PART 2

ILLUSTRATED PEDIATRIC DENTISTRY

Editors:
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Bentham Books

Illustrated Pediatric Dentistry (Part 2)

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FOREWORD 1

It is my great pleasure to pen down a foreword for this tremendous book on Pediatric Dentistry for a legend and doyen of the subject, a mentor and guide to the brightest of minds in the field of dentistry.

Rising from the fundamentals, comprehensive in-built, contemporary and authoritative in construct and approach, and hands-on to the core, ***Illustrated Pediatric Dentistry*** is a wonderful work engineered by some of the best-known academics in this noble realm. The chief author, ***Professor Satyawan Damle***, is a colossus among giants, having been a celebrated teacher, distinguished leader, and dynamic policymaker at several dental institutions and universities, including the most prized, the University of Mumbai.

Prof. Satyawan Damle is the rare blend of a gifted clinician and a carved-out academic guru whose intellect has emerged with decades of practice. It is no secret that the degree of acquisition of knowledge by students is one of the measures of the effectiveness of a medical curriculum; and with Pediatric Dentistry being one of the crucial epicentres of growth, it has the potential to make momentous advancements in the evolutionary trajectory of oral and general health.

His co-editors ***Ritesh Kalaskar & Dhanashree Sakhare*** are examples of excellence in their arena. The work reflects their collective understanding of where pediatric dentistry stands today, what have been the treasures and well-kept secrets of the past, and where this tree of knowledge finds fruition today pawing way for the future.

Embedding best care practices of all times, ***Illustrated Pediatric Dentistry*** is a comprehensive yet concise work, which fulfils the essentials of the pediatric dentistry curriculum both for graduates and postgraduates across all universities.

Walking you through the nitty-gritties of preventive, curative and restorative childhood dentistry, be it the behavioral challenges, cariology, endodontics, traumatology, para-surgical themes such as the use of conscious sedation and general anaesthesia at that age, and the management of medically compromised children, the work is a tree of knowledge, nurtured with experiential learning, and carries wonderful blossoms of practical wisdom.

Let us savour and celebrate the chef-d'oeuvre. Indeed, Illustrated Pediatric Dentistry is a must-read and must-assimilate work for each one of us. Students, practitioners and teachers of Pediatric dentistry will cherish it as a treasured possession on their shelves. I congratulate Prof. Damle and Bentham Science, Singapore, for publishing this irreplaceable tome.

Prof. (Dr.) Mahesh Verma
Vice Chancellor
Guru Gobind Singh
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New Delhi,
India

FOREWORD 2

I am delighted to write this foreword for a Book of Illustrated Pediatric Dentistry edited by Professor Satyawan Damle and other academicians. Prof. Satyawan Damle is a well-known researcher and academician with over 44 years of clinical and teaching experience in Dentistry. Besides the several posts and hats he wore in the various roles he played for the profession, he is also a recipient of several awards and recognitions, including the Lifetime Achievement Awards, Outstanding Public Servant Awards, and Research Awards and Fellowships. He is an active member of the Indian Council of Medical Research. Despite his extraordinary achievements as a Pediatric dentist, researcher, and academician, Prof Satyawan Damle will always be known as the longest-serving chief editor of Indexed journals. For almost 35 years. He dedicated himself to overseeing the publication of the highest-quality peer-reviewed studies and opinion pieces on child dental health.

Prof. Damle is actively involved in writing several books on Pediatric Dentistry and Dentistry, which is the testimony of his in-depth knowledge of the subject. The Book of Illustrated Pediatric Dentistry is their new venture initiated by him. I am confident that this book will be accepted by students and faculty involved in teaching Pediatric Dentistry. His work as a teacher, researcher, innovator, visionary and extraordinary academician made him a legend. His role as a mentor and friend made him a role model to those of us who know him and worked with him. His legacy persists not only in academics but also as an able administrator, as he proved his mettle as the Dean of a dental school, Director of Medical Education, Joint Municipal.

Commissioner of Mumbai and, ultimately, the Vice Chancellor of a University. Prof. Damle has worked conscientiously and untiringly to present an unmatched educational endeavour. The topics in this book display a clear and succinct clinical expertise and the capability of imparting updated education and information to Oral Health Professionals. The entire volume of this book deals with ultramodern and current state-of-the-art techniques. I take this opportunity to congratulate Prof. Satyawan Damle and his team of contributors - Ritesh Kalaskar and Dhanashree Sakhare for publishing this Textbook for Bentham Science.

Dr. Ashok Dhoble
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PREFACE

It is imperative to have an established approach to handling Children's oral diseases. **'Illustrated Pediatric Dentistry,'** is an unpretentious endeavour to integrate the latest developments and up-to-date reviews in the field of Pediatric dentistry by distinguished writers. The book intends to allow students to understand the conceptions of Pediatric dentistry and create a spur to discover the subject by advance reading. Several illustrations, descriptions and graphic drawings have been included to attract the students and make the subject simple to comprehend. A healthy mouth is a gateway to a healthy body and the best time to inculcate healthy habits is through childhood. Prevention of the initiation of oral diseases and training appropriate oral hygiene methods are commenced best throughout the formative years of the child. With a substantial percentage of the worldwide population being in the Pediatric age group, it is imperious to have a scientific approach in the behaviour management, prevention and treatment modalities in the dental office, as Pediatric dentistry is a fast-growing division of dental disciplines that lays the basis for the impending dental health of the populace.

The book has been divided into several sections. The sections on child psychology and the emotional development of children are important to learn the basics of various behaviour management strategies. The section on dental caries sensitizes the reader towards the most common dental disorder that is seen in children, and preventive procedures aimed towards lessening dental caries are the necessity of the hour. While an endeavour has been made to include the growth and development of the facial structures and dentition and along with their disturbances and the interceptive and preventive procedures to monitor the erupting teeth.

Pediatric Operative techniques, including endodontics and management of teeth with immature apices affected due to dental caries and traumatic injuries have been given prominence. Innovations in the field of Pediatric dentistry are transpiring amazingly fast, and it is crucial to stay up to date with the latest materials, equipment and techniques to deliver the highest quality of care to our little patients.

The new book cannot be successfully compiled without the collective contribution regarding meticulous reviews of the manuscript to keep pace with the latest innovative novelties. The credit for introducing a new textbook goes to the contributors for their engrossment, devotion and dedication in presenting a manuscript after applying prudent and well-adjudged scrutiny and analytical approach and have excelled in exploring the things to the ultimate.

Accumulation of information and its cogent management would not have been conceivable without the efforts of the contributors who have painstakingly submitted their manuscripts to shape this gargantuan task and to introduce this book in the service of Pediatric dentistry.

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ACKNOWLEDGEMENTS

We do not find such appropriate words to praise the unique nature of Dr. Mahesh Verma, Vice Chancellor of Guru Gobind Singh Indraprastha University, New Delhi, who himself being a great resolute and connoisseur of dentistry occupying an illustrious position with an eminent background in dentistry, has spared his valuable time from his busy schedule to inscribe the foreword for the textbook of "Illustrated Pediatric Dentistry". We take it as inventiveness and encouragement rather than a morale-boosting for us to uphold and keep up our determination to satisfy our hunger for academics for the advantage of budding dental professionals.

We also do not find such befitting words to laud the unique nature of Dr. Ashok Dhoble Hon, General Secretary, Indian Dental Association Head Office, who himself being a great advocate and connoisseur of dentistry occupying a distinguished position with an illustrious background in dentistry has spared his precious time from his busy schedule to write the foreword for the Textbook of Illustrated Pediatric Dentistry. I take it as an inspiration and encouragement rather than a morale-boosting for us to uphold and keep up our determination to satisfy our hunger for academics for the advantage of budding dental professionals.

We are also indebted and beholden to the contributors for their altruistic and substantial contribution to make this Textbook of Illustrated Pediatric Dentistry, a great academic endeavour. The contributors are highly competent and knowledgeable clinicians known for their aptitude and capability, which have successfully recognized the most complex and convoluted details of each topic, duly integrating and blending the latest advancements and innovations in Pediatric Dentistry. They are a terrific hard worker and legendary luminaries known for their admirable accomplishments and remarkable involvement in dental education. They have made lots of efforts to lead things to excellence. Credit goes to these patrons and benefactors for the benevolent bequest of their vast knowledge and experience for the betterment of dental education.

We would also like to thank Dr. Priyanka Bhaje, Dr. Parag Kasar, Dr. Sharath Chandra, Dr. Prachi Goyal and Dr. Vidya Iyer for their painstaking efforts and intransigent toil during the editing of this book. They displayed exceptional patients, forbearance, and commitment during the preparation of the book Our dream has come true due to the support of our past and present students. Credit also goes to our family members for their tolerance, Love, and affection.

We would like to appreciate the efforts of Mrs. Humaira Hashmi & Mrs. Fariya Zulfiqar of Bentham Science for giving us an opportunity to pen down our ideas and academic work to reality. We also convey our kind and sincere appreciation to Pascali Pascalis.

Representative of Porter Instrument Business Unit of Parker Hannifin Matrx by Parker and Parker-Porter Product for permitting us to use the company products in our book.

Lastly, we would like to state that fortune favours those who defy complexities and overcome them on their own. We also passionately believe that Man is the architect of his own destiny, and God is on the side of those who toil and perspire to make their providence.

We place our sincerest admiration and gratitude to all those who have delightfully contributed to this cause and for their wishes and devotions made for understanding our dream.

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CHAPTER 1

Swellings of Orofacial Structures in Children

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Abstract: Orofacial swelling is clinically a common problem found in pediatric dental patients. The causes of these swellings are mostly diverse, and the knowledge about specific clinical as well as imaging manifestations along with the most affected sites of these swelling is needed for the formulation of a differential diagnosis. Mid-facial non-progressive swelling is usually suggestive of a congenital defect (like a cephalocele, nasal glioma, epidermoid cyst or nasal dermoid). Swelling that is slowly progressive, may be indicative of a neurofibroma, hemangioma, vascular malformation, lymph angioma, pseudocyst or fibrous dysplasia. In cases of facial swellings that are rapidly progressive and associated with cranial nerve deficits, rhabdomyosarcoma, Ewing sarcoma, Langerhans cell histiocytosis, metastatic neuroblastoma and osteogenic sarcoma should also be included in the differential diagnosis.

Keywords: Congenital Defect, Differential Diagnosis, Oro-facial Swelling.

INTRODUCTION

Facial swelling is one of the common and significant clinical problems in pediatric dentistry. The etiological factors (origins) of a facial mass or swelling may vary from congenital causes to various acquired conditions like infections and conditions of soft tissue and/or bone (malignant or benign). The detailed history, physical manifestations and clinical examination are the most important factors when evaluating these facial swellings (Fig. **1**). Jaw swellings, another important problem in children, pose a major diagnostic challenge in Pediatric Dentistry. Detailed knowledge about these entities helps in the appropriate management of this condition.

Diseases of Jawbones

The diseases of jawbones are mentioned in the following Fig. (**1**):

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OSTEOPETROSIS	CAFFEY'S DISEASE
CHERUBISM	OSTEOGENESIS IMPERFECTA
FIBROUS DYSPLSIA	GARRE'S OSTEOMYELITIS
OSSIFYING FIBROMA	HISTIOCYTOSIS X
JUVENILE OSSIFYING FIBROMA	REILET-DAY SYNDROME
LEONTIASIS OSSEA	OSTEOMYELITIS

Fig. (1). Diseases of jawbones.

Osteopetrosis (Marble Bone Disease)

• Osteopetrosis is caused by an inherited defect in osteoclasts. Defective osteoclasts fail to resorb bone in the normal resorption remodeling cycle of the skeleton. So, all bones progressively become denser, less cellular, and less vascular. The bone foramina and marrow cavity spaces become compromised and compressed in the disease. Bone pain, fractures, anemia and thrombocytopenia, hepatosplenomegaly, and nerve dysfunction, due to compression of the nerve within foramina, ranging from hearing loss to visual disturbance to facial palsy, are possible (Fig. **2**).

• Facial deformity develops in many children. They manifest as a broad face, hypertelorism, snub nose and frontal bossing. Tooth eruption is almost always delayed. Osteomyelitis of the jaws can occur.

• Radiographically there is a highly increased density of the skull and mandible, and distinction between cortical and cancellous bone is lost [1, 2].

Treatment

Treatment by means of bone marrow transplantation and interferon-gamma 1b and calcitriol have been advocated.
Corticosteroid, parathormone, CSF and erythropoietin have been hypothesized.
In cases of fracture in the pediatric age group, surgery might be required.
Vitamin D (calcitriol) is administrated in cases of osteoclastic stimulation.

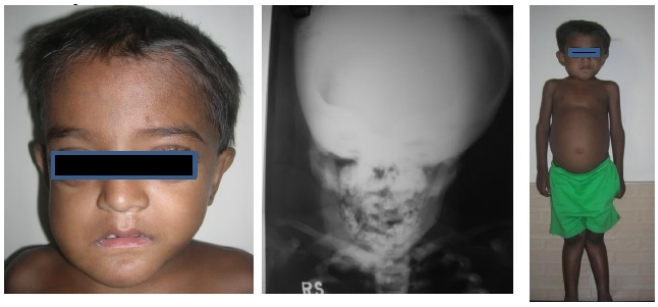

Fig. (2). Case of osteopetrosis.

Ossifying Fibroma

Ossifying fibroma is a fibro-osseous lesion that is composed of fibrous tissue that contains a variable mixture of bony trabeculae, cementum-like spherules or both. The origin can be from odontogenic sources and PDL. The mandibular premolar molar areas are commonly affected. It usually causes a slow enlarging, asymptomatic, painless mass of the affected bone, whereas larger lesions can cause facial asymmetry and cosmetic disfigurement (Fig. **3**).

Radiological appearance varies to some degree. The initial appearance is radiolucent, which becomes progressively radiopaque as the stroma mineralizes. Eventually, the individual radiopacities coalesce to the extent that the mature lesion may appear sclerotic. There is a presence of a well-demarcated radiologic margin.

Histopathology shows a benign, osteogenic, well-demarcated neoplasm, within a fibroblastic stroma, composed of calcified material in the form of osteoid and/or cementoid structures with variable osteoblastic rimming along with occasional multinucleated giant cells and endothelial lined blood-filled spaces [3, 4].

Fig. (3). Case of ossifying fibroma (Clinical photograph and corresponding OPG image).

CHAPTER 2

Oral Examination and Diagnostic Aids in Pediatric Dentistry

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[2] *Professor and Head, Department of of Oral Medicine and Radiology, Tamil Nādu Govt. Dental College and Hospital, Chennai, Tamil Nadu 600 003, India*

Abstract: The oral examination of the pediatric patients involves detailed evaluation and assessment along with comprehensive history taking. The pediatric history involves prenatal history, birth history, past medical history, past dental history, and family history. The examination part includes a general examination, extra oral examination and intra oral examination. The pediatric examination specifically includes dental caries, eruption pattern, shedding pattern, type of dentition, occlusion, supernumerary teeth, missing teeth *etc*. Various new diagnostic modalities have been introduced in the pediatric oral examination for both the hard tissues and soft tissues. Early diagnosis is mandated for precise treatment and proper prognosis for any disease which can be achieved by thorough examination through conventional and modern diagnostic techniques.

Keywords: Diagnosis, Dental caries, Examination, History, Pediatric.

INTRODUCTION

For successful treatment plan of a child patient, it is important to get a detailed medical, family, and dental history followed by thorough clinical and oral examination, appropriate investigations, correct diagnosis and accordingly an appropriate treatment plan and follow up. The prenatal and birth history plays a key role in the pediatric population with ages from birth through three years. They aid information about the presence of any infections at the time of birth, natal teeth at or around the time of birth *etc*. The family history, especially maternal history, can aid information on many congenital or birth defects. Maternal history, including habits, drugs and infection during pregnancy period must be recorded.

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In contrast to taking the case history in an adult patient, the case history in children and especially in young children must be taken through another person, often one of the parents. This has two important implications.

The information obtained from the accompanying person may not necessarily be a valid reflection of the situation of the child. Most often it is, but the dentist should keep in mind that the adult is talking on behalf of the child when evaluating pain, for example in the case of traumatic injuries, the pediatric dentist should be especially aware of atypical lesions that do not seem to correspond with the information obtained in the history to identify cases related to child abuse.

The complete evaluation of the pediatric patients involves:

1. Recording history
2. Clinical and oral examination

This enables to arrive at a provisional diagnosis and after appropriate investigations final diagnosis could be obtained and treatment planning could be done.

CASE HISTORY

- Personal information
  1. Name- if child is called by his or her name, it may help maintain a good rapport with the child. Sometimes calling by nick name may alleviate apprehension. It is also useful for communication and record purpose.
  2. Patient registration number should be mandatorily recorded for:
     a. Record maintenance
     b. Medico-legal aspects
     c. Billing purposes
  3. Date - for reference and record maintenance
  4. Age
     a. As a growth assessment parameter
     b. To recognize the disparities between the dental – chronological age
     c. Aid in treatment planning
     d. Appropriate use of behavioral management technique- it differs according to the age of the patient. In case of pediatric patients, the dentist must deal with the child as well as with the parent; hence in pediatric dentistry, the approach is 1:2; while in case of adults, the approach is 1:1.
     e. Helps in forensic odontology
     f. Child dose- it differs by age. It is used to calculate the drug dosage

5. Gender
    a. As an aid in treatment planning *e.g*., Growth spurts in girls are ahead of boys
    b. Sex related diseases like hemophilia, G6PD deficiency (causes hemolytic anemia), pubertal gingivitis seen in adolescent females.
    c. In trauma: – Boys sustain more injuries than girls – Ratio approx. – 2:1
    d. Child abuse—sexual abuse or exploitation is more common in case of females.
6. Address
    a. For communication purpose
    b. Record maintenance
    c. Medicolegal cases
    d. To rule out endemic diseases *e.g*., goiter, skeletal or dental fluorosis
7. Occupation of parents – determines the socioeconomic status of parents

• Chief complaint – it is the concern about what made the patient to visit the dentist. It should always be in patient's own words. To have good rapport with child, it is better to ask the child about his/her chief complaint before the involvement of parent. But it is also necessary to get information from parents.

• History of present illness – it is a detailed description of chief complaint. Information should be collected by asking questions that includes:

Duration and mode of action
Cause of onset
Progress
Severity nature
Aggravating or relieving factors
Any medications or treatment taken for same

All these give a hint towards a disease/condition.

History of pain should be elicited in detail that include location of pain, origin or mode of onset, intensity, nature, progression, duration, radiation of pain, effect on functional activity and association with any systemic effects.

Detailed history of swelling should include mode of onset, progress, symptoms, associated features, secondary changes, impairment of function and any medication taken.

• Family history – it should include information about

genetic diseases in family if any (like hemophilia, sickle cell disease)
Co-morbidities /systemic diseases present with family members
housing conditions
parents' education and occupation

CHAPTER 3

Dental Radiology in Pediatric Dentistry

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Abstract: Dental radiology occupies a pivotal role in pediatric dentistry and acts as an aid in the diagnosis of oral health and disease states. It is used in conjunction with clinical examination for the final diagnosis. It includes the intraoral radiograph, extra-oral radiograph, and specialized radiographs like Cone Beam Computed Tomography (CBCT), computed tomography (CT) *etc*. The Intra Oral Periapical Radiograph (IOPA) and orthopantomogram (OPG) are commonly used in the dental setting owing to the low exposure and broad coverage of the areas. Radiation protection includes many entities, which must be provided for both the patient and the accompanying person. The radiographic requirements differ for neonates, children, and adolescents. This chapter emphasizes the importance of dental radiology in pediatric dentistry and the various aspects of radiology from the perspective of the pediatric population

Keywords: Cone beam computed tomography, Diagnosis, Digital radiography, Orthopantomogram, Pediatric.

INTRODUCTION

Radiographs are valuable diagnostic aid for proper and detailed examination of the oral cavity of infants, children, adolescents, and individuals with special health care needs (Fig. **1**). It also helps the clinician to arrive at a precise diagnosis and proper treatment planning. American Academy of Pediatric Dentistry developed guidelines (Table **1**) [1, 2].

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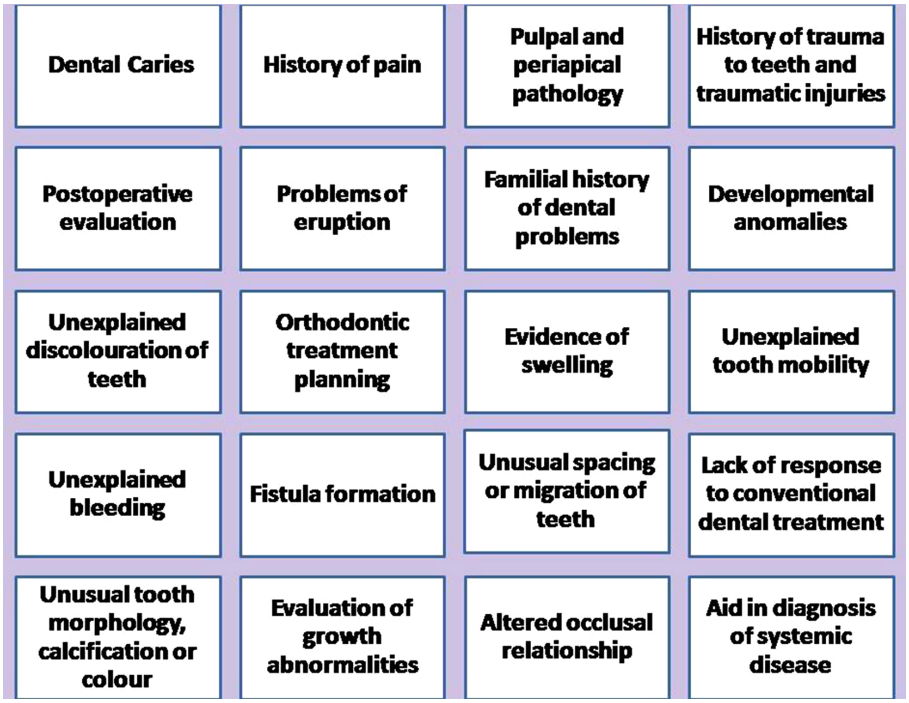

Fig. (1). Common conditions for indicating dental radiographs.

Table 1. Criteria for recommending dental radiographs.

Patient Age and Dental Developmental Stage			
Type of Encounter	A child with Primary Dentition before the eruption of the first permanent tooth)	A child with Transitional Dentition (after the r eruption of the first permanent tooth)	An adolescent with Permanent Dentition (before the option of third molars)
New patient being evaluated for dental diseases and dental development	Selected periapical/occlusal views and/or posterior bitewings if proximal surfaces cannot be visualized or probed. Patients without evidence of disease and with open proximal contacts may not require a radiographic exam at this time.	Posterior bitewings with panoramic exam or posterior bitewings and selected periapical images.	Posterior bitewings with panoramic exam or posterior bitewings and selected periapical images. A full mouth intraoral radiographic exam is preferred when the patient has clinical evidence of generalized dental disease or a history of extensive dental treatment.

(Table 1) cont.....

Patient Age and Dental Developmental Stage		
Recall patients with clinical caries or at increased risk for caries	Posterior bitewing exam at 6–12-month intervals if proximal surfaces cannot be examined visually or with a probe.	
Recall patient with no clinical caries and not at increased risk for caries	Posterior bitewing exam at 12-24 months intervals if proximal surfaces cannot be examined visually or with a probe.	Posterior bitewing exam at 18-36 months intervals.
Recall patient with periodontal disease	Clinical judgment as to the need for and type of radiographic images for the evaluation of periodontal disease. Imaging may consist of but is not limited to, selected bitewing and/or periapical images of areas where periodontal disease (other than nonspecific gingivitis) can be identified clinically.	
Patient for monitoring of growth and development.	Clinical judgment as to the need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development	Clinical judgment as to the need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development. Panoramic or periapical exam to assess developing third molars.
Patients with other circumstances including, but not limited to, proposed or existing implants, pathology, restorative/endodontic needs, treated periodontal disease and caries remineralization	Clinical judgment as to the need for and type of radiographic images for evaluation and/or monitoring in these circumstances.	

Radiation Biology

X-rays are the ionizing radiation that can cause biological damage, the severity of which is proportional to the dose. Biological effects or damage occur at molecular levels and are exhibited as direct effects or indirect effects. In the direct effect, the biological macromolecule is directly affected, whereas, in the indirect effect, the water molecules in the biological system are ionized, forming free radicals (hydrogen and hydroxyl free radicals), which further undergo biological damage [3].

At cellular levels, effect on the nucleus is seen more in the cytoplasm as it is more radiosensitive. DNA and chromosomes are the sensitive sites in the nucleus. When DNA condenses to form chromosomes at the time of mitosis, chromosomal aberrations are observed the most. Thus, the dividing or proliferating cells are the ones to be targeted by the radiation. Children, therefore, are more concerned

CHAPTER 4

Cephalometrics in Pediatric Dentistry

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Abstract: Cephalometrics, introduced by BROADBENT in the year 1931, plays a crucial role in Pedodontics and Dentofacial Orthopaedics. It has made it easier and economical to predict the post-orthodontic results of the patient using this as a tool. This chapter outlines the basics of cephalometrics, including the indications, limitations, *etc.*, with special emphasis on its role in Pediatric Dentistry. It lays down the recent guidelines given by the American Academy of Pediatric Dentistry for using cephalometrics in children. It provides details regarding various tools, equipment required, and methodology of tracing as well as analysing the cephalometric radiographs. It also enlists the skeletal and dental landmarks and planes needed for the analysis. Details regarding Down's, Steiner's, Tweed's, and Wit's analyses have been explained in this chapter.

With the new era of digitalization, this chapter also highlights the recent advances made in Cephalometrics, providing information about the different computer-based programs and smartphone applications available for efficient landmark identification and analysis. The fundamental essence of the chapter is to help both undergraduate and even post-graduate pediatric students to have the basic knowledge and information about Cephalometrics, including its advancements made.

Keywords: Cephalometrics , Cephalometric analysis, Cephalograms, Dentofacial pedodontics, Orthodontic.

INTRODUCTION

The American Academy of Pediatric Dentistry (AAPD) emphasizes the significance of dealing with a child's developing dentition and occlusion, as well as the effect on their general wellbeing. Early detection and treatment of emerging malocclusions are critical since it has both short-term and long-term advantages when achieving occlusal harmony, function, and dentofacial aesthetics objectives. Cephalometrics is radiographic health assistance that is used to investigate malocclusion as well as underlying skeletal anomalies and disproportions.

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Orthodontists and Pediatric Dentists must also consider how significant functional features of the face, such as the cranial base, jaws, and teeth, interact [1].

Components of Cephalometric Radiography

Cephalostat, x-ray apparatus, image receptor system, and film cassette holder are major components of cephalometric radiography (Figs. **1 - 3**).

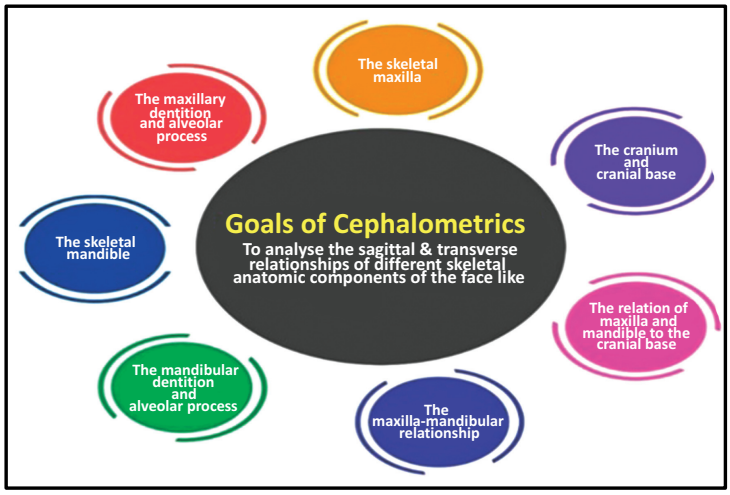

Fig. (1). Goals of cephalometrics in pediatric dentistry.

The Technique of Cephalometric Radiography (Figs. 2 and 3)

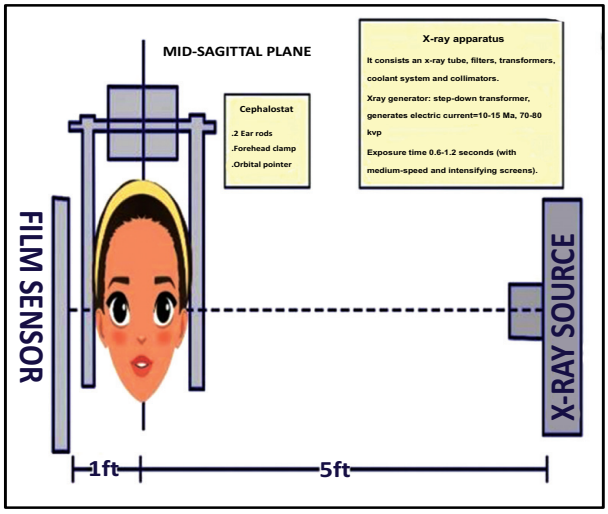

Fig. (2). Components of Cephalometric radiography.

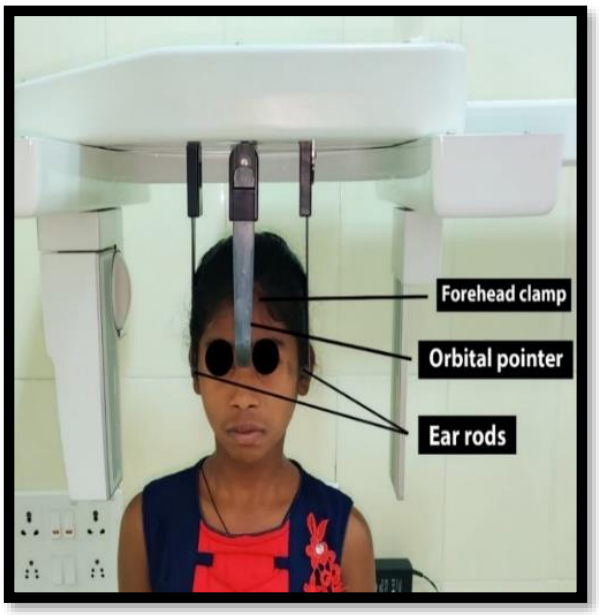

Fig. (3). Technique of cephalometric radiography.

Types of Cephalogram

There are two types of cephalogram, Lateral and Postero-Anterior (Frontal) cephalogram.

Lateral

This provides a lateral view of the skull. Taken from the x-ray source with the head in a standardized, repeatable position.

Uses

For the skeletal and dental growth analysis of the patient.
Evaluation of final treatment outcome.
Diagnosis and treatment planning.

Frontal

This provides the anteroposterior view of the skull.

CHAPTER 5

Infection Control in Pediatric Dentistry

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Abstract: Centres for disease control and prevention (CDC) has developed a framework for healthcare personnel and healthcare systems for the delivery of non-emergent care. Infection control is important in dentistry because patient saliva may be contaminated with oral commensal and opportunistic pathogens. In addition, it can harbour specific pathogens during infection as well as during the carrier state, including SARS-CoV-2. Due to the nature of the dental procedures, exposure to the blood and saliva aerosols is unavoidable. Direct contact with fluid-contaminated environmental surfaces, instruments and equipment is also a potential source of pathogen transmission. In a dental practice, the dentist, dental assistant, instrument processing and administration staff, as well as the patients, are at risk of transmission of infections. Dental laboratory staff members are also at risk due to the cross-contamination between the clinic and the laboratory. In addition, it can be extended to their families if the infection control measures are not taken correctly. Therefore, historically step by step infection control measures have been recommended by the CDC and countries across the globe have drawn up individual country-specific guidelines.

Keywords: Biodegradable waste management, Infection control, Personal protective equipment.

INTRODUCTION

Infection control is the discipline concerned with preventing nosocomial or healthcare-associated infection, a practical (rather than academic) sub-discipline of epidemiology. It is an essential, though under-recognized and under-supported, part of the important organization of health care. Infection control and hospital epidemiology are parallel to public health practice, practised within the confines of a particular health care delivery system rather than directed at society as a whole. The application of standard precautions regarding infection control during dental treatment is paramount. The Centres for disease control and prevention (CDC) [1, 2] and the occupational safety and health administration (OSHA) [3],

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as well as the state and local regulatory boards or agencies and equipment manufacturers, guide patient care, laboratories, and equipment management.

INFECTION CONTROL IN PEDIATRIC DENTISTRY

Definition- Infection Control, also called the "exposure control plan" by OSHA (Occupational Safety and Health Administration), is a required office program that is designed to protect personnel against risks of exposure to infection (Fig. **1**).

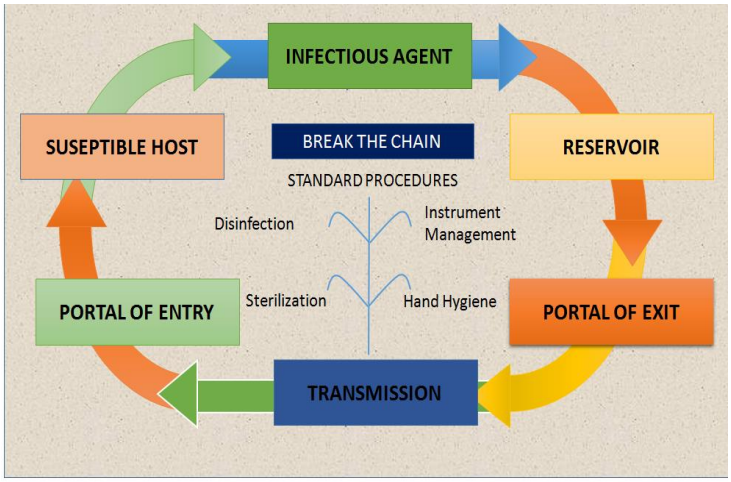

Fig. (1). Modes of transmission of infectious agents.

The recommendations for infection control procedures (Fig. **2**) in routine dental practice are as follows:

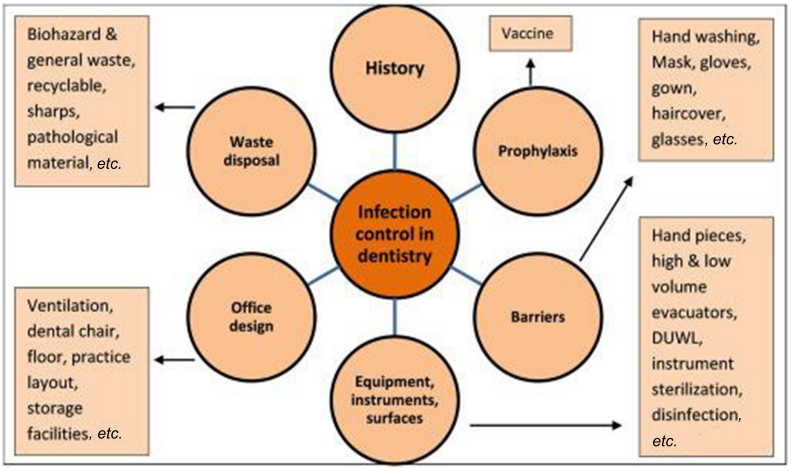

Fig. (2). Infection control in dentistry.

Training in Infection Control

The Dental staff must be aware of the procedures required to prevent the transmission of infection and should understand why these procedures are necessary.

Surgery Design (Figs. 3 and 4)

Fig. (3). Clinical contact surfaces.

Fig. (4). Housekeeping surfaces in dental clinic.

CHAPTER 6

Isolation Techniques in Pediatric Dentistry

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Abstract: Isolation of the operating field is a fundamental aspect of pediatric dentistry. The complexity of the oral environment presents many obstacles to performing dental treatment procedures. To minimize them, proper isolation is required to control the operating field as well as provide safe and quality treatment [1]. A rubber dam is considered the optimum isolation technique due to several advantages, such as providing an aseptic environment, minimizing the potential risk of transferring infective microbes between the operator and the patient, and preventing any ingestion or aspiration of dental instruments during a dental procedure [2]. Children may feel that the treatment takes place outside of their mouth. Nevertheless, children indeed tolerate longer treatments once the rubber dam has been applied. Other techniques such as cotton rolls and saliva ejectors are routinely used in paediatric dentistry besides rubber dams due to their ease of usage.

Keywords: Clamps, Cotton Rolls, Isolation, Retraction Cords, Rubber Dam, Throat Shields.

INTRODUCTION

Isolation of the operating field is a fundamental aspect of pediatric dentistry. The complexity of the oral environment presents many obstacles to performing dental treatment procedures. To minimize them, proper isolation is required to control the operating field as well as provide safe and quality treatment [1]. A rubber dam is considered the optimum isolation technique due to several advantages, such as providing an aseptic environment, minimizing the potential risk of transferring infective microbes between the operator and the patient, and preventing any ingestion or aspiration of dental instruments during a dental procedure [2]. Children may feel that the treatment takes place outside of their mouth. Nevertheless, children indeed tolerate longer treatments once the rubber dam has been applied. Other techniques such as cotton rolls and saliva ejectors are rout-

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inely used in paediatric dentistry besides rubber dams due to their ease of usage.

SIGNIFICANCE OF ISOLATION

Isolation is more significant in the case of pediatric dentistry as children have higher levels of anxiety that causes excessive salivation. Inappropriate or undesirable movements of the tongue, chances of aspiration or swallowing of restorative materials or broken instruments or fluids such as root canal irrigants or aerotor coolants are more common in the case of children.

METHODS FOR ISOLATION

Direct methods: Rubber dam, cotton rolls and cotton roll holder, gauze pieces, absorbent wafers, suction devices, gingival retraction cord and mouth props

Indirect methods: Comfortable position of patient and relaxed surroundings, local anaesthesia and drugs like anti-sialogogues, anti-anxiety, and a Muscle relaxant.

DIRECT METHODS OF ISOLATION

Absorbent Systems

Absorbents such as cotton rolls, cellulose wafers, gauze pads and throat shields can be used for isolation. They are placed in the first maxillary molar region at the opening of the parotid gland duct and in the anterior lingual sulcus at the opening of the submandibular or sublingual salivary gland ducts to absorb the secretions from the major salivary glands.

Cotton Rolls and Wafers (Fig. 1)

They absorb moisture and retract the soft tissues. They can be placed in the mouth where the salivary gland duct exits. It is either rolled manually or prefabricated (available in three sizes-small, medium, and large) cotton rolls are available. They act by absorption and therefore must be replaced frequently when saturated. Cellulose wafers may be used to retract the cheek and provide additional absorbency.

Fig. (1). Cotton rolls.

If removed improperly, a dry cotton roll may stick to the oral mucosa and can injure it, causing cotton roll burn/cotton roll stomatitis. Therefore, removing cotton rolls necessitates moistening them using an air-water syringe to prevent inadvertent removal of the epithelium from cheeks, the floor of the mouth or lips.

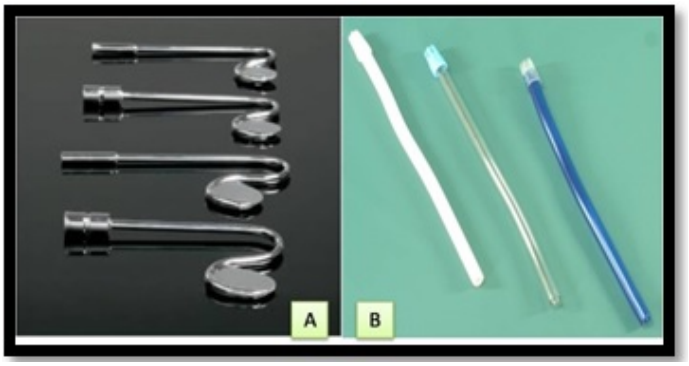

Fig. (2). A. Metallic saliva ejectors. **B.** Plastic saliva ejectors.

Throat Shields

Throat shields are indicated when there is a danger of aspirating or swallowing small objects, especially in the maxillary arch. A gauze sponge (2 x 2 inches) unfolded and spread over the tongue, and the posterior part of the mouth helps recover a small object, such as fillings, parts of teeth, parts of dental equipment, *etc.*, from falling into a patient's throat.

High Volume Evacuators & Saliva Ejectors (Figs. 2a and 2b)

Saliva ejectors prevent the pooling of saliva on the floor of the mouth, which help in maintaining a dry operative field. They are of two types: Metallic saliva

CHAPTER 7

Space Management

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Abstract: Deciduous teeth play a significant role in the normal development of occlusion, as a guide for the eruption of permanent successors. Early loss of deciduous teeth in the primary and mixed dentition stage alters the integrity of dental arches and is one of the main causes of malocclusion in permanent dentition. Management of space created by early loss of the deciduous tooth is important to prevent or intercept malocclusion, either by eliminating the need for orthodontic correction in future or to reduce the complexity of correction in permanent dentition. Hence, the role of paediatric dentistry is immense in space management as a part of managing developing dentition and occlusion in comprehensive oral health care of children.

Keywords: Deciduous teeth, Malocclusion, Space maintainers, Space management, Space regainers.

INTRODUCTION

In the growth and development of a child, primary dentition plays a pivotal role as it aids in mastication, speech, and prevention of deleterious oral habits and also guides the eruption of succedaneous teeth. It is imperative to preserve the primary dentition till its normal physiological exfoliation time by preventive measures, restorative or endodontic treatments since they act as natural space maintainers. But the proximal carious or premature loss of primary teeth leads to arch length reduction by migration of adjacent teeth resulting in malocclusion in the permanent dentition. This malocclusion can be seen as crowding, rotation, ectopic eruption or impaction of the succedaneous tooth, supra eruption of opposing tooth and dental midline shift [1, 2] (Figs. **1** and **2 a, b**).

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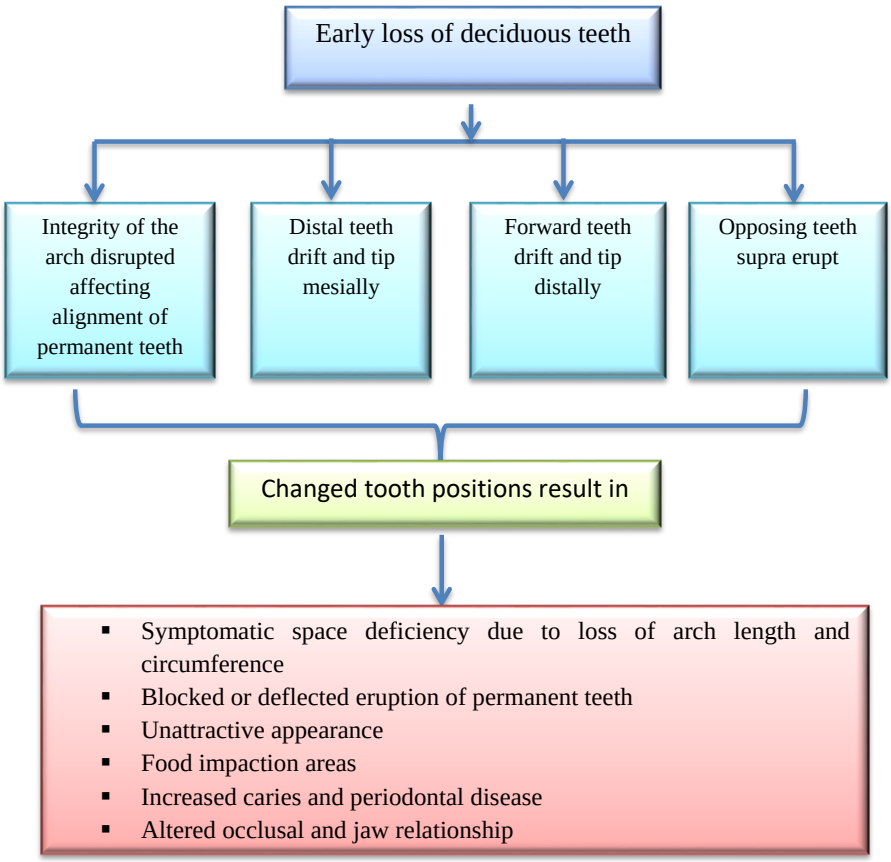

Fig. (1). Sequelae of early loss of the deciduous tooth.

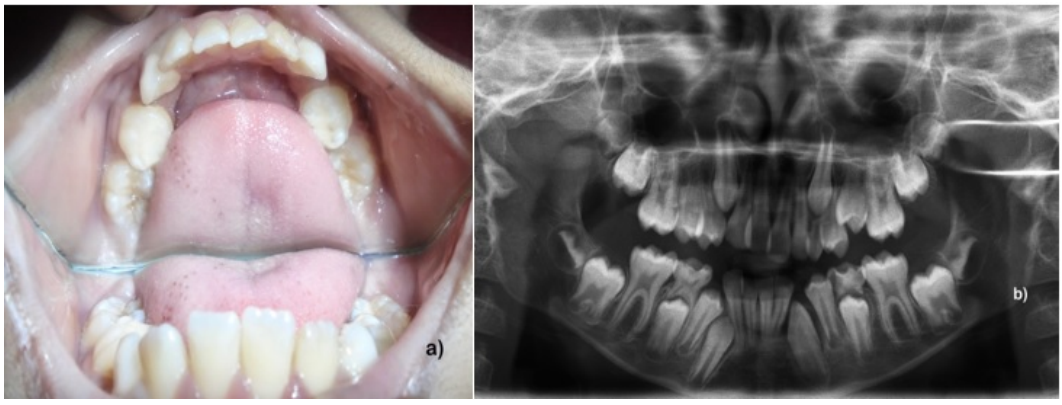

Fig. (2). a. Early bilateral loss of the deciduous first molar leads to space loss and a decrease in arch length. **b.** OPG of mixed dentition stage with a decrease in arch length resulting in inadequate space for the first premolar in the fourth quadrant.

Reasons for Premature Loss of Deciduous Teeth

Early childhood caries
Trauma
Failure of endodontic treatment of deciduous tooth

Consequences of Early Loss of Deciduous Teeth

Space management of developing dentition is an important consideration in planning comprehensive paediatric oral care, thus preventing loss of arch length and obviating complex orthodontic corrections in the future. According to the American Academy of Paediatric Dentistry guidelines, the main aim of space management is to prevent arch length, arch perimeter and arch width by maintaining relative positions of existing dentition [2].

Definition: Space management is defined as the measures that diagnose and prevent or intercept situations, so as to guide the development of dentition and occlusion.

Space management includes four sub-stages (Fig. **3**).

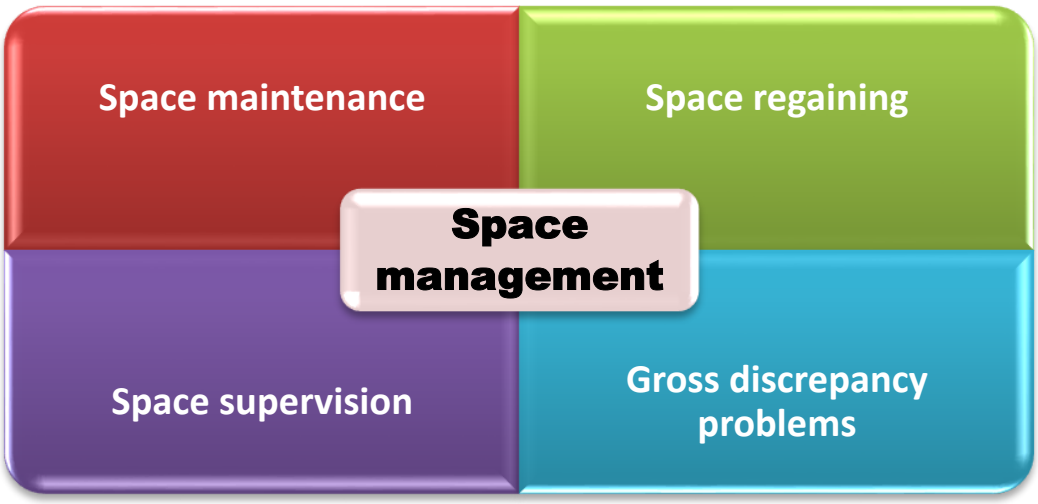

Fig. (3). Sub stages of Space management.

Objectives of Space Management

a. Maintain the integrity of dental arches
b. Maintain primate spaces
c. Maintain normal occlusal plane
d. Proper phonetics and esthetics in case of anterior space management

CHAPTER 8

Oral Habits and its Prevention in Children

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Abstract: A habit is a repetitive action that is being done automatically and is resistant to change. In the infantile period, certain repetitive behaviours are common, the majority of them begin and stop spontaneously. If oral habits persist beyond a particular developmental age, it results in unfavourable outcomes for the developing teeth, occlusion and surrounding orofacial tissues. Oral habits are considered one of the main causes of malocclusion, leading to unfavourable growth and development of dentoalveolar, which starts in the early childhood and mixed dentition stage. The severity of malocclusion depends on the frequency, duration, and intensity of the habit. Early detection and interception of the habit should be done by parent/child habit awareness and counselling, elimination, etiology, behaviour modifications and correction of malocclusion.

Keywords: Oral Habits, Malocclusion, Mixed Dentition.

INTRODUCTION

Oral habits in children are a prime concern for the dentist, which applies negative forces to the teeth and dentoalveolar structures. The alignment and shape of the teeth play an important role in function and esthetics, and dentists are expected to treat cases that involve a multidisciplinary approach. The American Academy of Pediatric Dentistry (AAPD) recognizes that an infant's, child's, or adolescent's well-being can be affected by oral habits and encourages clinicians to take an individualized approach to the management of these habits [1]. The extent of dentoalveolar or skeletal deformations such as increased overjet, redu1ced overbite, open bite, posterior crossbite, or increased facial height depends on the following factors (Fig. **1**).

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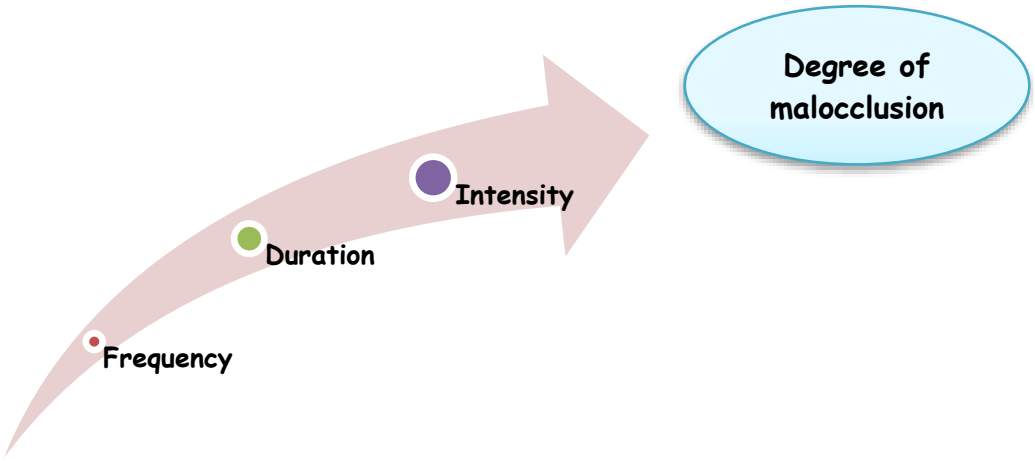

Fig. (1). Factors of oral habits influencing the degree of malocclusion.

Frequency: Number of times the habit is practiced in a day
Duration: Amount of time spent indulging in the habit
Intensity: Force with which the habit is performed

Definition

According to ***Boucher O.C (1963),*** habit is defined as a tendency toward an act or an act that has become repeated performance, relatively fixed, consistent, easy to perform and almost automatic.

According to ***Mathewson (1982),*** oral habits are defined as learned patterns of muscular contractions.

Classification of Habits (Fig. 2a, 2b)

Acquired oral habits	• Learned and could be stopped easily and when the child grows up. • Child can give up that behaviour and start another one.
Compulsive oral habits	• Fixed in child and when emotional pressures are intolerable for the child • Child can feel safety with this habit, and preventing the child from these habits make him or her anxious and worried.

Fig. (2a). Classification of habits.

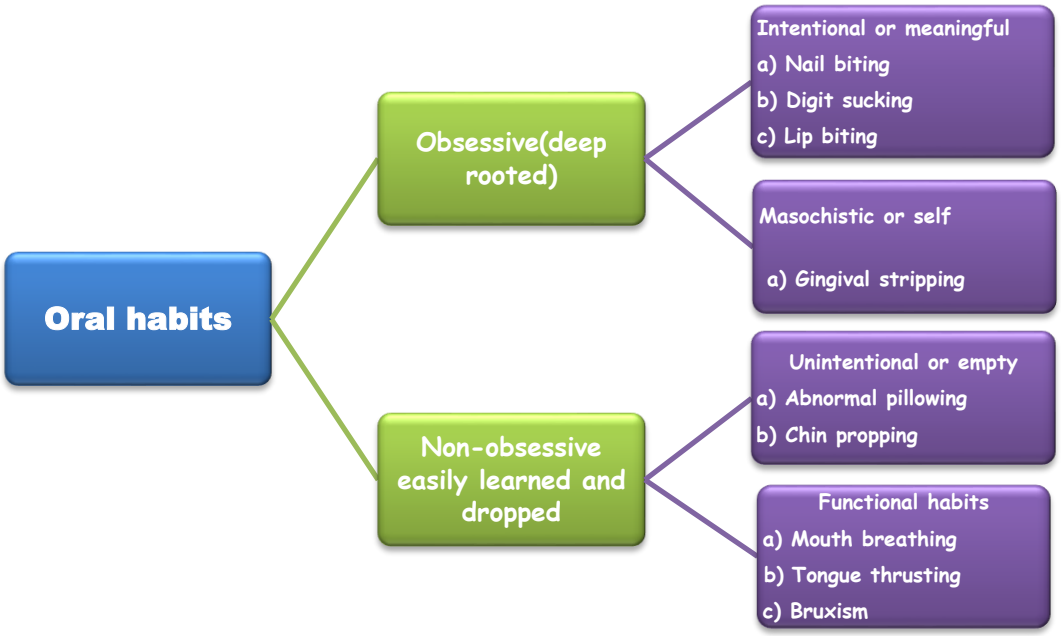

Fig. (2b). Classification of oral habits.

Treatment Objectives & Considerations

Treatment objectives are directed towards minimizing potential deleterious effects on the dentofacial complex by eliminating or decreasing the habit [1].

Habit interception should be done whenever the habit is associated with unfavourable dentofacial development of adverse effects on child health or when there is a reasonable indication that the oral habit will result in a developing permanent dentition in an unfavourable direction. This interception should be appropriate for the child's development, comprehension, and ability to cooperate.

Various treatment modalities include patient/parent counselling, behaviour modification techniques, myofunctional therapy, appliance therapy, or referral to other specialists like psychologists, myofunctional therapists, or otolaryngologists. The use of an appliance as a treatment modality will function as a reminder and would be beneficial only when the child wants to stop the habit.

Some of the habits which are of concern in growing dentition are

Non-nutritive sucking (thumb/finger sucking, pacifier use)
Tongue thrust swallow and abnormal tongue position
Bruxism

CHAPTER 9

Interceptive Orthodontics and Myofunctional Therapy in Pediatric Dentistry

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Abstract: Guidance of eruption and development of primary, mixed, and permanent dentition has a pivotal role in comprehensive oral healthcare in paediatric dentistry, which helps to achieve more stable, functionally, and aesthetically acceptable permanent dentition. Interceptive orthodontics includes procedures carried out in mixed dentition, and it takes advantage of the growth pattern and development during this phase. Early diagnosis and treatment of certain malocclusions will eliminate or reduce the severity of developing malocclusion, which would lessen the complexity of orthodontic treatment in the future, overall time, and cost. It also improves the child's self-esteem, confidence, and parental satisfaction. Overall clinical examination, radiographic evaluation, and study model analysis with thorough knowledge of growth and development help in diagnosing and carrying out appropriate interceptive treatments necessary.

Keywords: Early orthodontic treatment, Interceptive orthodontics, Mixed dentition.

INTRODUCTION

Early treatment means treatments undertaken during the most active stages of dentition and craniofacial skeletal growth to enhance dentoalveolar, skeletal and muscular development before the complete eruption of the permanent dentition. Historically, orthodontic treatment was provided for adolescents. But of late, the concept of early orthodontic treatment has gained approval, and many clinicians

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seek to modify skeletal, muscular and dentoalveolar abnormalities even before the eruption of full permanent dentition.

The early orthodontic intervention can be broadly classified as shown in Fig. (**1**).

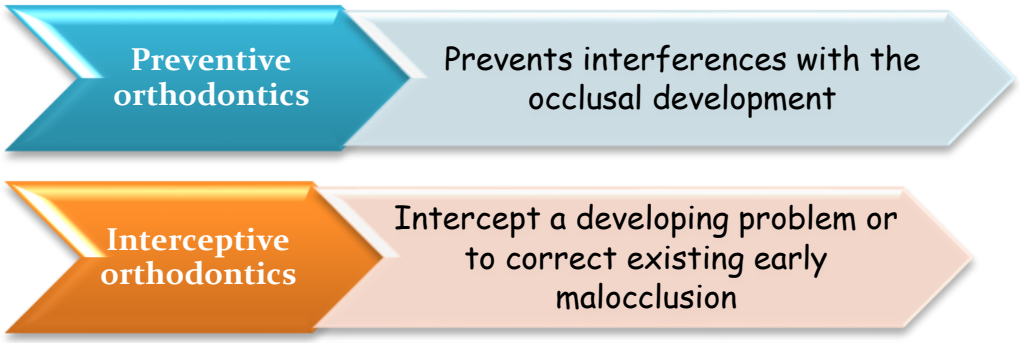

Fig. (1). Early orthodontic intervention.

BENEFITS OF EARLY TREATMENT

1. Certain malocclusions can be prevented or intercepted only at an early age.
2. More alternative treatment options are available at a young age.
3. Younger patients are often more cooperative and attentive.
4. Clinicians can utilize growth better at a younger age, and there is more growth remaining.
5. Psychological advantages in children by improving the esthetics of smile and the accompanying positive effects on self-image and improving the occlusion.
6. Compromise of quality of treatment is less as
   It may remove etiologic factors and restore normal growth, and
   It may reduce the severity of the skeletal pattern, making it possible, and easier and more precise tooth positioning in the adolescent.
7. Reduces the financial burden and is a much more affordable form of orthodontic treatment.
8. Possibility of achieving better results with modern precision bracketed appliances.
9. Early treatment of serious deleterious oral habits is easier than treating after years of ingrained habit reinforcement.

INTERCEPTIVE ORTHODONTICS

It is defined as “that phase of the science and art of orthodontics employed to recognize and eliminate potential irregularities and malposition’s in the developing dentofacial complex”- ***American Association of Orthodontists Glossary***.

In 1980, Ackerman and Proffit introduced Interceptive orthodontics as a means of correcting problems in the developing dentition and was considered efficient for improving oral hygiene, speech, masticatory efficiency, reduction of periodontal disease, the relief of temporomandibular disorder (TMD), resistance to trauma, and offer psychological benefits.

Interceptive orthodontics includes early diagnosis of certain features of malocclusion in the growing child and its early intervention by using removable appliances or simply fixed appliances by the dentist, will reduce the complexity of the malocclusion from developing as the child grows older. Thorough knowledge of craniofacial growth and development of the dentition must be used in diagnosing and reviewing possible interceptive treatment options before recommendations are made to parents.

Various Treatment Considerations are Addressed Based on Stages of Development of Occlusion [1].

Primary Dentition Stage

Oral deleterious habits and crossbites should be diagnosed and should be addressed as early as possible to facilitate normal occlusal relationships if they are not likely to be self-correcting.

Early-to-Mid mixed Dentition Stage

Treatments need to be addressed:

a. Crossbites
b. Arch length shortage
c. Intervention for crowded incisors
d. Intervention for ectopic teeth
e. Holding of leeway space
f. Oral deleterious habits
g. Soft tissue surgical needs
h. Adverse skeletal growth

Mid-to-Late Mixed Dentition Stage

Intervention for correction of skeletal disharmonies and crowding is initiated in this stage.

CHAPTER 10

Gingival and Periodontal Diseases in Children

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Abstract: Pediatric population experiences a wide array of gingival and periodontal diseases. Studies have shown that gingivitis is almost universally prevalent among pediatric patients. However, lesser attention is given to periodontitis in children owing to the shorter life span of primary dentition. Periodontal assessment must be incorporated into the routine oral examination of the child since prompt diagnosis plays a crucial role in successfully managing periodontal conditions. Severe periodontal disease may also occur among children with concomitant systemic conditions. Therefore, the presence of a destructive periodontal condition may serve as an early indicator of an underlying systemic condition, and the dentist may be the first to notice such a condition. Hence, a thorough medical evaluation should be performed for children exhibiting severe periodontitis, especially for cases that appear resistant to therapy, to determine the systemic causes of the condition. Although at present, there is increased awareness regarding periodontal health and treatment modalities, it is restricted to adults with a negligible focus on children. Intraoral assessment of children is cecentredroundan examination of hard tissues with minimal focus on the health of soft tissue. Hence, this chapter enlightens various gingival and periodontal conditions and the importance of overall health during childhood.

Keywords: Children, gingiva, gingivitis, gingival disorders, periodontium, periodontitis.

INTRODUCTION

The soft tissue which surrounds the neck of the tooth, coronal to the alveolar bone crest and extends up to the mucogingival junction is known as the Gingiva. It is a component of the supporting structure of the, *i.e*. periodontium, along with cementum, periodontal ligament, and alveolar bone (Fig. **1**).

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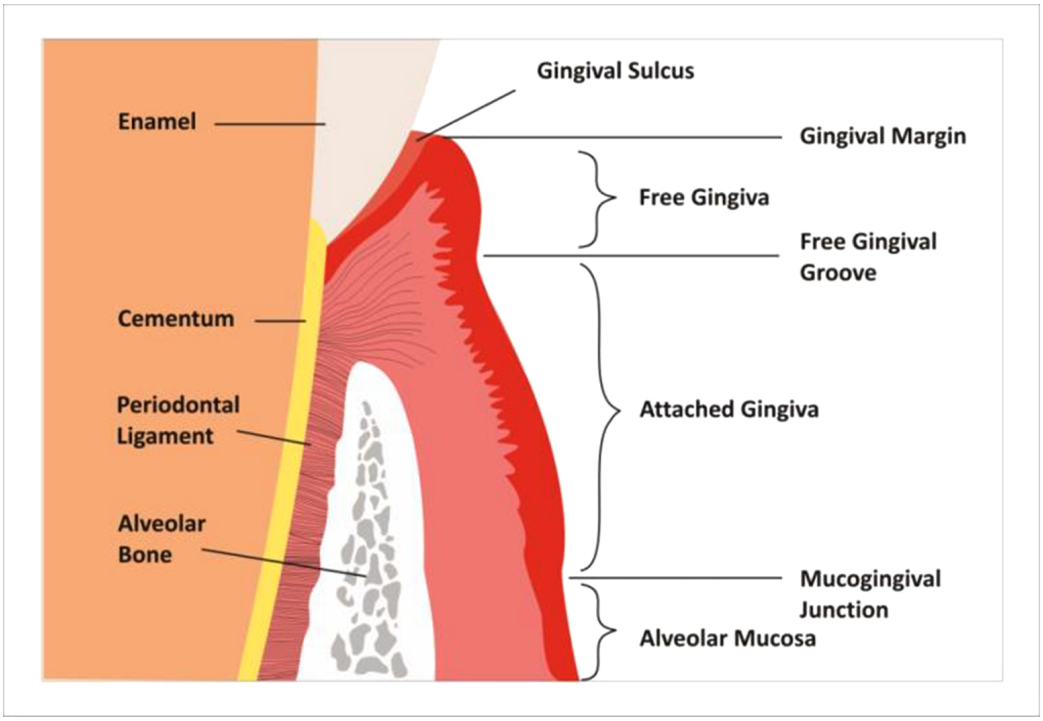

Fig. (1). Components of the periodontium.

Inflammation of periodontal tissues is common among children and adolescents. The inflammation is restricted to the gingival tissues in most cases. The presence of inflammation restricted to gingiva without associated loss of connective tissue or alveolar bone is the characteristic feature of gingivitis.

Children and adolescents present varying manifestations of periodontitis, just like adults. Presently, both aggressive (severe and rapidly progressing type) and chronic (slow progression of the disease) variants are observed and distinguished.

NORMAL PERIODONTIUM IN PRIMARY DENTITION

The marginal gingiva of primary teeth appears rounded and bulky. The characteristic stippling develops around the age of 2-3 years. The interdental tissues are comparable to saddle areas, *i.e.*, those areas of primary teeth with diastema (Fig. **2a**).

Fig. (2a). Clinical appearance of gingiva in children (Primary Dentition).

The interdental cleft and the retrocuspid papilla are the two unique anatomic features seen in the gingiva of children. The interdental cleft is present apical to the interdental area, whereas the retrocuspid papilla lies behind the mandibular canine below the marginal gingiva (Fig. **2b**). The retrocuspid papilla decreases with age and should not be confused with intraoral swelling.

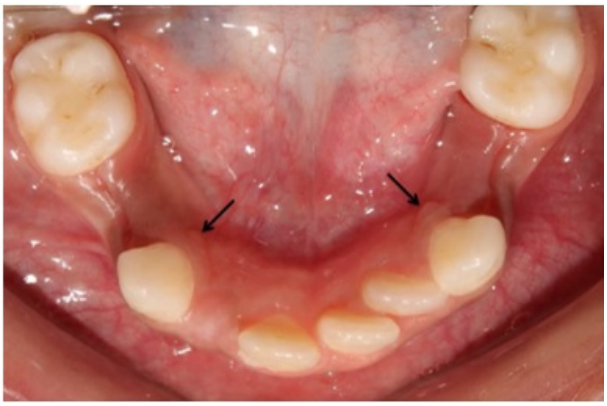

Fig. (2b). Retrocuspid papilla.

Once the molars establish proximal contact, the interdental region is filled with interdental papilla along with marginal concavity, *i.e.*, col, which corresponds to the shape of the contact area.

The composition of the connective tissue is similar to a young permanent tooth, but the primary teeth comprise a thicker junctional epithelium. It is more resistant to inflammation as it is less permeable. The alveolar bone comprises a relatively wider PDL membrane, and the lamina dura appears thin on radiographs. Also,

CHAPTER 11

Maintenance of Oral Hygiene in Infants & Children

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Abstract: Infant oral care is the foundation on which motivation and education for oral hygiene and various preventive dental care must be relied upon to augment the possibility of a life free of preventable dental ailments. Dental assessments and evaluations for children during their first year of life have been recommended by various organizations such as the American Academy of Paediatric Dentistry and the American Association of Paediatrics. A comprehensive infant oral health care program may include risk assessments at regular dental visits. Preventive approaches include topical fluoride application, sealants, parental education on the correct methods to clean the infant's mouth and establishing a dental home. Infant oral health is an integral part of the general well-being of an infant as they grow. It encompasses the care of the oral cavity and monitoring of the teeth' development. Unfortunately, many expecting mothers, parents and caregivers of infants often do not receive timely and accurate education about preventive oral and dental health care. This chapter discusses the importance of infant oral health care and its clinical implications. The transition required to maintain oral health as an infant progress to early childhood is highlighted. Appropriate use of topical and systemic fluoride providing timely and appropriate oral hygiene instructions is encouraged and discussed.

Keywords: Brushing technique, Dental home, Infant oral care.

INTRODUCTION

The period of infancy is defined as the first year of life of the newborn after birth. Sound oral health is not only the product of dental care of the infant, but measures taken by the mother way before the child's birth. Expectant mothers are unaware of the implications of poor oral health on their pregnancy and the unborn child.

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Identifying and educating mothers with poor oral health about the consequences on their health and the unborn child's health can help change the trajectory of oral care.

This chapter will highlight the measures to maintain oral health from infancy through childhood.

Prenatal Care
Perinatal Care
Postnatal Care
1. Oral care in infancy
2. Oral care in childhood

PRENATAL AND PERINATAL CARE

The first trimester of intrauterine life marks the development of the primary dentition. Thus, strengthening the developing dentition during this phase is of utmost importance. The maternal blood transports calcium, phosphorous and other minerals required during odontogenesis to the child's body. Hence a balanced nutritious diet with adequate supplementation of vitamins and minerals for expectant mothers must be prescribed by the treating doctor and other necessary minerals. Fluoride is one such element that must be supplemented to the mother in the dosage of 0.25-1 mg daily for proper odontogenesis and bone formation.

Mother's health in the first trimester is of paramount importance for sound primary dentition. An important risk factor for early involvement of primary dentition leading to advanced childhood caries is the usage of substances such as alcohol, tobacco and other addictive drugs becoming increasing popular in adulthood, also seen amongst expectant mothers [1]. A cohort study of 5.4 million participants noted that maternal substance usage before or during pregnancy doubles the risk of early childhood caries compared to no substance use [2]. To the pregnant mother, prescribing medications such as tetracycline and anti-epileptic drugs should be avoided. It has been shown to cause discoloration and developmental defects of the primary teeth.

The perinatal period starts around the 20^{th} to 28^{th} week of gestation and completes one to four weeks after birth. An inability to sustain and initiate enough respiration just after delivery is known as perinatal asphyxia. This impairment of gaseous exchange after delivery impacts the development of primary teeth. Many environmental factors such as substance use during pregnancy, infant birth weight and height, gestational age, nutritional status of the child, and infant feeding method have been significant determinants for the eruption and development of

primary teeth [3, 4]. Delay in tooth emergence is seen in infants with low birth weight and conditions like hypothyroidism.

In contrast, accelerated tooth eruption has been reported with childhood obesity, diabetes mellitus and maternal smoking [5]. Acquisition of micro-organisms primarily from mother to infant can occur *via* maternal saliva. Transfer of maternal antibodies to infants can also affect the colonization of *S. mutans* in the infant's mouth. This crucial time is essential for the oral and overall health of the newborn child.

Health care professionals such as physicians, paediatricians and nurses are more likely to interact and see expectant mothers during this phase. They can guide them to seek dental care whenever necessary (Fig. **1**). Therefore, these providers should be educated about the most commonly occurring dental anomalies and associated risk factors to make appropriate timely referrals.

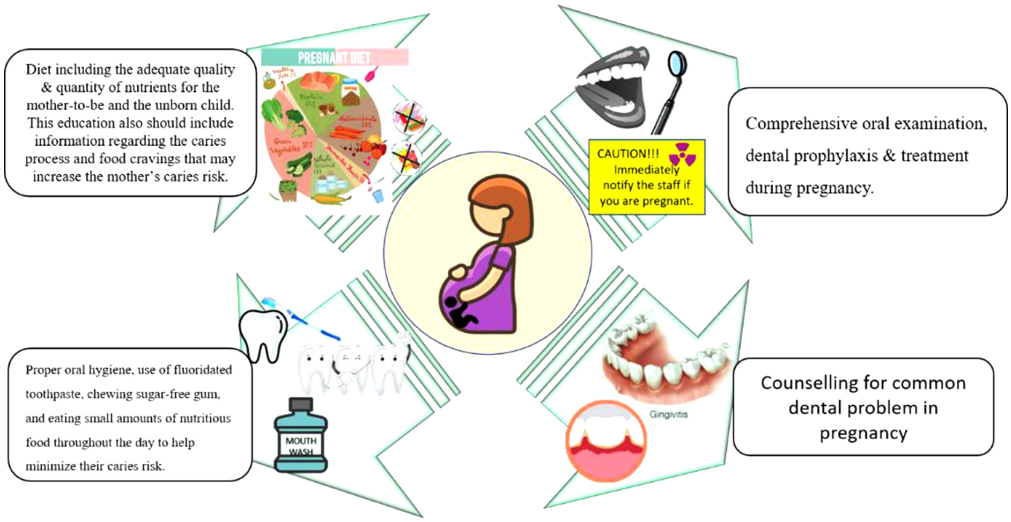

Fig. (1). Oral care during pregnancy.

POSTNATAL CARE

Infant Oral Health Care

The edentulous alveolar arches of the newborn after birth are known as gum pads. It is advisable to use clean wet cloth/gauze wrapped around the index finger for cleaning the gum pads after every feed. Wiping the gum pads also massages it, which soothes the child during teething (Fig. **2**). At six months of age, the first primary teeth erupt in the oral cavity, and the primary dentition completes by 33 months.

CHAPTER 12

Dental Materials Used in Pediatric Dentistry

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Abstract: The chapter describes various dental materials commonly used in Pediatric dental practice. Making an informed choice of the restorative material to be used in different clinical conditions is essential to ensure a successful and satisfactory restorative outcome. Knowledge of dental materials with their unique set of advantages and applications is an important determinant in the formulation of a treatment plan. Dental materials used for pulp therapies and full coverage restorations in primary teeth are exhaustive in their scope and as such, have been dealt with in depth in separate chapters.

Keywords: Alginate, Biodentin, Calcium hydroxide, Composite resins, Dental Materials, Elastomeric Impression Materials, Glass ionomer cement, Metapex, Mineral Trioxide Aggregate, Silver Amalgam, Zinc oxide eugenol.

INTRODUCTION

Dental caries is undoubtedly one of the most common chronic diseases of childhood. Its prevalence is higher than asthma and hay fever. Despite the innumerable advances in the field of preventive dentistry, restoration of teeth continues to be the mainstay of pediatric dental practice. Having said that, the clinical aspect of Pediatric dentistry has progressed in leaps and bounds in terms of the choices in restorative materials that are available today. Historically, pediatric dentists relied upon silver amalgam and stainless-steel crowns for restoring decayed posterior teeth; whereas, decayed anterior teeth were restored with silicate cement, acrylic, or other esthetically less-acceptable restorations.

The management of dental caries was originally based on the belief that caries is a progressive infectious disease that eventually leads to loss of teeth in the absence of a surgical/restorative intervention. However, it has now been established that

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dental caries is reversible in the initial stages of tooth demineralization shifting the focus on early intervention and prevention of decay. However, in case of cavitated lesions, restoring the form, function and esthetics of teeth using a biocompatible dental material is the standard practice.

SILVER AMALGAM

For decades, silver amalgam has been the gold standard for restorations in dentistry and has been the restorative material of choice for posterior teeth. The simplicity of its use, cost effectiveness and excellent mechanical properties has made silver amalgam one of the most dependable restorative materials. Its use in primary posterior teeth has resulted in successful long-term outcome. Amalgam contains a mixture of metals such as silver, copper and tin mixed with mercury. Silver amalgam restorations are generally recommended for Class I & II restorations in primary and permanent molar teeth and premolars [1]. In case of class II restorations in primary teeth, amalgam is suitable for preparations that do not extend beyond the line angles of teeth [2].

Composition

(Traditional low copper containing alloys)

Silver – 65 wt.%

Tin – 29 wt.%

Copper – 6 wt.% or less

High copper containing alloys (with copper content between 6 to 30 wt.%) possess superior physical properties as compared to the low copper alloys.

Classification

Silver Amalgam can be classified in various ways as shown in Table **1**.

Table 1. Classification of silver amalgam.

Based on alloy particle size and shape
Lathe cut alloys (irregularly shaped)
Spherical alloys (produced by atomizing the liquid alloy)
Admixed alloys (containing a mixture of lathe cut and spherical alloy particles)
Based on copper/zinc content in the alloy
Low copper alloys

(Table 1) cont.....

High copper alloys
Zinc containing alloys (Zinc content more 0.01%)
Zinc free alloys (alloys containing 0.01% or less zinc)
Based on addition of noble metals
1st generation – 3 parts silver + 1 part tin (original peritectic alloy)
2nd generation – original alloy + copper upto 4% + zinc upto 1%
3rd generation – Silver – copper eutectic alloy
4th generation – Alloy containing copper + silver + tin upto 29%
5th generation - Alloy containing silver, copper, tin + Indium
6th generation – Palladium + silver + copper eutectic alloy

Manipulation

Silver alloy powder and mercury are dispensed in a ratio of 1:1 (Eames technique). This minimal mercury technique is a good way of reducing mercury content, whereby 50% or less mercury will be present in the final restoration. For high copper alloys, a mercury-alloy proportion of 1:1 is recommended; whereas for low copper alloys, a 40:60 mercury-alloy ratio is advised. The process of mixing the silver alloy powder with mercury is termed as trituration and can be achieved by the following means:

a. Hand trituration –The specified quantity of silver alloy powder and mercury is dispensed in a glass/ceramic mortar and triturated into a homogenous mix with the help of a glass/ceramic pestle. After trituration, the excess mercury is squeezed out of the mix using a squeezing cloth. Following this the mix is mulled and condensed into the prepared cavity. As silver amalgam relies on mechanical retention, the GV Black's principles of cavity preparation should be strictly adhered to for clinical success of amalgam restoration (Fig. **1**).
b. Mechanical trituration – Pre-proportioned capsules containing alloy powder, mercury and a cylindrical metal or plastic piston is placed on a triturator/amalgamator and oscillated at the designated speed in order to obtain a more standardized mix as compared to the hand trituration method (Fig. **2**).

CHAPTER 13

Minimal Intervention Dentistry

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Abstract: Minimally invasive treatment of dental caries is an approach that uses conservative management strategies focusing on maximum preservation of tooth structure. Unlike the principles enumerated by GV Black, which advocated maximal excavation of carious tooth structure, Minimal Invasive Dentistry (MID) conserves as much tooth structure as possible and provides a conducive environment for the affected tooth tissue to self-heal. This chapter enumerates the various modalities of Minimal Intervention Dentistry or Minimally Invasive Dentistry (MID) and discusses Atraumatic Restorative treatment (ART) in detail.

Keywords: ART, Air Abrasion, Chemomechanical Caries Removal, MID, Microdentisry, Ozone Therapy.

INTRODUCTION

Despite the innumerable advances in dental materials, prevention methods and techniques, dental caries remain a scourge that is yet to be eradicated. It has long been recognized that the traditional treatment of dental caries involving cavity preparation and restoration with silver amalgam involves unnecessary removal of healthy tooth tissues, thereby weakening the tooth structure. This “extension for prevention” approach was necessary earlier on, given the understanding of dental caries at that time, its high prevalence among populations, the limitations of dental materials available, and the lack of proven alternative treatment options. The difficulty in diagnosing dental caries in its initial stages; before the stage of cavitation, also contributed to clinical decisions involving surgical intervention rather than attempts at remineralization & monitoring of carious lesions.

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However, with a greater understanding of the dynamics of dental caries, coupled with recent multifold developments of adhesive and biomimetic restorative materials, a paradigm shift has occurred towards 'Minimally invasive dentistry(MID). This MID approach for the management of dental caries incorporates the science of detecting, diagnosing, intercepting and treating dental caries at a microscopic level. Also known as 'Microdentisty,' the MID approach also includes non-surgical modalities based on the concept that, to a certain extent, dental caries is a 'reversible' infectious disease [1].

Components of Minimal Interventional Dentistry

The components of MID are listed in Fig. (**1**).

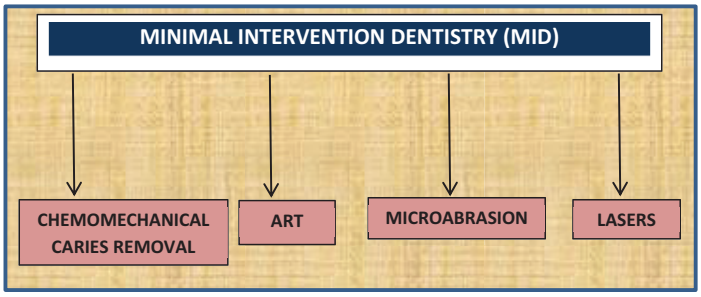

Fig. (1). Components of Minimum Intervention Dentistry.

Goals of Minimal Intervention

Minimal intervention dentistry focuses on arresting and reversing the progression of dental caries as compared to aggressive surgical intervention (removal of carious tooth tissue and replacing it with a dental restorative material), which has been the norm. The objective of MID is to defer operative/surgical intervention of dental caries for as long as possible and to conserve demineralized, non-cavitated enamel and dentin. This can be achieved through early detection of dental caries, evaluation of individual caries-related patient factors (caries risk assessment), interception of the process and finally, the treatment for any lesions already evident, with the aim of maximal preservation of tooth tissue and facilitation of self-repair of the tooth.

The principles of MID have been enumerated by Tyas *et al.* [2] as being as follows:

Early Caries Diagnosis

Besides early caries diagnosis, the operator must also evaluate the caries activity using caries activity tests, as an adjunct to clinical and radiographic examination.

Newer caries diagnostic methods like diagnosis, quantitative laser fluorescence *etc.*, can also help in the early diagnosis of caries.

Classification of Caries Depth and Progression

The use of the International Caries Detection and Assessment System (ICDAS) can serve as a good guide regarding the extent of the carious lesion. Digital radiography with low radiation exposure, diagnostic lasers and dental operative microscopes are other means to gain clarity on the caries lesion depth.

Assessment of Individual Caries Risk

Low Risk – Patients without caries in the past year, coalesced or sealed pits and fissures, good oral hygiene, appropriate fluoride use and regular dental visits.

Moderate Risk – Patients with a carious lesion in the past year, deep pits and fissures, fair oral hygiene, white spots or interproximal radiolucency, inadequate fluoride exposure, irregular dental visits and/or undergoing orthodontic treatment.

High Risk – Patients with two or more carious lesions in the past year, past smooth surface caries, deep pits and fissure, no/little fluoride exposure, elevated S. mutans count, poor oral hygiene, frequent sugar intake, inadequate salivary flow rate, irregular dental visits and prolonged bottle-feeding or nursing (infants).

Reduction of Cariogenic Bacteria To Decrease the Risk of Further Demineralization and Cavitation

Since demineralization of enamel and dentin is not a continuous irreversible process, the operator must utilize the tooth's capacity to self-heal (in case of a non-cavitated carious lesion) by altering the oral environment to favour remineralization. Proven preventive methods like diet modification and good plaque control measures at the dental office and at home should be emphasized, as they help reduce the bacteria population and improve oral health.

Arrest of Active Carious Lesions

Periodic topical fluoride application is necessary for ensuring increased availability of fluoride ions for the formation of fluorapatite, thereby increasing the resistance of teeth to demineralization. Other ways to intervene and convert an active carious lesion into an arrested lesion include the application of silver diamine fluoride, resin infiltration *etc.*

CHAPTER 14

Molar Incisor Hypoplasia (MIH)

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Abstract: Developmental defects of enamel a commonly encountered condition in both primary and permanent teeth enamel. Ameloblasts being highly specialized cells are highly sensitive to a host of environmental factors. As a result, a large number of factors can cause hypomineralization. Of the various hypoplastic and hypomineralization defects affecting the enamel, this chapter focuses on a distinct condition of hypomineralization involving mainly the molar and incisor teeth.

Keywords: Cheese molars, Hypoplasia, Idiopathic enamel opacities, Internal enamel hypoplasia, MIH, Non-endemic mottling of the enamel, Post eruptive breakdown.

INTRODUCTION

Enamel hypomineralization is a condition with the decreased mineral content of the enamel which is associated with a clinical presentation of well-demarcated chalky-white opacities. A disturbance during the late maturation and mineralization phase of amelogenesis leads to enamel defects. A commonly encountered pattern of such hypomineralization is seen as enamel defects in first permanent molars with or without the involvement of permanent incisors and has been termed as 'Molar Incisor Hypomineralization (MIH)' (Figs. **1** and **2**). MIH has also been observed in primary molars, in which case it is referred to as hypomineralized second primary molars (HSPMs). More importantly, HSPM is considered as a predictor for MIH [1].

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Fig. (1). MIH affecting permanent maxillary central incisors and all 4 first permanent molars.

Fig. (2). MIH affecting maxillary 1st permanent molars along with maxillary and mandibular incisors, incisal tips of mandibular canine.

The term Molar Incisor Hypomineralisation (MIH) was first introduced by Weerheijm *et al* in 2001; and is defined as a developmentally derived dental defect that involves hypomineralisation of 1 to 4 permanent first molars, frequently associated with similarly affected permanent incisors. MIH is also known as *nonfluoride enamel opacities, internal enamel hypoplasia, nonendemic mottling of enamel, opaque spots, cheese molars, idiopathic enamel opacities, enamel opacities, and idiopathic enamel hypomineralization.* Hypomineralized

enamel has higher porosity and less strength to withstand occlusal forces. The characteristics of MIH-affected teeth are mentioned in Table **1**. There have been reports of a greater incidence of dental caries and post-eruptive breakdown (PEB) in teeth affected by MIH. Often the teeth affected by MIH become sensitive to thermal changes and the breakdown of tooth structure makes it difficult to maintain oral hygiene, further increasing the risk of caries [2].

Table 1. Criteria for diagnosing MIH as enumerated by Weerheijm (2001).

Criteria	Definitions
Opacity	A defect involving an alteration in the translucency of the enamel, variable in degree. The defective enamel is of normal thickness with a smooth surface and can be white, yellow, or brown in color. The border of the lesions is demarcated
Post Eruptive Breakdown (PEB)	A defect that indicated deficiency of the surface after eruption of the tooth. This may be caused by such factors as trauma and attrition.
Atypical restoration	The size and shape of restoration do not conform to typical restorative characteristics. In most cases, restorations will be extended to the buccal or the palatinal smooth surface. At the border of the restoration, opacity may be noticed.
Extraction due to MIH	Absence of a molar should be related to the other teeth of the dentition. Absence of a first permanent molar in a sound dentition is suspected to have been an MIH molar.

Various epidemiological studies estimate the prevalence of MIH to be ranging from 2.8 to 40.2%. Currently, it is estimated that MIH affects one in six children worldwide [3]. Initially, MIH was described as a developmental qualitative defect of enamel affecting the permanent first molars and permanent incisors. But currently, MIH is known to affect primary molars as well as other permanent teeth.

Etiology and Diagnostic Criteria for MIH

The exact etiology of MIH is unclear. The localized and asymmetrical lesions seen in MIH probably suggest a systemic origin with the subsequent disruption of amelogenesis [4]. Many factors are known to be contributing to MIH; however, the threshold levels of these factors needed to cause enamel defects during the sensitive stages of amelogenesis not accurately known. Children with poor general health, those suffering from upper respiratory diseases, asthma, otitis media, tonsillitis, chicken pox, measles, and rubella. During the first 4 years of their life may exhibit MIH. Certain systemic conditions such as nutritional deficiencies, brain injury and neurologic deficits, cystic fibrosis, syndromes of epilepsy and dementia (Kohlschutter-Tonz syndrome), nephrotic syndrome, atopia, lead poisoning, repaired cleft lip and palate, radiation treatment, rubella embryopathy, epidermolysis bullosa, ophthalmic conditions, celiac disease, and

CHAPTER 15

Restoration of Carious Teeth in Children

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Abstract: Restorative procedures involving primary teeth constitute a major segment of clinical pediatric dentistry. Anatomic and histological differences between primary and permanent dentitions necessitate modifications of cavity preparation in primary teeth. Cavities must also be prepared keeping in mind the needs for newer restorative materials currently in use. Meticulously adhering to the principles of cavity preparation is essential for the longevity of restoration.

Keywords: Cavity preparation, Class I restoration, Class II restoration, GV Black's classification, Matrix, Wedges.

INTRODUCTION

Restoration of teeth affected by dental caries continues to remain the mainstay of dental treatment. Especially in children, dental caries is a major health problem that causes significant pain and discomfort. Even though the basic tenets of restoration of primary and permanent teeth are same, management of dental caries in children poses unique challenges in terms of obtaining patient cooperation during the treatment. Beginning with aggressive caries removal and extensive cavity preparation methods, the treatment strategy of dental caries has gradually shifted towards a more biological and conservative approach [1]. Additionally, a greater emphasis is now being laid upon prevention of dental caries and remineralization of incipient carious lesions by pediatric dental surgeons worldwide. Currently, restorations are being advised only when carious lesions have advanced to obvious cavitation and where remineralisation techniques have reached their limits.

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Restoration of primary teeth is aimed at preserving the integrity and function of the deciduous dentition so that a healthy oral environment is maintained till the permanent teeth occupy their rightful places in the dental arch (Table **1**).

Table 1. Goals of restoration of teeth in children.

Goals of Restoration of Teeth
• Symptomatic relief
• Arresting the progression of dental caries
• Prevention of damage to pulp tissue
• Maintenance of function
• Maintenance of arch length
• Improving esthetics

Anatomy and morphology of the primary teeth differ from that of the permanent teeth in spite of the same function and superficial resemblance. As a result, the clinical presentation of dental caries may differ between the two dentitions.

Crown Morphology

Crowns of the primary teeth are more bulbous than that of the permanent teeth. Mesiodistal width is bigger than that of the occluso-gingival height in primary molars whereas the permanent molars are wider buccolingually. However, the dimensions of anterior is same in primary dentition. Narrow occlusal table is seen in primary molars which is narrower in primary first molar as compared to that of primary second molar. Cervically, the tooth is broader with a prominent cervical bulge seen on the bucco-cervical aspect of mandibular first primary molar. Isthmus part of the tooth where occlusal and proximal preparations meet is very narrow in the primary molars so extra care is to be exercised during cavity preparation because it is a common site for restoration failure due to occlusal forces.

Contact Areas

Contact areas between teeth are broad and flat in primary dentition when compared to that of the permanent dentition. Hence, the proximal box is made wider to get a proper cavosurface margin. As the contact area is broad, proximal caries is difficult to detect during initial stages of decay. Bitewing radiographs can help in detecting proximal caries. In cases of extensive decay involving both the approximal surfaces of a primary molar, cavity preparation may be too close to the pulp chamber. Additionally, matrix placement is challenging in such cases as cervical constriction leads to less tooth surface in the cervical area. In such a

scenario, restoration of the tooth with stainless steel crown is the preferred treatment option.

Enamel Rods

In the cervical area, the enamel rods in primary dentition are directed occlusally; unlike in permanent dentition where the enamel rods are directed gingivally. Hence, the proximal box preparation in primary teeth for a class II amalgam restoration differs slightly from that of permanent teeth.

Pulp and Root Morphology

Pulp horns are placed higher and closer to the occlusal surface in primary teeth. Primary mandibular molars present with four pulp horns, whereas the primary maxillary molars have three prominent pulp horns. Caries excavation and preparation of cavity should be carried out with caution to avoid iatrogenic pulp exposure in deciduous teeth.

Due to these anatomic differences, the cavity preparation in deciduous dentition differs from that in permanent dentition (Table **2**).

Table 2. Differences between cavity preparation in primary and permanent teeth.

Cavity Preparation in Deciduous Teeth	Cavity Preparation in Permanent Teeth
Cavity preparation is smaller (due to smaller crown size), shallower (due to thin enamel) and narrower (due to narrow occlusal table)	Cavity preparation is comparatively larger due to larger crown size, deeper due to thicker enamel and wider due to a broad occlusal table
Pulpal floor is saucer shaped due to higher pulp horns	The pulpal floor is prepared flat
Occlusal walls of cavity are less convergent	Occlusal cavity walls are more convergent
The buccal and lingual walls of the proximal box of Class II cavity are more convergent occlusally	Buccal and lingual walls of proximal box of a Class II cavity are less convergent occlusally
Buccal and lingual retentive grooves are not indicated	Buccal and lingual retentive grooves can be provided for additional retention
In the gingival seat of Class II restoration, a Cavo surface bevel is not given as the enamel rods are oriented occlusally	A Cavo surface bevel is given at the gingival seat of a Class II restoration as enamel rods are directed cervically
Width of the isthmus is $1/3^{rd}$ the intercuspal distance	Width of the isthmus is $1/4^{th}$ the intercuspal distance

Preparation of cavity for placement of restoration is based on the anatomic area involved by dental caries as enumerated by Dr G.V Black in 1924 (Table **3**). The cavity preparation based on this classification was intended for silver amalgam restoration. With the declining use of silver amalgam in recent years, cavity

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Satyawan Damle

Professor Damle is a colossus giant, a celebrated teacher, distinguished leader, and policy-maker at several institutions and universities. He is the rare blend of a clinician and a scholar and has emerged with decades of teaching. He possesses more than 44 years of teaching experience. He was the Dean of Nair Hospital Dental College, Mumbai, for 13 years, also has been a postgraduate teacher for 30 years. He remained Director of Medical Education. He was the first Dental Surgeon promoted as Joint Municipal Commissioner, Medical Education. Prof. Damle is actively involved in research and has numerous publications in Indian and International journals.

Ritesh Kalaskar

Presently working as Professor and Head of the Department of Pediatric Dentistry at Government Dental College and Hospital Nagpur, Dr. Ritesh Kalaskar is a very well-known teacher and academician and has published nearly 70 scientific papers and 3 patents. Also, he is a recipient of the Best teacher award, awards for excellence in academics and research and a recipient of several Journals. He has been a member of organizing teams in various capacities to organize national and international conferences.

Dhanashree Sakhare

Dr. Dhanashree Sakhare has been enthusiastically involved in teaching and research activities with wide-ranging experience working in India at MM College of Dental Sciences & Research, Mullana. She was a lecturer of Orthodontics and then worked as an associate professor of Orthodontics & Dentofacial Orthopedics Currently, she is actively pursuing Australian Dental aspects and teaching aspirant overseas dentists in Australia. She has won best paper awards, delivered several lectures, and demonstrated clinical presentations at various Dental conferences. She has numerous publications to her credit.