

Foetal Retrognathia and the Cranial Base

R. H. BIRCH, M.D.S., F.D.S.R.C.S.

INTRODUCTION

The profile appearance of the human foetal skull suggests a differential in growth rate of upper and lower jaws. As a result of this process a temporary mandibular retrognathia was thought to develop during the later part of intrauterine life.

Scott³ considers that there is no rigid pattern of growth and that it may be rapid in one dimension and retarded in another and at various periods the emphasis of growth may be reversed. Ford¹ found the lower jaw was more retrognathic in relation to the upper between 12-20 weeks than at either the beginning or end of the foetal period. Orban² gives what he considers to be a specific example of a sudden spurt in growth rate when he describes the foetal mandible developing a protrusive relationship to the maxilla prior to the descent of tongue and fusion of the palatine processes. Later the mandible again lags behind the maxilla and a temporary physiological retrognathia results.

The present investigation is a cross-sectional study of the relationship of the mandibular symphysis to the cranial base between the 10th and 27th week in utero and also to ascertain linear changes of other structures in the median sagittal plane.

MATERIALS AND METHODS

The foetal material consisted of 132 skulls aged between 10 and 27 weeks which were hemisected in the median sagittal plane. Foetal age was determined on the basis of crown rump measurements and foetal weight with reference to Streeter's⁴ growth curve.

The points from which linear mea-

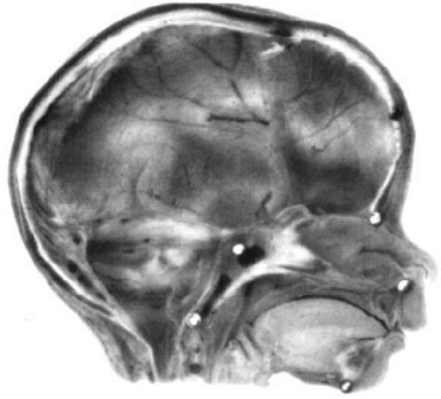


Fig. 1 Points from which linear assessments were recorded.

surements were made are shown in Figure 1 and are described as follows: nasion, basion, ANS, menton, and S [center point of the arc formed by the base of pituitary fossa in the sagittal plane]. The distances were assessed with calipers to an accuracy of 0.01 mm.

RESULTS

A series of nine graphs represents each of the dimensions plotted against the crown rump measurement. This allows a common basis against which the dimensional increases can be compared.

The graphs are arranged in three groups. *Group I* shows relative dimensional changes of points identified on the cranial base (Fig. 2). *Group II* indicates the linear increase between mandibular symphysis and the three points N, S and B (Fig. 3). In *Group III* the tip of the anterior nasal spine is related to the three points (N, S and B) on the cranial base (Fig. 4).

Tables I, II and III provide the basis for a diagrammatic representation (Fig. 5) of areas of relatively greater or less-

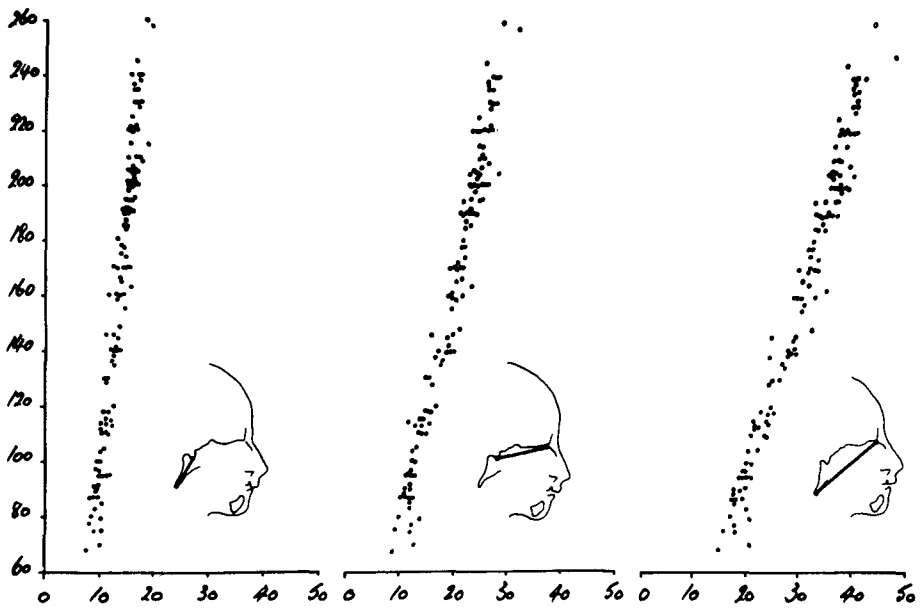


Fig. 2 Composite graph of the foetal BS, NS and BN dimensions plotted against crown-rump measurements.

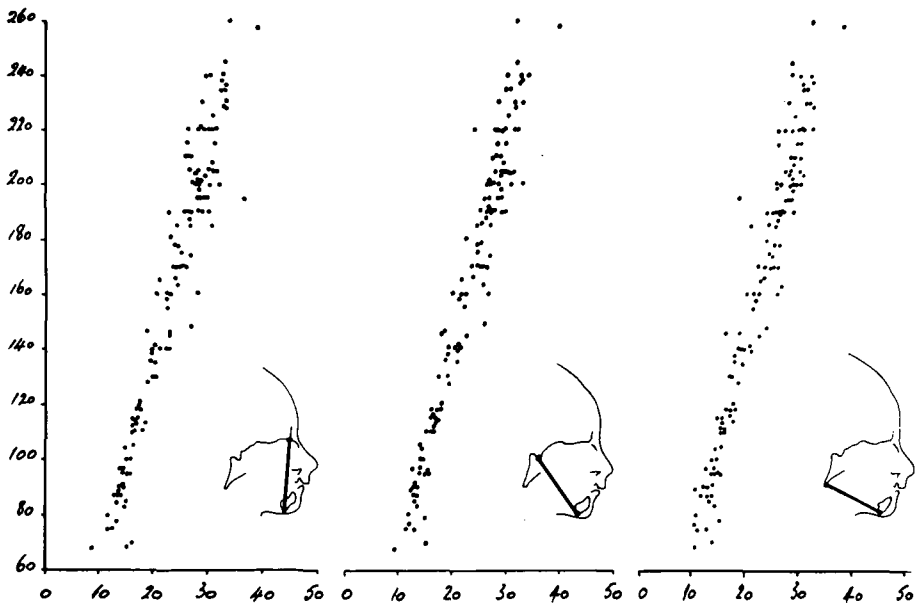


Fig. 3 Composite graph of the foetal NM, SM and BM dimensions plotted against crown-rump measurements.

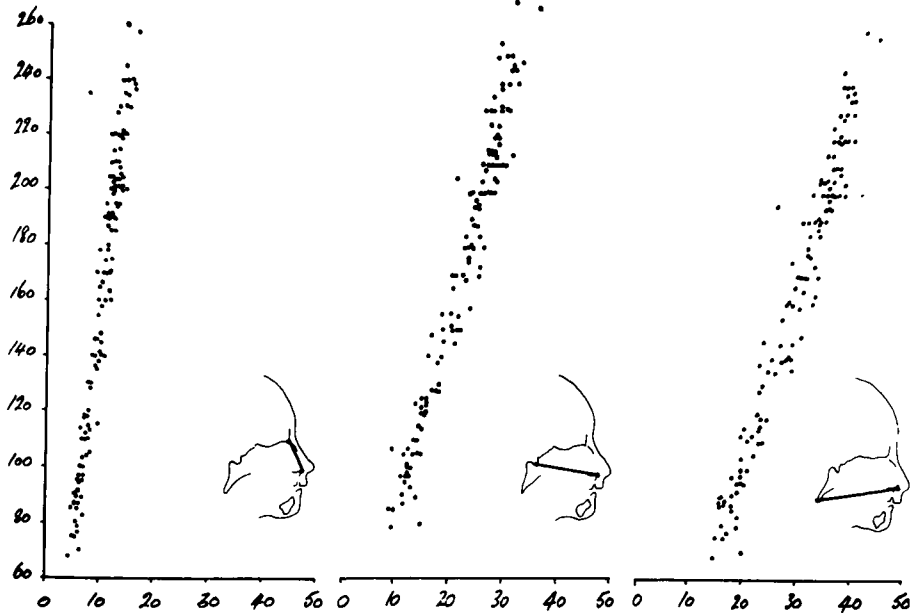


Fig. 4 Composite graph of the foetal N.ANS, S.ANS and B.ANS dimensions plotted against crown-rump measurements.

TABLE I

	<u>Linear Increases</u> (10 - 27 wks)
BS	12.0 mm
NS	24.5 mm
BN	34.0 mm

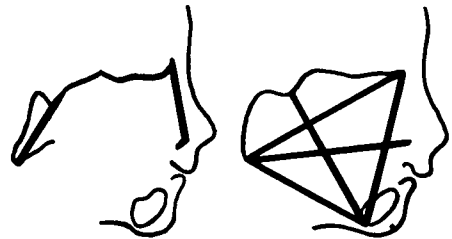


Fig. 5 Diagram illustrating areas of greater and lesser dimensional increase.

TABLE II

	<u>Linear Increases</u> (10 - 27 wks)
NM	31.0 mm
SM	31.5 mm
BM	30.0 mm

ser linear increase in the median sagittal plane.

Relation of Mandibular Symphysis to Cranial Base

TABLE III

	<u>Linear Increases</u> (10 - 27 wks)
N.ANS	12.0 mm
S.ANS	27.0 mm
B.ANS	31.5 mm

In order to compare the changes in the position of the mandibular symphysis (M) relative to the three cranial base points (N, S and B in Fig. 1), correlation coefficients were carried out to determine the strength of the association of each linear increase with each individual foetal increase in crown rump measurement (Table IV).

TABLE IV

Foetal Relationship of Cranial
Base to Mandibular Symphysis

Dimension	Linear Increase	r*
NM	31.0 mm	0.41
SM	31.5 mm	0.41
BM	30.0 mm	0.42

* Correlation coefficient

If the sudden alterations in mandibular growth rate postulated by Orban occur during the 10-27-week period, one would have anticipated that there would be some reflection of this change in the curve representing the linear increase of mandibular symphysis from basion.

The graph of actual linear change (BM) is shown in Figure 6 together with a hypothetically retarded curve representing a fall in the anteroposterior growth of the mandible (of 37 per cent after the 180 mm C.R. stage) and an increase in its relative retrognathia. The corresponding correlation coefficients are shown in Table V.

CONCLUSIONS

1. In the nine consecutive graphs (Figs. 2, 3 and 4) the linear increases are shown to occur in a regular manner when compared with increases in crown rump length and, within the limits of the investigation, sudden alteration of rates of increase in any of the linear dimensions cannot be seen.

2. The similarity between linear increases from the mandibular symphysis to the three points of the cranial base and also the closeness of their respective correlation coefficients suggest a uniform relationship of these structures during this growth period.

3. The anteroposterior linear increases of both ANS and mandibular symphysis from basion parallel each other very closely.

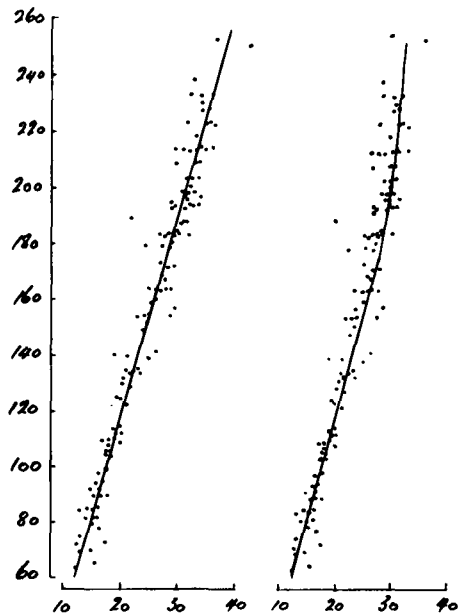


Fig. 6 Graphs representing the actual linear increase in BM (left) as compared with a hypothetically retarded growth curve (right) for the same dimension.

TABLE V

Comparative Correlation Coefficients

Dimension	r
BM	0.42
Retarded BM increases	0.23

4. The graphs and the correlations indicate that the state of mandibular retrognathia is a common and fairly constant feature during the whole period under consideration (Fig. 7).

5. In the midsagittal plane the anterior limb (N-S) of the cranial base increases its linear dimension at twice the speed of the posterior limb (B-S).

6. The vertical midline dimensional increase in the upper face is less than half of the anteroposterior increase in the same region.

7. Linear increases suggest that the



Fig. 7 Photographs of retrognathia in foetal specimens during the 10-27-week period.

mandibular symphysis moves downwards and forwards in a balanced vector.

*Univ. of Liverpool
Liverpool 7, England*

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