

# Development of the Lower Third Molar from 10 to 15 years

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The lower third molar develops in the angle of the mandible with its occlusal surface at an angle to the mandibular plane. As has been shown in a previous paper,<sup>4</sup> this angle can vary from  $11^\circ$  to  $83^\circ$  with an average of  $38^\circ$  at age ten years, but no definite relationship could be established between this angular developmental position and various dimensions of the teeth and jaws.

The present investigation was undertaken to examine the changes in position of the developing lower third molar and their relationships to various other factors.

## MATERIAL

From the records of a longitudinal study into the development of third molars a group of forty-six children who had had no teeth extracted from the lower arch and who had been recorded over a period of five years were selected. For each subject there were six sets of records taken at yearly intervals starting at an average age of ten years. Each set included plaster models of the teeth and four cephalometric radiographs,  $90^\circ$  left lateral, straight postero-anterior,  $60^\circ$  right and left lateral views.<sup>4</sup>

## MEASUREMENTS

Tracings were made on the first set of  $60^\circ$  lateral films of the outline of the mandible, the inferior dental canal, the most procumbent lower incisor, and first, second, and third molars. On each tracing the mandibular plane was marked joining gonion to menton and a line drawn through the occlusal surface of the third molar. The angle formed between these two lines was

measured ( $x_1$ ). These tracings of the first set of films were then transferred to the sixth set of films superimposing so that the tip of the chin, the inner outline of the mandibular symphysis and the inferior dental canal coincided as far as possible;<sup>2</sup> the new position of the third molar was traced and a line drawn through its occlusal surface. The angle between the two third molar occlusal lines was a measure of the angular difference in the position of the third molar ( $x_2$ ) as in Figure 1.

The linear change in position was measured as the distance between the points where the occlusal lines crossed the mesial surface of the third molar ( $x_3$ ).

Growth of the mandible was measured on the  $90^\circ$  left lateral films as the distance from articular to pogonion ( $y$ ).

## RESULTS

The angle of the lower third molar to the mandibular plane at age ten years was  $40.78^\circ$  on average, varying from  $70.0^\circ$  to  $12.5^\circ$ . The change in

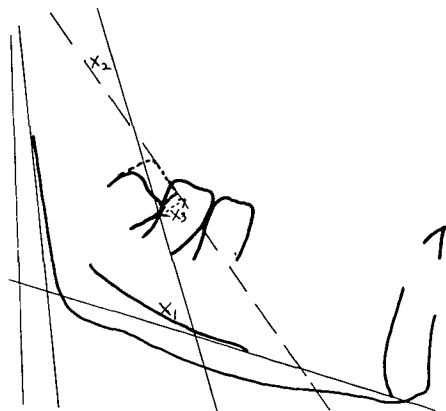


Fig. 1 Illustrating the measurements made on radiographs.

| Correlation Coefficients: Right Side N = 46                         |       |       |       |      | Correlation Coefficients: Left Side N = 46                          |       |       |       |      |
|---------------------------------------------------------------------|-------|-------|-------|------|---------------------------------------------------------------------|-------|-------|-------|------|
| $x_1$                                                               | $x_2$ | $x_3$ | $x_4$ | $y$  | $x_1$                                                               | $x_2$ | $x_3$ | $x_4$ | $y$  |
| $x_1$                                                               | 0.63* | 0.24  | 0.96* | 0.01 | $x_1$                                                               | 0.60* | 0.01  | 0.96* | 0.04 |
| $x_2$                                                               |       | 0.05  | 0.83* | 0.16 | $x_2$                                                               |       | 0.20  | 0.79* | 0.14 |
| $x_3$                                                               |       |       | 0.16  | 0.12 | $x_3$                                                               |       |       | 0.06  | 0.03 |
| $x_4$                                                               |       |       |       | 0.07 | $x_4$                                                               |       |       |       | 0.01 |
| $R_{x_1, x_2, x_3, y} = 0.7010^*$<br>$R_{x_1, x_2, x_3} = 0.6899^*$ |       |       |       |      | $R_{x_1, x_2, x_3, y} = 0.6336^*$<br>$R_{x_1, x_2, x_3} = 0.6044^*$ |       |       |       |      |
| * denotes significance at 1% level                                  |       |       |       |      | * denotes significance at 1% level.                                 |       |       |       |      |

TABLE I

TABLE II

angulation of the third molar between ten and fifteen years was on average 11.2°, ranging from 42.5° to 20.0°.

The linear change over the same period averaged 5.4 mm, ranging from 1 mm to 14.5 mm.

The mandibular growth increment for the five year period averaged 11.4 mm ranging from 4 mm to 19.5 mm. Most subjects appeared to grow fairly steadily, increasing about 2 mm annually, but some showed pronounced growth spurts.

STATISTICAL ANALYSIS

Zero order correlation coefficients were calculated between the following variables: the angle of the lower third molar to the mandibular plane on the first film ( $x_1$ ), the measured change in the angle of the lower third molar on the first and sixth films ( $x_2$ ), the linear change in position of the lower third molar on the first and sixth films ( $x_3$ ), and the amount of growth between first and sixth films ( $y$ ).

The results are shown in Tables I and II.

Significant correlation coefficients were found between  $x_1$  and  $x_2$ , 0.63 (right) and 0.60 (left). However, these two indices are not completely independent of one another and spurious results may be introduced into the correlations. To check the validity of the

correlation between  $x_1$  and  $x_2$  the mean of the measurement of the angulation of the third molar to the mandibular plane on the 1st and 6th films ( $x_4$ ) was used instead of  $x_1$  according to a method described by Oldham.<sup>3</sup>

The correlation coefficients between  $x_4$  and  $x_2$  were 0.83 (right) and 0.79 (left).

This would seem to indicate that there is, in fact, a strong positive correlation between the change in angulation of the third molar and its original angulation, part of which may be masked by the fact that the indices are not completely independent. Multiple correlation coefficients including the four original variables were calculated and gave figures of 0.70 (right) and 0.63 (left). On the right side this multiple correlation coefficient was not significantly reduced by omission of the growth measurement  $y$ , and on the left side omission of  $y$  and  $x_3$  did not significantly reduce the correlation.

These findings indicate that  $x_3$  contributes to the relationship of the variables on the right side but not on the left, and that the growth measurement  $y$  is not involved in the relationships on either side.

DISCUSSION

The average change in angulation of the lower third molar of 11.2° from

ten to fifteen years of age indicates a tendency for this tooth to become more upright; the angle of the lower third molar to the mandibular plane tends to decrease. Of the ninety-two third molars examined only ten showed an increase in this angle.

The correlation analysis shows that the steeper the angle of the lower third molar to the mandibular plane at ten years, the more this angle will decrease during the next five years. This does not necessarily mean that a third molar developing at a very steep angle to the mandibular plane can upright sufficiently to permit its eruption. It will be interesting at the end of this longitudinal study to check on the relationship of impaction of the third molar to its angular developmental position. Björk<sup>1</sup> could find no difference in angulation at twelve years of age between those third molars which became impacted at twenty years and those which did not; but at age twelve years some change in angulation may already have taken place. The material in the present study starting at an average age of ten years may show a relationship which Björk's material did not.

The correlation analysis shows no relation between changes in position of the lower third molar and growth in length of the mandible between ten and fifteen years. Björk showed that growth of the mandible was one of the factors which contributes to making space for the third molar, but the present findings suggest that this is not apparently a simple relationship of growth permitting the third molar to erupt or lack of growth inhibiting this change.

#### CONCLUSIONS

1. There is an average decrease in the angle of the lower third molar to the mandibular plane of 11.2° between ten and fifteen years of age.
2. The average linear change in position of the lower third molar over the same period is 5.4 mm.
3. The mandible grows on average 11.4 mm during this five year period.
4. The steeper the angle of the molar to the mandibular plane at ten years, the more it is likely to upright in the ensuing five years.
5. This change in angulation seems to be independent of any mandibular growth change which is taking place.

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