A Comparison Of Upper First Molar Rotation In Class II, Division 1 And Class I

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It has been commonly assumed that a Class II, Division 1 malocclusion is characterized in part by a forward drift in the maxillary denture, and that a diagnostic sign of such drift is the rotation lingually of the mesial portion of the upper first molar. It is presumed that this rotation takes place about the larger lingual root of the tooth. Moreover, it is charged that failure to restore this tooth to its proper rotation decreases arch length and develops faulty occlusion in the cuspid area. If mesial drift is usually accompanied by mesiolingual rotation of the first molar about the lingual root, a significantly greater amount of rotation in Class II, Division 1 cases would lend support to this concept of etiology.

REVIEW OF THE LITERATURE

Downs stated in 1938 that "mesial drift becomes effective as soon as the first permanent molars erupt and come into occlusion. Its function is to make up for proximal wear[4]. In considering an anterior component of force in the denture, the most important one by far is the erupting and occluding of the first permanent molars. Because of their anatomical form these teeth do not dissipate their stresses along their long axes. Their occlusal surface is not at a right angle to the tooth axis. Therefore, a vector of force is formed in a forward direction."[4]

Angle described the relation of the upper first molar to the lower first molar as the key to occlusion for the following reasons:

1. They are the first permanent teeth to be formed and to erupt.
2. They are the largest of the permanent teeth.
3. They come into the mouth unchanged by the presence of roots of preceding deciduous teeth.

Angle also considered that the upper first permanent molar would be more accurate in position than the lower first permanent molar because it erupts in a bone that is fixed in relation to skull anatomy.

Angle pointed out his belief for the steadfast and dependable position of the upper first permanent molar, and referred to it as a tool in the true basis of diagnosis.

Of interest is the provocative statement by Angle, "Now think of it! Was the dental apparatus made principally for the adornment of the face, and incidentally, possibly to eat with? Not in all living nature, either plant or animal, can I recall a single instance where utility in an organ is not placed before adornment."

He goes on to say that "the upper and lower first molars should be regarded as of equal importance in diagnosis only when they succeed in locking normally in their mesiodistal relations. But owing to the fact that the lower molar is dependent upon the caprices of the migratory mandible, it is in consequence less reliable than its steadfast antagonist. For this reason the upper first permanent molar be-

Support for this project was from a United States Public Health Service part-time fellowship grant to the University of California.

comes the true basis of diagnosis[1].

Baldridge concluded in 1941 that "the upper first permanent molar assumes the same definite relation to the face and cranium in Class I and Class II malocclusions. These teeth can therefore be used as a basis for classification in Class I and Class II cases according to the Angle classification[2]."

In Strang's description of Hellman's findings, we see that the latter placed emphasis on "the importance of the mesiolingual cusp of the upper first permanent molar in maintaining and designating a normal relationship of the maxillary and mandibular arches. Its value lies in the fact that it is the largest of the cusps and is surrounded on every side, when in occlusion, by a cusp on the mandibular molar so that it resists displacement to the last degree, and frequently when the forces are such, it will pivot about its mesiolingual cusp rather than move uniformly[7]."

Strang concluded that "rotated molars usually indicate that abnormal pressure has been exerted upon the dental arch in which they are located, or upon the opposing arch, and hence such a malposition becomes an interest and aid in case analysis for classification and treatment.

"Rotation of these teeth more often appears in the maxillary arch than in the mandibular arch because of the mechanics associated with the occlusion of the mesiolingual cusp. This large well-defined structure rests in the central fossa of the mandibular molar and thus is completely surrounded by sloping walls.

"When abnormal or perverted muscular force tends either to throw the crowns of the maxillary teeth mesially, or the maxillary teeth are subjected to the constant functional stress of a distally located mandibular denture, this mesiolingual cusp on the maxillary molar resists displacement so strongly that it often maintains its normal location on the mandibular first molar long enough to cause the maxillary first molar to rotate bodily around this tenacious portion of its crown. When this occurs, the crown of the maxillary first molar will, of course, occupy a much greater space, mesiodistally, than when unrotated. Such a malposition will disturb the normal plane relationship of the maxillary premolars and canine on that side, producing an end-to-end contact with the mandibular teeth, or it may result in establishing a mesioaxial perversion of these premolar and canine teeth."[7]

Dewel states that "a diagnostic aid in analyzing mesial movement of upper posterior teeth is the characteristic rotation of the upper first molar that usually accompanies its forward displacement. The upper first molar is probably the most defamed tooth in the denture, in that its so-called immobile or stationary position has been referred to so often. This tooth, in fact, reacts to force, causing displacement almost as readily as any other in the dental arches. As it moves forward it tends to rotate, and, in so doing, it provides a diagnostic symptom that is not particularly characteristic of any other tooth.

"The upper first molar is rhomboidal in form and wider buccolingually than mesiodistally. This means that its greatest diameter is not through the contact areas, but instead on a line extending diagonally across the tooth from the distolingual cusp to the mesiobuccal cusp. These are also the cusps that become the contacting areas when the upper first molar assumes its characteristic rotation. Consequently, more space is required between adjacent teeth when the upper first molar is rotated than when normal contact relations are maintained in the dental arch."[3]

Friel, in an investigation of upper first molar rotation of thirty-four cases of first-year medical students with

TABLE I

FREQUENCY DISTRIBUTION OF UPPER FIRST MOLAR ROTATION IN CLASS I AND CLASS II, DIVISION I CASES

Degrees of rotation	Malocclusion			
	Class I		Class II-I	
	Right	Left	Right	Left
42-43	0	0	1	2
44-45	2	1	1	0
46-47	3	3	2	0
48-49	3	3	3	5
50-51	8	9	2	1
52-53	9	5	7	3
54-55	7	9	12	3
56-57	19	11	15	12
58-59	8	15	9	11
60-61	12	8	13	15
62-63	6	11	8	8
64-65	4	7	2	7
66-67	9	9	0	4
68-69	8	8	1	4
70-71	3	3	0	2

normal occlusion in the premolar area, and a second group of thirty cases with postnormal occlusion (Class II, Division 1), found a significant difference between Class I and Class II. Friel's figures were as follows:

Normal — 59.78°; postnormal — 52.12°, with a standard deviation of 5.43, a significant difference. The normal group on the right side measured 60°, on the left 57°. The postnormal cases on the right side measured 52°, on the left side 51°. He found a significant difference between normals and postnormals on both sides[5].

Friel's technique utilized a plexiglass plate with the model pushed up against it from the underside and held in position by a spring. The measurements were taken by placing a protractor on the topside of the plexiglass plate and reading the molar rotation through the protractor and plexiglass plate.

Method and Materials

The method utilized in this study was to compare Angle Class I cases and Class II, Division 1 cases that had full complements of teeth, in permanent dentition, with no peg laterals, supernumerary teeth or other tooth anomalies. Supernumeraries or deformed teeth might alter the position of the upper first molar and it would have to assume a position other than that which would be obtained by a normal eruption pattern. Accordingly, these cases were eliminated in the sample.

TABLE II

MEAN NUMBER AND STANDARD DEVIATION IN THE TWO COMPARED CLASSES OF MALOCCLUSION

	Class I		Class II-I	
	Right	Left	Right	Left
Mean	58.3 ± 0.64	58.9 ± 0.63	56.7 ± 0.55	59.2 ± 0.66
Standard Deviation	6.48	6.34	4.80	5.84

The starting models of seventy-seven untreated Class II, Division 1 cases and one hundred Class I cases were obtained that met the requirements mentioned. This would allow one hundred fifty-four comparisons in Class II, Division 1 cases and two hundred comparisons of Class I cases if one were to compare each side of the arch to the midline individually.

In an effort to eliminate parallax, photographs of the occlusal view of each maxillary arch were taken with the occlusal plane parallel to the film in the camera. Then a line was drawn on the photograph that connected the mesiobuccal and mesiolingual cusps of the upper first molar; a line was drawn for the midpalatal raphe. A comparison was made relating the rotation of each molar to the midpalatal raphe. Then the figures of the two malocclusions were compared. The results are summarized in Tables I and II.

In view of Friel's finding significant differences between the two sides, separate means for left and right were calculated in this study. Among the four mean values, the largest difference is obtained by comparing lefts and rights in Class II, Division 1. But this difference could easily arise due to chance and, as our data suggests, unlike Friel's mesiolingual molar rotation occurs no more frequently on one side than on the other, nor more often in Class II, Division 1 than in Class I.

Conclusion

Far from settling the matter of mesial drift, these findings permit several interpretations. Unless one discards them altogether in order to accept Friel's -- based on a sample one-third the size of this one -- it seems evident that mesiolingual rotation of the maxillary first molar is no more prevalent in Class II than in Class I. From this, however, we cannot adduce that maxillary mesial drift could not account for a certain number of Class II malocclusions. Such a conclusion could easily be countered by the assertion that a like number of Class I cases show maxillary mesial drift, accompanied by a corresponding amount of drift in the lower arch, maintaining normal mesiodistal molar relationships. Another possibility is that drift occurs, but molar rotation is not an inevitable consequence of it, so that measuring the latter phenomenon does not assess the former.

The truth of the matter is that the whole concept, so readily accepted in the past, is based on a priori assumptions. Reasonable as they may seem, they have never been substantiated by objective observations. Many factors other than drift could account for molar rotation and for perverted axial in-

clinations of cuspids. This study provides some basis for skepticism and suggests that the theory of mesial drift as an etiological factor in malocclusion needs better substantiation.

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The author gratefully acknowledges the guidance and editorial assistance of Dr. Wendell L. Wylie.

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The Angle Orthodontist

A magazine established by the co-workers of Edward H. Angle, in his memory . . .

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Vol. XXXI, No. 3 July, 1961