

Prediction of preterm labor by ultrasonographic cervical length

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Objective

To determine whether transvaginal ultrasound assessment of the cervix is superior to transabdominal ultrasonography in evaluating the cervical canal in the second trimester and to see which one is more accurate in predicting preterm labor.

Method

The study entailed 294 women with singleton pregnancy, who attended our antenatal clinic for routine care. Each woman underwent a transabdominal and endovaginal ultrasonographic cervical length measurement at 20-24 weeks. Women with risk factors for preterm deliveries like history of preterm delivery, cervical incompetence, uterine abnormalities, and previous cervical surgery were excluded. Maternal and fetal data were collected. Statistical comparison was made between the two ultrasonographic methods for gestational age at birth and parity.

Result

10.8 % of the women delivered prematurely. Transvaginal ultrasonographic cervical length measurements of term and preterm deliveries showed a statistically significant difference ($P < 0.05$) but no significant difference was found in transabdominal measurements ($P > 0.05$). Although transvaginal cervical length measurements showed a statistically significant difference between primiparous and multiparous women ($P < 0.05$), the difference was not significant by transabdominal route ($P > 0.05$).

Conclusion

Transvaginal ultrasonography seems to be superior to transabdominal sonography in assessing the cervical length in the second trimester and for screening for spontaneous preterm delivery. (Rawal Med J 2009;34:191-194).

Key words

Cervical length, transvaginal sonography, transabdominal sonography.

INTRODUCTION

Preterm birth is the main cause of perinatal morbidity and mortality. In term of years of life, lost preterm birth is one of the most important diseases in medicine. A recent analysis of neonatal mortality (<28 days) in the United States between 1989 and 2001 revealed that extremely preterm delivery (<28 weeks) accounted for 49% to 58% of deaths, and preterm delivery (<37 weeks) accounted for 70% of neonatal death.¹ In addition to being at risk for neonatal death, preterm infants are at increased risk for long-term neurological and medical morbidity such as cereberal palsy, developmental delay, chronic lung diseases, and visual and hearing loss.² In fact, 40% of preterm births follow idiopathic preterm labor, 35% follow preterm prelabor rupture of membranes (PPROM), and the remainder are iatrogenic because of obstetric or medical indications.³

Interventions as home uterine activity monitoring,

administration of tocolytics, and intensive and frequent contact with healthcare providers have not shown any reduction in PTB.^{4,5} Prediction of PTL will ideally involve a screening test with high sensitivity and negative predictive value. It should also enable effective intervention, if the test gives a positive result. A wide variety of screening tools have been evaluated and those most extensively used are assessment of cervical length, measurement of cervical fibronectin,⁶ and presence of bacterial vaginosis in early pregnancy. Our study tackled the second most commonly used markers for PTB which is the assessment of cervical length.

PATIENTS AND METHODS

A total of 294 pregnant women who attended our antenatal clinic in their 1st trimester in Prince Rashed Ben AL-Hasan and Princess Haya Bent AL-Hussein Hospitals between January 2008 and December 2008 were recruited in the study. Patient's

characteristics, including age, parity and previous obstetric and medical history were obtained. Gestational age was determined from the last menstrual period and confirmed from the measurement of fetal crown-rump length. Patients with additional risk factors like multiple gestation, pre-eclampsia, diabetes, premature rupture of the membranes, fetal anomalies, cervical incompetence, previous cervical surgery, history of previous preterm delivery were excluded.

Transvaginal (TVU) and transabdominal sonographic (TAU) measurements of the cervical length were carried out simultaneously at 22-24 weeks.⁷ A transvaginal probe (5-7 MHz) was introduced and whole length of the sonolucent endocervical mucosa was identified in a sagittal section, and the image was magnified so that this occupies 75% of the screen. Three measurements were made over a period of three minutes to allow for any change in the state of the cervix, and the shortest measurement was recorded. The same obstetrician performed all examinations. All women were followed throughout pregnancy and delivered in our hospitals. None underwent induced preterm delivery because of other gestational complications. Data was analyzed and statistical comparisons were made between the two ultrasonographic methods for gestational age at birth and parity. To evaluate the predictive value of the mean cervical length measurement for preterm birth, the sensitivity, specificity, positive and negative predictive values for mean ± 1 SD of the mean cervical length of all subjects was calculated. 35 mm for TVU and 25 mm for TAU were taken as cut-off values. The same values were also calculated for mean ± 2 SD. 27.5 mm for TVU and 20 mm for TAU were taken as cut off values. Significance was set at P value < 0.05 .

RESULTS

The mean maternal age of the study population was 23.75 ± 4.65 years (range 17-38), and 32% (94/294) were nulliparous and 68 % (200/294) multiparous. Mean gestational age at the time of ultrasonographic cervical length measurement was 21.9 ± 1.6 weeks (range 20-24) and mean gestational age at birth was 38.7 ± 1.8 weeks (range 32-42). Preterm delivery

(before 37 weeks) was observed in 10.8% (n=32) and 89.2% (n=262) delivered after 37 weeks of gestation.

The mean cervical length was found to be 36.4 ± 6.9 mm by TAU and TVU measurement of cervical length revealed a mean of 42.5 ± 6.4 mm. The mean cervical length measurements of the women with regard to parity and gestational age at birth are shown in Table 1.

Table 1. The mean cervical length measurements with regard to parity and gestational age at birth.

Parity	Transabdominal sonography Cervical length (mm)	Transvaginal sonography Cervical length (mm)
Nulliparous	35.4 ± 8.3	44.3 ± 7.4
Multiparous	33.2 ± 6.4	40.6 ± 7.1
Gestational age		
Term	34.3 ± 7.4	43.7 ± 6.9
Preterm	31.8 ± 8.3	39.3 ± 10.2

A statistically significant difference was found between transvaginal ultrasonographic cervical length measurements of term and preterm deliveries ($p < 0.05$). However, no significant difference was found between transabdominal ultrasonographic measurements of term and preterm deliveries ($p > 0.05$).

Table 2. The sensitivity, specificity, positive and negative predictive values for the cut-off value taken as 1 standard

	Sensitivity	specificity	Positive predictive value	Negative predictive value
Transabdominal Ultrasound	19.6%	87.3%	21.1%	85.3%
Transvaginal Ultrasound	43.3%	86.7%	36.2%	89%

deviation).

Although, transvaginal cervical length measurements showed a statistically significant difference between primiparous and multiparous women ($p < 0.05$), such difference was not at significance limit when transabdominal measurements of cervical length were compared for parity ($p > 0.05$).

Table 3. The sensitivity, specificity, positive and negative predictive values for the cut-off value taken as 2 standard

	Sensitivity	specificity	Positive predictive value	Negative predictive value
Transabdominal Ultrasound	5.9%	99%,	50%	86.4%,
Transvaginal Ultrasound	5.9%	100%,	100%	86.6%

deviation).

Table 2 and 3 show the sensitivity and specificity of the sonographic findings.

DISCUSSION

Measurement of cervical length by ultrasound is one method used in the prediction of preterm labour.^{8,9} Only the cervical length was measured in this study and used as a single predictor of PTL. For preterm delivery risk assessment, cervical assessment by ultrasonography is not a routine.¹⁰ We believe that TAU is still an acceptable screening tool to measure cervical length. The main concern in screening with TAU is the potential for overestimating cervical length due to an overly distended bladder; funnelling of the cervix may also be missed.¹⁰ Mason and Maresh¹¹ demonstrated an increase in cervical length with increasing bladder volume. This was shown throughout the bladder volume range, and not just with over distension. Manual pressure exerted via the transducer may also lead to significant reduction in internal os dilatation for patients with suspected cervical incompetence, leading to missed diagnosis.¹²

Andersen et al¹³ were the first to note the use of TVU in the prediction of preterm birth. They reported a cervix of less than 39 mm before 30 weeks of gestation as a risk factor for early delivery. Interestingly, in several studies¹⁴⁻¹⁶ evaluation of the cervix was performed by TAU with an empty or nearly empty bladder, and the mean cervical lengths were similar to those detected by TVU. In our study, mean cervical lengths detected by TVU were not similar with TAU. Shorter cervical length measurements on TVU may be due to incomplete filling of the bladder.

We found the mean cervical length was shorter among women who delivered preterm, but only the

measurements of TVU were statistically different. These results confirm the findings of previous studies.^{13,17,18} In our study, transvaginal cervical length measurements showed a statistically significant difference between primiparous and multiparous patients. When the mean cervical lengths of women were examined with regard to parity, irrespective of gestational age at birth, mean cervical lengths of nulliparous women were found to be longer than those of multiparous ones by both methods. Hibbard et al¹⁹ report that on TVU the sensitivity, specificity, positive and negative predictive values of the cervical length <22 mm between 16 and 22 weeks of gestation were 12.9%, 98.5%, 30.0% and 89.6% respectively and with cervical length measurement of <30 mm they are 32.9%, 91.3%, 32.7% and 90.1%. Okitsu et al²⁰ suggests that the first cervical assessment by TVU be made between 18 and 22 weeks of gestation. During this period the cervical length is nearly maximal, and this is useful for assessing subsequent shortening. We propose that TAU be performed at 16 and 24 weeks gestation to screen for short cervix and risk of preterm labour. If the patients' cervixes are shorter than 3 cm, they should be subjected to TVU for more accurate assessment. Cervical length measurements in the third trimester were found not to be useful in this study.

CONCLUSION

A short cervix in the second trimester detected by ultrasound is a strong predictor of spontaneous preterm labour at all gestational age. TVU seems to be superior to TAU in assessing the cervical length in the second trimester and for screening for spontaneous preterm delivery. It is however considered premature to conclude that cervical ultrasound measurement has a place in routine

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antenatal care in low-risk pregnancies.

REFERENCES

1. Racial/ethnic disparities in neonatal mortality United

- States, 1989-2001. *MMWR Morb Mortal Wkly Rep* 2004;53:655-8.
2. Martin JA, Hamilton BE, Ventura SJ, Menacker F, Park MM, Sutton PD. Births: final data for 2001. *National vital statistics Reports*, 2002,51(2).
 3. Iams JD: Preterm birth. Gabbe SG, Niebyl JR, Simpson JL (Eds): *Obstetrics: Normal and problem pregnancies*, 4th ed. Philadelphia, Churchill Livingstone, 2002, PP 755-82.
 4. Goldenberg RL, Rouse DJ. Prevention of premature birth. *N Engl J Med* 1998; 339:313-20.
 5. Collaborative Group on Preterm Birth Prevention. Multicenter randomized, controlled trial of a preterm birth prevention program. *Am J Obstet Gynecol* 1993; 169:352-66.
 6. Ness A, Visintine J, Ricci E, Boyle K, Berghella V. Use of fetal fibronectin and transvaginal ultrasound cervical length to triage women with suspected preterm labor: a randomized trial. *Am J Obstet Gynecol* 2006;195:567.
 7. Colombo DF, Iams JD: Cervical length and preterm labor. *Clin Obstet Gynecol* 2000;43:735-45.
 8. Iams JD, Goldenberg RL, Meis PJ, Mercer BM, Moawad A, Das A. The length of cervix and the risk of spontaneous labour. *New Engl J Med* 1996;334:567-72.
 9. Taipale P, Hiilesmaa V. Sonographic measurement of uterine cervix at 18-22 weeks gestation: and the risk of preterm delivery. *Obstet Gynecol* 1998;92:902-7.
 10. Zemlyn S. The effect of the urinary bladder in obstetrical sonography. *Radiology* 1978;128:169-75.
 11. Okitsu O, Mimura T, Nakayama T, Aona T. Early prediction of preterm delivery by transvaginal ultrasonography. *Ultrasound Obstet Gynaecol* 1992;2:402-09.
 12. Confino E, Mayden KL, Giglia RV, Vermesh M, Gleicher N. Pitfalls in sonographic imaging of the incompetent uterine cervix. *Acta Obstet Gynecol Scand* 1986;65:593-7.
 13. Andersen HF, Nugent CE, Wanty SD, Hayashi RH. Prediction of risk for preterm delivery by ultrasonographic measurement of cervical length. *Am J Obstet Gynecol* 1990;163:859-67.
 14. Zemlyn S. The length of the uterine cervix and its significance. *J Clin Ultrasound* 1981;9:267-9.
 15. Bowie JD, Andreotti RF, Rosenberg ER. Sonographic appearance of the uterine cervix in pregnancy. *Am J Radiol* 1983;140:737-40.
 16. Varma TR, Patel RH, Pillai U. Ultrasonographic assessment of cervix in normal pregnancy. *Acta Obstet Gynecol Scand* 1986;65:229-33.
 17. Hýbbard JU, Tart M, Moawad A. Cervical length at 16-22 weeks' gestation and risk for preterm delivery. *Obstet Gynecol* 2000;96:972-8.
 18. Murakawa H, Utumi T, Hasegawa I, et al. Evaluation of threatened preterm delivery by transvaginal ultrasonographic measurement. *Obstet Gynecol* 1993; 82:829-32.
 19. Hibbard JU, Tart M, Moawad A. Cervical length at 16-22 weeks' gestation and risk for preterm delivery. *Obstet Gynecol* 2000;96:972-8.
 20. Okitsu O, Mimura T, Nakayau T. Early prediction of preterm delivery by transvaginal ultrasonography. *Ultrasound Obstet Gynecol* 1992;2:402-9.