Original Research Article

Obstetric outcome in sonologically short cervix: a prospective observational study

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ABSTRACT

Background: Preterm delivery is associated with significant perinatal morbidity and mortality. The prediction or early detection of preterm labour is often difficult because signs and symptoms often vary only a little from the normal physiological symptoms and signs of pregnancy. Prediction of preterm birth should ideally be by a screening test with high sensitivity and high negative predictive value. The screening tools available today have not enabled obstetricians to decrease the incidence of preterm birth. However, they may allow time for in-utero transfer to a tertiary care centre as well as administration of glucocorticoids to enhance fetal lung maturity. Till 24 weeks period of gestation, a cervical length measurement of <25 mm increases the risk of preterm labour by 4.5 times. Only limited data are available about the significance of cervical length measurement beyond 24 weeks period of gestation.
Methods: Antenatal patients were screened with trans-vaginal sonography (TVS) between 24 and 28 weeks period of gestation and cervical length recorded. Those who had undergone cervical encirclage prior to 24 weeks, those who were having vaginal bleeding or leaking of amniotic fluid, multifetal gestation and those who were unwilling for trans-vaginal sonography were excluded. A total of 611 antenatal patients were enrolled in the study, out of which 86 were lost to follow up. Relationship of cervical length with spontaneous preterm delivery at <34 weeks (primary outcome) and <37 weeks (secondary outcome) was statistically analyzed.
Results: There was a significant association between cervical length <26 mm and risk of preterm delivery at <34 weeks. However, no such association could be found for PTD <37 weeks.
Conclusions: The study confirmed that there is an increased risk of preterm delivery in women with sonologically short cervix. The study has brought out the significance of cervical length measurement after 24 weeks and its association with preterm labour at <34 weeks. Cervical length measurement by trans-vaginal sonography is a cost effective and simple method for prediction of preterm delivery at <34 weeks period of gestation.

Keywords: Cervical length, Preterm delivery, Trans-vaginal sonography

INTRODUCTION

Preterm delivery (PTD) is the most common cause of perinatal morbidity and mortality worldwide. Preterm delivery has severe psychological, social as well as financial impact on the affected family. Moreover, preterm neonate is at risk of developmental delay, cerebral palsy, chronic lung disease and visual and hearing impairments. Preterm labour is diagnosed when there is at least one uterine contraction every 10 minutes along with 3 cm dilatation and 80% effacement of cervix.[1,2] However, the patient may present with relatively mild symptoms and signs suggestive of labour, which may be features of normal pregnancy.[3]

Prediction of PTD is extremely important for an obstetrician who is working at a peripheral hospital where neonatal intensive care (NICU) facilities are not available. It allows him/her to administer antenatal corticosteroids for fetal lung maturity and contemplate in-utero transfer to a tertiary care centre. An ideal screening test for PTD, hence, should have high sensitivity and high

negative predictive value. There are many screening tools which have been evaluated, the most common being, monitoring uterine activity, assessment of cervical length, measurement of cervical fetal fibronectin and screening for bacterial vaginosis. However, none of these have enabled obstetricians to decrease the incidence of PTD and do not satisfy the requirement of an ideal screening test.

Previous history of PTD or preterm premature rupture of membranes(PPROM) or women who have previously had cervical surgery or have a known uterine anomaly are considered to be at risk for preterm labour. Ultrasound assessment of cervix has been used to predict the likelihood of women going into preterm labour. Cervical length and funnelling either alone or in combination have been found to be useful in predicting PTD.[4] One of the drawbacks of cervical sonography is a lack of standardization of this investigational technique. Moreover, most of the studies on cervical length and its association with PTD have been conducted between 16 and 24 weeks. Till 24 weeks period of gestation, a cervical length measurement of <25 mm increases the risk of preterm labour by 4.5 times.[5] There is a lack of data on correlation between cervical length after 24 weeks and prediction of PTD.

The aim of this study was to measure cervical length by means of trans-vaginal sonography between 24 and 28 weeks period of gestation and to assess its relation with spontaneous preterm delivery before 34 weeks as primary outcome and before 37 weeks as secondary outcome.

METHODS

This was a prospective observational study conducted at a peripheral hospital in an eastern state of India, between September 2014 and August 2016. Women attending antenatal clinic between 24 and 28 weeks of pregnancy were recruited for trans-vaginal sonographic measurement of cervical length. Written informed consent was taken from each participant and those who were unwilling for TVS were excluded. Other exclusion criteria were multifetal gestation, cervical encirclage, vaginal bleeding or leaking of amniotic fluid.

The trans-vaginal sonographic measurement of cervical length was performed by the treating obstetrician himself in the outpatient department during routine antenatal examinations. The equipment used was GE Healthcare Logiq C2 USG Machine with 6.5 MHz TVS probe, shown in Figure 1. A standardized technique for measurement of cervical length as described by Iams et al. was followed.[5] After emptying the bladder, the woman was placed in a dorsal lithotomy position on a gynaecological examination couch. The TVS probe was then introduced into the anterior fornix, taking care to optimize image quality while avoiding undue pressure on the cervix that will distort the anatomy. The whole length of the sonolucent endocervical mucosa was identified in a

sagittal section and the image was magnified so that it occupied 75% of the screen. Calipers were placed from the triangular echodense area marking the external os to the V-shaped indentation marking the internal os, and this distance was measured in a straight line as shown in Figure 2. Three measurements were made over a period of 3 minutes to allow for any change in the state of the cervix and the shortest measurement was reported. Funneling at the internal os, another cervical finding for prediction of PTD was not considered in the study.

Figure 1: GE healthcare logic C2 USG machine with 6.5 MHz TVS probe.

Figure 2: Trans-vaginal sonographic image of the cervix.

A total of 611 women were enrolled in the study and all of them underwent TVS screening for cervical length measurement once, anytime between 24 and 28 weeks

and data recorded. Eighty Six patients were lost to follow up. Remaining 525 patients were followed up till delivery and outcome recorded.

Statistical analysis

Statistical analysis of the data was done and results were arrived at, descriptive data for continuous variables were presented as mean, standard deviation (SD) and range, and for categorical data as numbers and percentages. The data were analyzed using logistic regression with spontaneous PTD at <34 and <37 weeks as the outcomes, for each 3mm decrease in cervical length. Sensitivity, specificity, positive and negative predictive values, and positive and negative likelihood ratios were calculated for each 3mm decrease in cervical length. The Diagnostic Odds Ratios for different cervical lengths were calculated to determine the best cut off value of cervical length for predicting PTD.

RESULTS

A total of 611 women (304 primigravidae and 307 multigravidae) were screened between 24 and 28 weeks period of gestation. The distribution of cervical length is represented by a bar diagram at Figure 3. The mean cervical length was found to be 37.57 (SD 6.85) mm, at a mean gestational age of 26^{+2} weeks. The mean cervical length of primigravidae was found to be 37.68 mm and that of multigravidae was found to be 37.50 mm.

Eighty six patients were lost to follow up. Remaining 525 patients delivered during the study period, out of which 33 (6.29%) were spontaneous PTD, of which 14 (2.67%) were spontaneous PTD at <34 weeks and 19 (3.62%) were between 34 and 36^{+6} weeks. The distribution of cervical length and its correlation with PTD is depicted in Table 1.
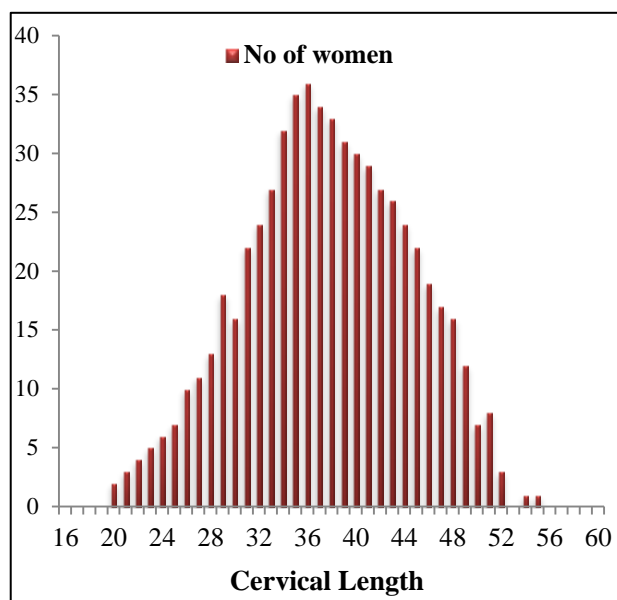

Figure 3: Distribution of cervical length (in mm), n=611.

Table 1: Distribution of cervical length and its correlation with spontaneous PTD.

Cervical length (mm)	20-22	23-25	26-28	29-31	32-34	35-37	38-40	41-43	44-46	47-49	50-52	53-55
Total No. of Women (n = 611)	9	18	33	56	83	105	95	82	65	45	18	2
Spontaneous PTD at < 34 weeks (n = 14)	8	4	1	0	1	0	0	0	0	0	0	0
Spontaneous PTD at 34 to 36^{+6} weeks (n = 19)	0	5	7	0	0	1	1	3	2	0	0	0

Logistic regression analysis for each 3 mm decrease in cervical length and risk of PTD at <34 weeks is represented in Table 2. Diagnostic Odds Ratio of cervical length 26 mm was found to be the highest.

The negative predictive value of the test, if 26 mm cervical length is taken as the diagnostic cut off, was found to be 99.79 % with a sensitivity of 92.86 %.

Nineteen women (3.62%) had spontaneous PTD between 34 weeks and 36^{+6} weeks. Diagnostic odds ratio of cervical length 29 mm was found to be the highest.

However, the sensitivity of the test at this cut off of 29 mm, dropped to 63.16%, failing the criteria for a good screening test.

DISCUSSION

In this prospective observational study, we measured cervical length in late second trimester i.e. between 24 and 28 weeks in asymptomatic singleton pregnancies and evaluated the association between these measurements and spontaneous PTD. Fourteen women had spontaneous PTD at <34 weeks (2.67%) and 19 women had spontaneous PTD at <37 weeks (3.62%).

Table 2: Logistic regression analysis with each 3 mm decrease in cervical length and preterm delivery at <34 weeks.

Cervical length (mm)	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	Likelihood ratio (+)	Likelihood ratio (-)	Diagnostic odds ratio
20	14.29	99.90	80	97.71	146.14	0.86	170.33
23	71.43	99.22	71.43	99.22	91.25	0.29	316.88
#25	85.71	97.46	48	99.6	33.69	0.15	229.85
26	92.86	96.67	43.33	99.79	27.88	0.07	398.28
#27	92.86	95.30	35.14	99.79	19.77	0.07	263.79
29	92.85	94.71	32.5	99.79	17.51	0.07	250.14
32	96.55	82.39	13.46	99.88	5.48	0.04	130.98
35	96.55	67.51	7.78	99.86	2.97	0.05	58.20
38	96.55	52.84	5.49	99.82	2.05	0.07	34.00
41	96.55	52.84	5.49	99.82	2.057	0.07	31.37
44	96.55	37.38	4.19	99.74	1.54	0.09	16.71
47	96.55	22.31	3.41	99.56	1.24	0.15	8.04
50	96.55	5.28	2.81	98.18	1.02	0.65	1.56
53	96.55	3.91	2.77	97.56	1.00	0.88	1.14

With 3 mm regression, the highest diagnostic odds ratio along with high sensitivity and high negative predictive value was found to be for a cut off value of <26 mm, however, to improve diagnostic accuracy, diagnostic indices for 26^{+1} mm were calculated and reconfirmed the cut off value of <26 mm.

Table 3: Logistic regression analysis with each 3 mm decrease in cervical length and preterm delivery between 34 and 36^{+6} weeks.

Cervical length (mm)	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	Likelihood ratio (+)	Likelihood ratio (-)	Diagnostic odds ratio
20	2.56	99.60	20	96.37	6.49	0.98	6.63
23	5.26	97.43	7.14	96.48	2.05	0.97	2.11
26	36.84	95.45	23.33	97.57	8.09	0.66	12.25
29	63.16	91.1	21.05	98.5	7.09	0.40	17.72
32	63.16	82.02	11.65	98.34	3.51	0.45	7.82
35	68.42	66.99	7.22	98.26	2.07	0.47	4.40
38	68.42	50.59	4.94	97.71	1.38	0.62	2.22
41	78.95	35.38	4.39	97.81	1.22	0.59	2.05
44	89.47	20.55	4.06	98.11	1.13	0.51	2.20
47	97.44	13.33	4.01	99.29	1.12	0.19	5.85
50	97.44	3.16	3.73	96.97	1.01	0.81	1.24
53	97.44	1.78	3.68	94.74	0.99	1.44	0.69

It was found that there is a high degree of association between cervical length <26 mm and spontaneous PTD at <34 weeks. However, this association was not found to be significant in predicting PTD at <37 weeks. There are various other studies which have similar outcome.[6-9] These studies reported a sensitivity of 60% for PTD at <34 weeks with a cervical length <25 mm. In all these studies, cervical length was measured between 16 and 24 weeks. Our study reported a sensitivity of 92.86% for PTD at <34 weeks with a cervical length of <26 mm, measured between 24 and 28 weeks. Currently, there are no further data available on significance of short cervix beyond 24 weeks.

There are many studies, which have identified a short cervix as cervical length <25 mm.[6,10] Our study has found a cervical length <26 mm as the ideal cut off for predicting PTD at <34 weeks. However, the sample size of our study was too small to validate this finding. The ideal gestational week at which cervical length should be measured and the ideal diagnostic cut off for cervical length requires further studies. At present, there is lack of evidence to prove the association of short cervix with PTD at <37 weeks. Our study also couldn't bring out any association between cervical length and PTD between 34 and 36^{+6} weeks.

The etiology of PTD is complex and is affected by multiple factors. It is possible that shortening of cervix is the end result of many other pathophysiological factors. It is also possible that a shortened cervix when influenced by other pathophysiological factors, leads to PTD. Hence, it is difficult to generalize the findings of one particular study for different populations. A large multicentric trial with adequate power is required to establish the predictive value of cervical screening for PTD.

CONCLUSION

The study confirmed that there is an increased risk of preterm delivery in women with sonologically short cervix. The study has brought out the significance of cervical length measurement after 24 weeks and its association with preterm labour at <34 weeks. Cervical length measurement by trans-vaginal sonography is a cost effective and simple method for prediction of preterm delivery at <34 weeks period of gestation.

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