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Class II Subdivision Malocclusions: Understanding Asymmetry and Enhancing Treatment Outcomes

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ABSTRACT:

Class II subdivision malocclusions, involving unilateral dental discrepancies, present significant treatment challenges. Treatment options can range from non-extraction and extraction protocols to surgical approach depending on the location and severity of the malocclusion. Additionally, the biomechanics involved may produce side effects that are either symmetric or asymmetric, based on the patient's specific needs. This review aims to elucidate the complexities of Class II subdivision malocclusions, emphasizing the importance of precise diagnosis and individualized treatment planning to achieve optimal outcomes.

Introduction

Clinicians encounter considerable difficulties when managing patients with Class II subdivision malocclusions, as attaining symmetry in one or both dental arches often stands as a key treatment goal. Class II subdivisions are one of the most common dental asymmetries and account for up to 50% of all the Class II malocclusions.[1,2] Subdivision is the occurrence of a unilateral malocclusion. In the extensive literature by Angle, Moyers, Salzmann, and Proffit, the precise definition of "subdivision" remains unclarified. However, a very clear statement regarding subdivision by Staley and Reske states that: "A Class II-1 Subdivision is written as follows: Class II Division 1 Subdivision right when the Class II molar relation is on the right side of the arches and Class II-1 Subdivision left when the molar relation is Class II on the left side of the arches." [3]

Types of Subdivision Malocclusion:

Janson et al in 2001[4] evaluated subdivision malocclusion with regard to dental and skeletal asymmetries as:

Type 1: Distal positioning of the mandibular first molar on the Class II side. (Frequency of occurrence is 61.36%) Characterized with coincident maxillary dental midline with the facial midline and deviation of mandibular midline towards the Class II side.

Type 2: Mesial positioning of the maxillary molar on the Class II side. (Frequency of occurrence is 18.18%) Characterized with Maxillary dental midline deviated away from the Class II side and coincident mandibular midline with the facial midline.

Combination type: Characterized by deviation of maxillary and mandibular dental midlines from the facial midlines in opposite directions. (Frequency of occurrence is 20.45%).

Cassidy et al in 2013[5] evaluated subdivision malocclusion based on similarities in the midline relationships, and the etiology of the asymmetries as:

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

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Etiology[6,7]

a. Dentoalveloar Asymmetry

1. Early loss of a primary second molar on one side with unilateral loss of leeway space
2. Premature exfoliation of primary canines
3. Ankylosed primary molars
4. Ectopic eruption of maxillary first molars
5. Congenitally missing teeth
6. Supernumerary teeth
7. Caries with loss of interproximal tooth structure
8. Tooth size discrepancy
9. Asymmetric crowding

b. Skeletal Asymmetry

1. Deficient mandible either due to reduced ramal height or mandibular length on Class II side
2. Asymmetric position of maxilla in relation to cranial base
3. More anterior positioning of glenoid fossa on the Class I side

c. Functional Deviations

Class II subdivisions can typically be evaluated by skeletal and soft tissue facial pattern, clinical examination, frontal photographs, PA view, submentovertex view. However, two dimensional images can be misleading, as they can have image distortion and magnification error. Three-dimensional images obtained through CBCT accurately depict the patient's anatomy, spatial positioning, dimensions, and shape.[8] During three-dimensional assessment utilizing cranial base registration asymmetric glenoid fossa can be evaluated displaying the lower fossa on the Class I side, pogonion shifting towards the Class II side and lower midline shifting towards Class II side. Mandibular asymmetry can be identified through the regional mandibular registration. Mandibular yaw is observed towards the Class II side. The etiology of the mandibular yaw could be an asymmetric mandible, an asymmetric fossa or combination of the two. If right and left side of the fossa is of same size then mandibular yaw is generated by anterior displacement of fossa. If right and left fossa are symmetric then mandibular asymmetry would generate mandibular yaw. If both anatomical structures are compensating, such as the fossa being displaced anteriorly on the side with the shorter mandible, then mandibular yaw is not noticeable.[9]

Treatment Modalities

The key to success is an accurate diagnostic process that precisely identifies the asymmetry, followed by the application of appropriate biomechanics for treatment. Options for the correction of Class II subdivision malocclusion can be divided into three distinct categories namely: non-extraction protocols, extraction protocols and orthognathic surgery. The decision for extraction is based primarily upon the degree of dental arch length shortage, existing arch form, growth potential of the face, relation of the lower incisors to the A-pogonion plane and the muscular environment.[10]

Non-Extraction Protocol

a. Headgear

The headgear can be adjusted to ensure a distalization force on the preferred side i.e. the side of Class II molar relation. Even though a distal force can be delivered unilaterally, a net lateral force is also present at the inner bow terminals and has a tendency to create a lingual crossbite on the side which receives the greater distal force. However, good patient co-operation is necessary when extraoral appliances such as headgear are prescribed and hence limits their use.[11]

b. Fixed Intra-Oral Appliance

It applies a continuous force to accomplish molar distalization. This includes the distal jet, pendulum appliance, Jones jig, Keles slider, Wilson arches, K loop.[7] Forsus fatigue appliance primarily induces changes at the dentoalveolar component, including intrusion and proclination of the mandibular incisors, extrusion and mesial movement of mandibular molars, extrusion and uprighting of maxillary incisors, and distalization and intrusion of maxillary first molars. The Forsus FRD is easy to install and comfortable for the patient. Compared to alternatives like intermaxillary elastics, it offers superior resistance and performance with light forces, while also permitting greater freedom of eccentric and centric mandible movements.[12] Other functional appliances, like the Herbst and Jasper Jumper, can achieve comparable long- term dentoskeletal outcomes, but have accompanying drawbacks. The Herbst appliance, because it is stiff and restricts mandibular movement, is considered extremely uncomfortable by adult patients; it is also difficult to install and has a high incidence of breakage. Semi-rigid devices like the Jasper Jumper allow greater freedom of functional movements, but their flexibility increases the risk of breakage.[13]

c. Intermaxillary Elastics, specifically asymmetric elastics (Class III on one side and Class II on the other):
Can be utilized to address midline deviations and asymmetry. However, a common side effect is the canting of the occlusal plane. In cases of significant midline deviation, an anterior elastic should be used, extending from the upper intermaxillary hook on one side to the

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lower intermaxillary hook on the opposite side."[14]

d. Temporary Anchorage Devices

In contrast, temporary anchorage devices (TADs) eliminate the need for patient cooperation and can correct midline deviations without causing negative vertical changes. As an alternative, miniscrews can be placed in the upper one quadrant and lower opposite posterior regions to correct midline deviations and prevent occlusal plane canting." In cases of Class II subdivision with upper midline discrepancy, patients presenting with misally placed maxillary molars, mini-screw placement in the IZC area (IZC) allows more biomechanical versatility of orthodontic movement since high screws prevent tooth roots from interfering in tooth displacement.[15]

f. Unilateral Tip Backs

Aberrant inclination of maxillary molar leading to Class II subdivision can be effectively corrected by use of tip back bends. The goal is to maintain a good occlusion on the Class I side and not to produce incisor side-effects. It is possible by connecting the right and left first molars with a transpalatal archwire or horseshoe arch to apply a tip-back moment on the side presenting the tipped molar. The molar on the opposite side experiences a tip-forward moment. This undesirable side-effect can be controlled by consolidating the rest of the dental arch using a heavy archwire. The resulting force system includes an increased tip-back moment on the side which needs the molar axial inclination correction. The molar on the other side of the arch experiences a tip-forward moment delivered by the palatal arch and is counteracted by the tip-back moment delivered by the tip-back springs. These two moments cancels each other, resulting in maintenance of an ideal occlusion on this side of the arch. Undesirable side-effects resulting from this mechanics include canting of the occlusal plane and incisor flaring.[16]

Extraction Protocol

Class II Subdivision Type 1 Cases (Janson et al)

If the patient's profile necessitates extraction, it can be performed symmetrically (extraction of 4 premolars) or asymmetrically (extraction of 3 premolars). Conversely, a pleasing profile typically contraindicates extraction.

4 Premolar Extraction Protocol: Completes the case with bilateral Class I canine and molar relationship. Without using skeletal anchorage devices, the 4 premolar extraction protocol 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.

3 Premolar Extraction Protocol: Two maxillary premolar and one mandibular premolar on the Class I side finishes the case with bilateral Class I canine relationship, maintaining the original Class I molar relation on the Class I side and Class II molar relation on the Class II side.[17]

The three premolar extraction methods demonstrates a slightly higher success rate in correcting midline deviations and tends to achieve better antero-posterior discrepancy correction compared to the four premolar extraction plans. Also, the treatment duration for these extraction protocols should also be considered.[18] The number of extracted premolars has a direct relationship to treatment time.[19] Thus, patients treated with 3 premolar asymmetric extractions can be treated faster than those having 4 premolar extractions.[20] In many Class II subdivision cases, it is beneficial to delay the extraction of a mandibular premolar in the affected quadrant (Class II side) until a good canine interlocking (Class I) relationship is obtained. This delay will concurrently correct compensatory mesiodistal inclinations of anterior teeth as well as midlines. Not extracting in the affected mandibular

quadrant disallows the drift of the canines and the anteriors in the flexible aligning wires. The premolar to be extracted also serves before it is sacrificed. Once the 6 anterior teeth are aligned with canine lock and corrected midlines, one can extract the premolar (first or second) on the affected side.[21]

Class II Subdivision Type 2 Cases (Janson et al)

Treatment options include either a single premolar extraction on the Class II side or a non- extraction approach by distalizing the molar on the Class II side. Extraction plan will correct maxillary midline deviation; the Class II molar can remain in Class II while the canine and contralateral molar will finish in a Class I relationship.

Another option involves extraction of 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.[10] Distalization will correct midline deviation as well as molar relation.[6]

Class II Subdivision Combination Type Cases (Janson et al)

Treating such patients necessitates a more strategic approach, with the treatment plan varying based on the etiology and severity of the discrepancy.

Orthognathic Surgery for Skeletal Asymmetry

Significant involvement of skeletal structure may require a combined surgical orthodontic treatment depending on the degree of roll and yaw, as well as the patient's age.

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The extent of yaw is a major factor in deciding between a more conservative or a more invasive treatment modality.[22]

Conclusion

Class II subdivision malocclusions pose a significant challenge for orthodontic treatment due to the inherent asymmetry in one or both dental arches. Advanced imaging techniques, particularly three-dimensional CBCT, have revolutionized the diagnosis and management of Class II subdivisions by offering detailed insights into craniofacial anatomy and spatial relationships. Accurate identification of the underlying etiology—whether dentoalveolar, skeletal, or functional—is crucial for devising effective treatment plans. By leveraging these diagnostic advancements and a thorough understanding of the etiological factors, clinicians can achieve better treatment outcomes, ultimately enhancing patient care and satisfaction.

References

1. Sheats RD, McGorray SP, Musmar Q, Wheeler TT, King GJ. Prevalence of orthodontic asymmetries. Semin Orthod. 1998;4:138-45.
2. Smith RJ, Bailit HL. Prevalence and etiology of asymmetries in occlusion. Angle Orthod. 1979;49:199-204.
3. Seigel MA. A matter of Class: Interpreting subdivision in a malocclusion. Am J Orthod Dentofac Orthop. 2002;122:582-6.
4. Janson GR, Metaxas A, Woodside DG, de Freitas MR, Pinzan A. Three-dimensional evaluation of skeletal and dental asymmetries in Class II subdivision malocclusions. Am J Orthod Dentofacial Orthop. 2001;119(4):406-18.
5. Cassidy SE, Jackson SR, Turpin DL, Ramsay DS, Spiekerman C, Huang GJ. Classification and treatment of Class II subdivision malocclusions. Am J Orthod Dentofac Orthop. 2014;145:443-51.
6. Kamboj A, Sharma A, Lakhani P, Chopra S. Decision in Class II Subdivision Malocclusions Treatment: Three Case Reports with Contrasting Strategies. J Contemp Orthod. 2020;4(4):6-10.
7. Coetsee M. Unilateral Class II treatment using fixed orthodontic appliances with open coil spring, sliding hook and light Class II elastics. International dentistry –African edition. 10(4):18-30.
8. Scarfe WC, Farman AG, Sukovic P. Clinical applications of cone-beam computed tomography in dental practice. J Can Dent Assoc. 2006;72:75-80.
9. Sencak RC, Benavides E, Cevidanes L, Yatabe M, Koerich L, Souki BQ, Ruellas ACO. Asymmetry in Class II subdivision malocclusion: Assessment based on 3D surface models. Orthod Craniofac Res. 2024;27(2):267-75.
10. Wertz RA. Diagnosis and Treatment Planning of Unilateral Class II Malocclusions. Angle Orthod. 1975;45(2):86-94.
11. Sadeghi S, Hedayati Z, Mousavi-Fard B. Comparison of two asymmetric headgear force systems: A finite element analysis. Dental Press J. Orthod. 2019;24(2):411-6.
12. Takane V, Jatti R, Bijapur S, Keluskar K. Treatment of an Adult Class II Subdivision Patient with the Forsus Fatigue Resistant Device and Maxillary Mini-Implants. J Clin Orthod. 2021;55(10):991-9.
13. Küçükkeleş, N.; Ilhan, I.; and Orgun, I.A.: Treatment efficiency in skeletal Class II patients treated with the Jasper Jumper, Angle Orthod. 2007;77:449-56.
14. Farret MM. Orthodontic biomechanics with intermaxillary elastics. Dental Press J Orthod. 2023;28(3).
15. Almeida M, Almeida R, Nanda R. Biomechanics of Extra-alveolar Mini-Implant Use in the Infrazygomatic Crest Area for Asymmetrical Correction of Class II Subdivision Malocclusion. APOS Trends in Orthodontics. 2018;8(2):110-8.
16. Shroff B, Lindauer SJ, Burstone CJ. Class II Subdivision treatment with tip-back moments. Eur J Orthod. 1997;19(1):93-108.
17. Janson G et. al., Stability of class II subdivision malocclusion treatment with 3 and 4 premolar extractions. Prog Orthod. 2014;15(1):1-6.
18. Janson GJ, Dainesi EA, Henriques JFC, de Freitas MR, de Lima KJ. Class II subdivision treatment success rate with symmetric and asymmetric extraction protocols. Am J Orthod Dentofac Orthop. 2003;124:257-64.
19. Fink DF, Smith RJ. The duration of orthodontic treatment. Am J Orthod Dentofacial Orthop 1992;102:45-51.
20. Singla A, Chandna A, Puri A, Roy A. Correction of Class II Subdivision Malocclusion in An Adult Patient By Asymmetric Extraction Treatment. Journal of Dental Specialities. 2013;1(1):51-6.
21. Mailankody J. Deferred extraction option for Class II subdivision malocclusion. Am J Orthod Dentofacial Orthop. 2006;129(4):45.
22. Ackerman JL, Proffit WR, Sarver DM, Ackerman MB, Kean MR. Pitch, roll, and yaw: describing the spatial orientation of dentofacial traits. Am J Orthod Dentofacial Orthop. 2007;131:305-10.