Some Aspects of Lower Third Molar Eruption

MARGARET E. RICHARDSON, M. Dent. Sc. D. Orth.

The mandibular third molar is something of an enigma in orthodontics. Its development and eruption are very variable. Development may begin as early as five years or as late as fourteen years, with the peak formation period at eight years,[1,7] or nine years.[8] Hellman[10] found the average age of eruption was 20.5 years but Haralabakis[9] found it was much later (24 ± 1.2 years) in Greek students.

Lower third molars are consistent throughout their development, those beginning calcification early, mature early,[7] but this does not necessarily result in their early eruption as they frequently become impacted. Twenty to twenty-five percent of lower third molars are impacted in Scandinavian males[2] and a 17.5 per cent incidence of impaction was quoted by Haralabakis[9] for Greek students and the same figure by Dachii and Howell[4] for American students.

The development of lower incisor crowding is often associated with third molar development. The extraction of teeth for the relief of crowding and its effect on the third molar has been investigated by a number of writers including Smith,[13] Huggins,[11] Faubion[6] and Cryer.[3]

In an attempt to clarify some of the problems associated with the lower third molar an analysis of some of the factors influencing its eruption was undertaken.

MATERIAL

Three groups of subjects were selected from the records of a longitudinal study of third molar development.

Group A was composed of 33 individuals who were the first to have one or both lower third molars erupted. The average age of eruption of third molars in this group was 16.09 ± 0.18 years which is considerably less than the general average. In all but two of this group, one or two teeth had been extracted from the lower arch. Where the extraction was unilateral, the third molar was erupted on the side of the extraction only.

Group B consisted of 23 individuals whose lower third molars had not erupted seven years after the beginning of the study and who had had one or two teeth extracted from the lower arch.

Group C was composed of 20 individuals whose lower third molars were not erupted after seven years observation and who had no extractions from the lower arch.

A number of variables were examined for each of these groups:

(1) age at commencement of the study;

(2) age at extraction for groups A and B;

(3) the angulation of the lower third molar to the mandibular plane at the beginning of the study;

(4) the amount of change in the angulation of the lower third molar between the beginning of the study and the eruption of the lower third molar or the time of examination (8th set of records); and

(5) the amount of growth of the mandible between the beginning of the study and eruption of third molars or 8th set of records measured between articulare and pogonion.

The last three variables were measured on cephalometric radiographs taken at yearly intervals, 3 and 4 on 60° rotated views and 5 on a 90° left lateral view.[12] Figure 1 illustrates the

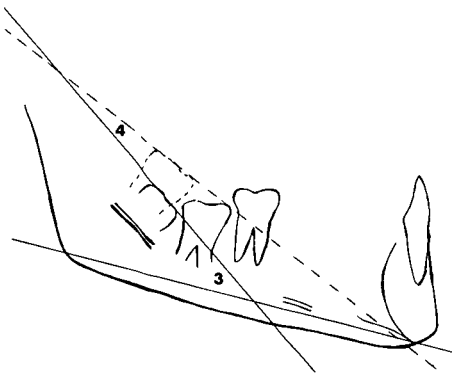

Fig. 1 Illustrating the measurement of the angulation of the lower third molar to the mandibular plane (3) and the change in angulation of the lower third molar during the observation period (4).

measurement of variables 3 and 4. A tracing was made of the first radiograph outlining the mandible, the mandibular symphysis, the inferior dental canal and the lower third molar. The mandibular plane and a line through the occlusal surface of the third molar were drawn and the angle between these lines (3) was measured. This tracing was superimposed on the later radiograph using the inner outline of the mandibular symphysis and the inferior dental canal for registration, keeping the lower borders of the mandible parallel. The new position of the third molar was drawn and the change in its angulation (4) measured on the tracing.

Results

Means were calculated for each variable for each of the three groups considering right and left sides separately where appropriate, (Table I) and comparisons of group means were made by Analyses of Variance (Table II).

Significant differences occurred between the group means in respect of variables 3, 4 and 5. The level of significance used was $P<0.05$.

The initial angulation of the lower third molar to the mandibular plane was significantly smaller in the group where third molars had erupted early than in the unerupted third molar extraction group or the nonextraction group on the right side.

During the period of study there was a significantly greater change in the angulation of the lower third molar in the erupted third molar group than in the nonextraction group on both sides, and between the erupted third molar group and unerupted third molar extraction group on the left side.

In the erupted third molar group the mandible grew significantly more than in the nonextraction group.

The three variables for which left and right sides were considered separately were checked for differences between sides using a series of paired "t" tests; the results are shown in Table III. Only subjects with bilateral third molars were used in these tests. Only one significant difference occurred between right and left sides; that was in group C for variable 3.

The two extraction groups were examined regarding the particular teeth which had been removed. Table IV shows the numbers and percentages of different teeth extracted in these two groups. It can be seen from these figures that, in the erupted third molar group, the teeth extracted were predominantly molars while in the unerupted third molar extraction group the teeth extracted were predominantly premolars.

Discussion

The evidence presented here seems to support certain observations on the eruption of lower third molars.

The high proportion of extraction cases (94%) in the early eruption group and the fact that in unilateral extraction cases only the third molar on the extraction side had erupted seem to indicate that extraction of a posterior

TABLE I
Showing the group means for each variable.

		A Erupted $\overline{8}$	B Unerupted $\overline{8}$ Extraction	C Nonextraction
1. Age at 1st set of records (years)		10.36	10.13	10.30
2. Age at extraction (years)	(left	11.58	11.50	—
	(right	11.41	11.33	—
3. Angulation of $\overline{8}$ to Mandibular Plane (degrees)	(left	34.94	42.58	39.25
	(right	34.17	41.62	45.72
4. Change in angulation of $\overline{8}$ between 1st and 8th sets (degrees)	(left	24.88	14.13	13.00
	(right	26.71	20.02	13.00
5. Growth of mandible 1st - 8th sets (mm)		15.63	14.30	11.62

TABLE II
Analyses of Variance

		Between Groups Mean Square	Within Groups Mean Square	Degrees of Freedom Between Groups	Degrees of Freedom Within Groups	F	P
1. Age at 1st set of records (years)		0.37	0.86	2	73	0.43	>0.05
2. Age at ext. (years)	Left	0.06	2.21	1	44	0.03	>0.05
	Right	0.04	2.28	1	48	0.02	>0.05
3. Angulation $\overline{8}$ M.P. 1st set (degrees)	Left	348.39	118.99	2	65	2.93	>0.05
	Right	834.14	146.73	2	67	5.69	<0.01
4. Change in angulation of $\overline{8}$ between 1st and 8th sets (degrees)	Left	1060.22	276.35	2	65	3.84	<0.05
	Right	1090.16	239.83	2	67	4.55	<0.05
5. Growth of mandible 1st set - 8th set (mm)		100.43	21.43	2	73	4.69	<0.05

TABLE III
Showing differences between measurements made on left and right sides.
Paired "t" tests.

Variable	Group	No. in group (pairs)	Mean Left	Mean Right	Diff. (L-R)	S.E. of Diff.
Age at extraction (years)	A	24	11.46	11.46	0.0	±0.06
	B	18	11.39	11.22	0.17	±0.12
Angle $\overline{8}$ / M.P. 1st set. (degrees)	A	26	35.58	33.35	2.23	±2.13
	B	18	42.41	41.44	0.97	±3.41
	C	18	37.83	45.72	—7.89*	±2.69
Change in angulation of $\overline{8}$ between 1st and 8th sets (degrees)	A	26	24.97	26.60	—1.63	±3.68
	B	18	17.47	20.03	—2.56	±4.58
	C	18	11.89	13.00	—1.11	±3.03

*Denotes differences significantly different from zero at $P<0.05$

A: Erupted $\overline{8}$ group

B: Unerupted $\overline{8}$ extraction group

C: Nonextraction group

TABLE IV
Showing the varieties of teeth extracted.

Teeth Extracted		First Premolar	Second Premolar	First Molar	Second Molar	Total	% Molars	% Premolars
Erupted $\overline{8}$	No:	13	5	27	10	55	67%	32%
Group	%	23.6	9.0	40.3	18.2			
Unerupted $\overline{8}$	No:	25	8	7	1	41	19%	80%
Ext. Group	%	61	19.5	17.1	2.4			

tooth encourages eruption of the third molar. This complements the findings of Fanning[5] who quotes median ages for third molar eruption in Bostonians and notes that these ages are reduced by extraction of permanent teeth.

The higher percentage of molar extractions as opposed to premolar in the early third molar eruption group and the reverse in the noneruption extraction group seem to indicate that molar extractions have more influence on third molar eruption than premolar extractions.

It is obvious from this material that extraction is not the only factor influencing the eruption of the third molar. The original angulation of the third molar to the mandibular plane is significantly lower in the early eruption group than in the unerupted extraction group or the nonextraction group although, in the latter, this difference does not reach the level of significance on the left side, but it is in keeping with the general trend.

Thus, in the early eruption group, a lesser degree of uprighting of the third molar was required during eruption.

The amount of change in the angulation of the lower third molar during the period of observation was significantly greater in the erupted third molar group than in the nonextraction group or in the unerupted extraction group; although in this last group the difference did not reach the level of significance on the right side, it was clinically a considerable difference.

Thus in the early eruption group there was a greater change in the angulation of the third molar than in the other two groups even though the third molars in this group were in a more favourable position for eruption.

The amount of growth of the mandible was significantly greater in the erupted third molar group than in the nonextraction group, but the unerupted third molar extraction group did not differ significantly from either of the other two groups in respect of growth. It seems, therefore, that mandibular growth is a contributory factor to third molar eruption but its effect is not clear. Björk noted that mandibular growth could be mainly vertical or mainly sagittal and found that more third molar impactions occurred when mandibular growth was mainly vertical.

The direction of mandibular growth might partly explain the present findings; this, together with other factors including the degree of crowding of the dental arch and the size and shape of the jaws, will be subject to further investigation.

Conclusions

Some factors associated with early eruption of lower third molars are:

1) a small initial degree of angulation of the developing lower third molar to the mandibular plane;
2) a large amount of change in this angulation;

3) a large amount of growth of the mandible; and
4) extraction of a tooth from the corresponding buccal segment, particularly a molar.

School of Dentistry,
Grosvenor Road,
Belfast BT 12 6BA
Northern Ireland

ACKNOWLEDGMENT

I am very grateful to Dr. J. D. Merrett for advice on statistical procedures.

REFERENCES

1. Banks, H.V.:Incidence of third molar development. *Angle Orthodont,* 4:223, 1934.
2. Björk, A., Jensen, E., and Palling, M.: Mandibular growth and third molar impaction. *Europ. Orthodont. Soc. Trans.*, 164, 1956.
3. Cryer, B. S.: Third molar eruption and the effect of extraction of adjacent teeth. *Dent. Practit.*, 17:405, 1967.
4. Dachii, S. F. and Howell, F. V.: A survey of 3,874 routine full mouth radiographs. II. A study of impacted teeth. *Oral Surg.*, 14:1165, 1961.
5. Fanning, E. A.: Third molar emergence in Bostonians. *Am. J. Phys. Anthrop.*, 20:339, 1962.
6. Faubion, B. H.: Effect of extraction of premolars on eruption of mandibular third molars. *J. Amer. Dent. Ass.* 76:316, 1968.
7. Garn, S. M., Lewis, A. B. and Bonné, B.: Third molar formation and its developmental course. *Angle Orthodont.* 32: 270, 1962.
8. Gravely, J. F.: A radiographic survey of third molar development. *Brit. Dent. J.*, 119, 9, 397, 1965.
9. Haralabakis, H.: Observations on the time of eruption, congenital absence, and impaction of the third molar teeth. *Trans. Europ. Orthodont. Soc.*, 308, 1957.
10. Hellman, M.: Our third molar teeth, their eruption, presence and absence. *Dent. Cosmos.* 78: 750, 1936.
11. Huggins, D. G.: Eruption of lower third molars following orthodontic treatment. *Brit. Soc. Study Orthodont. Trans.*, 67, 1962.
12. Richardson, M. E.: The early developmental position of the lower third molar relative to certain jaw dimensions. *Angle Orthodont.* 40, 3, 226, 1970.
13. Smith, D. I.: The eruption of third molars following extraction of second molars. *Brit. Soc. Study Orthodont. Trans.* 55, 1957.