

Class II Subdivision, The Rubik's Cube: Diagnosis and Planning

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Abstract: This paper describes various diagnostic challenges and treatment modalities for patients presenting with Class II Subdivision malocclusion.

Keywords: Asymmetry, Class II Subdivision, Diagnosis, Treatment Planning.

1. Introduction

Patients with Class II subdivision malocclusions have long been a treatment challenge for clinicians. Treating asymmetric malocclusions is inherently more difficult than treating symmetric malocclusions, since symmetry in one arch or both arches must be attained.

AAO Glossary describes 'Subdivision' as unilateral malocclusion characteristics of the affected posterior segmental relationships [1]. It was described by Angle as 'Occasionally the molar occlusion is Class II on one side, and Class I on the other' (Fig. 1) [2]. Both the definitions neglects to specify whether the subdivision is the normal or the abnormal side [3].

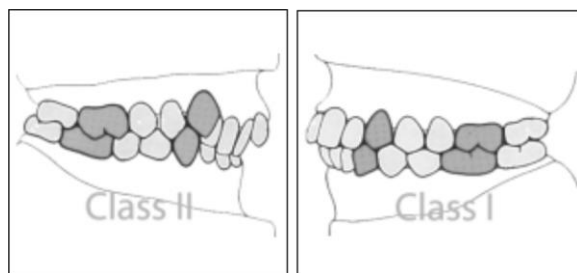


Fig. 1. Class II Subdivision Malocclusion

2. Classification

According to Strang it can be classified as [4]

Class II Div 1 Subdivision

Class II Div 2 Subdivision

According to Cassidy (2013) it can be classified as [5]

Group 1: Maxillary and mandibular midlines on with facial midline.

Group 2: Maxillary midline off from facial midline.

Group 3: Mandibular midline off from facial midline.

According to Janson (2014) it can be classified as [6]

Type 1: Created by distal positioning of the mandibular first molar on the Class II side.

Type 2: Mesial positioning of the maxillary first molar on the Class II side.

The frequency of Class II subdivision malocclusion types found in the frontal photographic evaluation were as follows [7]:

Type 1, 61.4%;

Type 2, 18.2 %; and

Combined, 20.5%.

3. Etiology

The cause of these asymmetries can be multivariate. They can be further classified as [8]:

Dental Asymmetry; which can manifest as a result of

- Abnormal dental eruption
- Premature loss of primary teeth
- Loss of permanent teeth

Skeletal Asymmetry; which can be due to

- Asymmetric maxilla
- Asymmetric mandible
- Combination of both

4. Diagnosis

First step in diagnosis and treatment planning of all patients is to identify these asymmetries and to differentiate between those that are of a dental or skeletal cause. It is only then a valid decision concerning the mode of treatment (surgical or non-surgical approach; if non-surgical then extraction or non-extraction is the treatment of choice. Diagnosis of skeletal or dental asymmetry can be accomplished by overall evaluation of the following,

- Skeletal & soft-tissue facial pattern
- Clinical examination

- Facial photographs
- Radiographs {Postero-anterior(PA) view, submental view}
- CBCT scans

5. Treatment Modalities

Various treatment modalities can be used to treat Class II subdivision malocclusion and depend on the severity, age, remaining growth and few other factors. They range from use of least invasive modalities like orthopaedic appliances, fixed functional appliances, camouflage (by extraction or non-extraction therapy) to most aggressive surgical treatment plans (Fig. 2).

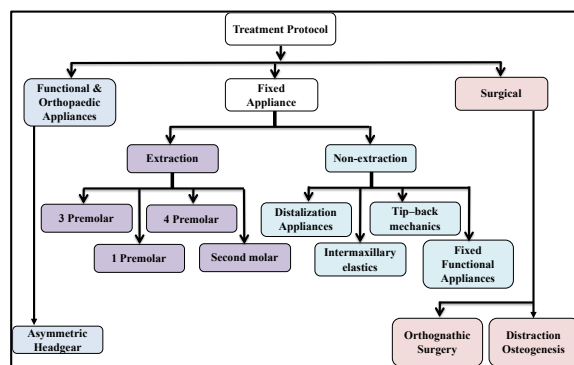


Fig. 2. Treatment Modalities

A. Orthopaedic Appliances

1) Asymmetric Headgear

Headgears were introduced as early as 1800s; different modifications have been introduced since then. It can be used for various purposes like holding the molars in place to reinforce anchorage, retract maxillary molars or restrain growth of maxilla [9]. However, to achieve favorable results, patient compliance is of prime importance.

In cases presenting with unilateral Class II malocclusion (Class II subdivision); asymmetric force system is called for. Changes are made in facebow to convert it from a symmetric to an asymmetric facebow. These changes include asymmetric length of right/ left outer bow, different angulation of right/ left outer bow, differential toe-in bend in the inner bow, hinged inner bow, swivel offset or a combination of them [10].

Shortening one outer bow or elongating one inner bow is most feasible method to design asymmetric headgear [11].

2) Fixed Appliances

Extraction or non-extraction treatment protocol can be followed according to need and severity of each particular case. Both the aforementioned protocols are described in detail below.

B. Extraction treatment

Choice of extraction in a Class II subdivision case ranges from extraction of a single premolar, three premolars, four premolars to molar unilaterally. Various clinical situations and choice of extractions have been described by Wertz [12].

1) Premolars

One or three premolar extraction cases finish with bilateral Class I canine relationships & Class I molar relationship on one side while Class II molar relationship on Class II side. Four premolar extraction protocol finish with Class I canine and molar relationship bilaterally (Fig. 3).

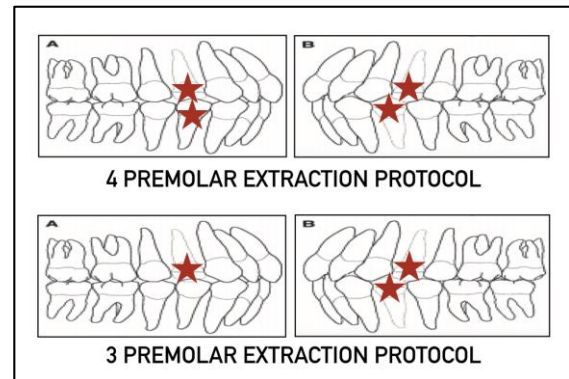


Fig. 3. Three vs. Four Premolar Extraction Protocol

2) Three vs. Four Premolar Extraction Protocol

The four premolar extraction protocol; without the use of skeletal anchorage requires more patient compliance in using class II and anterior diagonal intermaxillary elastics to obtain accurate occlusal outcome and coincidence of the maxillary and mandibular dental midlines.

For appropriately diagnosed patients, 3-premolar asymmetric-extraction treatment can be faster than treatment requiring 4 premolar extractions. Janson also claims that asymmetric extraction choice tends to be more successful in obtaining midline correction with reduced incisor retraction [13].

The asymmetric extraction protocols for Class II subdivision malocclusions are often successful because they maintain existing molar relationships, resulting in reduced treatment time, greater ease of midline correction and lesser tendency of canting of occlusal plane.

3) Molars

Extraction may involve first or second molars. First molar is extracted and case finished with second molar being in a Class I molar relationship w.r.t. opposing first molar. Second molar extraction can be done followed by distalization of first molar on Class II side in a Class I molar relationship with opposing molar.

C. Non-extraction treatment

Various non-extraction treatment modalities for correction of Class II subdivision malocclusion include use of unilateral tip back bends, intermaxillary elastics, temporary anchorage devices and fixed functional appliance [14]-[16].

1) Intermaxillary Elastics

Use of asymmetric elastics (Class III on one side/ Class II on other side) can be used for correction of midline and asymmetry. A common side effect of these being canting of

occlusal plane. In cases with significant midline deviation, anterior elastic from upper intermaxillary hook from one side to lower intermaxillary hook on other side should be used.

2) Temporary Anchorage Devices

Intermaxillary elastics are often used for correcting midline deviations. Though they are easy to use they generate a vertical force vector which is detrimental and at the same time require patient cooperation. With temporary anchorage devices on the other hand, no special patient cooperation is needed and midline can be corrected without any adverse vertical changes.

Canting of the occlusal plane can be worsened by application of intermaxillary elastics from the upper left intermaxillary hook to the lower right intermaxillary hook. As an alternative, miniscrews can be placed for anchorage in the upper left and lower right posterior regions to correct the midline deviation and prevent occlusal plane canting.

3) Fixed Functional Appliances

The ideal cases for unilateral correction with the Forsus appliance is as follows [16],

- Maxillary midline is nearly coincident with the facial midline;
- Mandibular incisors are either upright or slightly retroclined, crowding is mild to absent; and
- Asymmetry has a predominately dental component.

Major side effects like flaring of mandibular incisors and change in the arch form can be avoided by taking the following measures [17].

- Ligation of entire mandibular arch;
- Lingual crown torque incorporated;
- If additional maxillary molar distalization is desired, a 0.018 stainless archwire may be placed in the upper arch and a lower lingual arch may be utilized;
- If less maxillary molar movement had been desired, a fixed transpalatal arch (TPA) would be placed.

Clinicians have reported some temporary bite opening or canting of the occlusal plane with fixed functional appliance use, so monitoring progress at 6-week intervals may be advisable.

4) Unilateral Tip backs

Class II subdivision cases caused predominantly due to abnormal inclinations of maxillary molars can be effectively corrected by use of unilateral tip back bends. Shroff advocates the use of unilateral tip back bend on the Class II side which tips the molar distally; but causes the contralateral molar to tip mesially [18]. This is coupled by tip-back bends from transpalatal bar on both sides.

Two distal moments on the Class II side cause the molar to tip distally effectively, while one mesial moment and one distal moment (TPA) neutralizes the force on Class I side. Thus, asymmetric Class II molar relation can be corrected effectively

by this method.

6. Conclusion

Patients presenting with significant clinical asymmetry pose special diagnostic and treatment challenges to the Orthodontist. Determination of the underlying cause of the asymmetry is an important first step in the formulation of an appropriate treatment plan.

Meticulous clinical and radiographic evaluation and related cast analysis in centric relation and centric occlusion, as well as a thorough review of the past medical and dental history are necessary to evaluate the asymmetry in the three planes of space.

In the management of dental arch asymmetries, the clinician should select the appropriate force system and the appliance design necessary to address the asymmetry while minimizing undesirable side effects.

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