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Preventive Orthodontics

A Project Submitted to
The College of Dentistry, University of Baghdad,
Department of in Partial Fulfillment for the Bachelor of
Dental Surgery

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Certification of the Supervisor

I certify that this project entitled "**Preventive Orthodontics**" was prepared by **Abbas Shihab Ahmed** under my Supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervisor's name: Assistant professor Haider Mohammed Ali Ahmed

Date: /4/2023

Dedication

To my father for his support,

To my kind mother for her patience,

To my brothers and sisters and for their encouragement.

Acknowledgment

First and foremost, praises and thanks to **Allah** Almighty for helping me to fulfill my dream, for his blessings throughout my work to complete it successfully.

I would like to extend my deepest respect and gratitude to the Dean of College of Dentistry, University of Baghdad, **Prof. Dr. Raghad Al-Hashimi.**

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IPION	Index for preventive and interceptive orthodontic needs
DTE	Delayed tooth eruption
PO	Preventive orthodontics

Introduction

Preventive orthodontics is that part of orthodontic practice which is concerned with patients and parents education, supervision of the growth and development of the dentition and cranio-facial structures. The diagnostic procedures undertaken to predict the appearance of malocclusion and the treatment procedures instituted to prevent the onset of malocclusion. Interceptive orthodontics has been defined as that phase of science that can recognize and eliminate potential irregularities and malpositions of the developing dento-facial complex **(Keim *et al*., 2013)**.

Many of procedures are common in preventive and interceptive orthodontics, but the timings are different. Preventive procedures are undertaken in anticipation of development of a problem, whereas interceptive procedures are taken when the problem has already manifested **(Karaiskos *et al*., 2005)**.

Orthodontic problems in children can be divided conveniently into non skeletal and skeletal problems, which are treated by tooth movement and by growth modification. Such treatment may take place in deciduous or transitional dentition and may include redirection of ectopically erupting teeth, slicing or extraction of deciduous teeth, correction of isolated dental crossbites of recovery of minor space loss **(Xhemnica and Rroço, 2022)**.

The Purpose of early orthodontic treatment is to intercept developing problem. To prevent obvious problems from becoming worse. To correct obvious problems. To remove the etiologic factors and restore normal growth. To reduce the severity of skeletal problems, making possible easier and more precise tooth positioning in adolescence **(Varrela and Alanen, 2005)**.

Preventive orthodontics generally shows results over a period of time. The right time to initiate preventive orthodontics would be ideally during prenatal counseling. Some of the procedures and concepts of preventive and

interceptive orthodontics are common but the time of application pertaining to the stage of dental development are different. These procedures not only prevent or intercept a developing malocclusion, but also allow proper mastication to develop along with speech, which in turn leads to the development of an individual with good esthetics and has a positive psychological effect apart from guiding dental growth and development positively **(Singh, 2007)**.

Aims of the study

To review the available literature about the importance of early preventive treatment and discuss the various principles and modalities used in preventiveorthodontics.

Chapter one: Review of literature

1.1 Index for preventive and interceptive orthodontic needs

The index for preventive and interceptive orthodontic needs (IPION) was described and is currently the only such reported index.

The goal of IPION is to allow early detection of developing malocclusions, so that simple interceptive treatment can be undertaken to minimize or eliminate the need for more extensive and costly orthodontic treatment later **(Coetzee, 2007)**.

fIPION measures various occlusal traits (Table 1) and assigns a value depending on their severity. The trait scores are then added, yielding a total score that indicates the need for preventive or interceptive orthodontic treatment. Different factors have an influence on the development of malocclusion in 6 and 9 year olds, which is why slightly different indices exist for the 2 age groups. Although the index is a valuable tool for planning prevention or interception of potential malocclusions, it does not indicate the true prevalence of malocclusion. Severe malocclusions may be placed in a low treatment category due to the impracticality or inadvisability of rendering either preventive or interceptive treatment at the time of assessment **(Hiebert, 2006)**.

Table 1: Occlusal traits and criteria measured by IPION

6 year olds	9 year olds
Caries	Caries
Early loss	Early loss
Molar relationship	Molar relationship
Rotation/tipping of molars	Rotation/tipping of molars
Overjet	Overjet
Overbite	Overbite
Anterior crossbite	Anterior crossbite
Posterior crossbite	Posterior crossbite
Open bite	Open bite
Lip incompetency	Lip incompetency
	Submerged teeth
	Active frenum
	Absent incisors

1.2 Preventive protocol

1.2.1 Caries control

Untreated carious primary teeth create a risk for malocclusion by shortening the dental arch either through breakdown of interproximal surfaces or loss of these teeth **(Karaiskos *et al*., 2005)**.

There are two approaches to caries prevention: population-based approaches, such as water fluoridation, and targeted prevention, either to individuals or to populations assessed as being at increased risk. The detection of populations or individuals at increased risk of developing dental caries would allow preventive efforts to be focused on those most at risk of developing caries, in a cost-effective fashion, without reducing the community-wide benefits of preventive methods, such as oral health promotion **(Landis and Koch, 1977)**.

Caries risk assessment in pre-school children has been approached using a variety of factors: **(Proffit, 2019).**

1. dietary factors (further information can be found in the SDCEP guidance on prevention and management of dental caries)

2. oral hygiene factors
3. microbiological risk factors
4. sociodemographic markers
5. previous caries experience.

Potential risk factors for dental caries in children under seven years of age include: oral hygiene, diet, bacterial exposure, socioeconomic status, factors relating to breast and bottle feeding, fluoride exposure, and parental smoking. The presence of these factors is not necessarily predictive of decay. A child appears to be most at risk of caries if he or she acquires oral mutans streptococci at a young age. A high level of oral mutans streptococci may be partly compensated by other factors such as good oral hygiene and a non-cariogenic diet.

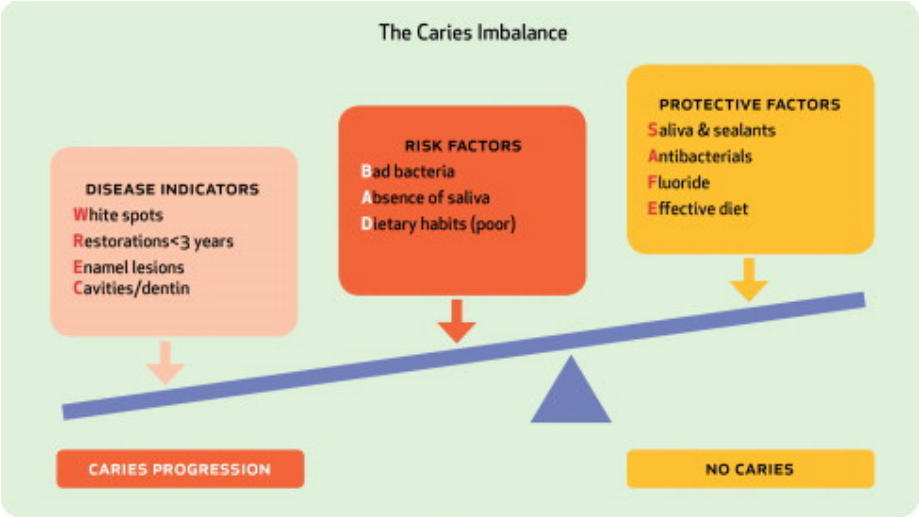

Figure 1: The caries "imbalance." The balance amongst disease indicators, risk factors, and protective factors determines whether dental caries progresses, halts, or reverses (Fontana *et al*., 2009)

1.2.2 Parental counselling

Maternal oral and systemic health, along with diet, self-care, and lifestyle can adversely impact fetal and early childhood dentition and oral outcomes. As

a critical early intervention tool, prenatal counseling holds promise for improving the oral health of mother and child **(Keim *et al*., 2013)**.

A number of early interventions, such as reducing or postponing the transmission of maternal oral microflora, implementing the use of chemotherapeutics (fluorides, chlorhexidine), or providing oral hygiene instructions, feeding considerations, caries risk assessment and information regarding caries development are important in improving the infant's oral health status and maternal education **(Lydon-Rochelle *et al*., 2005)**.

To better treat mother and child, a multidisciplinary approach with a firm oral health foundation needs to be constructed in the health care community. General dentists, working in tandem with other health care professionals (medical and dental), have a great opportunity to introduce preventive programs to help reduce early childhood caries. Hospitals and other health care settings along with general dentistry offices are natural points of contact for women in need of prenatal counseling. However, these resources may not be actively providing this information or the level of quality care that can influence outcomes **(Lindvall *et al*., 2020)**.

As a community resource, the generalist is an important conveyor of such information and little is known about this service area. This survey explored the opinion of the general dentists regarding their experiences and attitudes regarding prenatal counseling while trying to assess the frequency or number of interventions that are being performed, the time spent in counseling, the variety of counseling settings being utilized, and barriers to counseling. Such information is critical to strengthening the generalist's commitment to this public health issue as well as serving as a basis for further study **(Proffitt, 2000)**.

The ability to introduce oral health counseling to women early in their pregnancy, is conflicted by historical practices in dentistry and medicine regarding pregnancy. With respect to dental care during pregnancy, Strafford, Shellhaas and Hade compared the opinions of dentists, obstetricians, and patients, and found differences regarding the safety, accessibility, and necessity of prenatal dental treatments between the professions **(Salama *et al*., 2010)**.

A study indicated that more than 50% of general practitioners provide prenatal counseling. Practitioners who completed additional training were more likely to schedule more time for prenatal counseling. The most common reason for not providing prenatal counseling was that it was not a priority for the office. Other reasons cited were there is not enough time in the schedule, the parents are not interested. Several respondents noted they had never thought of providing prenatal counseling, but will start doing so in the future. The ultimate goal of the general dentist, obstetrician, family practice physician, pediatrician and pediatric dentist is a safe delivery for every mother and child. The hope is that the child will grow to be healthy, active and caries-free child **(Salama *et al*., 2010).**

1.2.3 Space maintenance

Primary teeth play a critical role in the growth and development of a child. In addition to their role in esthetics, eating, speech, encouraging normal growth and function, the other main function is to hold space for the permanent successor until it is ready to erupt **(Peter Schopf, 2003)**.

Crowding and lack of space in the permanent dentition are amongst the most common orthodontic problems encountered in patients. Often the etiology of these problems is linked to premature loss of one or more deciduous teeth with corresponding loss of space. The pattern of space loss depends on many

factors including age, stage of development, which teeth have been lost, the presence of crowding or spacing, and occlusal relationships **(Choonara, 2005)**.

Space maintainers are appliances used to maintain space or regain minor amounts of space lost, so as to guide the unerupted tooth into the proper position in the arch. After the premature loss of a tooth, not only do space maintainers maintain function and preserve arch length, they also maintain esthetics, prevent encouragement of detrimental habits and eliminate any potential psychological damage, a child could face as a result of the premature loss of teeth **(Watt *et al*., 2018)**.

The space maintainer also allows the permanent tooth to erupt unhindered into proper alignment and occlusion. The use of space maintainer appliance, or restoration of a carious primary tooth that can then act as a natural space maintainer, may potentially obviate the consequences of loss of arch length and the need for complex orthodontic treatment at a later stage. Careful consideration of many factors is required when deciding whether space maintenance is indicated. Radiographs and space analysis can be very helpful **(Durward, 2000)**.

I. Indications of space maintainers

As aforementioned, the use of space maintainers is indicated in case of premature loss of primary dentition when concern exists as regards the proper development and alignment of the newly growing dentition **(Morais *et al.*, 2016)**.

However, not all patients who lose their primary dentition early necessarily require dental instance, bands and loops are preferred in cases of premature loss of a primitive second molar specifically when the permanent first molar has erupted. They are also used in cases of premature loss of

maxillary primary molars during the transitional dentition or any primary molars in primitive dentition if the permanent succeeding molars failed to erupt two years after or if their root was shorter than its expected full length during this two-year period. Also,

A. The bands and loops can be used in cases of bilateral loss of primitive molars only if the permanent incisors have not yet developed **(Cornelius and Ehrenfeld, 2010)**.

The main contraindications for loops and bands appliances are active dental caries, overcrowding, marked space loss, space maintenance for anterior teeth, and space maintenance for second molars in transitional dentition **(Nayak *et al*., 2004)**.

Figure 2: Band and loop space maintainer (Sasa *et al*., 2009)

B. Fixed lingual arches, on the other side, are best suited in space maintenance in the lower dental arch. Fixed lingual arch is a bilateral fixed space maintaining appliance that consists of an arch with two bands cemented to the first permanent molars bilaterally and a wire butting against the lower four permanent incisors **(Housley *et al*., 2003)**.

The main advantages of fixed lingual arches are their relative stability, ease of cleaning, patient comfort, and permission of permanent teeth eruption without interference. However, they do not prevent eruption of opposing teeth

and they are not suitable for hypocalified hypoplastic teeth or teeth with caries **(Eliasson *et al*., 2000)**.

They are chiefly indicated for prevention of mandibular arch changes during the transitional dentition of lower incisors, prevention of anterior crowding and change of position of mandibular incisors, and as a base for cosmetic restoration of anterior teeth (Hollywood appliance). Fixed lingual arches do not suit cases that require frequent adjustment of appliances, patients with excessive anterior crowding, or those with anterior or posterior crossbite **(Roberts-Harry and Sandy, 2006)**.

Figure 3: Fixed lingual arches (Viglianisi, 2010)

C. Nance appliances are closely similar space maintainers that do not contact the anterior teeth. They are composed of a band and a palatal wire. The band is placed around the permanent molars, whilst the palatal wire approximates the anterior palate providing a resistance against anterior movement of the posterior teeth. The Nance appliances have the same indications of the fixed lingual

arches. Because of their soft tissue contact, their main disadvantage is discomfort and soft tissue irritation **(Singh and Cox, 2009)**.

Figure 4: Intra-oral view of patient fitted with Nance palatal arch (Williams, 2013)

D. The fourth type of dental appliance is the transpalatal arch. The transpalatal arch is a special type of dental maintainers that runs horizontally across the palate connecting bilateral molars. The main advantage of this appliance is that it does not contact the soft tissue and is subsequently associated with minimal irritation or discomfort **(Watt *et al*., 2018)**.

The main function of transpalatal arch is preventing the mesiolingual rotation of maxillary molars during development. Therefore, it is best indicated when several primary molars are lost one side on the maxillary arch whereas the other side is intact. In cases of bilateral loss of primary molars, trasnpalatal arch

cannot be used and a Nance appliance or fixed lingual arch can substitute **(Kumar *et al*., 2014)**.

Figure 5: Transpalatal arch (Mucedero et al., 2016)

II. Complications of space maintainers

Though considered generally safe, space maintainers carry the risk of several potential complications. The main complications include increased risk of infection, dental caries, plaque accumulation, local pain and discomfort, interference with the normal development and alignment of the erupting succeeding teeth, undesirable teeth position and movement, soft tissue irritation and impingement, and complications related to the appliances e.g. breakage, loss, or dislodgement **(Ramakrishnan *et al*., 2019)**.

Infection remains one of the most serious and most studied complications. Researchers reported that both removable and fixed dental space maintainers are associated with a significantly high risk of oral cavity microorganism growth and increased periodontal index scores **(Arikan *et al*., 2015)**.

Candida was found to be commonly encountered in patients with removable dental appliances whereas salivary Enterococcus faecalis was isolated from fixed appliances. Appliances with direct contact to the mucosa and soft tissue, such as loops, bands, and lingual arches, are potentially complicated with soft tissue impingement, ulceration, bleeding, and pain **(Woods, 2010)**.

Gingival hyperplasia and mucosal overgrowth are also commonly encountered. Complications related to the dental appliances such as dislodgment or displacement are commonly found with bands and loops **(Chandra *et al*., 2018)**.

Most of the complications of dental space maintainers are preventable. Patient education and close regular monitoring are the key for successful prevention and early detection and management of any potential complications. Education about oral hygiene and appropriate cleansing of the dental appliances is essential **(Qudeimat and Sasa, 2015)**.

Education about avoiding chewing on hard foods and eating sticky gums or candies is important to avoid loosening and failure of the dental appliances. Early identification of signs of infection, caries, or disintegration is fundamental for prevention of worsening of these complications **(Woods, 2010)**.

III. Contraindications for space maintainers: (Roberts-Harry and Sandy, 2006)

1. When the mesiodistal width of the underlying permanent tooth is less than the space present.
2. When the tooth is near to the crest of the ridge.
3. When the underlying permanent tooth is missing
4. When the molars are expected to drift forward

1.2.4 Exfoliation of deciduous teeth

Deciduous tooth eruption and their exfoliation followed by eruption of permanent dentition is an orderly sequential and assumed as important milestone and specific event during child's growth and development. Parents mostly anxious about the variation of timing of tooth eruption. They think that the children suffering from dangerous systemic diseases. Eruption is a physiologic, complex and tightly regulated process that strongly influences normal development of the craniofacial complex **(Zaidi *et al*., 2015)**.

The tooth begins its movement when the crown formation is completed. Tooth erupts into the oral cavity approximately ¾ of root is formed and reach the occlusion before the complete formation **(Rao, 2012)**.

Tooth eruption occurs over a broad chronological range and its influenced by factor likes genetics, gender, nutrition, pre-term birth, socioeconomic, craniofacial morphology, hormonal and systemic disease. Any other factors which are also suggested could affect tooth eruption are climate, race, diet and geographical factors **(Sabharwal *et al*., 2013)**.

Delayed tooth eruption (DTE) is a pathologic condition which is the most common encountered deviation from normal eruption time. It can directly affect the accurate diagnosis overall treatment planning and have significant impact on patient's proper oral health care. DTE can be as an indicator of a pathological condition, which is occur earlier, such as nutritional status, low birth weight, systemic disease and local factors. A significant deviation from the established pattern should alert the clinician to make investigation to evaluate and manage the DTE **(Suri *et al*., 2004)**.

The treatment of DTE is based on etiology. There are many techniques which is recommended for DTE, (1) surgical (extraction, obstacles removal, uncovering of affected teeth), (2) orthodontics (traction, creation and space

maintenance), (3) diagnosis and treatment of systemic disease **(Peedikayil, 2011)**.

1.2.5 Abnormal frenal attachment

A frenum is a mucous membrane fold which connects the lip to the alveolar mucosa, gingiva and the underlying periosteum. It exhibits inherent morphological variations. Frena are often seen in maxilla and mandible in midline or premolar region. Maxillary labial and mandibular labial and lingual frenum are most notable frenum of oral cavity. Its primary function is to provide stability of upper and lower lip and the tongue and to retain the lip in harmony with the growing bones of the maxilla **(Mintz *et al*., 2005)**.

The extent of their involvement in mastication is still not clear. It is histologically composed of connective tissue, elastic fibers, mucous glands with central artery and vein on either side. It exhibits wide diversity in position and structure and is of physiological importance. Aberrant frenal attachment leads to diastema, promotes plaque accumulation, gingival recession, bone loss and hinders proper smiling and speaking. It also has septomaxillary ligament that transmits septal growth force to premaxilla **(Hall and Precious, 2013)**.

By applying tension over frenum, abnormal or aberrant frena are noticed visually to see the movement of papillary tip or blanching produced due to ischemia of the region. Loss of papilla, recession, diastema, difficulty in brushing, malalignment of teeth and compromised the denture fit or retention are related to papillary and papilla penetrating type of frena which leads to psychological disturbances to the individual **(Priyanka *et al*., 2013)**.

A frenum can become problematic if tension from lip movement pulls the gingival margin away from the tooth, or if the tissue hinders the closure of a

diastema during orthodontic treatment. Frenal attachment that intrude on the marginal gingiva distend the gingival sulcus, encouraging plaque accumulation, intensifying the rate of progression of periodontal recession and thereby causing recurrence after treatment **(Boutsi and Tatakis, 2011)**.

There are various syndromes associated with relatively specific frenal abnormalities, ranging from multiple, hyper plastic, hypoplastic, or an absence of frena which includes Ehlers-Danlos syndrome, Infantile hypertrophic pyloric stenosis, Holoprosencephaly, Ellis-van Creveld syndrome, and Oro-facial-digital syndrome **(Priyanka *et al*., 2013)**.

A) Management

Three surgical techniques are effective in removal of frenal attachments

1. The simple excision technique
2. The Z-plasty technique
3. A localized vestibuloplasty with secondary epithelialization.

The first two techniques are effective when the mucosal and fibrous tissue band is relatively narrow; the third technique is often preferred when the frenal attachment has a wide base **(Priyanka *et al.*, 2013)**.

Figure 6: Thick maxillary labial frenum (Singh, 2007)

1.2.6 Locked permanent first molars

Ectopic eruption of permanent molars is a challenging situation that can arise in the early mixed dentition. Maxillary first molars are most frequently involved, with a prevalence that ranges from 1.8% through 6 % **(Barberia-Leache *et al*., 2005)**.

Generally, ectopically erupting first molars are impacted under the distal roots of the primary second molars. If they are not treated in a timely manner, the roots of the primary second molars continue to be resorbed and can exfoliate prematurely. This can lead to decreased arch length and delayed eruption of the succedaneous teeth **(Mucedero *et al.*, 2015)**.

For the development of normal occlusion, a smooth transition between the primary and permanent dentitions is important. Because locking of the first molar can cause severe root resorption and early loss of the primary second molar, it should be corrected as soon as possible **(Kim *et al*., 2020)**.

The appliance design used to unlock the first molar relies on the severity of the first molar locking against the primary second molar, recommended a simple separation method using brass wires or elastic modules when the amount of entrapment was 1 mm or less. Alternatively, they advised using a Humphrey-type appliance when the first molar needed to be distalized 2 mm or more. **Kennedy and Turley (1987).**

Anchorage is another important aspect when designing unlocking appliances. Appliances that tip back first molars tend to use primary second molars as anchorage. Consequently, a strong reactive force can concentrate on the primary second molar that causes mobility to increase. In our cases, the primary second molar roots had been resorbed substantially, so the primary second molars alone were not sufficient for anchorage **(Kim *et al*., 2020)**.

Therefore, the anchorage unit was reinforced by splinting the primary canine, first molar, and second molar. To do so, a 0.0195-in multistranded wire was adapted passively and bonded to the teeth. The permanent first molar could be unlocked without any anchorage concerns, such as unwanted movement of the primary second molar, through the use of a bonded passive wire that provided anchorage reinforcement **(Hwang *et al*., 2016)**.

Unlocking the first molar with a light wire takes place in 2 steps. The first step is distally tipping the first molar as the compressed 0.012-in nickel titanium wire straightens. As the deflected 0.012- in nickel titanium wire returns to its original shape, a moment is generated and the impacted first molar becomes free from locking. The second step is spontaneous eruption of the first molar. The 0.012-in nickel titanium wire is removed from the permanent first molar and primary second molar to allow the first molar to erupt **(Kennedy, 2002)**.

Because its roots are still underdeveloped, the first molar is expected to fully erupt on its own once it is unlocked. This unlocking technique has a self-limiting effect. The amount of compression of the 0.012-in nickel titanium wire determines the amount of distal movement of the first molar. Once the compressed nickel titanium wire is completely straightened, it ceases to exert an orthodontic force. Therefore, adverse effects from continuous orthodontic forces can be avoided even if a patient misses follow-up appointments for an extended period **(Kupietzky, 2000)**.

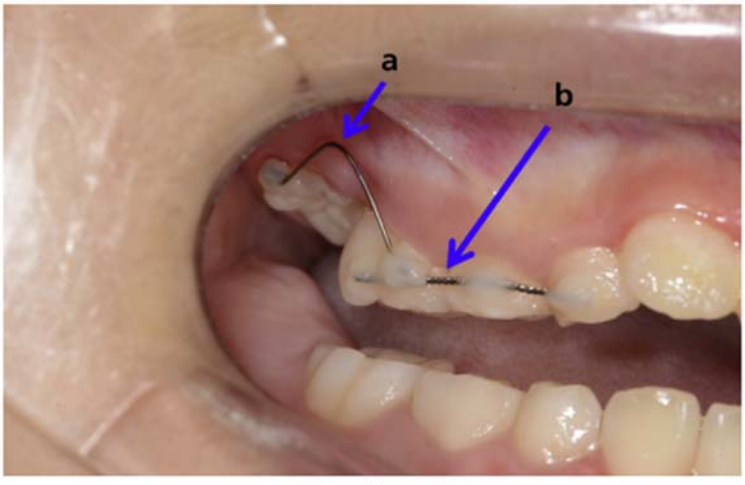

Figure 7: Appliance design for unlocking an ectopically erupting first molar. A 0.012-inch nickel titanium wire (a) and a 0.0195-in multistranded wire (b). (Hwang *et al*., 2016)

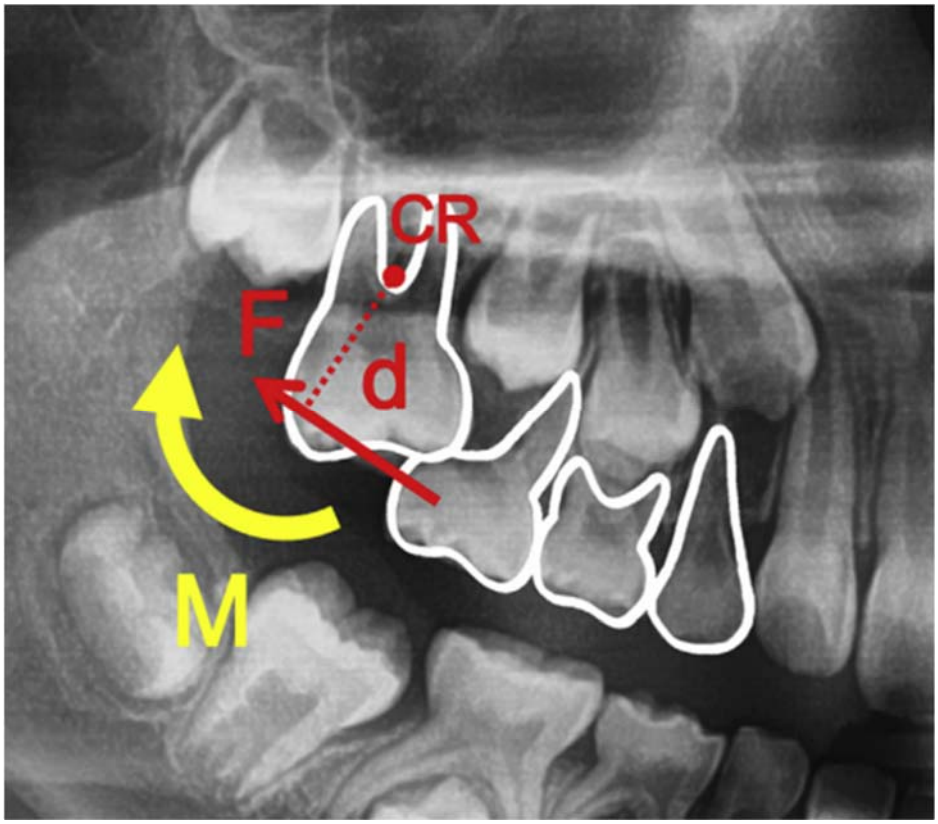

Figure 8: Unlocking mechanism of ectopically erupting permanent first molar.(Hwang *et al*., 2016)

1.2.7 Abnormal oral musculature

A) Thumb sucking

Thumb sucking is the most common oral habit and it is reported that its prevalence is between 13 to 100% in some societies. The prevalence of this habit is decreased as age increases, and mostly, it is stopped by 4 years of age **(Maguire, 2000)**.

There is a relationship between the level of education in parents, the child nutrition and the sucking habit. If the child chooses this habit in the first year of his or her life, the parents should move away his or her thumb smoothly and attract the child's attention to other things such as toys. After the second years of age, thumb sucking will decrease and will be appear just in child's bed or when he/she is tired **(Maguire, 2000)**.

Some of children who do not stop this habit, will give it up when their permanent teeth erupt, but there is a tendency for continuing the sucking habit even until adult life **(Johnson and Larson, 1993)**.

Thumb sucking has 2 types **(Tanaka *et al*.,2016)**:

1. Active: In this type, there is a heavy force by the muscles during the sucking and if this habit continues for a long period, the position of permanent teeth and the shape of mandible will be affected.
2. Passive: In this type, the child puts his/her finger in mouth, but because there is no force on teeth and mandible, so this habit is not associated with skeletal changes.

The side effects of finger sucking are: Anterior open bite, Increased overjet, Lingual inclination lower incisor and labial inclination upper incisor, Posterior cross bite, Compensatory tongue thrust, Deep palate, Speech defect and Finger defects (Eczema of the finger due to alternate dryness and moisture that occurs and even angulations of the finger). **(Yemitan *et al*., 2010)**

The severity of changes in dentition *due* to finger sucking is related to the duration and times of doing the habit. Also, the position of finger in mouth, dental arches relation and child's health affect the severity of changes **(Maguire 2000; Yemitan *et al*., 2010)**.

During active phase of permanent tooth eruption, there is a high risk for dental arches deviation. In children who do the sucking habit for 6 h or more,

especially during night or sleep, severe abnormalities in dentoalveolar system **(Proffit and Fields, 2000)** and minor skeletal effects will develop **(Moore and McDonald, 1997)**.

1) Treatment

Dental changes due to finger sucking do not need any treatment if the habit stopped before the 5 years of age and as soon as giving up the habit, dental changes will be corrected spontaneously **(Warren and Bishara, 2002)**.

At the time of permanent anterior teeth eruption and if the child is motivated to stop the sucking habit, it is time to start the treatment as follows:

(1) Direct interview with child if he/she is mature enough to understand.

(2) Encouragement: This can give the child more pride and self-confidence.

(3) Reward system.

(4) Reminder therapy.

(5) Orthodontic appliance: The final stage in treatment is the use of orthodontic appliance whether fixed or removable, which can play the role of reminder and can reduce the willing of finger sucking. For long-term habits or unwilling patient, the fixed intra oral appliance is the most effective inhibitor. After active phase of treatment, the appliance should remain in place for more 3 to 6 month to minimize the relapse potential **(Maguire, 2000)**.

Figure 9: Abnormal thumb sucking habit (Singh, 2007)

B) Tongue thrust

Tongue thrusting in simple terms is the habit of pushing the tongue forward between the upper and lower anterior teeth during deglutition **(Singaraju and Chetan, 2009)**.

Barbar described it as an oral habit pattern related to the persistence of an infantile swallow pattern during childhood and adolescence and causes an open -bite and protrusion of anterior teeth. The correct tongue posture entails the tongue to be placed against the palate behind the upper anteriors **(Matsumoto *et al.*, 2012)**.

Tongue thrusting habit has been baffling orthodontists for a long time regarding its role in malocclusion and regarding the approach to intervention in addressing it. The tongue is a powerful muscle that has the potential to alter the position of teeth. Inappropriate positioning of the tongue is seen as the major causative factor in the etiology of the malocclusion and relapse of treatment **(Dinesh *et al.*, 2013)**.

Clinical manifestations may include the following: Facial grimace and/or pursing of the lips when swallowing. Mouth breathing due to allergies or

enlarged tonsils and adenoids. An open bite condition of the teeth. Difficulty with speech, especially the s and z sounds. When at rest an open mouth position with a forward tongue posture is noted. Example, while watching television or reading a book. As stated that both tongue thrust swallow and teeth apart swallow favour development of distoocclusion, extreme maxillary over jet and open bite **(Maliael and Kumar, 2020)**.

C) Mouth breathing

Moulding action of upper lip on incisors is lost thereby resulting in proclination and spacing of maxillary anteriors. The lower lip is heavy and everted. V-shaped maxilla and high palatal vault. This is due to lack of normal musculature stimulation from the tongue and owing to the increased pressure on the cuspid and primary molar areas by the strained orbicularis oris and buccinator muscles, the buccal segments of the maxilla collapse giving a V shaped maxilla and a high palatal vault **(Woodside *et al.*, 2000)**.

The patients are more likely to have posterior dental cross bite. Anterior open bite may be seen. Mandible is rotated in a clockwise manner so that the mandible is in a more vertical and backward direction, causing elongation of the lower anterior face height, open bite and retrognathia. Mandible shows more obtuse gonial angle **(Maguire, 2000)**.

The increasing overjet and increased pressure from the stretched cheeks might cause a narrower maxillary dental arch. Experimental data for the relationship between malocclusion and mouth breathing are derived from studies of nasal/oral ratio in normal versus long face children. But most of the long face group were predominantly nasal breathers **(Aasim *et al.*, 2014)**.

Figure 10: an example of a child with narrow palate, high palatal vault and dental crowding due to mouth breathing (Jefferson, 2010)

While the effects on periodontal tissues and dental caries: is that in mouth breathers, children will hold their lips apart. So the gingiva becomes air-dried and causes irritation. Saliva over the exposed gingiva becomes viscous, debris collects on the gingiva as well as on the tooth surfaces, and the bacterial population becomes enormously increased. Subsequent to mouth breathing, most commonly anterior marginal gingivitis called mouth breathing gingivitis is seen **(Gulati *et al*., 2005).**

Chapter Two: Discussion

Preventive orthodontics in the mixed dentition implies several different possibilities, namely **(Bergersen, 2014)**,

(a) the guiding of erupting permanent teeth into an ideal position;

(b) using simplified procedures that produce a savings of time and effort;

(c) obtaining a more stable early result with less retention problems;

(d) avoidance of extraction of permanent teeth by utilizing the additional deciduous posterior tooth mass, distalization and/or expansion of posterior segments. These are compelling reasons for early treatment and historically there has been great interest in early interventive orthodontics, while others warned of the difficulties of predicting arch form, the need for extractions, anchorage control difficulties, proper control of Class II Division 1 cases and neuromuscular problems. Most orthodontists gradually became disenchanted with early treatment due to the inability to properly correct overbite and overjet with fixed appliances at this age because of lack of erupted posterior permanent teeth which are necessary for anchorage. A second phase of full treatment usually followed and this extended the time in appliances for the "worn-out" patient **(O'Meyer, 2009)**.

The most compelling reasons for a serious reconsideration of early preventive orthodontics in the mixed dentition are fourfold.

1) Treatment is begun prior to complete collagenous fiber bundle formation on as many teeth as possible so that when they erupt into the proper position horizontally and vertically, future relapse tendencies are lessened. Most relapse, certainly of rotations and possibly of vertical and horizontal drift as well may at least be partially due to treatment procedures done after complete formation of the supra-alveolar collagenous fibers. These fibers increase in thickness in

response to functional and stretching both of which are present during standard fixed appliance therapy. If treatment is begun before the teeth are fully erupted, they can be gently guided into position and completely straightened prior to their fiber formation, thereby theoretically eliminating part of this relapse tendency **(Popovitch, 2011)**.

2) Treatment is begun early enough in a child's life that adequate facial growth in the horizontal and/or vertical direction to fully compensate for the correction of overjet and overbite is present. This is particularly critical in moderate to severe discrepancies (over 6 mm.) in both sexes but particularly in the female. If inadequate growth is present, greater relapse can be expected. Functional appliances deal orthopedically with growth, particularly evident in the suppression of forward maxillary growth as well as a possible influence on the appositional restructuring of the glenoid fossa and growth of the mandible From the author's clinical experience, when an orthopedic correction of a horizontal or vertical skeletal or dental discrepancy represented as bone growth correction consists of 70% or more of the total correction, and when the dental correction is 30% or less, the result is extremely stable with little or no relapse. When the dental correction exceeds 30%, relapse of varying degrees occurs. Whenever treatment is attempted on a fully grown patient, the dental correction is close to 100% and adverse tooth tipping can occur which is frequently harmful to the integrity of the supporting tissues of the lower incisors and results also in greater relapse **(Ackerman and Proffit, 2006)**.

3) More can be done with the arches and teeth in the mixed dentition through successful expansion and utilizing the extra space allowed by the greater tooth mass of the deciduous posterior teeth. Up to about 7 mm. of anterior incisal crowding can be compensated thereby eliminating the need for extraction of bicuspids in about 50% of typical orthodontic extraction cases **(Bergersen, 2014)**.

4) If a single appliance can correct several varying problems at the same time in order to eliminate fixed appliance orthodontics in most cases when all permanent teeth erupt, the early treatment suddenly becomes worthwhile.

Chapter Three: Conclusion and Suggestions

3.1 Conclusion

1. Preventive orthodontics is the action taken to preserve the integrity of what appears to be the normal occlusion at a specific time.

2. Many of the procedures are common in preventive and interceptive orthodontics but the timings are different.

3. Preventive procedures are undertaken in anticipation of development of a problem. Whereas interceptive procedures are taken when the problem has already manifested.

4. Preventive orthodontics generally shows results over a period of time. The right time to initiate preventive orthodontics would be ideally during prenatal counseling.

The deciduous dentition is given the least importance, with the promise that the deciduous teeth have to exfoliate eventually. However, maintaining the integrity of deciduous teeth and occlusion leads to their preservation up to exfoliation, which in turn forms one of the most important steps in preventive orthodontics. Therefore, this is largely the responsibility of the general dentist. The general dentist's view of initiating treatment should be as early as possible instead of the now impregnated view that it should be initiated after all the permanent teeth have erupted.

3.2 Suggestion

- Conduct a survey study concerning PO protocols that every orthodontist follows in their practice.
- Carry a cross sectional study to view the effect of PO on patients seeking fixed orthodontic treatment later on.
- Carry a study to evaluate the effectiveness of PO

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