Nomogram of Nuchal Fold Thickness of Thai Fetuses

SAKNAN MANOTAYA, M.D.*, SOMCHAI TANAWATTANACHAROEN, M.D.*,
BOONCHAI UERPAIROJKIT, M.D.*, YUEN TANNIRANDORN, M.D.*,
DHIRAPHONGS CHAROENVIDHYA, M.D.*

Abstract

The aim of the study was to establish normal values of nuchal fold thickness during 14-21 weeks of pregnancy. Three hundred Thai pregnant women before 12 weeks of gestation were recruited. Gestational age was determined by last menstrual period and confirmed by crown-rump length. Subjects with date-size discrepancy of more than 7 days were excluded from the study. Nuchal fold thickness was measured twice, first during 14-17 weeks, and then during 18-21 weeks. Five hundred and nine measurements were obtained. Nomogram of nuchal fold thickness was constructed. Mean values of nuchal fold thickness increased steadily from 2.59±0.77 millimeters (mm) at 14 weeks to 4.12±0.98 mm at 21 weeks. Average rate of increase were 0.22 mm per week. In conclusion, nuchal fold thickness increased with advancing gestational age from 14 to 21 weeks of pregnancy. Different normal cut-off levels for each gestational week may be more appropriate for screening of fetal Down syndrome in Thai pregnant women.

It has long been known that 80 per cent of newborns with Down syndrome have excess nuchal soft tissue[1]. In 1985, Benacerraf first reported that second-trimester fetuses with Down syndrome also had thickened nuchal skin fold[2]. Her later study demonstrated that nuchal fold thickness (NFT) in a normal fetus was 1-5 millimeters during 15-20 weeks of gestation[3]. No statistical difference of normal NFT was observed among each gestational weeks[3]. NFT was 6 mm or more in 42 per cent of Down syndrome fetuses,[4] Other investigators reported that normal NFT may increase with advancing gestational age[5,6]. They also suggested that the cut-off level should be adjusted accordingly. The objective of this study was to establish normal values of NFT of Thai fetuses during 14-21 weeks of pregnancy.

* Department of Obstetrics and Gynaecology, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

MATERIAL AND METHOD

Three hundred pregnant Thai women were recruited into the study. Inclusion criteria were (1) known last menstrual period with regular menstrual cycle, (2) gestational age less than 12 completed weeks, (3) informed consent was obtained. Transvaginal ultrasonography was performed in all cases. Exclusion criteria were (1) women with date-size discrepancy of more than 7 days, (2) non-singleton pregnancy, (3) non-viable pregnancy. They were randomized into 4 groups. In the first group, transabdominal ultrasound examination was done at 14 and 18 weeks. In the second, third and fourth groups, transabdominal ultrasound examinations were done at 15 and 19 weeks, 16 and 20 weeks, 17 and 21 weeks, respectively. NFT was measured in modified transverse plane of fetal head including thalamus, cavum septum pellucidum, cerebellum, and cisterna magna. The measurement of NFT was made from the outer surface of occipital bone to the outer surface of skin as described by Benacerraf[3]. All women were followed until delivery, and no case of chromosomal aneuploidy was present. All ultrasound examinations were done by the staff members of the Division of Maternal-Fetal Medicine unit. Ultrasound machines used in the study were Aloka SSD-2000 (Tokyo, Japan) with 3.5 and 5.0 MHz curvilinear probes. Statistical analysis was done using SPSS statistical package (Chicago, IL). Mean and standard deviation (SD) were calculated.

RESULTS

Two hundred and sixty-one women satisfied the criteria, a total of 509 measurements were obtained. Mean and standard deviation of NFT during 14-21 weeks are presented in Table 1. There were 14 fetuses with NFT of 6 mm or more, and 13 fetuses with NFT more than mean+2SD. Details of which are presented in Table 2 and Table 3.

Table 1. Nomogram of nuchal fold thickness (N=509 measurements).

Gestational age (weeks)	Mean (mm)	SD (mm)	Mean + 2SD (mm)	N (cases)
14	2.59	0.77	4.13	64
15	2.75	0.77	4.29	66
16	3.01	0.82	4.65	71
17	3.36	0.91	5.18	53
18	3.78	0.94	5.66	65
19	3.58	0.84	5.26	68
20	3.94	1.01	5.96	65
21	4.12	0.98	6.08	57

Table 2. No. of cases with NFT more than cut-off limit.

Gestational age (weeks)	N (cases)	No. of cases with NFT more than cut-off limit.			
		6 mm or more	%	Mean +2SD or more	%
14	64	0	0	2	3.13
15	66	0	0	2	3.03
16	71	1	1.41	2	2.82
17	53	1	1.89	1	1.89
18	65	2	3.07	2	3.07
19	68	1	1.47	1	1.47
20	65	3	4.62	3	4.62
21	57	6	10.53	0	0
Total	509	14	2.75	13	2.55

Table 3. No. of cases with NFT more than cut-off limit.

Gestational age (weeks)	N (cases)	No. of cases with NFT more than cut-off limit.			
		6 mm or more	%	Mean +2SD or more	%
14-16	201	1	0.50	6	2.99
17-19	186	4	2.15	4	2.15
20-21	122	9	7.38	3	2.49
Total	509	14	2.75	13	2.55

DISCUSSION

Our study showed that the mean NFT increased steadily from 2.59±0.77 mm at 14 weeks to 4.12±0.98 mm at 21 weeks of gestation in chromosomally normal fetuses. Average rate of increase was 0.22 mm per week. Our results are similar to the study of Grandjean et al[5], who demonstrated an increase of NFT from 2.5 mm at 14 weeks to 3.9 mm at 21 weeks of gestation. In addition, an average rate of increment was also comparable[5] (0.2 mm per week.)

Among 14 cases with NFT of 6 mm or more; only 1 case (0.50%) was in the 14-16 weeks' group, 4 cases (2.15%) were in the 17-19 weeks' group, and 9 cases (7.38%) were in the 20-21 weeks' group. It is currently accepted that 14-21 weeks pregnant women with NFT of 6 mm or more should be referred for genetic counseling and amniocentesis. Using the cut-off level of 6 mm or more in our study, thickened nuchal fold would be found in 7.4 per cent of normal fetuses during 20-21 weeks, whereas, it would be found in only 0.5 per cent during 14-16 weeks. Thirteen cases with NFT more than mean+2SD were more evenly distributed across the entire range of measurement.

In conclusion, the mean NFT in our study was found to be increased with advancing gestation. Gestational age-dependent cut-off level, such as mean+2SD for each gestational week, will have a more constant false positive rate across the gestational age range, and may be used more suitably for Down syndrome screening in the Thai population. The sensitivity and specificity of this cut-off level for Down syndrome screening remains to be determined.

(Received for publication on December 19, 1997)

REFERENCES

1. Hall B. Mongolism in newborn infants : An examination of the criteria for recognition and some speculations on the pathogenic activity of the chromosomal abnormality. Clin Pediatr 1966; 5: 4-12.
2. Benacerraf BR, Barss VA, Laboda LA. A sonographic sign for the detection in the second trimester of the fetus of Down's syndrome. Am J Obstet Gynecol 1985; 151: 1078-9.
3. Benacerraf BR, Frigoletto FD Jr. Soft tissue nuchal fold in the second-trimester fetus : Standards for normal measurements compared with those in Down syndrome. Am J Obstet Gynecol 1987; 157: 1146-9.
4. Benacerraf BR, Frigoletto FD Jr, Cramer DW. Down syndrome : sonographic sign for diagnosis in the second-trimester fetus. Radiology 1987; 163: 811-3.
5. Grandjean H, Sarramon MF. Sonographic measurement of nuchal skinfold thickness for detection of Down syndrome in the second-trimester fetus : a multicenter prospective study. Obstet Gynecol 1995; 85: 103-6.
6. Buckshee K, Roy KK, Verma IC. Nomograms of fetal nuchal fold thickness for early detection of Down syndrome. Indian J Pediatr 1993; 60: 655-7.

ค่าปกติของ Nuchal fold thickness ของทารกไทย

ศักนัน มะโนทัย, พ.บ., สมชาย ธนวัฒนาเจริญ, พ.บ.*,*
บุญชัย เอื้อไพโรจน์กิจ, พ.บ., เยื้อน ตันนิรันดร, พ.บ.*, ธีระพงศ์ เจริญวิทย์, พ.บ.**

การศึกษานี้มีวัตถุประสงค์เพื่อหาค่าปกติของ Nuchal fold thickness ในทารกไทย สตรีไทยตั้งครรภ์จำนวน 300 รายที่อายุครรภ์ไม่เกิน 12 สัปดาห์ และได้รับการตรวจยืนยันอายุครรภ์โดยการตรวจ Crown-rump length ผู้ศึกษาทำการตรวจ Nuchal fold thickness 2 ครั้ง ครั้งแรกระหว่างอายุครรภ์ 14-17 สัปดาห์ ครั้งที่สองระหว่างอายุครรภ์ 18-21 สัปดาห์ ผลการศึกษาพบว่าค่าเฉลี่ยของ Nuchal fold thickness เพิ่มขึ้นจาก 2.59±0.77 มิลลิเมตรเมื่ออายุครรภ์ 14 สัปดาห์ เป็น 4.12±0.98 มิลลิเมตรเมื่ออายุครรภ์ 21 สัปดาห์ ค่าเฉลี่ยของ Nuchal fold thickness เพิ่มขึ้นสัปดาห์ละ 0.22 มิลลิเมตร โดยสรุป ค่าปกติของ Nuchal fold thickness เพิ่มขึ้นตามอายุครรภ์ที่เพิ่มขึ้นในช่วงอายุครรภ์ 14-21 สัปดาห์ และจุดตัดสำหรับการตรวจกรองทารกกลุ่มอาการดาวน์ในสตรีไทยควรมีการเปลี่ยนแปลงตามอายุครรภ์

* ภาควิชาสูติศาสตร์-นรีเวชวิทยา, คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพฯ 10330