

Cervical Length Measurement by Transvaginal Ultrasound at 20 to 24 Weeks Gestation and the Timing and Mode of Delivery

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ABSTRACT

Objective: To study the relationship between midtrimester cervical length measurement on transvaginal ultrasonography and timing and mode of delivery.

Materials and methods: A total of 200 asymptomatic antenatal women at 20 to 24 weeks gestation were recruited. Cervical assessment with transvaginal ultrasound was performed using a 5 MHz transvaginal probe. Findings of cervical assessment were then correlated with the timing and mode of delivery. Chi-square test and Odd's ratios with 95% confidence intervals were used.

Results: Sixteen percent women delivered preterm. A cervical length of ≤ 30 mm had good specificity and NPV. At the cut-off value of 25 mm or less, sensitivity was 31.3%, specificity was 100%, PPV was also 100% and NPV was 88.4%. Increased cervical length on TVS (>40 mm) was associated with higher rate of cesarean section as compared to <40 mm (66% vs 34%) and this observation was statistically significant.

Conclusion: Cervical length measured by TVS at midtrimester is a useful and significant predictor of the gestational age at delivery and the mode of delivery. The high negative predictive value avoids unnecessary interventions, such as tocolysis or cerclage in high-risk pregnancies.

Keywords: Cervical length, Transvaginal sonography, Preterm labor, Mode of delivery, Cesarean section

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INTRODUCTION

Transvaginal sonographic measurement of the cervix is a reliable alternative method for the assessment of cervical length as it allows better quality and more accurate visualization of the uterine cervix.^{1,2} Some of the changes associated with cervical ripening during labor can be detected by digital examination of cervix. However, endovaginal ultrasound allows the recognition of changes in endocervical canal length and in the diameter and shape of the internal cervical os before they are apparent to the fingers of the examiner. Cervical length is normally distributed and remains relatively constant until the third trimester.

Several studies have reported that cervical assessment on transvaginal sonography may be useful in the prediction of preterm delivery.³⁻⁵

From large observational studies in low-risk populations we know that the 50th percentile of the cervical length is 35 mm at 24 weeks of gestation.⁶

The aim of this study was to assess cervical length measurement at 20 to 24 weeks of gestation in an unselected group of pregnant women and correlate these measurements with the gestational age and mode of delivery.

MATERIALS AND METHODS

Two hundred asymptomatic antenatal women (79 primigravidae and 121 multigravidae) with gestational age of 20 to 24 weeks were recruited. The study was conducted at the Department of Obstetrics and Gynecology, Medical College and Hospital, Vadodara, India. Clearance was sought from the Hospital Ethics Committee. Informed consent was taken from the subjects. The inclusion criteria for the study were singleton pregnancy, no medical disorder, nonsmokers and no factors predisposing to preterm labor like previous preterm delivery, surgery on cervix, preeclampsia. The exclusion criteria were women unsure of dates, multiple pregnancy, polyhydramnios, women with Hb < 8 gm, past history of preterm birth or 2nd trimester abortion and fetal malformations at the 20-week anomaly scan. Gestational age was determined from last menstrual period and confirmed by measurement of the fetal crown-rump length at the first-trimester scan.

Cervical assessment with transvaginal ultrasound for the measurement of cervical length and diameter of internal os was performed using a 5 MHz transvaginal probe (Mylab 50, Esaote, Genoa, Italy), using the technique suggested by To et al.⁷ The woman were examined with an empty bladder in dorsal position. The internal os, external os, cervical canal and endocervical mucosa were identified. The endocervical mucosa was used to define the level of the internal os. The image was magnified. The distance between the internal os and external os was measured.

Three measurements were taken over a period of 3 minutes to observe any dynamic changes in cervix, and the mean of these three measurements was considered. The presence of funneling and the diameter at the internal os were noted. All ultrasonographic measurements were performed by the second author.

A cut-off value of cervical length of 30 mm and a period of gestation at which it is done (20 to 24 weeks) has good sensitivity and specificity⁸⁻¹⁰ and therefore these cut-offs were adopted for the purpose of this study.

STATISTICAL ANALYSIS

Data was entered into an excel sheet. Data analysis was performed using EPI-6 and SPSS version 10 software. p-value of 0.05 was considered statistically significant. In the univariate analyses, odds ratio with 95% confidence interval have been used. The Chi-square test was used to assess association between short cervical length on TVS at midtrimester and preterm labor. Diagnostic indices, such as sensitivity, specificity, positive (PPV) and negative predictive values (NPV) were calculated.

RESULTS

Cervical length was distributed approximately normally with minimum of 21 mm and maximum of 44 mm, a median of 30 mm, mean of 32.44 ± 3.84 mm. This normal distribution met the criteria for normality by inspection of histogram (not shown) and normality plot and basic descriptive statistics. Mean \pm SD cervical length in nulliparous women ($n = 79$) was 32.62 ± 4.37 cm. In multiparous women ($n = 121$), it was 32.32 ± 3.48 .

Table 1 shows comparison of cervical length with age and body mass index (BMI). The mean \pm SD cervical length did not show a significant correlation with age or BMI. Table 2 shows correlation of subjects with cervical length <30 mm (group A) and >30 mm (group B) with period of gestation in weeks at delivery. Of the 51 women with mean cervical length ≤ 30 mm, 3.9% ($n = 2$) delivered between 28 to 32 weeks of gestation whereas 29.4% ($n = 15$) delivered between 32 to 37 weeks of gestation and the remaining subjects 66.6% ($n = 34$) delivered at >37 weeks. Only 10% of subjects ($n = 15$) out of 149 women in group B delivered preterm between 32 to 37 weeks. This association was found to be statistically significant with p-value of 0.00009.

Table 3 shows the correlation of mean cervical length at 24 weeks of gestation and the mode of delivery. Among the women with cervical length >30 mm ($n = 149$), 14.09% ($n=21$) delivered by abdominal route and 85.9% ($n=128$) delivered vaginally. In the women with cervical length (≤ 30 mm) ($n = 51$), 100% women delivered vaginally. The difference was statistically significant with p-value 0.0045.

Table 4 shows diagnostic indices relating to cervical length in prediction of preterm delivery. At the cut-off value of 25 mm or less, sensitivity was 31.3%, specificity was 100%, PPV was also 100% and NPV was 88.4%. At the cut-off value of ≤ 30 mm the sensitivity was 53.13%, specificity was 79.7%, PPV was 33.3% and NPV was 89.9%. As the cut-off value increased to 35 mm, the sensitivity was 90.6%, specificity 20.8%, PPV was 17.9% and NPV was 92.1%. As the cervical length at 24 weeks on transvaginal scan decreases to 25 mm or less, specificity and PPV for predicting preterm labor was 100%.

DISCUSSION

This study reports the association between the midpregnancy cervical length and incidence of preterm labor. Our observations suggest that mean cervical length measured by TVS at midtrimester is a useful and significant predictor of the gestational age at delivery and the mode of delivery.

A cervical length of ≤ 30 mm had good specificity and NPV. At the cut-off value of 25 mm or less, sensitivity was 31.3%, specificity was 100%, PPV was also 100% and NPV was 88.4%. As the cut-off point was increased, the sensitivity increased but the specificity and the positive predictive value decreased.

Increased cervical length on TVS (>40 mm) was associated with higher rate of cesarean section as compared to <40 mm

Table 1: Cervical length at 22 to 24 weeks of gestation; patient characteristics and comparison of mean of each subgroup

Characteristics	N (%)	Mean cervical length (mm SD)	95% confidence interval	p-value
Age (years)				
<20	31 (15.5)	30.8 (5.34)	29.1-32.5	0.5
20-30	166 (83)	29.8 (7.78)	28.7-29.7	–
>30	3 (15)	30 (7.2)	21.9-38.1	–
Body mass index (kg/m ²)				
<20	74 (37)	27.7 (7.68)	26.3-29.1	0.07
20-26	123 (61.5)	29.9 (8.805)	29-30.8	–
>26	3 (1.5)	23.3 (5.77)	16.8-29.8	–

Table 2: Correlation with period of gestation at delivery

Groups	No.	Period of gestation in weeks at delivery			p-value
		28-32 N (%)	32-37 N (%)	>37 N (%)	
A	51	2 (3.9)	15 (29.4)	34 (66.6)	0.00009
B	149	0 (0)	15 (10.06)	134 (89.9)	–

Table 3: Cervical length and mode of delivery

Cervical length	N	Mode of delivery N (%)		p-value
		Abdominal	Vaginal	
>30 mm	149	21 (14.09%)	128 (85.9%)	0.0045
≤ 30 mm	51	0	51 (100%)	–

Table 4: Diagnostic indices for cervical length

Cervical length	≤25 mm	≤30 mm	≤35 mm
Sensitivity (%)	31.3	53.13	90.6
Specificity (%)	100	79.7	20.8
PPV (%)	100	33.3	17.9
NPV (%)	88.4	89.9	92.1

(66% vs 34%) and this observation was statistically significant. The risk of cesarean delivery increased with increasing absolute values for midpregnancy cervical length. These findings are in agreement with other studies.^{1,3,11-15}

Although cervical length is known to correlate with maternal age and BMI,^{3,11,14,15} this was not observed in our study. Similarly parity did not affect the cervical length. There is only a mild effect of parity on cervical length measurement, as suggested by other reports^{1,2,6} and no distinction should be made on parity when assessing cervical length. Contrary to the observation in our study, Salomon et al¹³ have shown from their large cohort of women that cervical length measurement does not follow a normal distribution and this should be taken into account for risk estimation based on cervical length. This difference could be due to the small sample size of subjects in our study.

Women at increased risk for spontaneous preterm delivery because of a short cervix may benefit from progesterone prophylaxis. Two clinical lines of evidence support that cervical status may identify patients who could benefit from vaginal progesterone administration.¹⁶ However, there is no consensus as to what constitutes a sonographic short cervix. Iams et al¹ proposed that a cervix of ≤25 mm at 24 weeks of gestation increases the risk for spontaneous preterm delivery (relative risk, 6.19; 95% CI, 3.84-9.97). Other investigators have proposed a cut-off of 15 mm,¹⁶ because a cervical length of ≤15 mm at or about 23 weeks is associated with a nearly 50% risk of spontaneous preterm delivery at ≤32 weeks of gestation.

Transvaginal cervical ultrasound is a powerful tool in the risk assessment for spontaneous preterm birth. It is simple to perform, well standardized, can be easily learnt and can be performed at the time of the second trimester anomaly scan. The high negative predictive value avoids unnecessary interventions, such as tocolysis or cerclage in high-risk pregnancies.

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