Nomogram of Fetal Nasal Bone Lenght at 11-13^{+6} Gestational Weeks in Fetuses

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Abstract

Objective: To obtain nomogram of fetal nasal bone length at 11-13$^{+6.}$ weeks gestation with known prognosis pregnancies.

Methods: Nasal bone length of 394 choromosomal and structural normal fetuses at 11-13$^{+6.}$ weeks gestation were measured by transvaginal ultrasonography, prospectively. Crown-rump length (CRL), biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur leight (FL) were obtained in the meanwhile. The correlation between nasal bone and other biometric parameters was assessed by regression analysis and average ± SD of nasal bone lengths were measured at CRL 45-54, 55-64, 65-74, 75-84 mm.

Results: A linear growth pattern was observed between nasal bone and fetal biometric parameters. The significant correlation were found between the nasal bone and biparietal diameter (BPD) (y=0.7843+0.0566xBPD, R= 0.4701, p<0.001), head circumference (HC) (y=0.5973+0.0177xHC, r= 0.5141, p<0.001), femoral bone length (FBL) (y=1.4028+0.0758xFL, r=0.4763, p<0.001), abdominal circumference (AC) (y=0.6802+0.0214xAC, r= 0.4919, p<0.001) and crown-rump length (CRL) (y=0.7561+0.0197xCRL, r= 0.489, p<0.001). Nasal bone length increased significantly with CRL from respective means of 1.75±0.30, 1.94 ±0.29, 2.11± 0.35 and 2.27±0.29 mm at 45-54, 55-64, 65-74 and 75-85 mm.

Conclusion: Measurement of the nasal bone length at 11-13$^{+6.}$ weeks gestation shows a linear growth pattern according to other biometric parameters of fetuses. Nomogram of nasal bone length was performed for early detection of trisomy 21 and other chromosomal abnormalities at low risk population.

Keywords: Nasal bone, 11-13$^{+6.}$ weeks, transvaginal ultrasonography, nomogram.

11-13^{+6} Gebelik haftasındaki fetüslerde nazal kemik uzunluk nomogramı

Amaç: Prognozu bilinen gebeliklerde 11-13$^{+6.}$ gebelik haftalarında fetüsün nazal kemik nomogramının elde edilmesi.

Yöntem: Bu prospektif çalışmada 11-13$^{+6.}$ gebelik haftasında kromozomal ve yapısal olarak normal 394 fetusa ait nazal kemik ölçümü transvaginal ultrasonografi ile yapıldı. Ayrıca fetusun baş popo uzunluğu (CRL), bipariyetal çapı (BPD), baş çevresi (HC), karın çevresi (AC), femur uzunluğu (FL) ölçümleri yapıldı. Fetusa ait nazal kemik uzunluğu ile diğer biyometrik parametreler arasında regresyon analizi yapılarak regresyon katsayıları hesaplandı ve regresyon denklemleri yapıldı. CRL 45-54, 55-64, 65-74, 75-84 mm iken nazal kemik ortalama ve standart sapmaları hesaplandı.

Bulgular: Fetusun nazal kemik uzunluğu ile diğer biyometrik parametreleri arasında lineer tipte ilişki olduğu gözlendi. Nazal kemik ile CRL (y=0.7561+0.0197xCRL, R= 0.489, p<0.001), BPD (y=0.7843+0.0566xBPD, R= 0.4701, p<0.001), HC (y=0.5973+0.0177xHC, R= 0.5141, p<0.001), AC (y=0.6802+0.0214xAC, R= 0.4919, p<0.001) ve FL (y=1.4028+0.0758xFL, R=0.4763, p<0.001) arasında anlamlı korelasyon saptandı. CRL 45-54 mm iken nazal kemik ortalama ve standart sapması: 1.75±0.30, CRL 55-64 mm iken nazal kemik ortalama ve standart sapması: 1.94 ±0.29, CRL 65-74 mm iken nazal kemik ortalama ve standart sapması: 2.11± 0.35, CRL 75-84 mm iken nazal kemik ortalama ve standart sapması: 2.27±0.29 olarak bulundu.

Sonuç: Gebeliğin 110-13$^{+6.}$ haftalarında fetal nazal kemik uzunluğu fetusun biyometrik parametreleri ve gebelik haftası ile birlikte lineer olarak artış göstermektedir. Kendi populasyonumuzda, düşük risk grubundan elde edilen nazal kemik nomogramı, trizomi 21 ve diğer kromozomal anomalilerin erken tanısı için sunulmuştur.

Anahtar Sözcükler: Nazal kemik, 11-13^{+6} hafta, transvajinal ultrasonografi, nomogram.

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Introduction

It is determined that first ossification points were seen as CRL was 42 mm in radiographic and histological study in between 9th and 24th gestational weeks.[1] Vomer bones first grow from functional matrix; while it seems as U shape in the beginning, it join together as gestation advances and becomes V shape. Nonexistence or hypoplasia of nasal bone in 11-13+6 weeks knows fetuses with increased risk by high activity for trisomy 21 and other trisomies. It was first reported in 2001 that nasal bone was not observed in 60-70% of fetuses with trisomy 21 in ultrasonography examination in 11-13+6 weeks.[2] Normal lengths of hypoplastic nasal bones should be known in order to ascertain them. Evaluation of fetus nasal bone lengths by transvaginal ultrasonography as to gestational week and standard bone measurements in pregnancies continued and resulted normally and achieving growing nomogram for 11-13+6 gestational weeks are purposed in this work.

Methods

This work was arranged prospectively and done in 403 pregnants who applied to Gynecology Clinic of Training and Research Hospital in between 26th October 2004 – 29th October 2005. 403 fetuses having 45-84 mm CRL measurement are included to the study. Each patient was examined in 11th – 14th weeks by 7 mmHz vaginal transducer of Logic 400 Pro series (General Electric, U.S.A.) ultrasonography device by same gynecologist having the certificate of scanning. Biometric evaluation of fetus was done by CRL, BPD, HC, AC, FL measurements. Nasal bones were displayed in low brightness setting by about 45° angle in middle line and sagittal plan in which chin and lips of fetus were displayed within the area maxilla and frontal bone limit. Ultrasonography settings were adjusted as each calibration movement would be 0.1 mm. Required image was obtained for appropriate measurement by returning by means of setting of ultrasonography device. While ultrasonography probe was on neutral position of fetus, three different hyperechogenic lines parallel to nasal bone were observed. Ultrasonography settings were adjusted as it would disperse the image of bone edges minimally. Top limit of the bone was clearly seen individually from frontal bone. Upper line was observed as skin, more hyperechogenic lower line was observed as bone and line on the edge of nose was observed as part of skin (Figure 1). It was especially paid attention not to mistake nasal bone with echogenic skin line of nose. Nasal bone was evaluated two times and recorded individually. Data were collected in computer. S.P.S.S. 11.5 program was used for statistical analyzes. r coefficients of data were calculated by analyzing data by means of Pearson correlation test. Linear regression analyze was done between nasal bone and other biometric parameters. Lower P value than 0.05 was taken as statistical significant limit. Normal and standard deviations of nasal bone were calculated while CR was 45-54, 55-64, 65-74, 75-84 mm.

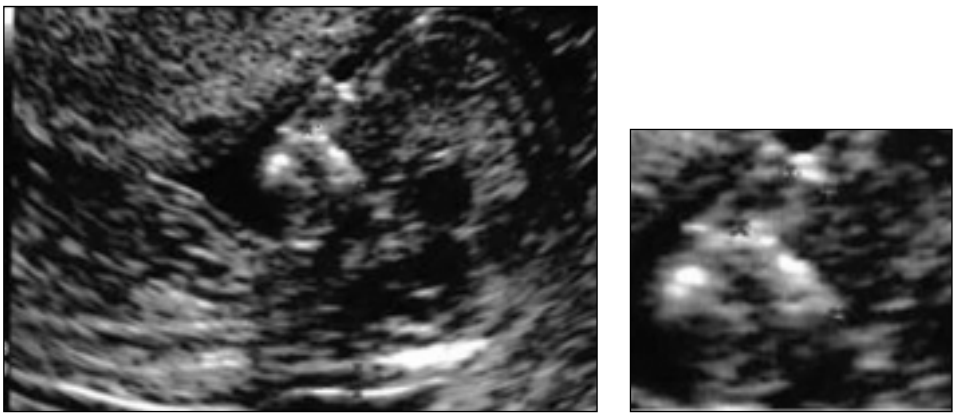

Figure 1. Nasal bone measurement.

Results

394 pregnants were found which suit to research criteria during study. Average gestation week was found as 12.40 ± 1.06. Average maternity age was 27.58 ± 5.69 and age interval was changing between 17 and 44. 3 of 403 fetuses had trisomy 21, 1 fetus had trisomy 18, 1 fetus was abortus in 12th week, 1 fetus had kyphoscoliosis, 1 fetus died as early birth in 26th week due to asymmetric intrauterine growing restriction, 1 fetus was discharged medically due to the fact that it was normal as karyotype but it had fetal anomaly and 1 fetus was discharged medically due to anencephaly and these 9 cases were not included to study while nomogram was being formed. Measurement was not done for 21 of 394 (5.3%) normal as chromosomally and structurally due to the fact that required position could not being obtained. Nasal bone measurements as to CRL were shown in Table 1. Nasal bone length of normal cases was increased linearly with CRL increase; a significant correlation between nasal bone length and CRL was found. When the regression analyze of relationship between nasal bone and CRL was done, regression equation was found as: y=0.7561 + 0.0197 x CRL, r=0.489, p<0.001 (Diagram 1). Also, statistically a significant correlation was found between nasal bone length and BDP, FL, AC and HC. When the regression analyze of relationship between nasal bone and BPD was done, regression equation was found as: y=0.7843 + 0.0566 x BPD, r=0.4701, p<0.001 (Diagram 2). When the regression analyze of relationship

Table 1. Nasal bone length as to CRL in normal cases.

CRL mm	n: 394	Measurable n: 373	Average maternity age	Nasal bone mm	
				Average ± SS	Change interval
45-54	55	50	28.20±5.56	1.75±0.30	1.0-2.6
55-64	137	130	27.47±5.65	1.94 ±0.29	1.2-2.8
65-74	137	132	27.71±5.53	2.11± 0.35	1.5-3.1
75-84	65	61	26.18±5.37	2.27±0.29	1.7-3.0

SS: Standard deviation

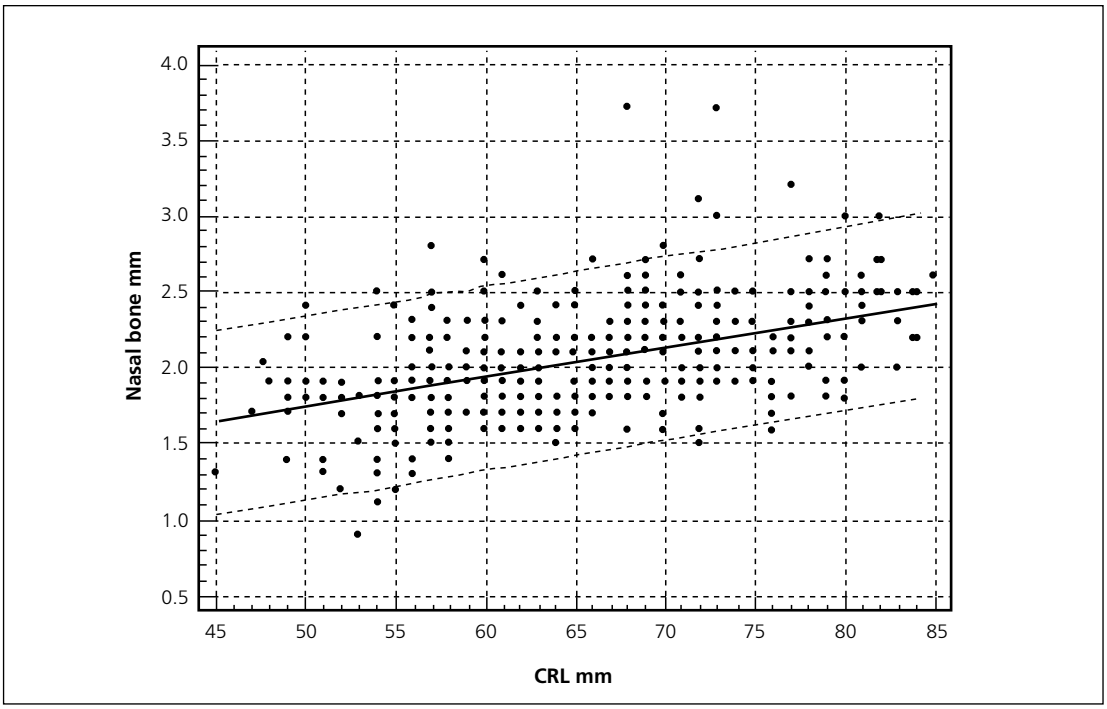

Diagram 1. Change of nasal bone length as to CRL.

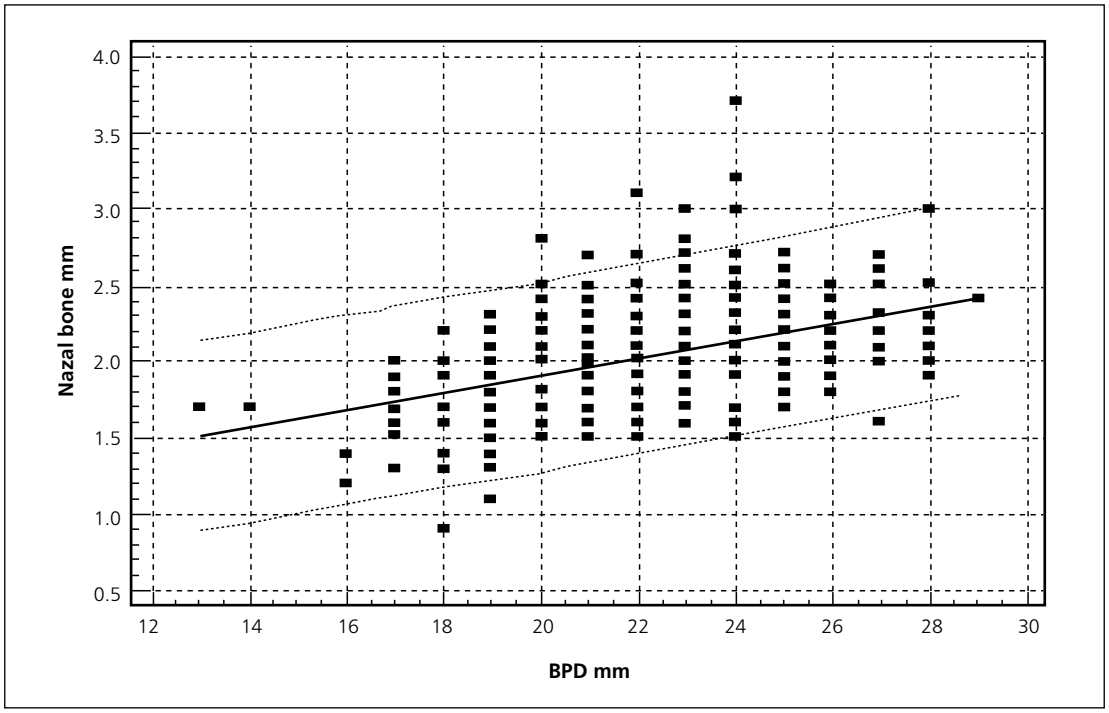

Diagram 2. Change of nasal bone length as to BPD.

between nasal bone and HC was done, regression equation was found as: y=0.5973 + 0.0177 x HC, r=0.5141, p<0.001 (Diagram 3). When the regression analyze of relationship between nasal bone and AC was done, regression equation was found as: y=0.6802 + 0.0214 x AC, r=0.4919, p<0.001

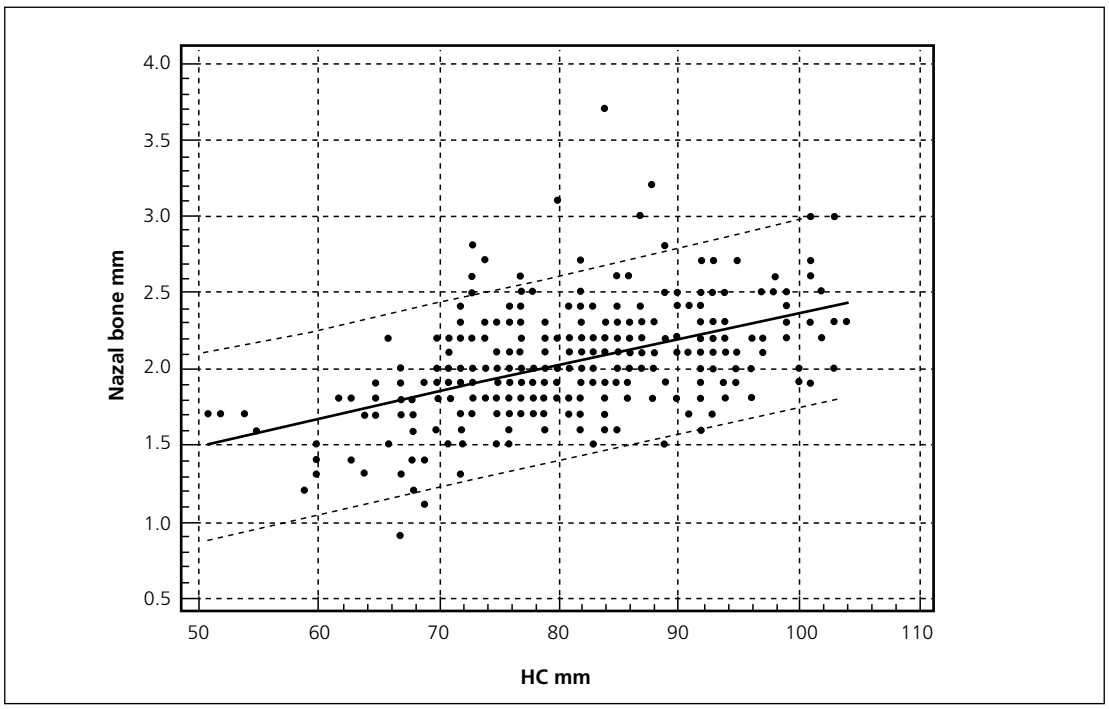

Diagram 3. Change of nasal bone length as to HC.

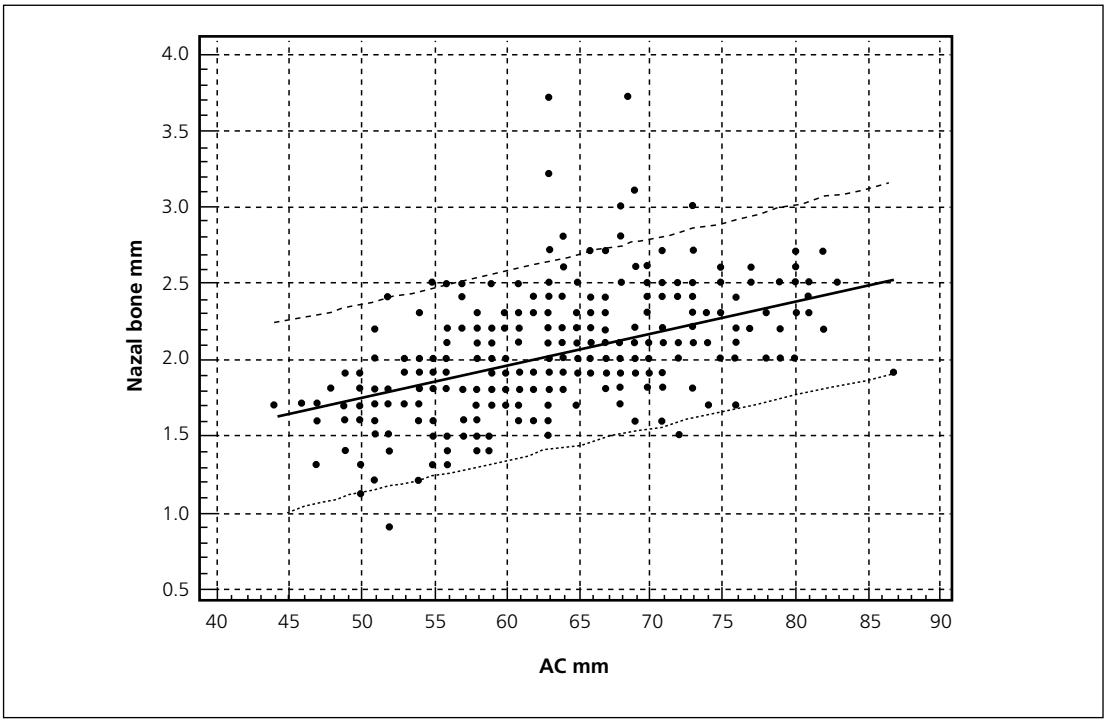

Diagram 4. Change of nasal bone length as to AC.

(Diagram 4) and lastly when the regression analyze of relationship between nasal bone and FL was done, regression equation was found as: y=1.4028 + 0.0758 x FL, r=0.4764, p<0.001 (Diagram 5).

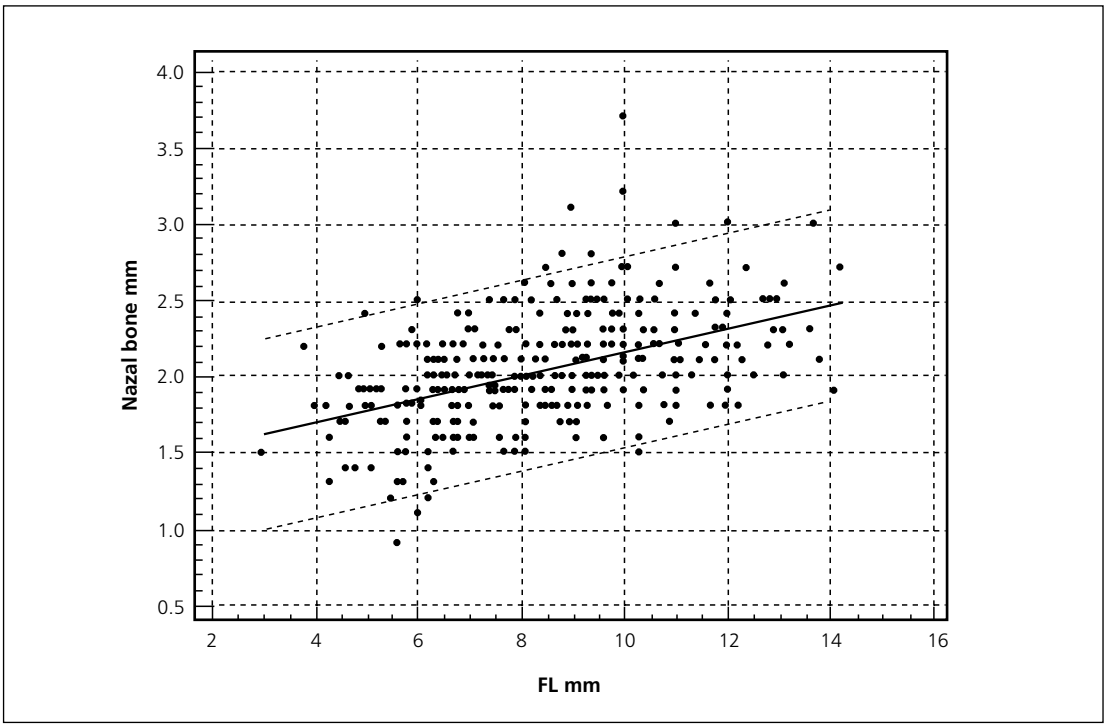

Diagram 5. Change of nasal bone length as to FL.

Discussion

Ossification in nasal bones are being delayed in fetuses with trisomy.[3, 4] Current studies maintains that Down syndrome and other chromosome anomalies should be scanned in the first trimester of gestation and various studies are done for that reason.[5] For finding hypoplasia of nasal bone; good and on-time usage of ultrasonography is required together with knowing qualities of society and whether there is any deviation from universal norms or not. It is essentially required to have basic education about that subject, to do necessary measurements in normal groups, to evaluate them in terms of background and to control them continually before examinations to be done for that purpose.[6] Current study was planned and carried on for one year in order to constitute data and nomograms belonging to our society during 11-13+6 week scanning done in our hospital. Nomograms are constituted by data belonging to our society and nasal bone measurements in 11-13+6 weeks discussed in world literature in recent years. Successful measurement rate with educated ultrasonographists for nasal bone was 90-99% in literature and our rate was 94% in our study, thus it was found similar to literature.[3,4] The earliest fetus size measurement for seeing nasal bones was found as CRL 42 mm within examinations done after abortus.[1] It was put forth that these bones could be measured beginning from 0.8 mm in 10th gestational week.[7] Our lowest measurement value in our work was 1.0 mm in 11th gestational week. Average nasal bone length in our work at 11-13+6 weeks was lower than that Orlandi et al reported.[4,8] When comparing the study of Cicero et al with the study of Cusick et al, it was found that average nasal bone lengths were similar.[9,10] Possible explanation for different measurements may be technical differences. Nasal bone evaluation in 11-13+6 weeks is quite hard even for experienced people. Additionally, mistaking the skin on fetus nose with nasal bone by less experienced ultrasonographists is not a rare situation; it requires sufficient education and experience. Nasal bone is a structure which actually formed of two separate bones and only seen by ultrasonography after 10th gestational week.[11] If it is not examined in an appropriate plan, it may be measured shorter or longer than normal or even it may be supposed that it does not exist.[12,14] Quality of device, experience of applier, oligohydroamnios, obesity, fetus position and gestational week may affect the success of evaluation.[15] Decreased ultrasonography resolution increases the dispersion and measurement becomes bigger. Doing our study as transvaginal helped us to obtain clearer image by preventing bone dispersion and to do more accurate measurement.

Conclusion

Nonexistence or hypoplasia of nasal bone in 11-13+6 weeks knows fetuses with increased risk by high activity for trisomy 21 and other trisomies. It is thought that nasal bone measurement may be done by experienced people for nearly all cases in these weeks. For that purpose, we constituted nasal bone nomogram belonging to normal fetuses chromosomally and morphologically in our society at first trimester and we presented for the purpose of ascertainment of nasal bone hypoplasia.

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