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Interceptive Orthodontics

A Project Submitted to

The College of Dentistry, University of Baghdad, Department of orthodontics in Partial Fulfillment for the Bachelor of Dental Surgery.

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Certification of the Supervisor

I certify that this project entitled **"Interceptive Orthodontics"** was prepared by the fifth-year student **Zainab Sabeeh Hameed** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

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Dedication

I dedicate this project to my Family they support me every time in academic career and to that who support me and gave me all the love, my Dear husband.

Acknowledgment

Before all, praise is to **Allah** the Almighty for inspiring and giving me the strength, willingness and patience to do my project**.**

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List of Abbreviations

FPM	**First permanent molar**
IO	**Interceptive Orthodontics**
NNSH	**Non-nutritive sucking habits**
OSCR	**Open coil space regaining**
TAD	**Temporary skeletal anchorage devices**

Introduction:

The American Assosiation of Orthodontists (1969) defined interceptive orthodontics as that phase of science and art of orthodontics employed to recognize and eliminate the potential irregularities and malpositions in the developing dentofacial complex. Profitt and Ackermann (1980) defined interceptive orthodontics as the elimination of existing interferences with the key factors involved in the development of the dentition.14%-49% of children are reported to benefit from interceptive management **(Popovich ,1997).**

For the development of normal adult occlusion, transition phase from primary to permanent dentition should be thoroughly monitored and intervened when necessary. Planned intervention at mixed dentition eliminates future retreatment complexities and further treatment needs can be categorized as elective The conditions requiring interceptive management and various interceptive treatment modalities are described in this article **(King *et al*, 2010).**

In conclusion interceptive orthodontics is effective in reducing the malocclusion even though it does not produce finished quality results. 57% of children are present with an anomaly during the transition phase from deciduous to mixed dentition. In the view of the greater number of malalignments in the deciduous and mixed dentition there is an increased need for preventive and interceptive orthodontic therapy **(Stahl *et al*.,2003).**

An interceptive procedure undertaken at the right time can, therefore, either eliminate a developing malocclusion or make it less severe, so as to allow corrective orthodontics to deliver a stable and conservative result, in the shortest treatment time possible with least discomfort to the patients **(Singh,2007)**.

interceptive early treatment problems require complete orthodontic supervision, usually additional mechanotherapy, and several stages of treatment **(Graber, 2017)**.

The basic interceptive procedures that are undertaken by the interceptive pedodontist are**: (Singh,2007)**

1. Space regaining

2. Correction of anterior and posterior cross bites

3. Elimination of oral habits

4. Muscle exercises

5. Removal of soft or hard tissue impediments in the pathway of eruption

6. Resolution of crowding

7.Serial extraction

8. Interception of developing skeletal malocclusions

Aims of the study

To review literatures that concerned about interceptive treatment, benefits for the patients, patient's awareness of interceptive protocol of treatment:

1.Permanent dentition with all teeth in good alignment and contacts anatomically compatible with a healthy periodontium.

2. Dental arches well related in all three planes of space with an optimal intercuspation that is substantialy identical in both centric relation and occlusion.

3. Dentition in harmony with esthetic in frontal and profile appearance. Stability between skeletal and muscular components.

Chapter one

Review of literature

1.1 Interceptive orthodontics

1.1.1 Definition of the concept

The concept and the necessity of interceptive orthodontic treatment, so called early, have been controversial. Some define it as removable or fixed appliance intervention in the deciduous, early mixed, or mid mixed dentition. Others place it in the late mixed dentition stage of development (before emergence of the second premolars and the permanent maxillary canines). The American Association of Orthodontists' Council of Orthodontic Education defines interceptive orthodontics as "that phase of the science and art of orthodontics emoloyed to recognize and eliminate potential irregularities and malpositions in the developing dentofacial complex **(Borrie *et al* .,2014).**

While some profession's leaders advocate that early treatment is always desirable because tissue tolerance and their power of adjustment are at or near their maximum, others warn that there is no assurance that the results of early treatment will be sustained, and that several-phased treatment will always lengthen overall treatment time. Emerging Trends in Oral Health Sciences and Dentistry Early treatment not only may do some damage or prolong therapy, it may exhaust the child's spirit of cooperation and compliance (**Kerosuo et al., 2008).**

Joseph Fox (1776-1816, English), in his "Natural History of the Human Teeth , recommended that treatment be started "before 13 or 14years of age, and as much earlier as possible." Angle advocated the institution of orthodontic treatment "as near the beginning of the variation from the normal inthe process of the development of the dental apparatus as possible" **(Norman,2006).**

1.2. interceptive protocol

1.2.1. Space regaining

In 1998, Hoffding and Kisling reported that premature loss of primary teeth caused space loss **(Hoffding *et al*.,1978).**As a result of space loss, the permanent tooth may remain impacted, or it may erupt buccally or lingually **(Kisling *et al*.,1979).**

In the case of premature loss of primary second molars, the space closure is much more than premature loss of primary first molar. In such circumstances, where there is space loss, routinely we require space regainer. Various appliances will help for both regaining the lost space as well as its maintenance for the eruption of the permanent tooth. At the initial appointment, the appliance is activated to regain the lost space and then it is kept passive till the tooth is erupted into the oral cavity. The dual function of the appliance will reduce the cost to the parents and saves time for both the dentist as well as for the patient **(Muthu ,2011).**

Figure 1.1: Space loss due to decayed deciduous teeth.

(https://images.app.goo.gl/HQxvE633cpgZKr199)

Space regainers:

A.Fixed space regainer B.Removable space regainer

A)fixed space regainer:

1.open coil space regainer : The Fabrication of OCSR is same as sliding loop regainer. However, in the “U” loop of the appliance enough solder is flownto make a stop at the junction of the straight part & curved part of the wire, bothbuccally & lingually in contrast to the occlusal stop in the sliding loop applianceto prevent the rotation of the first premolar. The limitation of this appliance is that it is not possible to control the axial inclination of the tooth being moved and tipping may occure **(Costa et al., 2015).**

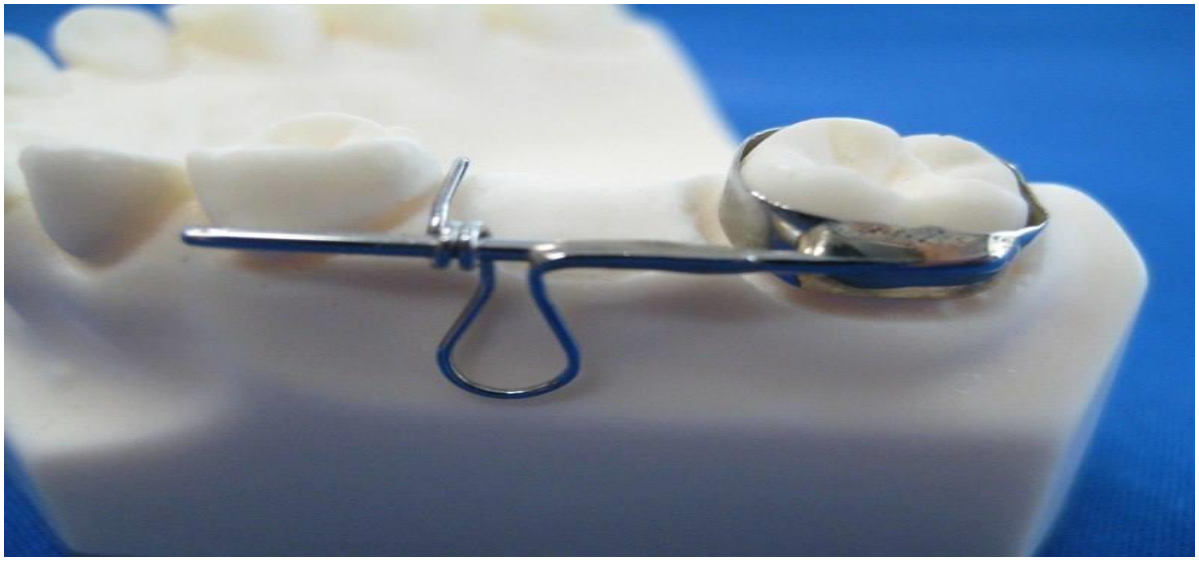

Figure 1.2 : Open coil space regainer .

(https://images.app.goo.gl/kuaHNZk2JUckaQZT7)

2.Gerber Space Regainer: A band is prepared for the abutment tooth and fitted, and the mesial surface is marked for placement of “U” loop, which may be stabilized by welding or soldering **(muthu , 2011) .**

Figure 1.3: Gerber space regainer
(https://images.app.goo.gl/FGCFd8GzcqqeT6C76)

3. Jackscrew Space Regainer: The jackscrew space regainer is used to recover the loss of space caused by tooth drift into an edentulous area **(Singh ,2007).**

Figure 1.4: Jackscrew space regainer
(https://images.app.goo.gl/pFmLyLEHvDDBTdag8)

B.Removable Space Maintainer

1.Upper or Lower Hawley's Appliance with Helical Spring: use to move an upper first molar distally with a Hawley appliance, a compressed helical spring is formed at a right angle to the alveolar ridge immediately adjacent to the mesial surface of the first molar to be moved , The spring is arranged so that it can be adjusted to maintain a distally directed pressure over a distance of 3 to 4mm**(Sim , 1977).**

2. Hawley's Appliance with Split Acrylic Dumb-bell Spring: It is used to regain up to 2 mm of lost space by tipping one of the permanent first molars distally. It is an effective and comfortable appliance during treatment **(Singh,2007)**

Figure 1.5: Hawley's Appliance with Split Acrylic Dumb-bell Spring

(https://images.app.goo.gl/uB3dkVTUSzMo5s6W6)

3.Hawley's Appliance with Slingshot Elastic :

the distalizing force is produced by the elastic stretched between the two hooks. One hook is located on the middle of the lingual surface of the molar to be moved. The other is arranged in the same position on the buccal surface of the molar. The child places a new elastic between the hooks while the appliance is outside the mouth. It is slipped into place, then the child's finger can guide the elastic into place smugly against the gingiva on the mesial margin of the molar to be distalized. The elastic can be changed once each day **(Sim ,1977).**

Figure 1.6: Hawley's Appliance with Slingshot Elastic
(https://images.app.goo.gl/PH1otDaky6vmgq3a6)

4.Hawley's Appliance with Palatal Spring: It is made up of 0.5 mm stainless steel wire. The active arm of the palatal spring is placed mesial to the permanent molar to be distalized. The activation is 2 mm by opening of the spring. It is important that the active arm should not be too long and that the helix diameter should be 2 mm **(Singh ,2007).**

Figure 1.7: Hawley's Appliance with Palatal Spring

(https://images.app.goo.gl/nbL3pNERfsRYV5yP8)

5. C-space reagainer : is a removable appliance used to achieve bodily molar movement without significant incisor flaring. This appliance can be used to intrude teeth as well as to move them distally or sagitally, in cases with mild arch length discrepancy treated by extraction of second or third molars, and in open bite cases **(Chung *et al*.,2000)**

1.2.2 Correction of anterior and posterior crossbite

I.Anterior crossbite:

Anterior cross bite which is localized must be treated at an early stage because the upper incisor may be abraded by the lower and the periodontal support of the incisor may suffer as a result of occlusal trauma. Cross bite can also result in mandibular shift; this can produce an undesirable growth pattern, dental compensation leading to a true prognathism and/or asymmetry at a later time and potentially harmful functional patterns **(Pirtiniemi , 1994) .**

If maxillary incisors erupt too far lingually, they may be trapped into a crossbite malocclusion. When an anterior crossbite is detected in the mixed dentition, clinicians are concerned that the malocclusion may adversely affect forward maxillary alveolar growth and further complicate the crowding of the

maxillary anterior teeth in patients with arch length deficiency problems **(Bishara, 2001).**

Some of the common appliances used in the correction of anterior crossbite are tongue blade therapy, inclined planes, composite inclines, reversed stainless steel crowns, removable acrylic appliances with lingual springs and fixe appliances **(Vadiakas *et al*.,1992; Kiyak,2006).**

Figure 1.8 :Simple removable appliances can provide effective treatment for anterior crossbites. (Noar,2014)

II.Correction of Dental Posterior Crossbite

Posterior crossbite is defined as an inadequate transversal relationship of maxillary and mandibular teeth, i.e., the buccal cusps of the maxillary teeth are in contact with the central fossae of the mandibular teeth **(Silva OG *et al* ., 1991)** .Some studies have suggested a posterior crossbite prevalence range between 8 to 16% **(Kisling E,1981).**

The etiology of this malocclusion may comprise deleterious oral habits and early loss of primary teeth, among others **(Hannuksela *et al* ,2001).** Regarding the problems that affect the maxillomandibular complex, the transversal arch stands out because of its limited growth, as the first dimension to stop growing **(O`Grady *et al* ,2006).**

The early treatment aimed at promoting a better tooth/skeletal relationship, thus

improving masticatory function, and establishing a symmetrical condyle/fossa relationship (Bell et al ,1981) . The treatment proposed for an early posterior crossbite correction comprises fixed or removable appliances, such as the Haas expander. This orthopedic appliance increases the transversal dimension of the maxillary dental arch by opening the median palatine suture, and due to proclinate maxillary posterior teeth **(Silva *et al* ,1995).**

Figure 1.9: Removable appliance can eliminate the need for patient compliance as it is not removable from the mouth (Noar,2014) .

1.2.3 Elimination of oral habits

Thumb sucking, tongue thrusting, mouth breathing, pacifier, nail biting, lip chewing, bruxism is some of the habits in children. Early intervention is necessary to prevent the adverse effects. If the child continues the thumb sucking habit even after the age of 5 years at the time of eruption of permanent teeth the child is motivated, given rewards and reminder therapy is followed. The orthodontic appliance is enforced as the final stage of intervention **(Warren *et al* .,2002).**

Nail biting adversely causes malocclusion and root resorption of the anterior teeth. intestinal parasitic infections. change of oral carriage of Enterobacteriacee, bacterial infection and alveolar destruction. Children with nail biting should be evaluated for emotional problems **(Maguire ,2000) .**

Bruxism is one of the common problems encountered and the common clinical side effects include grinding or impacting sounds of teeth; erosion of the teeth occlusal surfaces and breakdown of repairs; hypertrophy of masticatory muscles; hypersensitivity of teeth to cold air; joint sounds. increasing awareness of the patient, intraoral appliances, behavioural treatment and drugs like diazepam and clonazepam have been reported to be effective **(Pierce *et al* .,1988).**

Figure 1.10: Thumb sucking habit. (Singh ,2007)

1.2.4. Muscle exercises

The normal development of the occlusion depends on the nature of the muscles of the face. If the oro maxillofacial musculature were in a state of balance, a good occlusion would develop and if any of the muscle groups were aberrant it would result in a malocclusion in some form or the other. Muscle exercises allow a clinician to bring such aberrant muscular functions into normal functioning, to create normal health and function, as they are important elements in aiding growth and development of normal occlusion **(Singh,2007).**

Uses (Singh ,2007)

1.To guide the development of occlusion. 2.To allow optimal growth patterns.

3. To provide retention and stability in post-corrective orthodontic cases.

Exercises (Singh,2007)

A) Exercises of the Tongue Exercises of the tongue are done to correct any aberrant tongue swallow patterns.

B) Exercises of Masseter Muscles The patient is asked to clench his teeth, count up to 10 in his mind and then relax them. This has to be repeated over a period of time, until the masseter muscles feel tired.

C) Exercises of Pterygoid Muscles the patient is asked to protrude the mandible as much as possible and then retracted. Repeat the exercises until the muscles feel tired. The ability to keep the mandible in correct position gradually improves **.**

1.2.5. Removal of soft and hard tissue impediments in the pathway of eruption

The clinical conditions in which the hard and soft tissue acts as an impediment in the natural pathway of tooth eruption are: **(singh,2007)**

Retained deciduous tooth/teeth: A clinical manifestation, which has become more common today due to the shift from hard, detergent diet to a soft diet. Interception by extraction of the retained deciduous teeth would resolve the malocclusion completely or decrease its severity, thus allowing easier management of the same **(Singh ,2007).**

Supernumerary teeth: he presence of a supernumerary tooth may cause failure of eruption and displacement of a permanent tooth. Displacement of the crowns of the incisor teeth is a common feature in the majority of cases associated with delayed eruption **(Howard ,1967).**

Fibrous/bony obstruction of the erupting toothbud: Unerupted teeth can be detected and evaluated by radiographic examination only, the causes for non-eruption of teeth are numerous. Surgical intervention may be required. Wherein, the excision of the fibrous soft tissues is done or removal of any overlying bone over the unerupted crown is done. The soft or hard tissue excision is done in such a way so as to expose the greatest diameter of the unerupted tooth crown or slightly larger. A zinc oxide eugenol dressing is recommended for a period of 2 weeks postsurgically **(Singh,2007).**

Figure 1.11: Retained deciduous teeth (Singh,2007).

1.2.6. Resolution of Crowding

Management of crowding in the mixed dentition includes interproximal primary tooth reduction, extraction of the primary tooth and/or sectional fixed appliance to align rotated permanent incisors. If there is no spacing in the primary dentition there is 70% chance of crowding of the permanent teeth, if there is less than 3mm spacing there is 50% chance of crowding **(Leighton ,1969).**

The leeway space provides adequate space to resolve crowding that is present in the mixed dentition in the majority of individuals. This space can be maintained by preserving arch length with a lingual arch as the primary teeth begin to exfoliate, unless conditions such as the premature loss of a primary canine require earlier intervention. A lip bumper can also be inserted after the eruption of the first premolars to preserve arch length **(Gianelly ,1995).**

The stepwise management of crowding involves the following steps: **(Singh,2007)**

1. Observation
2. Disking of primary teeth
3. Extractions and serial extraction
4. Corrective orthodontic referral

Fixed orthodontics might be required in some cases even in the mixed dentition case,Intervention should be of a short duration and only undertaken in selective cases. A retention appliance is a must following removal of the appliance **(Singh , 2007).**

Figure 1.12: Fixed appliance therapy in ectopically erupting.(Singh.2007)

1.2.7. Serial extraction

The term serial extraction describes an orthodontic treatment procedure that involves theorderly removal of selected deciduous and permanent teeth in a predetermined sequence **(Dewel, 1969).** Is the correctly timed, planned removal of certain deciduous and permanent teeth in mixed dentition cases with dento-alveolar dispro- portion in order to: Alleviate crowding of incisor teeth and to allow unerupted teeth to guide themselves into improved positions (canines in particular), and to lessen (or eliminate) the period of active appliance therapy. Thus, it is one of the positive interceptive orthodontic procedure generally applied in most discrepancy cases where supporting bone is less than the total tooth material (**Almeida *et al* .,2012).**

Indications (Singh,2007)

1. Class I malocclusion with an arch size—tooth size deficiency of 5 mm or more per quadrant, normal eruption sequence as assessedradiographically and a skeletal growth pattern within normal limits.

2. Arch length deficiency, which could be unilateral or bilateral.

Contraindications (Singh,2007)

1. Mild to moderate crowding—tooth size arch length deficiency < 5 mm per quadrant.
2. Class II division 2 and Class III malocclusions.
3. Spaced dentition.
4. Congenital absence—anodontia/oligodontia.
5. Extensive caries involving permanent first molars, which cannot be conserved.
6. Open bite and deep bite, which should be corrected first.

Diagnosis (Singh,2007)

The primary step is to assess that a malocclusion exists on a clinical examination and the need for investigations and collection of diagnostic records. The investigations recommended are:

a.Study models

b.Radiographs

c.Photographs.

Procedure

Different authors have given different sequences for following guidance of occlusion. Some of the most common and accepted sequences are: **(Singh,2007)**

a. Tweed's method c. Nance's method

b. Dewel's method d. Grewe's method

1.2.8. Interception of skeletal malocclusion

A developing skeletal malocclusion if detected at an earlier stage can be intercepted so as to decrease its severity and at times even resulting in a normal occlusion. These changes are brought about by myofunctional therapy, which more appropriately is known as Functional Jaw Orthopedics today **(Singh,2007).**

I. Class II malocclusion:

Class II malocclusion is among the most common developmental anomalies with a prevalence ranging from 15 to 30% in most populations **(Elkordy *et al*.,2015;Vasquez *et al* ., 2009).** This malocclusion is likely to produce significant negative esthetic, psychological, and social effects **(Kiekens *et al*.,2006 ; Tehranchi *et al* ., 2015).**

This dentofacial anomaly can be divided into two different categories based on the involved arch to maxillary excess or mandibular deficiency **(Feres *et al* .,2015 ; Perillo *et al* ., 2012).** The resulting anomaly may demonstrate various severities of class II malocclusion in different ages, which dictates the preferred approach to clinical management. the etiology of class II malocclusion has been linked to hereditary and environmental factors **(Shaughnessy *et al*.,1988).**

A) Class II division 1:

Proclination of upper incisors and/or retroinclination of the lower incisors by a habit or the soft tissues can result in an increased overjet in any type of skeletal pattern **(Zaher *et al* ., 2014).** In class II division 1, the lips of the parents are usually incompetent and they try to compensate it via circumoral muscular activity, rolling the lower lip behind the upper incisors, or moving the tongue forward between the incisors, or a combination of all these items **(Moyers *et al* .,1980).**The etiology of class II division 1 Angle anomaly comprises many entities, including heredity and the vicious habit of sucking the finger **(Brodie,1931 ;Richard,1938).**

B) Class II division 2:

Vertical dimension of class II division 2 patients is usually decreased in comparison to other types, which may result in the absence of an occlusal stop on lower incisors and consequently an increase in the overbite (**Moyers *et al* .,1980).**

Dental crowding also, in contrast to the div 1 category, is exacerbated by retroinclination of the upper incisors (**Baccetti *et al* .,1997).**

-Treatment of class II malocclusion:

Treatment strategies of class II malocclusion are categorized based on the growing and non-growing status of patients. Treatment timing of class II malocclusion has long been a topic of controversy for decades **(Wheeler *et al*.,2006 ;Burden *et al*.,2007).**

The existing evidence suggests that providing early orthodontic treatment for children with class II malocclusion and prominent upper front teeth is more effective in reducing the incidence of incisal trauma than providing one course of orthodontic treatment when the child is in early adolescence **(Thiruvenkatachari *et al*.,2013) .**

The best treatment modalities for class II malocclusion in growing patients include using functional appliances either removable (Activator, Bionator, Frankel, and Twin-block) or fixed appliances (MARA, cemented Twin-block, or Herbst appliance) that mostly enhance further mandibular growth via mandibular advancement and also headgear (Cervical, Highpull, and combination type), which provides extra oral force to restrict further maxillary growth **(Firouz *et al* .,1992; Behnia *et al*.,1997) .**

Figure 1.13 : Removable Frankel appliance usage in the management ofclass II malocclusion . (https://images.app.goo.gl/9AGjomMzb2CeoeSKA)

II. Class III malocclusion:

The incidence of skeletal class III malocclusion varies in different population types. It is around 5% in patients of Caucasian origin but between 9% and 19% in those of Asian descent **(Hardy *et al* .,2012).** It can be caused by a retrognathic or hypoplastic maxilla, a prognathic mandible, or a combination of the two **(Toffol , 2008).**

The patient's age and growth stage are decisive factors in treating this craniofacial disharmony. In adults, the treatment can be a combination of orthodontics and surgery, or just orthodontic camouflage. At a young age, orthopaedic treatment aims to reduce future therapeutic needs in the permanent dentition **(Proffit ,2007).**

Traditionally, a face mask, chin cup or functional appliance has been employed **(Yang *et al* .,2014).** In recent years, however, a number of authors have carried out orthopaedic treatment using skeletal anchorage **(Nguen *et al* .,2011; Wilmes *et al* .,2014).**

It would appear that using miniplates and miniscrews achieves greater skeletal effects with a smaller dentoalveolar component than is the case with conventional orthopaedic appliances **(Kokich *et al* ., 1985 ; Lee *et al* ,2012).**

However, skeletal anchorage presents certain drawbacks: these are invasive treatments that require surgery both to insert and remove them, and some of the components are not stable throughout the treatment **(clerck ,2011).**

Postoperative inflammation, irritation of adjacent tissues in contact with the mini screws and buildups of food scraps in the area are reported as side effects **(Cornelis *et al*.,2008).**

-Treatment of class III malocclusion:

A) Extraoral appliance:

1. Face mask: Face mask promotes midface orthopedic expansion with slight inferior and anterior movement of the maxilla. The protraction face mask provides a direct constant anterior force to the maxilla with downward and backward rotation of the mandible (**Roberts *et al*.,1988).**

Figure 1.14: Face mask

(https://images.app.goo.gl/bbJeXLxYgPC2sSse8)

2.Reverse chin cup: Chin cup is to provide growth inhibition or redirection and posterior positioning of the mandible **(Bishara,2001).**

Figure1.15: Chin cup .
(https://images.app.goo.gl/xwGjLbQpSUF1etiC8)

B)Intraoral appliance:

1.Removable tongue appliance:

The tongue appliance is a habit breaker which is constructed via Adams clasps in the first upper molars and C clasps in the anterior teeth in order to increase retention. Three to five separate tongue cribs are placed in the palatal area from canine to canine. These cribs are long enough to cage the tongue and are adjusted to prevent traumatizing the floor of the mouth. A screw is mounted in the midpalatal area to correct bilateral posterior cross bite. The patients are instructed to tighten the screw once per week **(Jamilian *et al*.,2009).**

Figure 1.16: Removable tongue appliance

(https://images.app.goo.gl/9DvHV9aMiwUUDpJU6)

1. Fixed tongue appliance: In order to remove the need for patient compliance in removable tongue appliances, Showkatbakhsh designed a new appliance called the "fixed tongue appliance" **(Showkatbakhsh *et al.*, 2013).**

Figure 1.17: Fixed tongue appliance
(https://images.app.goo.gl/aLY1xYwVEoirUmn49)

2. Tongue plate:

The tongue plate is a tightly fitting and well-retained upper removable appliance fabricated with Adams clasps on the upper first permanent molars and C clasps placed on the upper primary canines **(Showkatbakhsh et al., 2013).**

Figure 1.18: Tongue plate

(https://images.app.goo.gl/7Eydwm1bR4yJzzhS6)

3.Frankel III appliance:

Is a removable appliance used to stimulate the growth of the upper jaw and move it forward. The appliance was first designed by Professor Frankel and is composed of wire and four acrylic parts: two vestibular shields and two upper labial pads **(McNamara *et al.*,1985).**

Figure 1.19: Frankel III appliance

(https://images.app.goo.gl/KACWMgCZ5iVWJtmk8)

3. Skeletal anchorage:

Recently dental implants, miniplates, and modified fixation screws have become popular for bone anchorage in orthodontics. These temporary skeletal anchorage devices (TAD) are smaller than extraoral appliances and require short healing periods **(Cevidances et al.,2010).**

Various techniques have been developed to use miniplates and miniscrews as temporary anchorage devices. De Clerck et al. treated a series of Class III cases with orthopedic traction on miniplates **(Clerck *et al*.,2009).**

1- Miniplate in combination with Class III elastics Class III elastics use to connected from two mandibular miniplates to an upper removable appliance to treat maxillary deficiency **(Showkatbakhsh et al.,2011).**

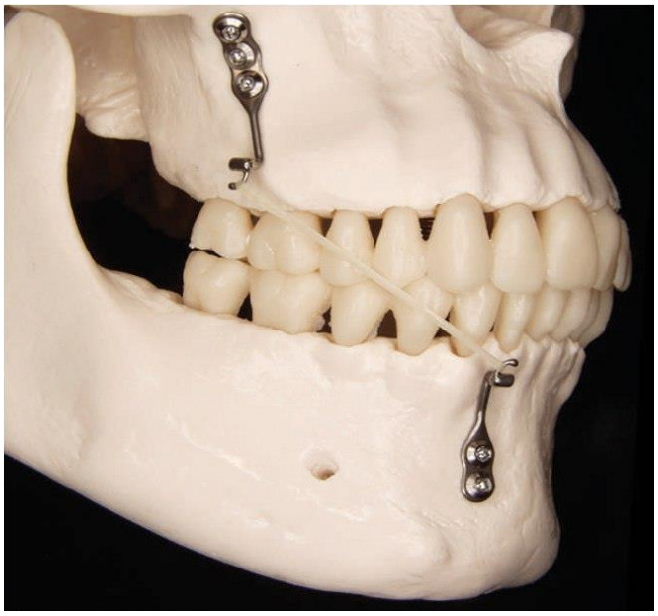

Figure 1.20: Miniplate anchorage

(https://images.app.goo.gl/2f34XesFscqQjEri6)

2-Miniscrews in combination with Class III elastics have proven to be a useful addition to the orthodontic armamentarium for control skeletal fixation in less-compliant or non-compliant patients, but the risks involved in mini screw placement must be clearly understood by both clinician and patient **(Cope,2005;Ohnishi,2005).**

Figure 1.21: Miniscrews anchorage

(https://images.app.goo.gl/BjMgZDKrX2pys7yF8)

Chapter two

2.1. Discussion

Early intervention mainly aims at the elimination of the primary etiologic factors. The commonly seen conditions are sagittal dysplasias, occlusal discrepencies, unilateral or bilateral posterior crossbite, anterior crossbite or open bite, habits associated malocclusions. Bishara conducted a longitudinal study in 5-year-old children. On following the subjects for over a period of eight years the study concluded that the distal step present in the primary dentition eventually developed into a class II malocclusion in 100% of cases **(Bishara et al.,1988).**

Tulloch in 1997 stated that spontaneous relief of lower anterior crowding is unlikely once the mandibular lateral incisors erupt. Managing arch length discrepancies to resolve crowding and future extraction indicates the need for early orthodontic treatment**. (Tulloch et al.,1997)**

IO can significantly reduce the severity of a developing malocclusion but it must be remembered that it is unlikely to produce finished results **(Jolley *et al.*, 2010).** Often, IO can be undertaken by the general dental practitioner, meaning that it can significantly improve outcome for patients especially where access to specialist orthodontic services is limited **(Al Nimri & Richardson, 2000; Borrie & Bearn, 2013).**

However, compliance with treatment can be disappointing in younger age groups **(Al Nimri & Richardson, 2000).**

Voidance of fixed appliances and use of simple appliance for IO can reduce the risk of damage to the teeth and root resorption **(Borrie & Bearn, 2011),**

especially considering that fixed appliance treatment can result in white spot lesions in between 15 to 85%of patients (**Borrie & Bearn, 2013).**

It is important to consider which treatment is appropriate for the age of the child in order to improve compliance. On the whole, treatment of the deciduous dentition is considered inappropriate .Treatment for delayed incisor eruption, early loss of deciduous teeth, crossbites, NNSH and severe crowding can be instigated in the early mixed dentition. In the late mixed dentition, discrepancies such as ectopic canines and poor quality FPM can be considered. It is, however, important to remember that treatment should be planned as soon as the discrepancy becomes evident in order to have ample opportunity to resolve it, even if resolution is more appropriate at a later stage **(Borrie & Bearn, 2013; DiBiase, 2002).**

Chapter Three

3.1 Conclusion:

Prompt recognition and elimination of misalignment and malposition is facilitated through interceptive orthodontics as they reduce or eliminate the severity of developing malocclusion. This review has discussed the common clinical problems and its management presenting during the mixed dentition. More awareness among parents and children are necessary for treatment and prevention of malocclusion at an early stage.

3.2 Suggestion

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

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