Normative values of fetal nasal bone lengths of Turkish singleton pregnancies in the first trimester

Abstract

Objective: Evaluation of nasal bone improves the performance of first-trimester screening for trisomy 21. In this retrospective study we aimed to determine normative values related to the measurement of nasal bone length of the Turkish population during the first trimester ultrasonographic fetal screening.

Material and Methods: Medical records of singleton pregnancies, whose first trimester fetal screening was performed between 2004 and 2010, were evaluated retrospectively. Pregnancies with any detected/suspicious anatomical or genetic fetal anomalies, biochemical abnormalities, increased nuchal translucency measurements, and pregnancies of artificial reproduction techniques were excluded from data analyses. Mean±standard deviation, median and percentile values of the length of nasal bone were calculated separately for 11th, 12th and 13th gestational weeks.

Results: Nasal bone could be visualized in 99.6% of the included 1762 singleton pregnancies. In 16.5% of the cases nasal bones were not observed as present or absent. Mean maternal age was 29.67±4.50 years and mean gestational age was 12.54±0.61 weeks. Median values of nasal bone lengths were 1.7, 1.9, and 2.2 mm for 11th, 12th and 13th gestational weeks respectively. Nasal bone length (NBL) increased linearly with advancing gestational age and CRL. NBL (mm)= [0.298xGestational Age (weeks)] – 1.779, R²=0.318; p<0.001 and NBL (mm)= [0.023 x CRL (mm)] + 0.520, R²=0.331; p<0.001

Conclusion: The present study presents normative values of nasal bone in the first trimester screening of normal singleton pregnancies of Turkish population. Nasal bone length increases with advancing gestational age and CRL. (J Turkish-German Gynecol Assoc 2011; 12: 225-8)

Key words: Screening, nasal bone, pregnancy, ultrasonography, fetus

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Introduction
The nasal bones, which begin to develop as collections of neural crest cells, can be histologically demonstrated when the fetal crown-rump length is 42 mm (10.9 weeks) (1). Absence of nasal bone ossification is one of the key skeletal features of trisomy 21 (2). Thus, determination of absence of presence of nasal bone is being used in the fetal sonographic screening for trisomy 21 (3-8). The evaluation of the nasal bone has been also shown to improve the performance of first-trimester screening for trisomy 21 (9). However, interobserver and intraobserver variability is a limitation for the measurement of length of the nasal bone and experience was shown to be important in the use of the nasal bones as an additional sonographic marker in first trimester screening (10-14).

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Original Investigation
In this retrospective study we aimed to determine normative values related to the measurement of nasal bone length of the Turkish population during the first trimester ultrasonographic fetal screening.

**Materials and Methods**

All medical records of singleton pregnancies, whose first trimester fetal screening was performed between January 2004 and December 2010, were evaluated retrospectively. Ultrasonographic fetal screening were performed by one of two sonographers using one of two ultrasound machines (Voluson 730 Pro (U.S.A) and Philips 4000 (U.S.A)). Pregnancies with any detected/suspicious anatomical or genetic fetal anomalies, biochemical abnormalities, increased nuchal translucency measurements, and pregnancies of artificial reproduction techniques were excluded from the data analyses. Ultrasonographic evaluation and measurement of fetal nasal bone had been performed mostly transabdominally (in case of inadequate fetal position transvaginally) in accordance with previously stated in the literature (5, 6).

Mean±standard deviation, median and percentile values of the length of nasal bone were calculated separately for 11th-11 6th, 12th-12 6th, and 13th-13 6th weeks of gestational age. The linear regression analyses were done between the length of nasal bone and gestational week and CRL. Statistical analyses were done with SPSS ver. 14.0.

**Results**

In accordance with the inclusion and exclusion criteria, data of 1762 singleton pregnancies were analyzed. The nasal bone could be visualized in 99.6% of these 1762 singleton pregnancies. In 16.5% of the cases nasal bones were only noted as present or absent. Therefore demographics and ranges of nasal bones were studied in 1465 fetuses. The mean maternal age was 29.67±4.50 years and the mean gestational age was 12.54±0.61 weeks. The mean and percentiles of ultrasonographic measurements of nasal bone according to the gestational weeks are shown in Table 1. The mean and percentiles of ultrasonographic measurements of nasal bone according to the measurements of CRL are shown in Table 2.

NBL increased linearly with advancing gestational age and was described by the following equation; NBL (mm)=[0.298 x Gestational Age (week)]-1.779, R²=0.318; p<0.001. Again, a linear relationship was present between NBL and CRL and that was described by the following equation; NBL (mm)=[0.023xCRL (mm)]+0.520, R²=0.331; p<0.001 (Figure 1 and Figure 2).

**Discussion**

Genetic sonography is an important tool in prenatal fetal evaluation. Evaluation of the nasal bone has been suggested to improve the performance of first-trimester screening for trisomy 21 (3-9). Experience has been shown to be an important factor for the use of the nasal bone as an additional sonographic marker in first trimester screening (10-14). In most of the previous studies determining the presence of nasal bone for screen-
ing of trisomy 21 the ratio of successful examination varied
between 83.2% to 100% (4, 8, 14-18). However, in these studies
the determination ratio of trisomy 21 varied between 60% to
80% (4, 8, 14-18).

The ossification of the vomeral bone begins with two bilateral
ossification centers before ossification of the nasal bone and
then these two bilateral ossification centers fuse caudally below
the cartilaginous nasal septum, changing into a U-shaped bone
when observed in the coronal plane (1). The gap between
these structures may sometimes be misinterpreted as absence
of nasal bone (19).

In the literature, there are many studies indicating the nor-
mative values related to the length of nasal bone in different
geographical parts of the world (12, 20-24). The median values
of these nasal bone measurements vary from one study to
another. In the present study, the sample size is larger and our
results of nasal bone measurements were between the values
of two other studies with a large sample size (20, 23). The val-
ues related to various previous studies indicating nasal bone
measurements including the ones above mentioned are shown
in Table 3. In all of these studies the reference values have dif-
ferent ranges. The examinations were commonly performed as
transabdominal in the previous studies and as well our study
(12, 20, 24). However, our mean NBL findings differ negatively
at the 11\textsuperscript{th}, 12\textsuperscript{th} and 13\textsuperscript{th} gestational weeks from some of these
studies (12, 22, 23) and positively from some others (19, 23).
This difference might be due to ethnical difference (25) as well
as interobserver and intraobserver variability in the measure-
ment of length of the nasal bone (11, 13, 14). Variations may
also be due to the quality of the machine as well, however it
seems to be difficult to compare all these previous studies in
this sense as most had different brand types of sonographic
devices (12, 20-24). As a result, it seems to be impossible to
clarify whether these differences are solely due to ethical dif-
ference, interobserver/intraobserver variability or systematic
differences in these studies.

The nasal bone length has been already found to increase
linearly with advancing gestational week or CRL in the first
trimester (13, 20, 22-24). In this study NBL of Turkish singleton
pregnancies is also found to increase linearly with advancing
gestational week and CRL in accordance with these previous
studies in the literature.

**Conclusion**

This study presents normative values of nasal bone in the first
trimester screening of normal singleton pregnancies of the
Turkish population. In accordance with previous reports, nasal

**Table 3. Different studies indicating nasal bone measurements in the first trimester of pregnancy**

| Gestational Age | Percentile | Present Study | Casasbuena et al. (20) | Staboulidou et al. (21) | Chen et al. (22) | Sonek et al. (23) | Moon et al. (24) | Bekker et al. (12) |
|-----------------|------------|---------------|-----------------------|------------------------|-----------------|-----------------|-----------------|------------------|
| 11\textsuperscript{th} week | 5 | 1.3 | 1 | ** | ** | 1.4 | 1.2 | ** |
| | 50 | 1.7 | 1.5 | 1.73 | ** | 2.3 | 1.5 | 2.3 |
| | 95 | 2.2 | 1.8 | ** | ** | 3.3 | 1.9 | ** |
| 12\textsuperscript{nd} week | 5 | 1.5 | 1.2 | ** | 1.7 | 1.7 | 1.4 | ** |
| | 50 | 1.9 | 1.7 | 2.25 | 2.2 | 2.8 | 1.7 | 2.6 |
| | 95 | 2.4 | 2.2 | ** | 2.8 | 4.2 | 2.1 | ** |
| 13\textsuperscript{rd} week | 5 | 1.8 | 1.4 | ** | 2.0 | 2.3 | 1.6 | ** |
| | 50 | 2.2 | 1.9 | ** | 2.5 | 3.1 | 1.9 | 2.9 |
| | 95 | 2.8 | 2.4 | ** | 3.2 | 4.6 | 2.3 | ** |
| 14\textsuperscript{th} week | 5 | ** | ** | ** | 2.2 | 2.5 | 1.7 | ** |
| | 50 | ** | ** | ** | 2.9 | 3.8 | 2.1 | ** |
| | 95 | ** | ** | ** | 3.5 | 5.3 | 2.6 | ** |

**: data not given
bone length increases linearly with advancing gestational age and CRL. The values show variance similar to previous studies, which might be a consequence of ethnical difference or interobserver/intraobserver variability.

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**Conflict of interest**

No conflict of interest was declared by the authors.

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