and protective reflexes should be intact.



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### Clinical Features

Tooth is usually asymptomatic. Sometime sensitivity can be reported.

### Management

1. *Reattachment of the fractured tooth segment:* The fractured segment can be esthetically restored by reattaching it with the help of dentin bonding agent and composite resin.
2. *Recontouring of the fractured enamel:* Sharp edges of the fractured tooth are rounded off as a prophylactic measures to reduce stress and to help to prevent again fracture of tooth. This can be accomplished by shortening the adjacent central incisors and reshaping both the teeth to a symmetrical outline.
3. Fluoride varnish is applied to prevent sensitivity.
4. Missing tooth structure can be restored by using an acid etch technique with composite resin, if the lost structure is more.

**Note:** Various observations are done at different time interval during the course of Class I fracture treatment.

1. **Pulp vitality:** Vitality test should be performed at the time of treatment and are repeated after every 6 to 10 weeks. Discolorations of tooth may indicate loss of vitality.
2. **Radiograph:** To check for the development of any periapical pathology. Radiograph is repeated after 6 to 8 weeks.

### ELLIS CLASS II FRACTURE AND ITS MANAGEMENT

In this class, there is a horizontal or diagonal fracture line usually involving considerable amount of dentin and incisal proximal angle without pulp exposure. An emergency treatment is necessary to protect already traumatized pulp from further insult by placing a dentin stimulating layer of calcium hydroxide overexposed dentin. To insure that calcium hydroxide dressing is retained until the pulp has retreated from proximity of fracture and adequate layer of secondary dentin has formed, a suitable retainer in the form of orthodontic band, adhesive sealing, celluloid crown, or stainless steel



**Fig. 32.1:** Right and left maxillary central and left lateral incisors shows Class I, II and III fracture respectively



**Fig. 32.2:** Right, left, central and left lateral fracture incisors were restored with composite restoration (pre- and postoperative photograph)

crown may be employed. After secondary dentin formation, composite restoration or permanent esthetic restoration can be done.

*Retainer of Ca (OH)<sub>2</sub> dressing over fractured tooth:*

1. Orthodontic band
2. Celluloid crown
3. Stainless steel crown
4. Adhesive sealing (Fig. 32.2).

Secondary dentin formation can be insured by 4 to 6 weeks interval of repeated radiograph. Permanent esthetic restoration can be done over fractured site if secondary dentin has been formed.



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### Complications of Traumatic Injuries of

#### 1. *Primary teeth:*

- Failure of eruption
- Color changes
- Infection
- Space loss
- Ankylosis
- Abnormal exfoliation
- Injuries to developing permanent tooth bud.

#### 2. *Permanent teeth:*

- Poor esthetics
- Difficulty in phonetics
- Color changes
- Infection
- Loss of space
- Ankylosis
- Abnormal root development
- Resorption of root
- Loss of alveolar bone support.



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### Treatment

No treatment is indicated and most papillae regress with age.

### Macroglossia

Enlargement of the tongue due to overdevelopment of the tongue musculature. The causes of macroglossia are Pituitary gigantism, Hypothyroidism, Down's syndrome. Clinician must differentiate between true macroglossia from hypotonia of the tongue and Perioral musculature.

### Treatment

1. Remove any systemic cause
2. Surgical excision of enlarged tongue may be considered but may limit the tongue movement during speech due to scarring of wound.

### Lingual Thyroid

It is a developmental anomaly 2 to 3 cm. in diameter, located at midline, base of the dorsum of the tongue. The lesions have a smooth surface and appear vascular. Dysphasia is most common complaint associated with lingual thyroid. The lingual thyroid most probably developed by failure of complete migration of the thyroid tissues from the foramen caecum.

### Treatment

Surgical excision.

### Precaution

Seventy five percent of patient with lingual thyroid have no other functional thyroid tissues so thyroid functional test should be done before surgical excision and location of gland should be checked.

### Fordyce Granules

Fordyce granules are small yellow spots slightly elevated and commonly located on buccal mucosa. This lesion is bilaterally symmetrical. They may occur on the inner surface of lip and on the mucosa distal to the mandibular molars. These developmental lesions are heterotrophic collection of sebaceous glands in oral mucosa. Fordyce granule begins to appear by 10 years of age and increases in size and number during puberty.

### Treatment

Required no treatment.

### Mucocele (Fig. 34.1)

It is a mucous retention phenomenon. The lesion appears as a fluid filled well circumscribed raised bulla several millimeters to centimeters or more in diameter. This retention of the mucous in sub epithelial tissues most commonly occurs in children and adolescents on lower lip and midline and commissure. The cause of mucocele is trauma to a minor salivary gland with pouring of mucous in an obstructed and dilated excretory duct. The lesions are usually asymptomatic and smooth surfaced with bluish or translucent in nature. A mucocele in the floor of the mouth is termed as Ranula. It represents a unilateral mass that is of normal mucosal color if deep seated or bluish in color if superficially seated.

### Treatment (Fig. 34.1, Step 1 to 6)

Surgical excision with removal of associated minor salivary gland to prevent recurrence.

### Odontogenic Cyst

#### *Parulis*

Parulis is also known as Gumboil or Periapical abscess. It is soft solitary reddish papule located on the facial or lingual area of nonvital tooth. It occurs at end point of a dental sinus tract. When sinus tract is obstructed, pain may result. Parulis is caused by necrosis of the pulp due to carious process or trauma. Parulis is common in toddler years through adolescence.

In periapical abscess, tooth may be slightly mobile or extruded out of socket. The systemic sign associated with Parulis are fever, and lethargy. Chronic accumulation of purulent debris finally leads to draining sinus tract. Those cases in which draining sinus do not develop, the infection may spread through facial plane producing cellulitis (Fig. 34.2).

Children with vitamin D resistant rickets develop spontaneous gingival abscess due to defect in tooth formation allowing invasion of microbiota into the pulp tissues with subsequent necrosis. Similar spontaneous periapical abscess is also found in Dentinogenesis imperfecta.



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Some guidelines have been laid down for modification of dental clinic, examples are:

- i. Wider width of door ways (4½ feet).
  - ii. Provision of wheel chair turning space.
  - iii. Operatory specifically designed with movable dental chair and adjustable bed along with instrument control unit and suction system.
  - iv. Dental chairs adjustable to match different wheel chair designs etc.
- II. *Patient screening*: The purpose of screening is to gather basic information which will assist the office in planning the patient's first dental visit. If done in a pleasant, empathic and knowledgeable manner, it establishes credibility and confidence and faith between child and dental team.

*Screening includes*

- i. Basic general body examinations
- ii. Medical diagnosis
- iii. Present/past medications
- iv. Name of physician and date of visit
- v. Date of last dental treatment
- vi. Financial information.

*Note*: Apart from this in patients with complicated medical history additional information is required that includes medical summaries, reports of hospitalization and psychological evaluation, laboratory investigation reports, etc.

III. *First dental visit*: The first dental visit sets stage for subsequent visits. Factors to be kept in mind during 1st dental visit are:

- a. Patient's medical status: Since, it affects length of appointments, it is necessary to make appointments, short and stress free for a patient having poor stress tolerance and easy fatiguability. Avoid scheduling treatment around sleeping and napping periods.
- b. Appointment is scheduled on day's time where activity is conducive to treatment.
- c. Apart from this, transportation and living condition of the patient influences their ability to keep dental visit at a given time (day or evening).

IV. *Radiographic techniques*: In certain handicapping conditions, such as neuromuscular diseases, mental retardation and spinal injuries, modified radiographic technique may be necessary. Modified

radiographic technique may also be used in following condition:

1. Macroglossia
  2. Limited oral access
  3. Hyperactive gag reflex
  4. Management problem
  5. Poor muscle control
  6. Inadequate muscle strength.
- When standard radiographic series is beyond the physical or emotional capacities of the patient the alternatives radiographic technique can be used.
    - a. Anterior occlusal projections
    - b. Lateral jaw projections
    - c. Buccal bite wing projection
    - d. Snap—A Ray biting projections.

These technique compromises image quality to some extent compared to standard projections or technique.

**a. Anterior occlusal projections** – This radiographic technique helps in visualization of maxillary and mandibular incisors and their supporting bone. For this projection standard occlusal film is used by modified sandwich technique. Advantages are:

- i. It provides information normally obtain from periapical X-rays.
- ii. No discomfort from impingement of film on the soft tissues.
- iii. A single film is sufficient for both maxilla and mandible.
- iv. Child can reliably stabilize the film.

**b. The lateral jaw projections (cephalogram)**: It helps in visualization of overall view of posterior maxillary and mandibular teeth and supporting structures on one side of maxilla. It is useful in the patient who cannot tolerate intra oral technique and those who experience difficulty in maintaining a stable head position.

The projection is best obtained with help of parent, who is seated in a dental chair reclined at 45° and draped in lead apron a 5" × 7" cassette (using intensifying screen) wrapped in a towel is placed on parent's sternum. Patient is positioned on parent lap with head resting on the cassette, in a position where the cassette is tangent to zygomatic area in posterior and tip of nose anterior. The cone is oriented perpendicular to the cassette, ½" below and behind the angle of mandible on the contra lateral side.



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### Hepatitis infection control in dental operatory

#### Protocol:

1. Provide treatment in isolated and sterilized area
2. Staff involved in hepatitis control should wear sterilized disposable gown
3. Cover dental chair and all other equipment with disposable sterilized sheet
4. Dental staff should follow strict aseptic technique
5. Dental staff should use protective eyewear
6. Minimize the handpiece aerosol with the help of suction
7. All contaminated instrument should be placed in labeled color coded-plastic bag for sterilization and waste disposal
8. All gowns and covers must be sterilized or properly discarded
9. Dental operatory must be appropriately cleaned after use.

### Precautions During Dental Management

- If patient is suffering from hepatitis, he should not receive any elective dental treatment. Only emergency care is delivered.
- Strict hepatitis precautions must be advised.
- When surgical procedure is required, PT and bleeding time must be assessed.
- Drug therapy should exclude medications that are metabolized by liver.
- Dentist and dental professional are at a very high risk and should receive Hepatitis B vaccine.
- Patients with advance a liver disease should be treated in a hospital. In candidates for liver transplantation all foci of infection such as advanced dental caries and oral infections should be first eliminated.

### Endocrine Disorders

#### i. **Diabetes Mellitus;**

Diabetes mellitus is a generalized disturbance caused by deficiency of insulin. It is characterized by derangement of carbohydrate, protein and fat metabolism. Three major forms of diabetes have been identified.

1. Juvenile Onset (Type I): Insulin dependent, mostly occurs in children.
2. Maturity Onset (Type II): Non-insulin dependent occurs after 40 years of age.
3. Secondary Diabetes: Occurs secondarily to certain disease such as cystic fibrosis.

### Clinical Manifestation

- Polyphasia
- Polydypsia
- Polyurea
- Failure to gain weight
- Fatigue, dizziness, confusion and hyperventilation. Uncontrolled diabetes is more prone to infections.

### Precautions During Dental Management

- Well controlled diabetics can be treated normally in a dental office.
  - In case of juvenile diabetics, it is advised that patient should receive their insulin and breakfast as usual before initiation of treatment. Appointments should be kept in morning hours and either a glucose solution or juice is kept available to treat hypoglycemia.
  - Use of prophylactic antibiotic is always advised.
  - Reduction of stress during treatment is important.
  - L.A. is not contraindicated.
  - Acute infections should be treated aggressively by high antibiotic doses.
- ii. **Hyperthyroidism:** It usually occurs between the age of 12 and 16 years. It is characterized by following sign:
- Restlessness
  - Palpitations
  - Tachycardia
  - Systolic hypertension
  - Exophthalmos goiter
  - Large sized jaws
  - Accelerated growth and development including dentitions and precocious puberty.

*Note:* Patient receiving regular therapy require no special precautions. Patient poorly treated are susceptible to thyrotoxicosis crisis.

- iii. **Hypothyroidism:** In children hypothyroidism is known as cretinism and it can be either congenital or acquired. Insufficiency of thyroid hormone is associated with physical and mental sluggishness, poor muscle tone, macroglossia, hypothermia, bradycardia and large fontanelles.

No specific precaution is necessary. It is important to treat infection promptly. Use of Epinephrine is avoided in poorly controlled case.



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### Management

- Children with mild retardation can manage with simple, preventive and short, predictable operative procedures and are very cooperative.
- Children with moderate mental retardation respond well in dental sitting. Sometime they may require heavy sedation and restraint method of behavior modification.
- Children with profound mental retardation are candidates for GA.
- Mentally retarded patients usually present with anomalies of facial structure, morphology of teeth, malocclusion, and open bite, hypoplasia or hypocalcification. Most common dental disease is caries. *Following procedure have proved beneficial in treatment of patients with mental retardation.*
- Familiarize patient with dental personnel and facility available in dental office.
- Give one instruction at a time. Reward with compliments.
- Listen carefully to the patient.
- Keep appointments short.
- Schedule patient in the morning.

### Childhood Autism

Childhood autism is an early onset developmental disturbance of behavior and communication. Koppel listed 12 behavioral characteristics:

- Extreme loneness,
- Language disturbance,
- Mutism,
- Parrot like repetitions
- Speech difficulty with concept of 'yet',
- Confusion, obsessive desire for maintenance of sameness,
- Eating disturbance,
- Mobility such as intrigue with spinning objects,
- Hyperactivity,
- Self stimulatory behavior,
- Nystagmus,
- Mental retardation and seizure disorder.

Behavior modification techniques using positive reinforcement, special education programs, psychotherapy, and family counseling to pharmacologic therapy have been employed. Gingival hypertrophy may be seen due to Phenytoin administration.

### Oral Manifestation

- Poor tongue coordination with food pouching.
- Increased rate of oral trauma due to accident proness and self inflicted injuries.

### Management

- Dentist should use patience with slow approach.
- Behavioral management techniques such as Tell-show Do, modeling technique and positive reinforcement may be useful.
- Preoperative sedation with muscle relaxant and use of N<sub>2</sub>O-O<sub>2</sub> analgesic may be required.

### Hyperactivity

It is a childhood disorder also termed as minimal brain dysfunction or hyperkinetic syndrome. It is characterized by following sign and symptoms:

- Increased motor activity and restlessness
- Short attention span and inability to concentrate
- Lack of motor coordination
- Difficulty in performing structured task and lack of social integration
- Although, children may be of normal intelligence but demonstrate learning disabilities and fail to achieve expected level of intellect.

Factors such as brain damage in uterus or during birth, hypocalcaemia, and nutritional deficiencies may be etiological.

Treatment consists of medications in addition to psychological and behavior therapy. Amphetamines are most effective.

### Management

- Patient delay in reception area should be kept minimum.
- Because of short attention span, dental appointments should be kept short.
- Routine behavioral modification techniques are of little use.

**Cerebral palsy:** Cerebral palsy is a chronic condition in the neuromuscular system resulting from early damage during prenatal, perinatal, and postnatal stage before the CNS has reached maturity. It is characterized by following signs and symptom:

1. Increased muscle tone
2. Decreased muscular strength



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particular wavelength requires different sets of safety glasses to absorb that particular wavelength.

2. Rubber dam should be used for isolation. A matrix band can be used to protect the adjacent tooth in case of class II cavity preparation.
3. A wet gauge should be placed to protect adjacent tooth, especially while working on soft tissues.
4. It is mandatory for the laser working team to wear special laser masks that filter out smaller than usual

particulate matter. At the same time high power evacuator is fitted with laser filters to remove "laser plume" (a common byproduct of photo thermal laser effect; a smoke like material comprised of cellular and tissues debris).

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Table 39.1: Oral manifestation of metal poisoning

Metal	Poisonous Compounds	Fatal Dose	Oral Manifestation
1. Arsenic	(i) Arsenious oxide or Arsenic trioxide (ii) Copper arsenate (iii) Arsenic acid (iv) Sodium potassium arsenate (v) Arsenic sulfide	0.1 to 0.2 g	(i) Sweetish metallic taste (ii) Difficulty in swallowing
2. Mercury (Quick silver)	(i) Mercuric chloride (ii) Mercuric oxide (iii) Mercuric iodide (iv) Mercuric cyanide (v) Mercuric sulphide	1 to 4 gm	<b>First phase</b> 1. Acid metallic taste 2. Tongue, mouth becomes corroded, swollen and show grayish – white coating 3. Hot burning pain in the mouth <b>Second phase</b> (i) Glossitis (ii) Ulcerative gingivitis (iii) Loosening of teeth (iv) Necrosis of jaw
3. Lead	(i) Lead acetate (ii) Lead carbonate (iii) Lead chromate (iv) Lead monoxide (v) Lead trioxide	About 20 g lead acetate and 40 g lead carbonate	Acute poisoning On astringent metallic • A stripped blue line called Burtonian line seen on the gums in 50-70 percent of cases • It appear due to subepithelial deposit of granules at the junction teeth Foul breath
4. Copper	(i) Copper sulfate (ii) Copper subacetate	10-20 gm	(i) Metallic taste (ii) Increased salivation
5. Manganese	Potassium permanganate	10-20 gm	(i) Burning pain from mouth to stomach (ii) Swallowing

amount of mucosal and gingival pigmentation. Pedodontist may come across cases of chronic metal poisoning and should be able to diagnose it by clinical signs and symptoms, coupled with the history.

### Treatment of Metal Poisoning

#### 1. Arsenic Poisoning:

- Emetics can be given
- Stomach should be emptied and then thoroughly and repeatedly washed by the stomach tube with large amount of slightly warm water.
- Freshly prepared and precipitated hydrated ferric oxide (antidote) is given orally.
- Patient is advised to eat butter and greasy substance to prevent intestinal absorption.

#### 2. Mercury Poisoning:

- Give egg white, milk or animal charcoal to precipitate mercury.

- Gastric lavage is done with 5 percent solution of formaldehyde sulfoxylate.
- 10 gm of sulfoxylate in 100 to 200 cc of distilled water is administered by slow IV injection and repeated after 4 to 6 hours acts as an antidote.

#### 3. Lead Poisoning

##### a. Acute Poisoning

- Gastric lavage with 1 percent solution of sodium or magnesium sulfate
- Demulcents
- The combination of BAL and calcium disodium versenate is effective.

##### b. Chronic Poisoning

- Potassium or sodium iodide up to 2 g, 3 times a day may be given.
- Sodium bicarbonate 20 to 30 gm a day in lividea transforms the insoluble tribasic lead phosphate to the soluble dibasic phosphate through the liberated carbonic acid, and is excreted in the urine.



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## Genetic Counseling in Dentistry

### INTRODUCTION

Prenatal genetic counseling is provided for all prospective parents, ideally before conception, to assess risk factors for congenital disorders. Parents with risk factors are advised about possible outcomes and options for evaluation. If testing identifies a disorder, reproductive options are discussed; preconception options include contraception, artificial insemination if the man is a carrier, and oocyte donation if the woman is a carrier; post conception options include pregnancy termination and, in some cases, treatment (eg, Dexamethasone).

**Risk factors:** Some risk of genetic abnormality exists in all pregnancies. Among live births, incidence is 0.5 percent for numeric or structural chromosomal disorders, 1 percent for single-gene (Mendelian) disorders, and 1 percent for multiple-gene (polygenic) disorders.

- Chromosomal disorders are more likely to be present in foetuses that spontaneously abort during the 1st trimester (50 to 60%), in foetuses with a major malformation (30%), and in stillborns (5%).

Genetic counseling is the process of:

- Evaluating family history and medical records
- Ordering genetic tests
- Evaluating the results of this investigation
- Helping parents understand and reach decisions about what to do next

Genetic tests are done by analyzing small samples of blood or body tissues. They determine whether you, your partner, or your baby carry genes for certain inherited disorders, or not.

### ROLE OF THE PEDIATRIC DENTIST IN GENETIC COUNSELING

Pediatric Dentists treat children with Dentofacial anomalies and therefore should have a working knowledge of syndromology and molecular Genetics. Often Pediatric Dentists are the first health care practitioners to document Dentofacial dysmorphic features in a child. It is thus important for them to have an understanding of molecular genetics because the sensitivity and specificity of molecular based diagnosis have revolutionized how disease and disorders are defined. These specific and technological advances translate into improved health, disease prevention, smarter diagnostics, and innovative therapeutic approaches to Dentofacial dysmorphogenesis. Dentist should work with the genetic counselor and radiologist to reach the conclusion of molecular based diagnosis of the child, and take a preventive and interceptive treatment plan for the abnormal dentofacial structure of a child (phenotype).

Prior to molecular based diagnosis, craniofacial disorders were established based on characteristic features (pattern recognition), e.g. a child with a molar hypoplasia, Mandibular retrognathia, down slanting palpebral fissures, coloboma of the lower eyelid had the clinical appearance of Treacher Collins Syndrome. Although the common disorders were identifiable, there was difficulty in establishing the diagnosis for all patients. Some had clinical characteristics that did not readily fit into a particular syndrome or the condition was uncommon and most clinicians were unaware of its existence.



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syndrome or Trisomy 21 is the most common chromosome abnormality. Genetic disorders include disorders like cystic fibrosis. The most common neural tube defect is spina bifida. Amniocentesis is occasionally used late in pregnancy to assess whether the baby's lungs are mature enough for the baby to breathe on his own. Amniocentesis also provides access to DNA for paternity testing prior to delivery. DNA is collected from the potential father and is compared to DNA obtained from the baby during amniocentesis. The results are accurate (99%) for determining paternity.

*The cordocentesis test looks for:*

The procedure is similar to amniocentesis except the objective is to retrieve *blood* from the fetus versus *amniotic fluid*. Cordocentesis detects chromosome abnormalities (i.e. Down syndrome) and blood disorders (i.e. fetal hemolytic disease). Cordocentesis may be performed to help diagnose any of the following concerns:

- Malformations of the fetus
- Fetal infection (i.e. toxoplasmosis or rubella)
- Fetal platelet count in the mother
- Fetal anemia
- Isoimmunization

This test is different from amniocentesis in that it does not allow testing for neural tube defects.

### Prenatal Screening for Down Syndrome

Genetic screens are often performed on pregnant women older than 30 or 35. Common screening procedures for Down syndrome are (Table 40.3):

- Fetal nucleated red blood cells test for trisomy 13.

In a pilot study to establish fetal nucleated red blood cell (NRBC) detection in maternal blood, trisomy 13 was diagnosed by FISH analysis at 11 weeks' gestation.

### Diagnostic Testing for Trisomy 18

Ultrasonographic evaluation of trisomy 18; The sonographic finding of increased nuchal translucency appears to be a prominent phenotypic manifestation of double trisomy in the first trimester.

Other abnormal findings, namely subcutaneous edema, omphalocele, and a large atrioventricular septal defect. These sonographic findings were initially considered highly suggestive of trisomy 18.

### Diagnostic Testing for Trisomy 9

Detection of trisomy 9; trisomy 9 can be detected prenatally with chorionic villus sampling and cordocentesis, and can be suggested by obstetric ultrasonography

### Diagnostic Testing for Turner's Syndrome

#### *Ultrasonographic Analysis for Turner's Syndrome*

The first time presented for uterine ultra sonography 15 weeks from the date of last menstrual period. The fetus has a posterior cervical mass, typical of the cystic hygroma of Turner's syndrome, as well as generalized edema and protruding abdomen with ascites and a single horseshoe kidney.

A mass in the posterior nuchal region detected by ultra sonography is likely an encephalocele or a meningocele.

Table 40.3: Common screening procedures for Down syndrome

Screen	Gestation periods in weeks	Detection rate	False positive rate	Description
Triple screen	15-20	75 percent	8.5 percent	AFP and abnormal levels of hCG (human chorionic gonadotropins) and estriol may indicate that the developing baby has Trisomy 21 (Down syndrome), Trisomy 18 (Edwards Syndrome) or another type of chromosome abnormality
Quad screen	15-20	79 percent	7.5 percent	Same as above
APF/	13-22	80 percent	2.8 percent	This test measures the alfa fetoprotein, produced by the fetus and free beta hcg, Produced by placenta.
Nuchal translucency	10-13.5	91 percent	5 percent	Uses ultra sound to measures nuchal translucency in addition to the free beta HCG and pregnancy associated plasma proteins.



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### Prospective Study

A study also called a 'Cohort study or Follow up study' that follows its subject forward in time from initial exposure (or non exposure) to some expected risk factor, to the eventual disease out come. (disease is expected to occur in future).

- development of disease in exposed and non exposed compared
- suitable for common disease with common exposure.
- bias is generally lower.

### Retrospective Study

- This study is also called as case control study) that looks backward in time from final disease out come to potential cause.(in this case, disease has already occurred)
- In it groups of affected individuals (cases) and unaffected individuals (controls) are compared to the extent of their exposure to the same suspected risk factor.

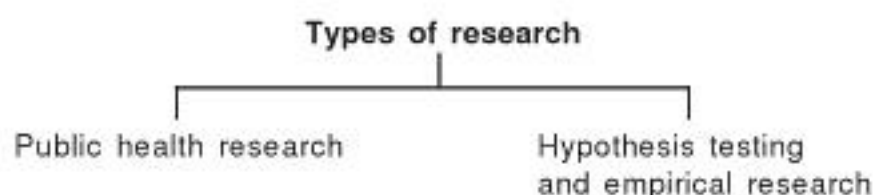
### Advantages

1. Relatively easier to carry out.
2. Useful for rare case with smaller numbers, substantial bias can occurs

### Cross Sectional Study

This study is simplest in concept and execution. It measures the prevalance of the disease hence also called 'prevalance study'. In this, a set of individuals are chosen who may be the representative sample of the general population or of people in a particular community, or a sample of members of some special subgroup-school children,and the measurement of exposure as well as effect are made at the same time.

We are able to get information on the relationship between a disease and other variables of interest as they exist at one point of time. For example in cross-sectional study of oral malignancies, we can also collect data during their survey on history related, occupation, tobacco habit and age, sex.



1. Types of public health research (documentation-descreptive research)
  - A. Epidemiology research
  - B. Descriptive epidemiology (description of the distribution of the disease, the comparison of its frequency in different populations and in different segments of the same population).
  - C. Risk assesment: Correlation studies to identify risk factors for disease.
  - D. Identifying trends in a population
  - E. Product testing: Report on product quality and use.
  - F. Financial and manpower documentation.
2. Hypothesis testing and empirical research
  - A. Randomized controlled trials.
  - B. Field experiment (fluoride study, Area related disease).
  - C. Laboratory study.

### Research Design

- Any work or research should start from the library; there should be some crystallization of present objectives of the study.
- Young researchers should develop index cards of possible topics of research.
- Finally the reseach project should be adapted to the available material and method within individuals limitation.
- The subject of research should be capable of being tested as alternative hypothesis. It should therefore test propositions in which there is real difference in opinion.
- The research project should be circumscribed, specific, and definite in its objectives.

### Research Planning

- It is the protocol by which research guide and researcher decide, in advance, how the investigation will proceed, in what order, and what observations shall be made.
- It proposes the objective which should be limited in extent and eminent obtainable. Policy of the course of action, procedure adopted and the step by step program needed to accomplish the mission in a specific time and budget.

### Pilot Research Study

- It proposes the objective which should be limited in extent and eminent obtainable policy of the course



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- Make sure that parents are completely satisfied with the treatment done and do everything to gain their satisfaction and enthusiasm. This is the time to tell them how much we appreciate them as patient and to ask them for referral.
- Give reason for recall visit.

*Note:* Now a days, the chief marketing idea is the appearance of dental clinic, facility available in the clinic; internal dental environment, dentist personality and statement at the time of treatment provide a warm attractive and promote the feeling of high trust and low fear to the patient and parents. The chief marketing rule of the pediatric dentistry is to be people oriented, not time oriented, production oriented and definitely not dentist oriented. Pedodontist must provide a little more facility to the patient than they could receive in another dental practice.

#### *Place*

Term place in the marketing system denotes that how the product or services are distributed and how do we make our services available to our targeted population or communities. These goals can be achieved by establishing the dental clinic at an appropriate location. It is easy to do business where a need exist rather than an already overcrowded market, usually near the neighborhood school. Dental clinic location must be highly visible and in the way of high traffic road.

- Distribution refers not only location but also to the hours that our services are available. Try to work in the odd hours and open your clinic an hour earlier and eat lunch later so that you will be available before working hours of the individual and during lunch hours when working individual can get free. Pedodontist always offer people hours not doctor's hours.

#### *Price*

We always keep in mind that if patient ask about fee, is not correlated with lowest price but want to know about value and quality of work. Pedodontist must be ensuring the patients regarding comparative advantages and disadvantages of all the available services, and showed the worthiness of fee. Supply and demand must be considered in mind, when we are dealing with pricing strategies. Today, those dentists whose fees are modest have a marketing advantage.

- Pedodontist should provide the treatment option with fee and explain the advantage/disadvantage; so that patient can choose the option of higher fees or lower fees related with their socioeconomic status.
- Most important component of pricing is the spectrum of financial services offered. Usually, a cash policy severely limit the sizes of our patient load, where as time payment, discounts for cash, acceptance of third party payments, medical assistance and other alternative will significantly increase our share of the market.
- Most of the patient can't handle large dental bills in one payment and borrowing many at high interest rate is also impractical, so multimonh (EMI) payment arrangement seems to be necessary in virtually every practice. In many instances people will purchase our services based more on the level of monthly payments than on the total cost.

*Note:* Remember that aim of our practice is to serve our patient needs and extension of adequate , flexible credit term and acceptance of assignment of insurance benefits will enables us to meet the needs of a larger segments of our population.

*Promotion:* Promotion is not advertising of dental clinic but it includes all of the tools available to inform existing and potential patient about who we are and what our services consist of.

#### **Internal Marketing (Internal Promotion)**

- All those extra things do for maintenance of existing patient to say that we care about them. Patient who will tell all their friends about the special care, they receive from the particular dental clinic, called as Dental missionaries. Internal marketing must involve all dental personnel utilizing every contact with patient as an opportunity to promote our practice. Birthday card sent to the pediatric patient and small toy or balloon is given to every child, coming to the pediatric dental clinic to promote our practices.
- Dental missionaries or references might grant with special gift after 3rd or 4th referrals.
- The dental personnel should be well dressed and dental clinic can be decorated on every festivals. It will also help us to keep these patients in our practice.
- Emergency care should be available at our clinic 24 hours a day. Make emergency patient a marketing





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# Index

## A

Absorption of fluoride 170  
Access opening for RCT in primary teeth 213  
Accidental and non-accidental oral trauma 323  
Acid etched composite crown 195  
Acidogenic theory 142  
Acidulated phosphate fluoride solution 178  
Acquired heart disease 298  
Acrylic  
  jacket crown 197  
  partial denture 96  
Acute  
  dental caries 144  
  necrotizing ulcerative gingivitis 292  
ADA recommendations for mouth guard 314  
Adrenal insufficiency 304  
Adsorption and ion exchange method 181  
Advances in dental instruments 338  
Advantages of  
  CT scan 343  
  electrosurgery 112  
  fixed space maintainer 97  
  incineration 13  
  LA vs GA 223  
  laser 312  
  surgery 112  
  myofunctional appliances 136  
  water fluoridation 175  
Age specific plaque control 123  
Alveolar  
  cyst 283  
  lymphangiomas 283  
Anesthesia for maxillary primary molars and premolars 237  
Ankyloglossia 283  
Anodontia 75  
Anomalies of tooth  
  form 73  
  number 74  
  structure 75  
Anterior teeth 205  
Anteroposterior TMJ articulation 46  
Antibiotic  
  prophylaxis 299  
  vaginitis 132

Antihistamines 248  
Antimicrobial action of fluoride 173  
Apex locator 343, 345  
Apexification pulpless in immature apex 216  
Apical barrier technique 216  
Arrested  
  caries 144  
  lesion 145  
Arsenic poisoning 322  
Articulatory speech 26  
Atraumatic restorative technique 198  
Autoclave 5  
Autoimmunity theory 143

## B

Baby bottle tooth decay 132  
Bacterial  
  growth and proliferation within dental plaque 118  
  infections 292  
Balanced diet 66  
Band and  
  bar type space maintainer 101  
  loop space maintainer 98  
Battered baby syndrome 320  
Behavioral theory 104  
Benzodiazepines  
  antagonist 247  
  group 247  
Bisecting angle technique 41  
Bite wing technique 42  
Blindness 308  
Breastfeeding 130  
Brudevold technique 178  
Bruxism 288  
Buccal  
  and lingual surfaces 192  
  object rule 44  
Buckley's formacresol 212

## C

Caffey syndrome 320  
Calcium hydroxide 212  
Canal irrigating agent 214  
Candidiasis 293  
Canines 72  
Capabilities and limitations of laser 311

Carbohydrate 66  
Cardiac diseases 298  
Careful handling of biopsy specimen 2  
Caries  
  activity tests 151  
  detection 32  
  management 166  
  protective component of food 149  
  risk assessment 151  
  vaccine 168  
Cariogram 155  
Cariology 142  
Cartridges 220  
Castable glass ceramic veneer 197  
Causes of mouth breathing 104  
Cavity  
  in primary tooth 184  
  preparation in primary teeth 184  
Cell inductive agents 213  
Cementation 197  
Cemented pins 265  
Cerebral palsy head support 298  
Chair side  
  method 153  
  veneered 194  
Chalky Whitespot lesion 144  
Challenges for pediatric dentistry in 21st century 3  
Characteristics of *Streptococcus mutans* 168  
Cheek and lip chewing 288  
Chelation theory 142  
Child abuse and neglect 320  
Child's  
  first dental visit 163  
  position during dental treatment 22  
Childhood  
  autism 307  
  development 55  
Child-language development 26  
Childs orofacial examination 20  
Chronic  
  dental caries 144  
  inflammatory intestinal diseases 306  
  renal failure 302  
Clark's rule 255  
Classification of  
  fluoride administration 174  
  foods 64

- fracture 277
- matrix band 185
- resin fissure sealant 165
- tongue thrust 105
- waste 8
- Cleft lip and palate 309
- Clinical
  - classification of caries 43
  - examination of child 25
  - feature of digit sucking 104
  - significance of developmental theories 49
- Coagulation disorders 299
- Collecting forensic evidences 325
- Collection of
  - important information 37
  - waste 9
- Color of teeth 32
- Combination of methods and sedative agents 245
- Combustion chamber 12
- Commissural lip pit 285
- Common
  - infectious lesion of oral cavity in child and adolescent 290
  - pediatric oral pathology 283
- Commonly used drugs in pediatric dentistry 254
- Community
  - activities of pediatric dental surgeon 164
  - water fluoridation 175
- Complete denture 97
- Complexity of plaque bacteriology 116
- Complications of
  - local anesthesia 224
  - traumatic injuries 276
- Component of developing dental marketing 355
- Composition of
  - dentifrices 121
  - local anesthetic 219
- Computerized delivery systems 222
- Concentration of Buckley's formacresol 212
- Concepts of
  - bacterial specificity 118
  - preventive orthodontics 89
- Congenital
  - heart disease 298
  - lesions 283
- Conscious sedation in children and adolescents 241
- Consequences of faulty wedging 186
- Considerations of maxillofacial injuries in growing patient 277
- Contents of counseling 130
- Contraindication for
  - primary root canals 213
  - pulpotomy in primary tooth 212
- Contraindications of removable space maintainer 96
- Conventional
  - cartridge syringes 220
  - local anesthesia technique 235
  - method 156
- Convulsive disorder 304
- Copper poisoning 323
- Cross sectional study 349
- Crown
  - adaptation 196
  - and loop space maintainer 97
  - fracture 275
  - selection 196
- Cystic fibrosis 301
- D**
- Defluoridation 181
- Delayed
  - eruption of permanent teeth 72
  - speech 26
- Demineralization process 146
- Dental
  - air abrasion 340
  - caries 306
  - history 262
  - injuries 262
  - microscope 346
  - office access 19
  - plaque 116
  - radiology for child and adolescent 40
  - staff, policies and systems 357
  - uses 343
    - of EDA 233
- Dentifrices 121, 128
- Dentinogenesis imperfecta 77
- Dentistry for sport players 314
- Detergent food 149
- Determination of working length 214
- Development of
  - dentition 80
  - supernumerary tooth 74
  - supragingival plaque 112
- Developmental
  - lesion 285
  - stages of nursing caries 159
- Diagnodent 157
- Diagnosis of
  - dental caries 155
  - ectopic eruption 71
- Diagnostic testing for
  - trisomy 18 336
  - trisomy 9 336
  - Turner's syndrome 336
- Dietary
  - fiber 66
  - fluoride supplements 175
- Digit sucking 103
- Digital imaging fiberoptic
  - transillumination 157
- Disadvantages of
  - CAD/CAM systems 339
  - fixed space maintainer 97
  - laser surgery 113
  - myofunctional appliances 136
- Discussion and interpretation of results 351
- Disinfection of operatory surface and dental appliances 6
- Displacement injuries 275
- Distal shoe space maintainer 100
- DNA probe 35
- Down syndrome 306
- Drawback of formacresol 212
- Dual defluoridation technique 181
- Duration of expected anesthesia 230
- E**
- EDA
  - advantages 234
  - contraindications 234
  - disadvantages 234
  - indications 234
- Electric pulp testing 33
- Electrical conductance measurements 156
- Electronic dental anesthesia 232
- Ellis and Davey classification of tooth fracture 263
- Ellis class
  - I fracture 263
  - II fracture 264
  - III fracture 265
  - IV fracture 267
  - V fracture 268
  - VI fracture 268
  - VII fracture 269
  - VIII fracture 272
- Embryonic development 80
- Emergency
  - equipment 243
  - treatment 278, 302
- Emotional abuse 321
- Enamel hypoplasia 75
- Endocrine disorders 303
- Endodontic therapy in primary and young permanent teeth 209
- Eruption cyst 70, 287

- Eruption of  
 permanent teeth 82  
 primary teeth 81  
 teeth 69
- Special tooth vitality test 263
- Esthetic  
 anterior space maintainer 101  
 composite 187  
 restoration of primary anterior teeth 194
- Etching 196
- Etiology of hypoplasia of enamel 75
- Examination of  
 dentition 31  
 head and neck 22  
 maxillofacial injuries 263  
 palate 31  
 tongue and sublingual space 31
- Excretion of fluoride 172
- Fabrication 100
- F**
- Facility option 12
- Factors  
 affecting fluoride absorption 170  
 influencing design of crown 189  
 responsible for dental caries 146
- Failure of anesthesia 230
- Fatty acids 65
- Federation dentaire international system 33
- Fentanyl 248
- Ferric sulfate 213
- Fiber optic transillumination 34, 156
- Finger nails biting habit 107
- Finn's modification of Black's classification  
 for primary teeth 184
- Fissured tongue 285
- Fixed space maintainer 92
- Fluoridated  
 dental materials 179  
 sugar 176
- Fluoride  
 and dental health 170  
 containing oral prophylaxis paste 179  
 exposure 296  
 in beverages 176  
 in blood plasma 171  
 in calculus 172  
 in dental tissues 172  
 in plaque 172  
 in saliva 172  
 probe 35  
 sustained release device 176  
 toxicity 180  
 varnishes 178
- Fordyce granules 286
- Forensic  
 dentistry 319  
 odontostomatology 319  
 pedodontist 321, 325  
 science for pedodontist 319
- Formalin gas chamber 5
- Fosdick calcium dissolution test 155
- Foster-Miller probe 35
- Fracture of  
 mandible 279  
 maxilla 281  
 zygomatic arch 282
- Frank cavitation 145
- Free smooth surfaces 167
- Frequency apex locator 344
- Friction lock pins 266
- Function regulator appliance 141
- Functions of proteins in body 65
- Fundamentals of  
 marketing plan 355  
 private practice in pediatric dentistry 354
- G**
- General  
 anesthesia in pediatric dentistry 250  
 principles of pediatric drug therapy 254  
 refuse waste 8  
 survey of child 25
- Genetic  
 counseling 306  
 in dentistry 330  
 session 331
- Geographic tongue 285
- Gerber space maintainer 101
- Gingiva 31
- Gingival health considerations in child and  
 adolescents 109
- Gluteraldehyde 212
- Greater palatine nerve block 238
- Growth and development of nasomaxillary  
 complex and mandible 85
- Growth of maxilla 85
- Gum pad 81
- H**
- Hand, foot and mouth disease 291
- Harvold activator 140
- Hazardous waste 8
- Hazards of radiation 46
- Head  
 injury 318  
 positioners 298
- Health education room 18
- Heat exchangers 13
- Hemangiomas 284
- Hematoma 287
- Hepatic disorder 302
- Herbst appliance 141
- Hereditary factor 151
- Herpangina 291
- Herpes labialis 290
- Hidden caries 145
- Home dental care regime 296
- Human immunodeficiency virus 291
- Hyperactivity 307
- Hypomineralization of enamel 76
- Hypomineralized incisors 22
- Hypoplasia 76
- Hypoplastic canine and premolars 22
- I**
- Ideal pits and fissure sealant 165
- Immune disorder 305
- Immunologic response in gingivitis and  
 periodontitis 119
- Impaction and delayed eruption of  
 maxillary permanent canines 72
- Impedance apex locator 344
- Impetigo 292
- Importance of  
 forensic dentistry 319  
 pediatric dentistry 1  
 pedodontics 3
- Incineration 9
- Incisors 72
- Inclined plane 137
- Indication for  
 full coronal coverage of incisors 195  
 GA in treatment of children 250  
 local anesthesia 223  
 pulpotomy in primary teeth 212  
 radiograph in children and adolescence 33
- Indication of topical fluoride application 176
- Infection  
 control  
 in diabetic dental patient 6  
 in pediatric dental clinic 4  
 through hospital waste disposal 8  
 to dental staff 6
- Infectious  
 parotitis 292  
 waste 8
- Infraorbital nerve block 240
- Inhalation sedation equipment 246
- Internal  
 marketing 356  
 promotion 356
- Intraosseous technique 227
- Intraligamentary injection 225
- Intramuscular sedation 245

- Intraoral  
 camera 347  
 lesion 291  
 radiography [41](#)
- Intrapapillary techniques 228
- Intrapulpal anesthesia 229
- Intraseptal injection 226
- Intrinsic staining 78
- Introduction to pediatric dentistry [20](#)
- Iontophoresis 179
- J**
- Jaw fracture in children 278
- Jaws rotation during growth 87
- Jet injectors 223
- Juvenile periodontitis 114
- K**
- Knutson technique 177
- L**
- Lacking in cooperative ability [57](#)
- Lap to lap position [22](#)
- Laser  
 beam sterilization [6](#)  
 Doppler flowmetry [34](#)  
 for hard tissues 310  
 in dentistry 310
- Late fetal development 80
- Lateral  
 displacement 269  
 skull projections 44
- Lead poisoning [322](#)
- Leukemia 305
- Lighting of operative field 39
- Limitations of functional appliances [140](#)
- Lingual  
 holding arch space maintainers 99  
 nerve block 235  
 thyroid [286](#)
- Listerfluor fluoride dental rinse 179
- Local  
 anesthesia for maxillary permanent molars [238](#)  
 anesthetics 223
- Long buccal nerve block 236
- Low temperature carbonization [12](#)
- Lymphangiomas 284
- M**
- McDonald's classification 324
- Machined restoration 338
- Macroglossia [286](#)
- Malformation of teeth [32](#)
- Management of  
 acute toxicity of fluoride [180](#)  
 dens in dente [73](#)  
 dental problems of handicapped and systemically compromised children 294  
 double teeth [73](#)  
 nursing caries 161  
 soft tissues 271  
 staining 78  
 teething [69](#)  
 tongue thrust 106
- Mandible 86
- Mandibular rotation 88
- Manipulation of polycarbonate crown 196
- Maternal diet and nutrition 129
- Matrix bands [185](#)
- Mayne space maintainer [101](#)
- Measurement of  
 buffering capacity of saliva 154  
 mutans streptococci in saliva 153  
 salivary flow rate 154
- Mechanical devices to hold mouth in open condition 297
- Mechanism of  
 action of fluoride [173](#)  
 fluoride absorption 170  
*Streptococcus mutans* adherence to tooth surface [169](#)  
 submergence 70
- Median alveolar notch 284
- Melanotic neuroectodermal tumor of infancy 285
- Menopause and oral health 133
- Mental  
 nerve block 240  
 retardation 306
- Meperidine 248
- Mercury poisoning [322](#)
- Methods of  
 cross bite correction 92  
 sex determination 329
- Microbial test 153
- Microbiota of  
 enamel caries 147  
 root surface caries 147
- Microwaves sterilization [9](#)
- Midazolam 247
- Milk fluoridation 176
- Minimal intervention for proximal caries in primary teeth [185](#)
- Modification of clinic for disabled child [19](#)
- Motor aphasia [26](#)
- Mottled enamel 78
- Mouth  
 breathing 104  
 guard [317](#)
- Mouthwashes 290
- MTA  
 barrier technique 216  
 for root perforation 268
- Mucocele [286](#)
- Muhler technique 177
- Mumps 292
- Mycotic infection 293
- Myofunctional appliance therapy 135
- N**
- Nalgonda  
 calcined magnesite technique 181  
 technique 181
- Naloxone 248
- Nance holding arch 99
- Narcotic 248  
 antagonist 248
- Nasal fractures 282
- Nasoethmoidal fracture 282
- Nasopalatine nerve block [238](#)
- Natal teeth 285
- Neonatal candidiasis 293
- Nerve anesthetized 226
- Neuropsychological disabilities 306
- Non spaced primary dentition 84
- Normal  
 child development [49](#)  
 periodontium [109](#)
- Number of teeth [31](#)
- Nursing bottle caries [132](#), 158
- Nutrition during pregnancy and lactation [132](#)
- Nutritional  
 considerations for children and adolescents 64  
 strategies for adolescent girl 131
- O**
- Obturing materials for primary root canals 214
- Obturation technique 214
- Occlusal  
 radiographic technique 42  
 reduction 192  
 surface 167
- Occlusion of teeth [32](#)
- Odontogenic cyst [286](#)
- Odontology 319
- Open face steel crown [194](#)
- Operating room protocol 250
- Oral  
 flora 118  
 health of child 130  
 leukoedema 284  
 manifestation of mentally retarded

- patient 306  
   mucosa [30](#)  
   symptoms of menopause 133  
 Orbital fracture 282  
 Origin of dental caries 145  
 Oximetry [347](#)
- P**
- Palatal cyst 283  
 Panoramic radiography 43  
 Paralleling technique [41](#)  
 Parent counseling 161  
 Parental of caretaker history [23](#)  
 Parulis [286](#)  
 Pediatric  
   dental  
     clinic 162  
     uses of air abrasion [341](#)  
   oral habits 103  
   restorative dentistry 183  
 Pedodontics in India 1  
 Peg shaped lateral incisors [73](#)  
 Periapical radiographic technique 43  
 Periodontal  
   pathogenicity of oral bacteria 116  
   probe [37](#)  
 Periodontitis and loss of tooth in young children [113](#)  
 Periotemperature probe 35  
 Permanent  
   teeth 76  
   tooth pulpotomy 215  
 Pharynx and tonsil's examination [31](#)  
 Philosophy of dental practice 354  
 Phosphorylating theory 143  
 Physiological changes in body of pregnant women 129  
 Pilot research study [349](#)  
 Pit and fissure caries 143  
 Plaque maturation [117](#)  
 Polycarbonate crown 196  
 Position of dental  
   assistant [22](#)  
   and patient around dental chair 38  
 Postanesthesia trauma 288  
 Posterior teeth 202  
 Postnatal  
   and infancy history [23](#)  
   counseling 163  
 Potentially cooperative behavior 58  
 Powered injectors 223  
 Practical implication of temperamental development 51  
 Prasanti technology for defluoridation 181  
 Preeruptive caries [144](#)
- Prefabricated  
   crown in pediatric dentistry 189  
   metal crowns 190  
 Preformed plastic crowns 197  
 Prenatal  
   and natal history [23](#)  
   dental counseling 130  
   effect on facial development 80  
   fluoride 129  
   oral health and oral health in pregnancy 129  
   screening for Down syndrome [336](#)  
   trimester screening for Turner's syndrome 337  
 Preparation of  
   child for general anesthesia 252  
   socket 270  
   tooth 196  
 Prepubertal periodontitis [113](#)  
 Pressure laminated mouth guard 316  
 Pre-veneered stainless steel crowns [194](#)  
 Primary  
   anterior tooth preparations 192  
   dentition 206  
   posterior tooth preparation 192  
   root canal anatomy 209  
   teeth 76  
   tooth  
     fracture 275  
     injuries 275  
     preparation 192  
 Principles of  
   cavity preparation 183  
   dental surgery for adult women 131  
   preventive dentistry 161  
 Probable factors of parents responsible for child abuse 321  
 Properties of  
   inhalation general anesthesia 251  
   MTA 267  
   X-rays 40  
 Proteolysis theory 142  
 Proximal  
   slices 192  
   slot preparation [185](#)  
 Psychoanalytic theory 103  
 Psychological changes in pregnancy 129  
 Psychology of hospitalized children 250  
 Puberty and adolescence 131  
 Pulp  
   diseases in primary teeth [210](#)  
   therapy agent 215  
   treatment for young permanent teeth 215  
   vitality test [33](#)
- Pulpotomy in primary teeth 213  
 Pulse oximetry in evaluation of pulp vitality [34](#)
- Q**
- Quantitative light induced fluorescence 157
- R**
- Radiation caries [144](#)  
 Radioactive waste 8  
 Radiographic techniques in dentistry [41](#)  
 Radiovisiography [156](#)  
 Rampant caries 158  
 Recent  
   concept of caries development 146  
   development in dentifrices [121](#)  
 Recommended daily allowance 66  
 Recurrent  
   aphthous ulcers 291  
   caries [144](#)  
 Regular professional supervision 296  
 Reheating chamber [13](#)  
 Removable  
   distal shoe space maintainer [97](#)  
   space maintainer 96  
 Removal of  
   dental fluorosis strains 78  
   fluoride 181  
 Renal disorders 302  
 Repetitive speech or stuttering [26](#)  
 Research  
   design [349](#)  
   empirical studies 350  
   methodology and biostatistics 348  
   planning [349](#)  
   study format 350  
 Resistance  
   apex locator 343  
   form 274  
 Respiratory disorders 301  
 Restorative treatment 265  
 Restraints for extremities 297  
 Retainers [185](#)  
 Retrocuspid papilla 285  
 Reverse osmosis 181  
 Role of  
   hygienist 162  
   oral microbiota 147  
   pediatric dentist 161  
     in genetic counseling [330](#)  
   pedodontist in forensic science 320  
   substrate 148  
 Root canals cleaning and shaping 214  
 Root canals of  
   mandibular

- 1st primary molars [210](#)
  - 2nd primary molars [210](#)
  - maxillary
    - 1st primary molars [210](#)
    - 2nd molars [210](#)
  - primary molars [210](#)
  - Root fracture [275](#)
  - Rotation of maxilla [86](#)
  - Rubeola [291](#)
- S**
- Saliva [30](#), [154](#)
  - Salt fluoridation [175](#)
  - School water fluoridation [175](#)
  - Scope of pedodontics [1](#)
  - Secondary factor of caries development [150](#)
  - Sedative hypnotics [248](#)
  - Selection of
    - crowns [191](#)
    - target market [354](#)
    - teeth for sealant application [166](#)
  - Self applicable topical fluoride [179](#)
  - Self-threaded pins [266](#)
  - Set-up of pediatric dental clinic [15](#)
  - Sexual abuse [321](#)
  - Showroom of preventive dentistry [164](#)
  - Single
    - in house facility [12](#)
    - use syringes [221](#)
  - Size of teeth [32](#)
  - Slavkin squares model for environmental caries risk factor [148](#)
  - Smokeless tobacco [289](#)
  - Smooth surface caries [143](#)
  - Snyder test [155](#)
  - Sodium fluoride solution [177](#)
  - Soft tissue injuries [279](#)
  - Sources of
    - fluoride intake [170](#)
    - proteins [65](#)
  - Space
    - maintainers [95](#)
    - relationship in replacement of deciduous
      - canine and molars [83](#)
      - incisors [83](#)
  - Spot-welded matrix band [185](#)
  - Stages of machined restoration
    - fabrication [338](#)
    - with CAD-CAM [339](#)
  - Staining of teeth [22](#)
  - Stainless
    - crown trimming [192](#)
    - orthodontic bands [197](#)
    - steel crown [190](#), [194](#)
  - Stannous fluoride solutions [177](#)
  - Sterilization of
    - endodontic instrument [4](#)
    - glass slab [5](#)
    - gutta-percha [5](#)
    - silver cone [5](#)
  - Storage of fluoride in bone [171](#)
  - Strip crown preparation [195](#)
  - Sub-mentovertex projections [45](#)
  - Submerged tooth [70](#)
  - Submucosal sedation [245](#)
  - Success of post and core restoration [272](#)
  - Sulfatase theory [143](#)
  - Supragingival plaque [117](#)
  - Supraperiosteal technique for maxillary primary, permanent incisors and canine [236](#)
  - Swab test [155](#)
  - Systemic administration of fluoride [174](#)
- T**
- Tactile examination [156](#)
  - Talon cusp [74](#)
  - Technique for
    - fabrication of post and core [274](#)
    - maxillary and mandibular nerve block [235](#)
  - Technique of
    - fissure sealant application [166](#)
    - human identification [320](#)
    - inhalation [251](#)
  - Teething
    - and associated problems [69](#)
    - process [69](#)
  - Temperature of body [27](#)
  - Temporomandibular disorders in pregnancy [132](#)
  - Tetracycline staining [78](#)
  - Tetralogy of dental caries [146](#)
  - Thermal testing [34](#)
  - TMJ projection [46](#)
  - Tongue thrust habit [105](#)
  - Tooth vitality test [263](#)
  - Topical
    - anesthesia [224](#)
    - fluoride [176](#)
      - administration [174](#)
      - agents [178](#)
      - application [176](#)
  - Toronto automated probe [35](#)
  - Transcranial TMJ articulation [46](#)
  - Traumatic ulcers [288](#)
  - Treatment
    - during pregnancy [131](#)
    - of metal poisoning [322](#)
    - planning [37](#)
  - Tunnel shaped cavity preparation [185](#)
  - Turner's syndrome [336](#)
  - Twin bloc [141](#)
  - Types of
    - fissures [165](#)
    - apex locator [343](#)
    - appliances [137](#)
    - bionators [140](#)
    - bodies coming for dental identification [320](#)
    - caries [143](#)
    - dentifrices [122](#)
    - gait [25](#)
    - mouth guards [315](#)
    - periodontal probe [37](#)
    - research study [348](#)
    - wedges [186](#)
- U**
- Unconventional local anesthetic techniques [224](#)
  - Uniform dental recording [32](#)
  - Unintentional ingestion of fluoride [176](#)
  - Use of
    - iontophoresis [179](#)
    - natural or head lamp operating light [201](#)
    - pit and fissure sealant [165](#)
    - preventive
      - and interceptive orthodontics in pediatric dentistry [89](#)
      - orthodontics [89](#)
    - wedge [186](#)
    - weight for determination of dosage [255](#)
- V**
- Vacuum custom made mouth guard [316](#)
  - Vastness of pedodontics [2](#)
  - Veneer restoration in primary teeth [187](#)
  - Vincent infection [292](#)
  - Viral infection of mouth [290](#)
- W**
- Waste
    - disposal [9](#)
    - from medical/dental environment [8](#)
    - management [8](#)
    - minimization options [13](#)
  - Weight-watchers phenomenon [149](#)
  - Wheel chair head rest [298](#)
- X**
- Xeroradiography [156](#)
- Y**
- Young's rule [255](#)