

## Class II division 1 malocclusions: the subdivision problem

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*The purpose of this study was to determine the frequency of occurrence of subdivisions, in Class II division 1 malocclusions. Sixty patients seeking orthodontic treatment at the dental college of King Saud University were selected. The results revealed that 45% of Class II division 1 patients examined had subdivisions. The most commonly affected side was the right (66.7%). Mandibular shift upon closure was noted in 36% of the subdivision cases. Mandibular asymmetry was noted in 62.6% of the patients. It can be concluded from this study that subdivisions are a frequent finding in Class II division 1 malocclusions. Appropriate diagnosis of these cases should be done early in the mixed dentition phase, to avoid developing dental or skeletal asymmetries that can persist throughout adulthood.*

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### INTRODUCTION

The practicing orthodontist is faced daily with challenging malocclusal problems. Class II subdivision malocclusion is one of them. These cases pose difficulty not only during orthodontic treatment, but also in post retention stability where the subdivision side has a tendency to relapse. Correcting the anteroposterior relation and achieving a Class I molar relation can be very difficult. Unilateral mechanics directed at bringing one of the buccal segments anteriorly or posteriorly, is one method that can be used during treatment of the mandibular arch. Asymmetric extractions of either the premolar on the Class I side, or the first premolar on the Class I side and the second premolar on the Class II side, is another method of treatment to achieve canine symmetry. In the event of inadequate arch length, extractions of all four premolars may be required for proper alignment of the arches.

In certain circumstances, accepting the asymmetry is the only choice. This problem arises when the maxillary arch shows no asymmetry anteroposteriorly, or if minimal or no crowding is present in the arches. Deviation of the mandibular midline at the end of treatment is inevitable.<sup>1,2</sup>

Several factors have been linked to the development of subdivision malocclusions. These range from dental, skeletal, or a combination of both.<sup>7-19</sup> Whatever the cause is, achieving and maintaining ideal results can be a very difficult task.

Although Class II malocclusion is the second most common type of malocclusion present,<sup>3,4</sup> only very few studies have been performed regarding the frequency of occurrence of subdivisions in these cases.<sup>5,6</sup> Therefore, an investigation of this matter was done. The purpose was to familiarize the practicing clinician with the relative frequency of subdivisions in Class II malocclusions, and to discuss the importance of early diagnosis of these patients so as to avoid potential asymmetric malocclusions in the future.

### MATERIALS AND METHODS

Patients seeking orthodontic treatment at the Dental College of King Saud University were chosen for the purpose of this study. These patients were screened for the presence of Class II division 1 malocclusion, mild crowding, and no severely displaced teeth. This was done to rule out the effect of a mesially drifted maxillary molar, from a severely displaced premolar or canine. Patients were diagnosed with Class II division 1 malocclusions, if the molar and canine on both sides or one side was end on or  $\frac{1}{2}$  a cusp width away, from the mandibular molar. The patient was classified as having a subdivision malocclusion, if the molar and canine of one buccal segment was in an end-on or a full class II malocclusion, and the other side presented with a Class I occlusion.

A sample of 60 patients fulfilling the criteria was collected; 30 male and 30 female subjects. The age of the patients ranged from 14 to 26 years of age, with an average age of 18 years. All permanent teeth were present

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including second molars, with no missing or extracted teeth.

The following were examined clinically: molar and canine relationship, upper and lower midlines, presence of mandibular shift, mandibular function, and mandibular asymmetry. Deviation of the midlines were evaluated and determined clinically if it were due to the maxillary teeth, mandibular teeth, or a shift in the mandible upon closure. Mandibular asymmetry was viewed clinically by observing the position of the chin relative to a line constructed to the middle of the face. An examination of the TMJ was done to determine if any clicking, tenderness, or locking was present. This was done through palpation of the temporomandibular joints and history taking. Joint sounds were recorded as (0) none, (1) clicking, or (2) crepitus, while the subjects were instructed to open as wide as possible and then close slowly.

The statistical package for social sciences program (SPSS) was used for all statistical computations. Frequency, percentages, and chi square tables were generated.

## RESULTS

The total sample taken for this study was 60 patients with Class II division 1 malocclusions. The results of this study revealed that 45.0% of these patients, presented with subdivision malocclusion (Table 1). Fifty-six percent were females, while 46.0% were males, with no statistical significance between both genders. Subdivisions were present on the right side in 66.7% of the cases (Table 2).

When the midlines were evaluated, 48.1% of the patients had mandibular midline deviated towards the right, which was the side of the subdivision, 25.9% had lower midline deviated towards the left, and 25.9% had midlines on (Table 3). Mandibular shift upon closure was noted in 36.0% of the subdivision cases.

When the TMJ was examined, 18.53% of the patients had clicking of the joint on the same side of the subdivision (Table 4). This clicking was present mostly in the mandibular shift group. Gender differences were significant, with females being affected more frequently than males ( $P = 0.000$ ). Furthermore, tenderness of the joint area was present in 11.12% of these cases, mainly females, with no history of locking ( $P = 0.000$ ).

Mandibular asymmetry was evaluated in all patients presenting with subdivision malocclusions. Asymmetry of the mandible was noted in 62.6% of the patients, varying from mild to a marked appearance. In the mandibular shift group, the chin was noticeably deviated towards the side of the subdivision in approximately 72.0% of the patients.

## DISCUSSION

Class II subdivision malocclusions, although not a rare phenomenon, has still received little attention in

Table 1. Number of subdivisions in class II division 1 patients.

Total Number	Subdivision	%
60	27	45.0%

Table 2. Common side of subdivisions.

Subdivision	Frequency	%
Right	18	66.67
Left	9	33.33

Table 3. Midline deviations in subdivision cases.

Midlines	Frequency	%
Right	13	48.14
Left	7	25.93
On	7	25.93

regards to the frequency of occurrence in patients seeking orthodontic treatment. The present study demonstrates that subdivision malocclusions occurred in 45% of Class II division 1 cases. This is in agreement with others, who have found that subdivision malocclusions constitute approximately 50% of the Class II population.<sup>5,6</sup> In these situations, a dilemma exists as to whether treatment of this asymmetry is necessary, especially when no obvious malocclusion problem (crowding, increased overjet, openbites, etc.) exists.

Generally, some degree of mandibular asymmetry can be found in normal subjects.<sup>7,8</sup> But in some, the discrepancy manifests itself as a class II subdivision malocclusion. These asymmetries can be caused by dental, skeletal or dento-skeletal factors. Several investigators have conducted studies regarding this matter and have found that the mandible in Class II subdivision malocclusions shows no unusual skeletal positioning or skeletal asymmetry. They concluded that the mandibular dentition was at fault, and that the resulting asymmetry was mainly due to the distal positioning of the lower first molar on the Class II side.<sup>9,10</sup> In fact, they further explain that the mandibular dentition seems to be rotated on the subdivision side within an otherwise symmetrical mandible.

Advocates of asymmetries due to skeletal reasons believe that these types of patients do not exhibit solely a dental or dentoalveolar malocclusion on the class II side.<sup>11-16</sup> In their opinion, these cases demonstrate either

Table 4. TMJ findings in the subdivision group.

TMJ:	Frequency		%		Total %	Significance Level
	Males	Females	Males	Females		
Clicking	1	4	3.71%	14.82%	18.53%	Highly Significant 0.000
Crepitus	0	0	0	0	0	Not significant p>0.05
Locking	0	0	0	0	0	Not significant p>0.05
Tenderness	0	3	0	11.12%	11.12%	Highly Significant 0.000

a unilateral mandibular growth problem or a unilateral skeletal aberration in form or position. An example of this is unilateral retardation of the mandible during growth, which persists throughout adulthood thus leading to the development of an asymmetrical mandible, and a subsequent subdivision malocclusion.

TMJ dysfunction has also been linked to the development of skeletal asymmetries.<sup>15</sup> Subtelny<sup>12</sup> believes that a certain proportion of youngsters with Class II division 1 malocclusion might be experiencing TMJ dysfunction and internal derangement on the Class II side that could lead to growth disturbance on that side.

In the present study, 36.0% of the patients with subdivision malocclusions had a mandibular shift upon closure. Of these, 18.53% experienced clicking of the temporomandibular joint on the same side of the malocclusion. Several investigators have studied the effect of internal derangement of the TM joint on the mandible, and have found that disk displacements may have a negative effect on mandibular growth.<sup>17-19</sup>

In a study conducted by Legrell and Isberg,<sup>19</sup> experimentally induced unilateral disk displacement was performed on growing rabbits. The findings confirm that the mandible on the side of the displaced disk was consistently shorter with a midline shift towards the ipsilateral side. They concluded that disk displacement in the TM joint during growth can result in a disturbance in mandibular length and midline asymmetry.

Whatever the cause, the problem lies in the fact that asymmetrical malocclusions are more difficult to treat than symmetrical ones.<sup>7-10</sup> If it is diagnosed as a dental asymmetry, forward positioning of the mandibular segment maybe required, but can be difficult without extractions. Retropositioning of the maxillary dentition is another option, but maybe undesirable since a marked shift of the midline and an obvious asymmetry will occur. If a skeletal problem exists such as unilateral retardation in growth of the mandible, orthopedic forces directed at stimulating anterior mandibular growth is necessary. Treatment of the maxillary denti-

tion with the use of unilateral headgears or Class II elastics should be avoided, since the malocclusion will be worsened.<sup>12</sup>

The present finding of the relative frequent occurrence of subdivisions in Class II malocclusions emphasizes the importance of obtaining correct initial diagnosis of these cases, since management can be complex and time consuming.

## CONCLUSION

Subdivision malocclusions are not an uncommon finding in Class II division 1 malocclusions. The presence of lower midline deviation towards the subdivision side, mandibular shift upon closure, and mandibular asymmetry maybe more pronounced in subdivisions groups. The practicing clinician should be aware of difficulties that may arise during and after orthodontic treatment of subdivision malocclusions.

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