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RESEARCH ARTICLE

EARLY AND LATE TREATMENT IN CLASS II MALOCCLUSION

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ABSTRACT

Class II Malocclusion has been called the most frequent treatment problem in the orthodontic literature. Among the various jaw based discrepancies that exist, a Class II Skeletal pattern is probably the most prevalent one. The best timing for treatment of Class II malocclusion has been controversial. The question is whether early treatment, which is initiated during the mixed dentition, is more effective and efficient than treatment started in the permanent dentition. Patients can experience "burn out" with this potential prolonged treatment time. Lastly treatment could begin in the permanent dentition, which could shorten the treatment time and lessen the costs to the patient. Orthodontics today has a variety of treatment protocols and tools that may be used. Many of these include: fixed appliances, functional appliances, extra-oral headgear, Inter maxillary elastics, distalizing appliances, selective extraction patterns, and surgical correction. In this article various factors are outlined which shows a distinctive differentiation and relation between the early and late treatment timing in Class II malocclusions.

INTRODUCTION

Class II malocclusion is second in frequency in distribution and prevalence among all malocclusion cases. It is the most frequently encountered and treated malocclusion in orthodontic practice¹. In class II jaw relationship the mandible is positioned distally relative to the maxilla. This is usually found in connection with a class II molar relationship but occasionally could be present despite a class I molar relationship (Contemporary Orthodontics). The majority of patients with a class II malocclusion has some sort of skeletal imbalance, because class II malocclusion becomes apparent early in mixed dentition, the possibility of growth modifications and optimal timing of treatment are both questions of considerable clinical interest.³ The best timing for treatment of Class II malocclusion has been controversial. The question is whether early treatment is more effective and efficient than treatment started in the permanent dentition. Orthodontic researches have analyzed patient's compliance with early treatment and have shown different results. Some authors state that cooperation is better in the mixed dentition with younger patients than the older adolescent patient while.

Others argue that early orthodontic treatment prolongs orthodontic care and beginning the treatment in the primary dentition is often tempting and has a downside. The best timing of Orthodontic treatment is the decision made by the Orthodontic, the parent, and the patient based on all the factors that impact success.

Etiology: Occurrence of class II malocclusion is multifactorial and the etiological factors may be prenatal, natal factors or postnatal factors.

Prenatal: Hereditary: Majority of the Class II cases are genetic in origin. The size, position and relationship of both the jaws to a large extent are determined by the genes. Thus Class II malocclusion exhibiting skeletal anomalies such as an absolute or relative prognathic maxilla and retrognathic mandible or combination of both can be due to hereditary factors.

Congenital factors: Congenital or developmental defects are ones that are present at the time of birth.

These defects are mainly associated with malformation of 1st and 2nd branchial arches as many of the facial structures are derived from these two arches.

Intrauterine fetal posture: One of the factors that seem to play a role in molding the craniofacial region is the intrauterine fetal posture. Abnormal posture such as hands against the chin region in the growing fetus is found to affect mandibular growth.

Natal Factors: In some difficult births, however the use of forceps to the head to assist in delivery might damage either or the temporomandibular joints.

Postnatal factors: There are number of conditions that can lead to Class II malocclusions.

- Any factors that affects the condylar growth, in turn hampers the growth of the mandible. This includes traumatic injuries of TMJ leading to ankylosis, infective diseases like rheumatoid arthritis, long term radiation therapy to the craniofacial region.
- Mesial drift of the maxillary molars due to premature loss of deciduous molars,
- Congenital absence of second primary molar, microdontia of premolars and lateral incisors.

Abnormal functions such as mouth breathing, abnormal swallowing pattern and aberrant muscular habits such as prolonged thumb sucking and tongue thrusting prevent normal muscle activity. These patients have a low tongue position leading to unrestrained activity of the buccinators group of malocclusion.

Incidence and prevalence: The prevalence of Class II malocclusion in USA was found to be 34% in whites and 18% in blacks. It has been reported that prevalence of Class II malocclusion was 31% in Danish children population while it was as low as 8% in Johannesburg, 11% in Kenya and 16.4% in Saudi Arabia. Indian population has been largely divided into seven ethnic groups- The prevalence of malocclusion in North India in age group 10-13 years is 45%. Of this, Class I malocclusion is 26 %, Class II 15% and Class III 3.5%, The prevalence of malocclusion in Southern India (Thiruvananthapuram) in age group 12-15 is 49.2 %.Of this, Class I malocclusion is 44%, Class II 4.9% and Class III 0.3%. The incidence of this malocclusion is around 25-30% in early mixed dentition and decreases to 15-20% in adults.

Class II Div 1

Presentation during deciduous and early mixed dentition (Contemporary Orthodontics; Mathews, 1971): A distal step relationship of 2nd deciduous molars is an indication of a developing Class II malocclusion the mixed dentition. The occlusal traits of Class II malocclusion in the deciduous dentition include: distal terminal of second molars, distal canine relation, large overjet and overbite. Other findings include a narrow maxillary basal bone and poor or no spacing in the deciduous dentition. These children also show a transverse discrepancy between maxillary and mandibular deciduous intermolar widths (2.8-11) compared to nil among normal occlusal groups.

Skeletal features: The abnormal skeletal features most often found are:

- Maxillary protrusion

- Mandibular retrusion

A combination of maxillary protrusion and mandibular retrusion. Wits analysis is an indicator of jaw discrepancy. It is based on a project of points A and point B to the occlusal plane, along which the linear difference between these points is measured.

Class II division 2 malocclusion or Deckbiss (German) malocclusion: It is a distinct category of malocclusion having a high incidence of familial inheritance. It has distinct and unique facial, craniofacial and dental features which differentiate it from all other types of malocclusion to the extent it has been said that it is a syndrome in itself.

Facial features

- Squarish or round pleasing face
- Prominent chin
- Deep labiomental sulcus
- Hyperactive lower lip
- High lower lip line
- Thin upper lip
- Small gonial angle
- Higher biting force
- Horizontal type of face
- Lips are usually thin and there is lack of vertical development of the face below the nose.

Dental features

- Class II molar and canine relationship.
- Deep traumatic bite
- Retroclined maxillary incisors

Diagnosis

The problem list often includes two types of problems:

- Those relating to disease or pathologic processes
- Those relating to disturbances of development that have created the patient's malocclusion.

Case History: It is the eliciting and recording all the relevant information from the patient and the parents that might be necessary for examination, diagnosis and treatment planning.

Personal Details

Name: It helps in identification and location of the patient. Most patients like being called by their name.

Age, Sex, Height & Weight: Helps us assessing the growth status of the patient. This helps the clinician in identifying the priorities & desires of the patient. Most patients seek orthodontic care for the reasons of either aesthetic or impaired function.

Medical history: Chronic illness, prolonged starvation and excessive stress are factors that can hinder growth and development, which may lead to Class II malocclusion. History of repeated cold, allergic rhinitis, pneumonia, tonsillectomy, adenoidectomy should be examined for nasal obstruction before taking orthodontic treatment which may be the etiologic factor for Class II malocclusion. Patient with history of allergic to acrylic resin might be managed with fixed appliance. History of blood dyscrasias may need special management if extractions are planned.



Figure 1. Class II Div 1



Figure 2. Class II Div 2

Dental history: Evaluation of the dental status is of great importance for the prognostic assessment of dental development. Chronologic age and dental age are synchronous in the normal patient. A child is labelled as early or late developer if there is difference of +2 years from the average value. If the chronologic age of the patient is younger than the dental age, one can rely on increased growth to a greater degree.

Prenatal history: Nutritional disorder, drugs taken, diseases and accident of the mother during pregnancy. Drugs induced deformities such as:

Thalidomide, injury and trauma may lead to oro-facial deformities. Abnormal fetal position can lead to facial asymmetry.

At birth: Injury to temporomandibular joint either due to intra-uterine pressure, or pressure due to forceps while delivery can result in ankylosis.

Postnatal life: Changes in mastication affecting masticatory muscle development, abnormalities in the normal functions like breathing, deglutition and speaking, and damaging habits including thumb sucking, lip-sucking or resting tongue posture may lead to development of malocclusion.

Family history: It is important because Class II malocclusion have strong inheritance character:

Clinical examination:

General Examination

- **Height & Weight:** They provide a clue to the physical growth & maturation of the patient which may have dento-facial correlation.
- **Gait:** It is the way a person walks. Abnormalities of gait are usually associated with neuromuscular disorder which may have a dental correlation. E.g. **Treacher-Collins Syndrome.**
- **Posture:** Abnormal posture can cause to malocclusion due to alteration in maxilla-mandibular relationship. E.g.: **Treacher- Collins Syndrome, Pierre Robin Syndrome.**
- **Body built:** Classify the physique into three types-
- **Aesthetic:** They have thin physique & usually narrow dental arches.

Pletoric: They have obese physique & generally large, square dental arches.

Athletic: They have normal physique & normal sized dental arches.

Examination of face

Overall shape of face and cephalic index: Overall shape skull may fall in one of three types.

- **Dolicocephalic:** Long and thin this is often associated with the ectomorphic body type.
- **Brachycephalic:** Broad and square could be associated with endomorphic body type.
- **Mesocephalic:** Ovoid face (A and B) is usually seen in meso or endomorph body types.

Facial height

Facial height is of two types.

They are

- Upper facial height
- Lower facial height
- Ideal proportion of Upper facial height is 45% of total facial height & Lower facial height is 55% of total facial height.

Causes of decrease Lower facial height:

Skeletal deep bite cases

- Class II div 2 cases
- Class II div 1 cases
- Growing children

Causes of increase Lower facial height: Skeletal open bite cases (vertical Class I). In long face syndrome- Examining the dental casts in occlusion will reveal any anterosuperior problems in the buccal occlusion or in anterior relationships. It is important to diagnose whether a Class II buccal segment relationship or excessive overjet of the incisors is caused by a jaw (skeletal base) discrepancy, displaced teeth on well-proportioned jaw (dental Class II), or a combination of skeletal and dental displacement.

Extraoral and intraoral photographs (Kharbanda, 2009):

They are useful in assessment of facial symmetry, facial type & profile, they serve as diagnostic records, and they help in assessing the progress of the treatment.

Profile Photographs: The features which have to be blocked in profile photographs are:

- Profile convex in Class II div1 patients.
- Lip prominences.
- Nasolabial angle (acute in Class II div 1 patients)
- Lip chin throat angle
- Neck chin angle

Intraoral Photographs: It supplements the clinical findings of the occlusion. The intraoral photos help review hard and soft tissue findings that exists before treatment. E.g. While spot lesions, clefts etc.

Rationale of early treatment (hahn, 1995): Three of the more common principles in early intervention are the:

- Elimination of primary etiologic factors
- Elimination of occlusal discrepancies such as unilateral, bilateral posterior crossbite, and the correction of skeletal dysplasia.
- Another need for early orthodontic treatment is managing arch length discrepancies to avoid the future extraction of teeth (premolars) to resolve crowding.

Benefits and goals of early treatment:

- Superior facial esthetics which helps in developing self-concept and self esteem
- Habit is controlled thus equilibrium is established
- Less extraction need giving an esthetic profile
- Can utilize growth-Facilities guidance of developing occlusion and growth modification.
- Reduced risk of trauma. Ex: Protruded incisors.

Limitations of early treatment:

- No assurance about treatment results so there is a questionable stability
- No definitive goals-Misperception about goals of early treatment like there will be no need of treatment at later time.
- Social immaturity of child treatment impracticable.
- 2 phase treatment can lengthen chronologic treatment time early treatment not only may do some damage or prolong therapy; it may exhaust the child's spirit of cooperation and compliance.
- Iatrogenic problems like Dilaceration of root, Decalcification under bands left for too long, impaction of maxillary second molars from distalizing first molars.

Although most orthodontic problems can be resolved during the transition from the mixed to permanent dentitions when most children are still growing and reasonably cooperative, orthodontic treatment during the preadolescent are sometimes provides a real benefit of the patient. Some of this earlier-than-usual treatment has been described as "preventive" or "interceptive" and during recent years it has become increasingly popular.

Early treatment procedures (Baccetti, 2001)

- Dental neglect in the primary dentition is the principle cause of malocclusion in the permanent dentition.
- Early, regular and satisfactory dental care will help maintain the primary teeth in healthy condition until the time for their normal exfoliation.

Preventive orthodontics: As discipline encompasses all the necessary steps to provide proper transition of primary to permanent dentition without any problems into proper functional, esthetic and occlusal relationships helping in proper growth and development of the jaws and face in turn.

- Patient/Parent education
- Maintain tooth shedding time table
- Space maintenance
- Preventing oral habits

Patient/Parent education: The important part of preventive orthodontics is to develop a good rapport between the dentists and child and his parents at the first visit.

- Mother should be educated on proper nursing and care of the child proper brushing technique.
- Fluoride application and dental checkup should be done every 6 months.
- Through illustrations and models it should be made clear to the parents that normal occlusion just do happen.

Self Correcting Anomalies

- **Anterior open bite:** Gets corrected after eruption of primary incisors.
- **Infantile swallowing pattern:** Introduction of solid food in diet during first year of life.
- **Retrognathic mandible:** Differential and forward growth of lower arch.

Anterior deep bite

- Cause-Incisors more upright
- Correction
- Forward and downward growth of mandible
- Proclination of anterior
- Eruption of permanent molars
- **Ugly-Duckling stage**-normal at 9-10 yrs

Maintain tooth shedding time table**Space Maintenance**

- Deciduous teeth act as natural space maintainers
- All efforts are taken to prevent early loss of deciduous teeth
- Pit and fissure sealant application
- Direct/Indirect pulp capping/pulpotomy
- Correct Handling of spaces created by intimate loss deciduous teeth
- Use of space maintainers is advocated

Preventing oral habits

- It is just important to see surrounding soft tissue maintain normal development and function as it is to watch for normal development in teeth and bone.
- A loose tooth, a premature lost tooth, high restoration can intimate abnormal muscular habit which can cause a malocclusion.
- Warning the patient about harmful effects and prescribing some exercises may be helpful.

Interceptive orthodontics: "It is that phase of the science and art of orthodontics, employed to recognize and eliminate potential irregularities and appositions in the developing dento facial complex".

Purpose: To prevent a potential malocclusion from progressing into a more severe one and is thus undertaken at a time when the malocclusion has already developed and is aimed at elimination factors, that may lead to malocclusion.

Interceptive Procedures

- Developing skeletal problems
- Equilibration of occlusal disharmony
- Interceptive oral habits
- Space regaining
- Occlusal related problems
- Eruption disturbances
- Space related problems

Corrective Orthodontics

Biomechanics for Non-extraction Class II patients: When panning non-extraction treatment, we opt to use early treatment, redirection of growth, saving leeway space, guidance of eruption, and mechanics that aim to achieve distal movement of the maxillary molars. For a successful outcome, it is necessary before the initiation of treatment to take into consideration the type of malocclusion, facial type, required arch perimeter, individual growth, and motivation of the patient.

Patient selection: Patients need to be carefully selected for non-extraction treatment. Prospective patients to be treated using maxillary molar distalization techniques should exhibit a Class II dental relation or a minor skeletal Class II relation. A Class II relationship with mesial migration of maxillary molars due to premature loss of the primary molar is preferred. The patients should have minimal or no mandibular arch length discrepancy, preferably with meso- or brachi-facial types, and potential remaining growth. A low mandibular plane angle is most suitable because in high angle the distal movement of molars will tend to open the bite due to the extrusive force component. Even a full Class II relationship can be corrected if treated earlier.

Intraoral appliances: They mainly include:

- Fixed functional appliances
- Molar distalization appliances

Fixed functional appliances: Fixed functional appliances are preferred over removable appliances because they require minima patient compliance.

- They have the advantage of 24 hour continuous stimulus for mandibular growth.
- They are smaller in size permitting better adaptation to functions like mastication, swallowing, speech and respiration.
- They treat Class II malocclusion successfully in a shorter time span.
- Their greater advantage seems to be for those patients who report for orthodontic treatment at the far end of the facial growth. Fixed functional appliances being 24 hour wear appliances produce rapid sagittal correction hence utilizing short span of remaining growth to maximum advantage.

They are classified as

- Rigid fixed functional appliances
- Flexible fixed functional appliances
- Hybrid fixed functional appliances

Rigid fixed functional appliances: They are attached distally to the maxillary molars or the upper arch and are expected to hold the mandible in the postural forward position through rigid mechanism which is attached to the lower arch. Once the appliance is fitted, a patient cannot close the teeth in centric relation. Herbst appliance was the first such appliance to be introduced in orthodontic practice.

- Herbst appliance
- Cantilevered Bite Jumper
- MALU Herbst appliance
- Flip Lock Herbst appliance
- Ventral Telescope
- Magnetic Telescopic Device
- Mandibular Protraction appliance
- Universal Bite Jumper

Conclusion

- If the findings in the light of current literature are considered then it can be concluded that both single phase and two phase treatment are effective in treatment of Class II malocclusion.
- However, various other factors should be considered like the cost benefit ratio, long term stability of results, patient compliance and duration of the treatment before making an option.
- Some researchers justify early treatment because of the psychological benefits, improved self esteem and reduction in the increased susceptibility to trauma, however this has to be taken with caution as both these objectives are still controversial in literature and there has been no clear-cut evidence for the same.

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