

Quality of nuchal translucency measurements in multifetal pregnancies

EFRAIM ZOHAV, OCTAV SEGAL, JACOB RABINSON, SIMION MELTCER,
EYAL Y. ANTEBY, & RAOUL ORVIETO

Ultrasound Unit, Department of Obstetrics and Gynecology, Barzilai Medical Center, Ashkelon, and Ben-Gurion University of the Negev, Beer Sheva, Israel

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Abstract

Objective. A prospective comparative study was conducted to investigate the effect of multifetal pregnancies on the quality of nuchal translucency measurements using an image scoring method.

Methods. The study sample included 72 consecutive multiple gestations (164 fetuses) and 195 singleton gestations (control) matched for maternal age and fetal crown-rump length. Nuchal translucency ultrasound was performed similarly in singleton and multiple pregnancies. A single sonographer scored an elected ultrasound image of each fetus according to a nuchal translucency image scoring method and the mean image score was compared between the whole singleton and multiple gestation groups and between subgroups defined by fetal distance from the abdominal wall.

Results. There was no significant difference in mean image score between the multiple and singleton gestation groups (6.60 ± 1.3 and 6.69 ± 1.5 , respectively; $p = 0.595$). Within the multiple gestation group, there was a significant difference in mean score between fetuses positioned proximal to the abdominal wall ($n = 72$) (3.7 ± 1.1) and both the middle fetuses (6.2 ± 1.4 ; $p < 0.01$) and distal fetuses (5.7 ± 1.06 ; $p < 0.008$). There was no difference between the proximal fetuses and controls.

Conclusions. The fetuses in multiple pregnancies that are located further from the abdominal wall have a poorer image score.

Keywords: *Nuchal translucency, multiple pregnancies, screening test, ultrasound, image scoring method*

Introduction

The use of strict ultrasonographic criteria by well-trained sonographers [1-4] is essential during first trimester nuchal translucency (NT) measurements in order to ensure high reproducibility, high detection of chromosomal abnormalities, and accurate audit reports [1,5]. An increase in the NT measurement is a well-established direct fetal marker for Down syndrome, cardiac defects, and other chromosomal syndromes in both singleton [6-9] and multiple gestations [10]. In multiple pregnancies, owing to the lack of precise biochemical information about each fetus [10], the risk assessment for Down syndrome is based mainly on their individual NT measurements.

The ability to measure NT and obtain reproducible results improves with training and requires an efficient method for ongoing quality review, either qualitative or quantitative. The NT image score [11], an option for NT quality assessment, is based on the

criteria of the Fetal Medicine Foundation (FMF) and is used to quantify the various factors affecting the quality of NT measurements and to investigate each one more precisely [12,13]. Central epidemiological monitoring of NT measurement data appears to be a good quantitative technique for assessing a center's quality and identifying individuals deviating from the mean performance [14].

It has previously been shown that the quality of NT measurements in singleton pregnancies is significantly affected by the distance of the fetus from the abdominal surface [13]. However, this factor has hardly been investigated in multiple pregnancies. In multiple pregnancies, the fetuses are located in various locations beneath the abdominal surface, so that the quality of the NT measurements of each one may be impaired. The aim of the present study was to examine the quality of NT measurements in multifetal pregnancies compared to singleton pregnancies using the image scoring method.

Patients and methods

The study group was comprised of 72 consecutive multiple gestations for a total of 164 fetuses. There were 52 twin pairs and 20 triplet sets. The control group was comprised of 195 consecutive singleton pregnancies matched to the study group for maternal age and fetal crown-rump length. All women were referred to the Obstetrical Ultrasound Unit of Barzilai Medical Center during the years 1999–2001.

Before the ultrasound examination, maternal age and weight was recorded. All scans were performed by the same experienced FMF-qualified sonographer using an ATL 3000 HDI device (ATL, Bothell, WA, USA), equipped similarly in singleton and multiple pregnancies. Each fetus was scanned abdominally, and NT measurements were obtained. At least three ultrasonographic measurements were performed, and the best-quality image was elected. The elected image was then printed on high quality paper (SONY-110HD-UPP High Density). The size of the fetal image on the screen was reduced in order to measure abdominal wall thickness (distance between the abdominal surface and the anterior wall of the amniotic sac), amniotic sac diameter (distance between the anterior gestational wall and posterior amniotic membrane of each fetus), and distance of the posterior amniotic membrane from the abdominal surface of each fetus (multiple pregnancies only). The fetuses of multiple gestations were numbered according to the distance of their posterior amniotic membrane from the abdominal surface, as follows: 1 – proximal fetus; 2 – in-between fetus in triplets or distant fetus in twins; and 3 – distant fetus in triplets.

A single sonographer, blinded to singleton versus multiple fetuses, scored the elected image of each fetus according to the method described by Herman and coworkers [11]. This scoring system includes six criteria, as follows: three major criteria – section (oblique, 0; mid-sagittal, 2), caliper placing (misplaced, 0; proper, 2), and skin line (nuchal only, 0;

nuchal and back, 2); and three minor criteria – image size (unsatisfactory, 0; satisfactory, 1), amnion (not visualized, 0; visualized, 1), and head position (flexion/hypertension, 0; straight, 1). The final score was categorized into one of four quality groups: excellent (8–9), reasonable (4–7), intermediate (2–3), unacceptable (0–1). The mean image score of multiple gestation groups and subgroups were compared to the singleton group.

For further analysis, the multiple-gestation and singleton groups were divided according to their location at more or less than 80 mm from the posterior amniotic membrane [13] and compared for image score.

The results are expressed as means and standard deviations. Findings were analyzed statistically with Student's *t*-test and one-way ANOVA. A *p* value of 0.05 or less was considered significant.

Results

NT was successfully measured in all 164 fetuses of the multiple pregnancies and all 195 singletons. The background and ultrasound variables of the groups are shown in Table I.

Mean maternal age and crown-rump length were similar, as expected by the inclusion criteria. Mean maternal weight was higher by 3 kg in the multiple-pregnancy group. There was no difference in mean posterior amniotic membrane depth between the singleton and multiple pregnancy groups. However, within the multiple pregnancy group, depth was greater for the middle and distant fetuses (2 and 3) than for the proximal fetuses. This was also true for mean amniotic sac diameter, although abdominal wall thickness was similar.

Table II shows the mean image score of each group and subgroup. There was no significant difference in mean image score between the multiple gestation and singleton groups (*p* = 0.595). Within the multiple gestation group there was a significant

Table I. Background and ultrasound variables in singleton pregnancies and multiple pregnancies (whole group and by fetal location*).

Variable	Singleton pregnancy	Multiple pregnancy	Proximal fetus	In-between fetus	Distal fetus	<i>p</i>
Number of fetuses	195	164	72	72	20	
Maternal age (years)	29.7 ± 4.9	30 ± 3.9				0.691
Maternal weight (kg)	62.3 ± 9	65 ± 11				0.06
Abdominal wall thickness (mm)	38 ± 14	37 ± 11	32 ± 8	40 ± 12	44 ± 13	0.008
Gestational sac diameter (mm)	36 ± 10	40 ± 13	36 ± 12	43 ± 12	47 ± 18	0.006
Posterior amniotic membrane depth (mm)	74.9 ± 16	77.6 ± 22	67 ± 18	82 ± 22	97 ± 20	0.000
CRL (mm)	59.4 ± 11	58.3 ± 9	58.8 ± 9	58 ± 9	56 ± 10	0.332
Nuchal translucency (mm)	1.2 ± 0.7	1.3 ± 0.9	1.4 ± 1.3	1.3 ± 0.3	1.2 ± 0.4	0.484

Note: Values are mean ± SD unless otherwise indicated. *Divided distance of posterior amniotic membrane from abdominal surface: proximal, in-between (in triplet pregnancy) or distant (in twin pregnancy), and distant (in triplet pregnancy). CRL, crown-rump length.

difference in mean score between the proximal fetuses and both the in-between fetuses ($p < 0.01$) and the distant fetuses ($p < 0.008$).

No significant difference in mean image score was found between the multiple-gestation and the singleton fetuses with a posterior amniotic membrane distance of less than 80 mm from the abdominal surface ($p = 0.729$), or between the multiple-gestation and single fetuses with a posterior amniotic distance of more than 80 mm ($p = 0.935$). When a cut-off of 80 mm was used [13], the mean difference in quality was 1 point in the singleton group and 1.1 points in the multiple pregnancy group (Table III).

Discussion

Two main factors affect NT quality: performer qualification [2] and non-performer-dependent variables [13]. The effect of the latter in multiple pregnancies has not been thoroughly investigated. In the present study, the quality of NT measurements in multiple pregnancies was compared to a singleton control group matched by maternal and fetal age. In a previous study of singleton pregnancies [13] by our group, we observed that fetuses positioned more than 80 mm beneath the abdominal surface had a 1-point lower image score than fetuses located more proximally. In multiple pregnancies, the fetuses are located at different distances from the abdominal surface. In the present study, with an identical measurement technique for singleton and

multiple pregnancies, the mean image score of the whole multiple pregnancy group was similar to that of the singleton group. However, it should be emphasized that in order to demonstrate a difference of 2 points in the mean image score at a power of 80% and an α value of 0.05, more than 2500 measurements would be needed for each group.

Within the multiple pregnancy group, the middle and distant fetuses had a significantly worse mean image score (by 0.9 and 1.4 points, respectively) than the fetus located closest to the abdominal wall. Analogous results were found when the multiple and singleton groups were divided by location of more or less than 80 mm from the abdominal surface. The mean image scores of the multiple and singleton fetuses in the same depth categories were similar, with a difference in quality of screening of less than 0.3. The difference in quality between the fetuses located at distance above the cut-off versus those located closer to the abdominal wall yielded a difference in quality of about 1 point in the multiple and singleton group each. This finding indicates that the depth of the fetus from the abdominal surface affects the quality of the NT measurement by the same power for singleton and multiple-pregnancy fetuses. However, since 2 points are needed for a shift between the quality groups, the observed difference did not categorize the image score to a different quality group.

In a previous study [13], we observed a further decrease of 1 point when the examination was performed after fetal crown-rump length reached 70 mm (13 weeks and 1 day). Therefore, the combination of performing NT beyond 13 weeks gestation in fetuses number 2 and 3, or in fetuses located at more than 80 mm from the posterior amniotic membrane, may deteriorate the quality of measurements and shift the score to a lower quality group.

In conclusion, the greater distance of fetuses in multiple pregnancies from the abdominal wall deteriorates the quality of NT measurements. First trimester screening of multiple pregnancies performed on fetuses located > 80 mm from the abdominal surface, may necessitate a different approach (such as, transvaginal) in an attempt to improve the quality of NT measurement.

Table II. Mean image scores by group and by mean posterior amniotic membrane depth.

Groups	N	Mean image score	Mean posterior amniotic membrane depth
Singleton pregnancies	195	6.69 \pm 1.5	74.9 \pm 16
Multifetal pregnancies	164	6.60 \pm 1.3	77.6 \pm 22
No. 1 group	72	7.1 \pm 1.1	67 \pm 18
No. 2 group	72	6.2 \pm 1.4	82.1 \pm 22
No. 3 group	20	5.7 \pm 1.0	97.2 \pm 20

Table III. Mean difference in quality of NT measurements between subgroups by posterior amniotic membrane depth (80 mm cut-off).

Definition of subgroups	< 80 mm distance	> 80 mm distance	Mean of difference in quality	p
Singleton pregnancies	6.9 \pm 1.4	5.9 \pm 1.7	1.0	0.000
Multiple pregnancies	7.0 \pm 1.4	5.9 \pm 1.4	1.1	0.005

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