Research Article

Diagnostic Accuracy of Mid-Pregnancy Transvaginal Ultrasonography of the Cervical Length in Predicting Caesarean Section Risk in Primigravida Females

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Abstract:

Background: Caesarean section is considered a safer surgical procedure compared to other procedures, however, the risk of maternal and fetal morbidity and mortality is greater in case of emergency caesarean section compared to elective caesarean section.

Objective: To assess the diagnostic accuracy of mid-pregnancy transvaginal ultrasonography of the cervical length in predicting caesarean section risk in primigravida females at term,in an effort to properly council patients for optimal labour and delivery management during antenatal period.

Methods: This cross sectional study was carried out at Lady Willingdon Hospital, Lahore. For a duration of 6 months. The non-probability, consecutive sampling was used. Demographic information was recorded after informed consent. Measurement of cervical length was performed at 20-24 weeks of gestation using TVS scan by the senior ultrasonologist. Patients were followed until delivery and mode of delivery was decided by senior most obstetrician. The mode of delivery was noted and results were compared with cervical length through TVS scan at mid pregnancy. Data was entered and analyzed by using SPSS version 17. 2x2 table was generated to find sensitivity, specificity, PPV, NPV and diagnostic accuracy of cervical length on TVS.

Results: The mean gestational age was21.97±1.41 weeks. The sensitivity, specificity, PPV, NPV and diagnostic accuracy of CL on TVS was 94.21%, 89.87%, 93.44%, 91.03% and 92.5% respectively.

Conclusion: Our study results showed that the transvaginal ultrasonography of the cervical length has a high sensitivity, specificity and diagnostic accuracy in predicting caesarean section in primigravida females.

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Introduction:

Caesarean section is considered a safer surgical procedure compared to other procedures, however, the risk of maternal and fetal morbidity and mortality is greater in case of emergency CS compared to elective CS.[1] It is hence important to make enough effort to convince patients for optimal labor and normal delivery during antenatal period. [2]

The failure of proper labour and its progress are main reasons for primary cesarean delivery.[4] Several studies have shown that length of cervix affects and determine duration of labour.[5] The cervix starts some physiological changes in start of third trimester that proceed till delivery and these changes show the cervical alteration due to intrauterine pressure because of increase in size of fetus.[6]

A number of studies have confirmed an inverse correlation of length of cervix as measured on ultrasound with preterm birth. To differentiate the lower uterine segment from the endocardial canal

before 14 weeks is challenging and due to this, measurement of cervical length is very challengeable before 14 weeks. There is agreement that between 18 and 24 gestational weeks is the reliable period to determine cervical length to ascertain the preterm birth risk. There are multiple techniques to measure cervical length but the most commonly used and approved technique is the TVS.[5] TVS has been considered as a safe alternative procedure to assess the cervical length because of its superior quality of imaging as well as precise visualization.[7]

One study showed that in pregnancies bearing single fetus there is greater risk of preterm birth among those found to have short length of cervix in second trimester.[8] Another study showed that cervical length has correlation with outcome of labor induction irrespective of the bishop score.[9] At 23 weeks or median gestational age, an increase in cervical length may give prediction of a cesarean section at term among the primigravida females.[10-12]

The sensitivity and specificity of TVS examination of cervical length in second trimester has been reported to be 66.7% and 65% respectively in a study.[13] In Pakistan, the frequency of CS has been reported as 21.40%13. This study has been designed to assess diagnostic accuracy of TVS for cervical length in mid pregnancy in order to predict cesarean section at term in the primigravida females taking mode of delivery as the gold standard. Literature has also presented useful results but the reported accuracy is not enough to be reliable and not much work is found in literature regarding the assessment of cervical length for prediction of mode of delivery. So we conducted this study to find whether cervical length assessment during second trimester for prediction of mode of delivery is helpful or not. In future, we can use cervical length assessment through TVS during second trimester so that mode of delivery can be predicted early and can be planned. Females can be prevented from complications of emergency caesarean sections.

Methods:

This cross sectional study was conducted at Lady Willingdon Hospital, Lahore for duration of Six months. Sample size estimated was 200 cases using 95% confidence level, 12% margin of error for sensitivity and 8% margin of error for specificity and taking expected percentage of caesarean section 21.40% and senstivity and specificity of cervical length assessment on TVS i.e. 66.7% and 65%12 respectively in predicting caesarean section in primigravida female taking mode of delivery as gold standard.Non-probability, consecutive sampling was used and all nulliparous females of age 18-35 years with Singleton pregnancy (on USG), at 20-24 weeks of gestation (on LMP and antenatal record) presenting for antenatal checkup were included. The exclusion criteria included:

- Fetal abnormalities or IUGR (on USG)
- Malpresentation of fetus (per abdominal examination+USG)
- Females with PIH (BP≥140/90mmHg), pre-eclampsia (PIH with proteinuria >+1 on dipstick method) or eclampsia (convulsions with PIH) or any pregnancy complications.
- Extremely short statured women (height<4.9 feet).
- Polyhydramnios(AFI>10)

Informed consent was taken & demographic information (name, age, gestational age) was recorded. Measurement of cervical length was performed at 20-24 weeks of gestation with the use of TVS scan by the senior ultrasonologist. Patients were labeled as positive or negative for prediction of caesarean section. Cervical Length of ≥19mm was predicted as positive indication for caesarean delivery while cervical length <19mm was predicted as negative for caesarean section.

All females followed-up in OPD till term and were advised to present in labour room in case of active labour pains or if they are post-dated. Induction of labour done by hospital protocol if they were postdated. In labour room, females were given trial for vaginal delivery by senior medical officer. The C-section was performed if any indication arose like fetal distress (assessed by non-reactive CTG or meconium staining of liquor) or failure to progress (if dilatation of cervix I <1cm/hour).The parameters which were noted include gestational age at delivery, whether labour was spontaneous or induced, indication for caesarean section and mode of delivery. The results were compared with cervical length through TVS scan. All this information was recorded on proforma.

Data analysis was performed using SPSS version 17 software. Quantitative data like age and gestational age was presented by mean and standard deviation. Qualitative data like frequency of caesarean section was presented by frequency and percentage. 2x2 table was generated to find sensitivity, specificity, PPV, NPV and diagnostic accuracy of cervical length on TVS taking mode of delivery as gold standard. Data were stratified for age, BMI (>30kg/m2, <30kg/m2) and induction of labour to address the effect modifiers. Post stratification chi square test was applied with p-value<0.05 as significant.

Results:

In this present study total 200 cases were enrolled. The mean age of the patients was 25.41±4.43 years with minimum and maximum age of 18 & 32 years respectively. The mean gestational age was 21.97±1.41 weeks with minimum and maximum gestational age of 20 & 24 weeks respectively. The mean mid-pregnancy CL was 19.66±2.69 with minimum and maximum 15 & 24 respectively. (Table 1)

Table 1: *Descriptive Statistics of Age (Years), Gestational Age (Weeks) and Midterm Pregnancy Cervical Length (CL)*

		Age (Years)	Gestational age (weeks)	Mid Pregnancy CL
Age (years)	n	200	200	200
	Mean	25.41	21.97	19.66
	SD	4.43	1.41	2.69
	Minimum	18	20	15
	Maximum	32	24	24

There were 122 (61%) patients positive for CS by CL on TVS while 78 (39%) patients were negative. Normal delivery occurred in 79 (39.50%) patients and CS was performed in 121(60.50%) patients. The sensitivity of CL on TVS was 94.21%, specificity was 89.87%, PPV was 93.44%, NPV was 91.03% and diagnostic accuracy was 92.5% taking mode of delivery as gold standard (Table 2). Data was stratified for age of patients. The study results showed that in below 25 years patients, the CL on TVS was predicted positive on 53 cases in which CS was performed in 49 cases, similarly in above 25 years patients the CL on TVS was predicted positive on 69 cases in which CS was performed in 65 cases.

Table 2: *Comparison of CL on TVS with Mode of Delivery*

		Mode of Delivery		Total	P-Value
		CS	NVD		
CL on TVS	Positive	114	8	22	0.000
	Negative	7	71	78	
Total		121	79	200	

Sensitivity = 94.21%

Specificity = 89.87%

Positive Predictive Value = 93.44%

Negative Predictive Value = 91.03%

Diagnostic Accuracy = 92.5%

Statistically significant difference was found between the CL on TVS and mode of delivery stratified by age. i. e p-value=0.000 & 0.000 respectively. In < 25 years patients, the sensitivity of CL on TVS was 90.7%, specificity was 90.2%, PPV was 92.5%, NPV was 88.1% and diagnostic accuracy was 90.5% taking mode of delivery as gold standard.

In >25years patients, the sensitivity of CL on TVS was 97.0%, specificity was 89.5%, PPV was 94.2%, NPV was 94.4% and diagnostic accuracy was 94.3% taking mode of delivery as gold standard..Data was stratified for induction of labour. In induced females, the sensitivity of CL on TVS was 93.1%, specificity was 88.1%, PPV was 84.4%,NPV was 94.9% and diagnostic accuracy was 90.1% taking mode of delivery as gold standard. In females without induction, the sensitivity of CL on TVS was 91.9%, specificity was 91.9%, PPV was 95%, NPV was 94.4% and diagnostic accuracy was 91.9% taking mode of delivery as gold standard.

Discussion:

Progress of physiological changes in uterus determines the parturition and delivery outcome. Short cervix in second trimester is an established cause for higher risk of preterm birth.[14] To differentiate the lower uterine segment from the endocardial canal before 14 weeks is challenging and due to this, measurement of cervical length is very challengeable before 14 weeks. There is agreement that between 18 and 24 gestational weeks is the reliable period to determine cervical length to ascertain the preterm birth risk in accordance with this technique. A number of research studies demonstrated

that the size of cervical length in the 1st trimester is not predictive of preterm delivery.[15] It is reported recently in another study that in pregnancies which followed to spontaneous deliveries before 34 weeks, the endocervical length at 11 to 13 weeks is shorter as compare to deliveries after 34 weeks.[16]

The outcome of labor and mode of delivery is dependent on cervical length. Dystocia or poor labor progress is one of the major reasons of primigravida CS. Some researchers have recently reported that cervical length measured at second trimester is a risk factor for CS among primiparous females. Also, increased cervical length has significant association with poor labor progression as well as higher risk of induction for delivery. A number of procedures are available for measuring the cervical length including transabdominal, digital, transperineal and transvaginal.[17-19] Literature so far has not been able to produce any consensus if the TVS assessment for cervix is valuable for prediction of outcome of labore. Where some studies have reported the same[20,21,] others have disagreed with the statement.[19,22]

In this study we aimed to test the hypothesis that a long cervix in mid pregnancy would be associated with an increased risk of cesarean delivery during labor at term. This cross sectional study was conducted at Lady Willingdon Hospital, Lahore to determine the diagnostic accuracy of mid-pregnancy transvaginal ultrasonography of the cervical length in predicting caesarean section in primigravidas, females taking mode of delivery as gold standard at term.

In our study the mean age of the patients was 25.41±4.43 years with minimum and maximum age of 18 & 32 years respectively. The mean gestational age was 21.97±1.41 weeks with minimum and maximum gestational age of 20 & 24 weeks respectively. The mean midpregnancy CL was 19.66±2.69 with minimum and maximum 15 & 24 respectively. One study with similar objectives recruited 281 women with mean gestational age of 22 weeks and mean age of 26 years. 4 Whilst in another study 200 women were studied. Majority of these females (83%) were 20-30 years old within 22-24 weeks gestational age. The CL ranged from 21-40 mm with mean of 32.44±3.84 mm and median of 30mm.[7]

In our study mean value of mid pregnancy CL was 19.66±2.69. The positive prediction for CS by CL on TVS was found in 122(61%) patients. The sensitivity, specificity, PPV, NPV and diagnostic accuracy of CL on TVS was 94.21%, 89.87%, 93.44%, 91.03% and 92.5% respectively. Other studies showed similar results as ours. Sensitivity, specificity, PPV and NPV of cervical length as a predictor of mode of delivery was 54.8 percent, 91.4 percent, 82.1 percent and 73.6 percent respectively shown by Mamta Rath Datta.[23] They concluded that at mid trimester the transvaginal cervical length measurement can be used as a predictive tool to assess the risk of primary cesarean section as well as induction labour need. A study by Iams et al[24] in their study that TVS was performed at 24 weeks, showing a sensitivity of 37 percent and specificity of 92 percent for predicting preterm delivery. One study has reported that the sensitivity and specificity of cervical length assessment through TVS during second trimester are 66.7 percent and 65 percent respectively.[12]

One more study by R. Maymon et al[25] showed after scanning by TVS from week 26 and follow up till the delivery through the receiver-operating (ROC) curve that a cervical length of 25mm could precisely predict any possibility of premature delivery with 94 % sensitivity and 45 % specificity.

Another study by payal arora et al[7] assessed the readings of TVS and its possible effect on delivery mode. A sensitivity of 31.3%, specificity of 100%, PPV of 100% and NPV of 88.4% was observed in this study. Hence they concluded that higher cervical length based on TVS has significant association with greater risk of CS.

Gomez et al. argued in his research that the rates of sensitivity, specificity, PPV & NPV of cervical length in preterm labor , which was 73 percent, 78 percent, 68 percent and 83 percent respectively for cervical length of <18mm. Kalu et al.[4] indicated the role of mid pregnancy transvaginal cervical length measurement in prediction of pregnancy outcome and established that risk of cesarean section may be predict by long mid trimester transvaginal cervical length. Hence a number of studies published results having consensus with our findings that cervical length assessment in second trimester using TVS may give accurate prediction regarding mode of delivery.

Conclusion:

Our study results showed that the transvaginal ultrasonography of the cervical length at mid-pregnancy has a high sensitivity, specificity and diagnostic accuracy in predicting caesarean section in primigravida females.

Ethical Approval: Given

Conflict of Interest: The authors declare no conflict of interest.

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