An objective measurement to diagnose micrognathia on prenatal ultrasound

G. Palit, Y. Jacquemyn, M. Kerremans

Department of Obstetrics and Gynaecology Antwerp University Hospital UZA, Edegem (Belgium)

Summary

Purpose: We introduce the frontal naso-mental angle as an objective measurement for the prenatal detection of fetal retrognathia. The aim of this study is to present normal values for the frontal naso-mental angle from 18 to 35 weeks gestational age. *Materials and methods:* In 81 patients between gestational ages 18 and 35 weeks the frontal naso-mental angle was measured on a profile view of the foetal face. The values were compared with four cases of proven Pierre Robin syndrome. *Results:* The frontal naso-mental angle is not dependent on gestational age, the mean value is 146.74°, standard deviation 2.7°; 5th percentile 142°, 95th percentile 151°. All four cases of Pierre Robin syndrome demonstrated a significantly lower frontal naso-mental angle below the 5th percentile. *Conclusion:* The frontal naso-mental angle represents an objective way to diagnose retrognathia.

Key words: Retrognathia; Pierre Robin syndrome; Prenatal diagnosis; Foetal face.

Introduction

The prenatal ultrasound diagnosis of micrognathia, characterized by a small mandible and receding chin, is usually made on a subjective basis. On sagittal images of the foetal face a small receding chin and a lower lip residing posterior to the upper lip may be detected [1]. Charts of normal sonographic measurement of the mandible have been published [2, 3]. True posterior replacement of the chin with a mandible of normal dimension is known as retrognathia, and by definition is not diagnosed by measuring the mandible. Different approaches to the prenatal diagnosis of retrognathia and micrognathia have been published [4, 5].

In several cases involving more subtle degrees of micrognathia-retrognathia, we have been involved in discussions on the subjective interpretation of the foetal profile. Therefore we aimed at developing a simple and objective measurement that allows easy identification of micrognathia and/or retrognathia in the more doubtful cases.

Methods

We introduce the frontal naso-mental angle on a midsagittal view of the foetal face which is defined by two lines (Figure 1): one from the most prominent point of the bony part of the foetal forehead (os frontale) to the tip of the visible soft tissues of the nose, and the other from the most prominent point of soft tissue of the foetal chin (mandible) to the tip of the visible soft tissue of the nose. The measurement is performed with the head in a neutral position (no extension or flexion of the neck) and the mouth closed.

All ultrasound examinations were performed with an ALOKA SSD 1700 and a 5 MHz curvilinear abdominal probe. A printout was made of the midsagittal image of the foetal face and the frontal naso-mental angle was measured manually with a graduated arc after drawing the two lines on the printout. To have an impression on intraobserver variability one observer measured the frontal naso-mental angle twice with a 5-10 min interval in ten foetuses. To study interobserver variation, ten foetuses were measured independently by two examiners.

Ultrasound examinations were performed between 18 and 35 weeks. After 35 weeks a correct foetal profile can only rarely be obtained.

Data for normal foetuses were plotted and compared with four cases of postnatally proven Pierre Robin syndrome.

Calculations were performed with SPSS 12.0. For intra- and interobserver variation the mean difference between measure-

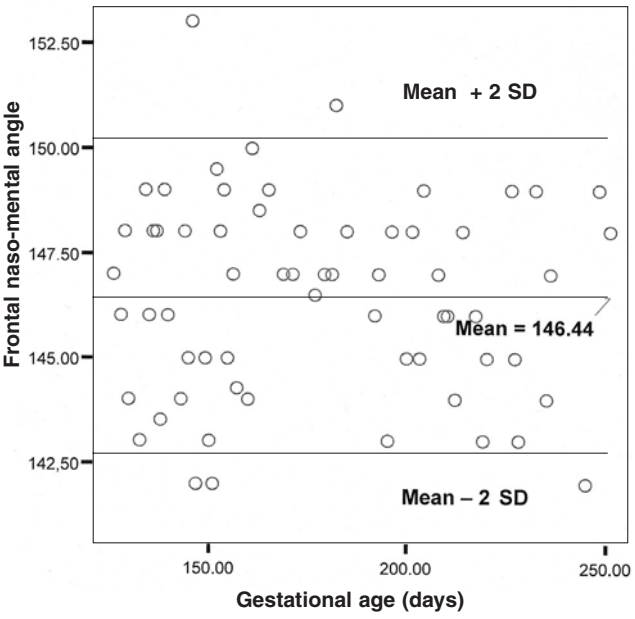

Figure 1. — Measurement of the frontal naso-mental angle in a normal foetus (left) and in a case of Pierre Robin syndrome (right).

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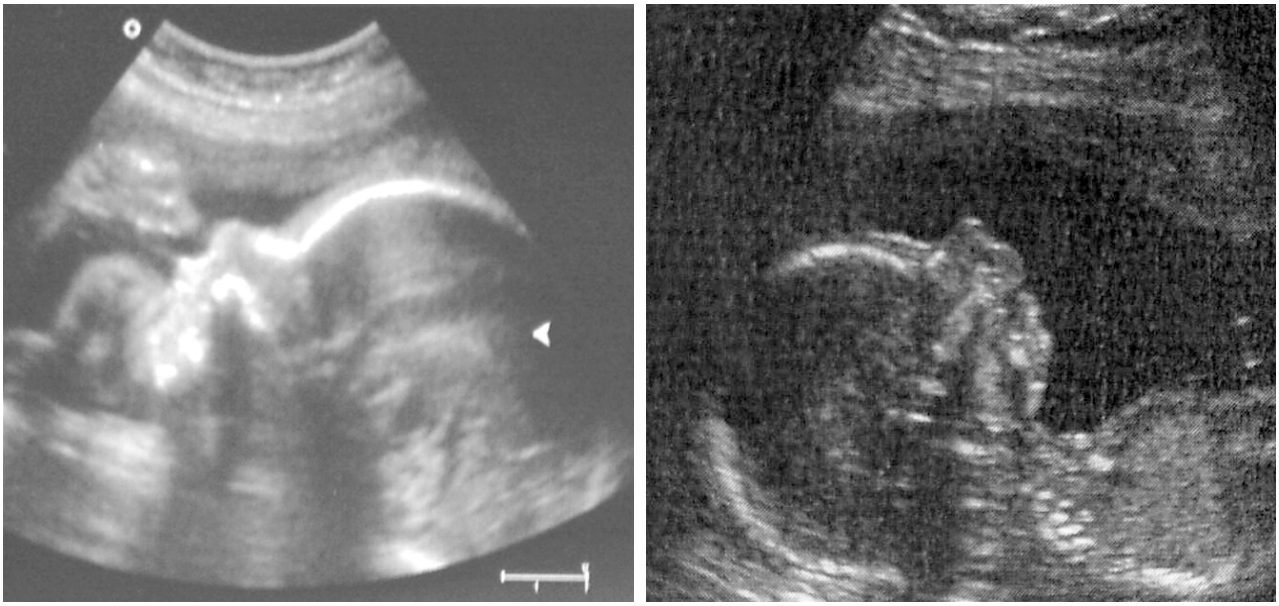

Figure 2. — Plotted measurement of the frontal naso-mental angle with mean and two standard deviations.

ments and the standard deviation were determined. The mean, standard deviation, 5th and 95th percentiles were calculated.

Results

An overview of the frontal naso-mental angle measurement in 81 foetuses between 18 and 22 weeks is shown in Figure 2. It is clear from Figure 2 that the frontal naso-mental angle does not significantly change with gestational age (in linear regression p = 0.58 for gestational age).

The mean frontal naso-mental angle was 146.4°, standard deviation 2.77°, 5th percentile 142°, 95th percentile 151°. The values in four foetuses with postnatally proven Pierre Robin syndrome were 115° (at 27 weeks), 123° (at 22 weeks), 119° (at 19 weeks) and 120° (at 21 weeks); all clearly below the 5th percentile of 142°.

The mean difference between measurements for intraobserver variation was 2° (standard deviation 1.15°) maximal difference 4° and for interobserver variation 2.5° (standard deviation 1.19°), maximal difference 4°.

Discussion

The Online Mendelian Inheritance in Man (OMIM) database at the National Library of Medicine includes 211 genetic conditions with micrognathia and/or retrognathia [6]. Affected foetuses are at increased risk for an abnormal karyotype and amniocentesis should be offered.

Possible complications of micrognathia-retrognathia include hydramnios, neonatal respiratory obstruction, difficult infant feeding and the need for several surgical repair procedures.

Care should be taken to obtain a correct midsagittal profile; an oblique sagittal view will result in a false impression of micrognathia or retrognathia. It has been suggested that three-dimensional multiplannar imaging facilitates the realisation of a true midsagittal view [7].

Subjective interpretation of 2-D images that are mentally interpreted by the sonologist can result in discussion on whether micrognathia-retrognathia is or is not present.

Some have advocated mandibular measurements for this assessment [2], while others have applied a newborn parameter, the jaw index, to foetal ultrasound [8]. This method improved the detection rate of micrognathia as compared to subjective evaluation (sensitivity rises from 72.7% to 100%).

It is possible that the frontal naso-mental angle as we propose it is influenced by ethnic factors but our data do not allow for this analysis.

There is certainly need for a prospective study to compare the detection rate of micrognathia by subjective evaluation of the facial profile versus the frontal naso-mental angle and/or the jaw index.

Conclusion

Measurement of the frontal naso-mental angle seems to be a simple and reproducible method for an objective diagnosis of micrognathia.

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Address reprint requests to:
Y. JACQUEMYN, M.D.
Department of Obstetrics and Gynecology
Antwerp University Hospital UZA
Wilrijkstraat 10
B-2650 Belgium
e-mail: yves.jacquemyn@uza.be