Relationship Between Fetal Nuchal Thickening and Crown-Rump Length in Thai Fetuses During 10-14 Weeks of Gestation

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ABSTRACT

Objective: To investigate the relationship between the Nuchal thickening (NT) and crown–rump length (CRL) in normal Thai fetuses during 10-14 weeks of gestation.

Methods: A prospective observational study was conducted. Ultrasound measurement of NT and CRL was offered for 1,000 consecutive Thai fetuses between 10-14 weeks of gestation. Regression analysis was used to analyze the relationship between the NT and CRL.

Results: The mean maternal age was 28.03 ± 5.8 yr (range 14-47 yr). The mean CRL was 54.7 ± 12.7 mm (range 10.0-82.0 mm), and the mean NT was 1.6 ± 0.60 mm (range 0.3-6.9 mm), respectively. The median gestational age was 12.0 weeks. The regression equation relating median NT to CRL was described as follows: expected Nuchal thickening (mm) = 0.437 + (0.01764 × CRL) (mm) (R2 = 0.134, p <0.001).

Conclusion: The present study offers normative data of the fetal NT in Thai fetuses, which may improve the performance of NT measurement during the first-trimester as a screening tool for chromosomal abnormalities or other congenital abnormalities in the first trimester. The present study shows that NT measurements increase with increasing CRL.

Keywords: Crown-rump length, nuchal translucency

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Increased NT during the first trimester of pregnancy is well-established in fetal chromosomal abnormality and fetal abnormalities.[1-2] A screening test may identify over 70% of trisomy 21 pregnancies in the first trimester, with a 5% false positive rate.[1-2] Increased NT during 11-14 weeks of gestation is also strongly correlated with fetal structural defects, genetic syndromes, and poor perinatal outcomes.[3-5] NT has been widely used as a screening test for fetal Downs syndrome in the first trimester either alone or in combination with serum markers.[6] NT measurements between fetuses of different ethnic origins showed a significant difference.[7] The correlation between nuchal translucency and CRL have not been previously studied in Siriraj Hospital. Therefore the correlation between NT and CRL in Thai fetuses is established.

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MATERIALS AND METHODS

This study was approved by the Ethics Committee at Faculty of Medicine Siriraj Hospital, Mahidol University, (No.119/2003).

A total of 1,000 pregnant women who attended the antenatal clinic at Siriraj Hospital were recruited for this study. The fetal NT was measured between 10 and 14 weeks of gestation from January to December 2005. Pregnancy outcomes were reviewed from the records. The excluded cases were chromosomal and major structural abnormalities and cases resulting in miscar-riage or intrauterine death. The gestational age was calculated from the first day of the last menstrual period and confirmed by crown-rump length measure-ment.[8] If the estimated gestational age by menstrual and ultrasound estimation were different for more than 7 days, the ultrasound estimation was used. Fetal NT was measured using transabdominal or transvaginal sono-graphy (ALOKA, Dynaview 2, SSD 1700 with a 3.5 MHz

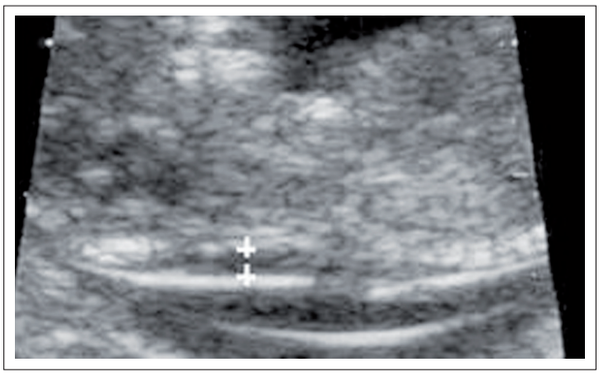

Fig 1. Nuchal thickening was measured as shown.

convex transducer). The fetus which was in a good mid-sagittal section occupied at least 75% of the image on the screen. (Fig 1)

The NT was defined as the black area between the inner skin outlines echo and the outer border of the soft tissue overlying the cervical spine. The maximal thickness of the black area was measured with caliper placed on the lines (representing the nuchal skin and the underlying soft tissue) to 0.1 mm when the sagittal section of the fetuses was obtained (Fig 1). At the same time, the fetal crown-rump length (CRL) was measured. Cystic hygroma was defined as a sonolucent area consisting of two systemic cavities completely separated by a midline septum, irrespective of size.[9] These cases were excluded from the study. The measurements could not be performed in cases of hyperextended fetus and indistinguishable area between the fetal skin and the amniotic membrane.[10] The excluded cases were also fetal malposition. At least three measurements were taken during the scan and the largest was recorded. In order to establish the correlation between fetal NT and CRL, the linear regression method was analyzed. According to the regression equation, the expected the 5th, 50th, and 95th percentile values of NT were obtained for a given CRL.

RESULTS

From January to December 2005, a total of 1,000 pregnancies satisfied the above inclusion criteria and

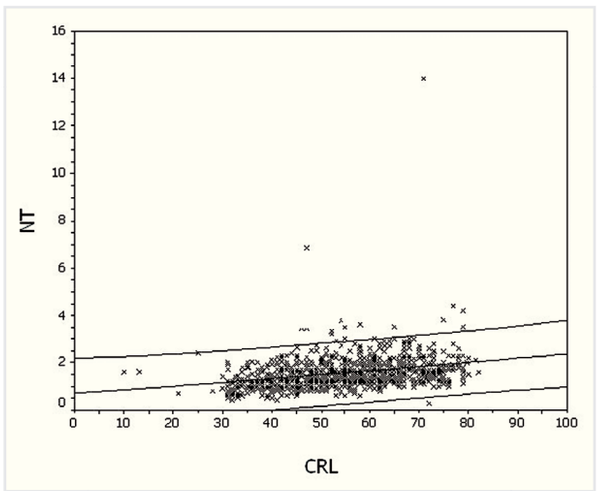

Fig 3. The correlation between NT and CRL was shown.

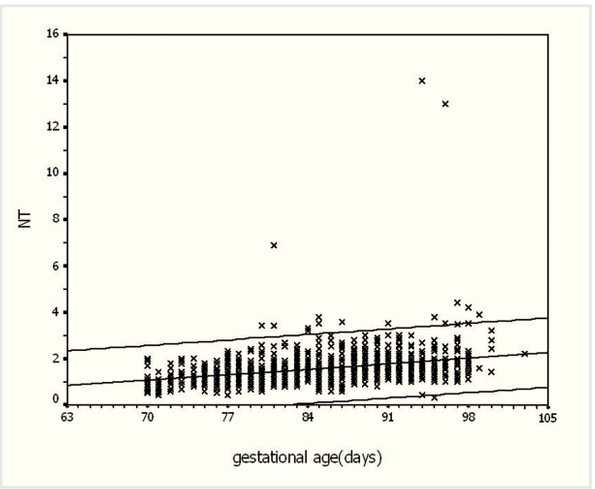

Fig 2. The correlation of NT and gestational age was shown.

were included for analysis. The mean maternal age was 28.03 ± 5.8 yr (range 14-47 yr). The mean CRL was 54.7 ± 12.7 mm (range 10.0-82.0 mm), the mean NT was 1.6 ± 0.60 mm (range 0.3-6.9 mm), respectively. The median gestational age was 12.0 weeks. The distribution and the 5% and 95%, lower and upper limits of NT according to the simple linear regression was shown. (Fig 2) The mean NT at each gestational age was shown in Table 1. NT increased with CRL estimates of gestational age. (Fig 3) The regression equation relating median NT to CRL was described as follows:

expected Nuchal thickening (mm) = 0.437 + (0.01764 × CRL) (mm) (R2 = 0.134, p <0.001).

DISCUSSION

The aim of the present study was to investigate the relationship between the NT and CRL in normal Thai fetuses during 10-14 weeks of gestation. The data were collected from pregnant women with singleton pregnancies in whom fetal ultrasound was performed and the fetal NT was measured between 10 and 14 weeks of gestation. A total of 1,000 fetuses were included in this study. The present study showed that NT measurements increase with increasing CRL and a false positive rate increases with increasing gestational age. Therefore, a fixed cut-off point through the first trimester was not appropriate and each NT measurement should be examined according to the gestational age.

The results demonstrate that fetal NT increases with CRL and are compatible with those of previous reports.[4,11,12] The screening for chromosomal defects, and the use of a fixed cut-off in fetal NT is inappropriate, and each measurement NT should be examined according to the CRL.[13] Schuchter et al. have used MoM values to express the relationship between NT and gestational age[14] which was similar to that of biochemical

TABLE 1. Mean NT at each gestational age (weeks) was shown.

Gestational age (weeks)	Mean	SD	5th centile	95th centile
10	1.2	0.4	0.6	1.9
11	1.5	0.6	0.8	2.3
12	1.6	0.5	0.9	2.7
13	1.9	1.2	1.1	2.9
14	2.1	0.8	1.1	4.0

markers used in second-trimester Down's syndrome screening.[15] The normative distribution of fetal NT measurement was established.

Jou et al. suggested that, given the small but statistically significant NT differences, race-specific normative data should be used.[16] Other reports concluded that it is acceptable to use a single standard, because screen positive rates in different NT groups are similar.[7,17] In this study, the mean NT in normal Thai fetuses was 1.6 mm. Compared to the study in the Taiwanese population by Jou et al.,[16] the mean NT in this result was smaller than those by 0.08 mm. Therefore, the ethnic difference is not significant in interpretation of NT measurements. However, the result showed the correlation of NT and CRL with R2 = 0.134 and p<0.001 which represented significance, but can only be used in a small population. Therefore related factors which affected to the NT measurement including chromosome and fetal abnormalities must be identified.

A false positive rate increases with increasing gestational age, and each NT should be examined according to the gestational age for the screening of chromosomal abnormalities.[18] More recently, a new ultrasound marker has been described; the nasal bone at 11 to 14 weeks was found to be absent in about 70% of fetuses with trisomy 21 and in 0.5% of chromosomally normal fetuses. It was estimated that screening for trisomy 21 by a combination of maternal age, fetal NT, and examination of the nasal bone could increase the detection rate to 85% whilst decreasing the false-positive rate to 1%.[19] Also, Cicero et al. reported that integrated sonographic (fetal NT and nasal bone) and biochemical tests using maternal serum free beta-hCG and pregnancy-associated plasma protein-A (PAPP-A) at 11-14 gestational weeks can potentially identify about 90% of trisomy 21 fetuses for a false-positive rate of 0.5%.[20]

This study offers normative data of the fetal nuchal thickening in Thai fetuses, which can be used as a reference for screening chromosomal abnormalities or other congenital abnormalities and may be very beneficial in establishing the screening for Downs syndrome in the first trimester in the Thai population. As a false positive rate increases with increasing gestational age, nuchal thickening should be adjusted according to the gestational age for screening of chromosomal abnormalities.

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