Original Research Article

Study of comparison of transvaginal cervical length and Bishop score in predicting successful labour induction- a prospective study from a tertiary care hospital of Rajasthan

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ABSTRACT

Background: Labor induction is one of the common interventions in obstetric practice. Assessment of cervix has been used as a predictor of the successful vaginal delivery. The traditional method of predicting whether an induced labour will result in successful vaginal delivery is based on the pre induction favourability of cervix as assessed by the Bishop score. Now we used transvaginal sonography (TVS) as an objective method of assessment of cervical length to evaluate the role of the pre-induction transvaginal ultrasonographic (TVS) cervical length in predicting labour outcome and comparing it to the Bishop score in patients undergoing induction of labour.
Methods: This observational prospective study included 100 pregnant women in which induction of labour was performed at 37-42 weeks of gestation. Cervical length on transvaginal ultrasound and bishop score by digital examination is assessed prior to induction in cases according to standard protocol.
Results: In our study though the sensitivity of the Bishop score in predicting the successful labour induction was higher (75.6%) compared with that of cervical length measured trans vaginally (69.35%). The specificity and positive predictive value for the cervical length (2.7 cm) was 77.78% and 91.49% compared with the Bishop score (4) 55.55% and 81.82% respectively.
Conclusions: Bishop score and transvaginal cervical length both are good predictors of successful induction of labour. Transvaginal cervical length provides a better prediction of the likelihood of vaginal delivery within 24 hours of induction.

Keywords: Bishop score, Cervical length

INTRODUCTION

Induction of labour means initiation of uterine contractions after the period of viability by any method (medical, surgical, combined) before spontaneous onset of labour for the purpose of vaginal delivery.[1] The condition of the cervix or favourability is important to the success of labour induction. Assessment of cervix has been used as a predictor of the successful vaginal delivery. Induction of labour carried out in approximately in 20% of pregnancies. The commonest indication for induction is prolonged pregnancy and several studies have shown that induction compared to expectant management is associated with a substantial reduction in perinatal mortality.[2]

The traditional method of predicting whether an induced labour will result in successful vaginal delivery is based on the pre induction favourability of cervix as assessed by the Bishop score. Bishop developed a standardized cervical scoring system called the Bishop score. Bishop score include cervical consistency, effacement, position, dilatation and head station.[3] Calder modified the original Bishop score in 1974 which known modified Bishop score. The effacement of cervix denoted percentage in the

original score replaced with length of cervix in centimetres in modified Bishop. However, bishop score assessment is subjective method and several studies demonstrated a poor predictive value for the outcome of induction due to controversy in assessment by different examiners. Bishop score has a poor predictive value especially in women with a low bishop score. Labour induction with low bishop score has been associated with failure of induction, prolonged labour, high rate of caesarean section deliveries.[5]

Recently, transvaginal ultrasonography has increased application in obstetrics in induction of labour. Transvaginal ultrasonographic measurement of cervical length has primarily focused on detecting cervical changes in women at risk for preterm delivery.[6] Cervical shortening as seen in sonography has been proposed as representative of the process of cervical effacement. Transvaginal ultrasound allows visualization of the cervix beyond a closed external os and measures the cervical length accurately without much inter-observer variation, especially in cases of non-palpable cervix on digital examination.[7] It may accurately reflect the cervical anatomy and it is considered a well-tolerated examination than painful pelvic examination.[8] Transvaginal has been proposed as representative of the process of cervical effacement. Transvaginal ultrasonographic measurement of the cervix could represent a more accurate assessment of the cervix than digital examination, because the supra vaginal portion of cervix usually compromising about 50% of the cervical length is very difficult to assess digitally in closed cervix.[9] In addition, the assessment of the effacement which starts at the internal os will be difficult to predict in a closed cervix.[10] In contrast, sonographic measurement of the cervical length is quantitative and easily reproducible method of assessing the cervix which can be achieved easily with minimal discomfort of the patient. Transvaginal ultrasonographic cervical length measurement is objective method.[11]

This study was designed to investigate transvaginal ultrasonographic cervical measurement as a predictor of duration of labour and successful induction resulting in vaginal delivery and also compare the performance of ultrasonographic cervical measurement with that of the bishop score in predicting outcome of labour induction.[13]

METHODS

This prospective study was conducted at the department of obstetrics and gynecology, Pannadhay Rajkiya Mahila Chikitsalaya, RNT Medical College, Udaipur between October 2021 and December 2022.

Sample size

Study group included 100 pregnant women in which induction of labour was performed at 37-42 weeks of gestation. Cervical length on transvaginal ultrasound and

bishop score by digital examination was assessed prior to induction in cases according to standard protocol.

Inclusion criteria

Age 20-35 years, gestational age 37-42 weeks, indications like pre-eclampsia, prolonged pregnancy, mild intra-uterine fetal growth restriction, elective inductions etc. singleton foetus, cephalic presentation with live foetus, unfavourable cervix, absence of uterine contractions, reactive NST before induction, intact membrane, Bishop score ≤6

Exclusion criteria

Foetal malpresentation, antepartum haemorrhage, previous uterine incision, contraindications for prostaglandins (allergy, bronchial asthma, hypotension palpitation), suspicion of foetal distress on admission, patient in active phase of labour, multiple gestation, presence of severe maternal and foetal compromise e.g. severe PIH, severe IUGR, heart disease etc. ruptured membrane.

Methodology

All patients who were willing to participate in this study were included in the study baseline characters such as age, gestational age at induction and indication for induction are noted.

Oral and written informed consent was taken from all participant women before starting the study. Women who were recruited to undergo induction of labour were asked to participate in the study.

Figure 1: TVS cervical length.

Cervical length was measured by a transvaginal ultrasound scanner. All ultrasound measurements are carried out according to standard protocol i.e. women were examined in a dorsal lithotomy position with an empty urinary bladder. Once the cervical canal was identified the probe was withdrawn slightly so there was no pressure of the tip

of the probe on the cervix. A sagittal plane through the cervix was identified where the external cervical os, the cervical canal and the internal cervical os was visible. The length of the cervix was measured from the outer to the inner cervical os as a straight line. Cervical length measured 3 cm away from posterior fornix. It is important to include only that part of the cervical canal that is bordered by the endocervical mucosa. Three measurements were obtained and the shortest, technically best measurement in the absence of uterine contractions was recorded (Figure 1).

Then attending obstetrician performed digital examination of the cervix for consistency, effacement, dilatation, position and station of the presenting part as described in modified Bishop score. Bishop score was noted on a Performa.

Induction of labour was carried out according to standard protocol. The agents used for induction was tablet misoprostol 25 microgram or dinoprostone gel 0.5 mg within 1 hour of cervical assessment. Regular foetal monitoring done during induction of labour by CTG. The patient was reassessed after 6 hours. If she did not exhibit regular uterine contractions and cervical change, a second dose of misoprost was administrated intracervically. Maximum of 3 doses can be repeated.

Subsequent dose was withheld if: a) the patient was in active labour; b) rupture of membrane; c) if cervical effacement >60% and cervical dilatation ≥3 cm; d) regular uterine contractions 2-3 in 10 minutes.

Active phase of labour was diagnosed as 3-4 contractions in every 10 minutes, each lasting for 45 to 60 seconds. And the cervix was dilated ≥3 cm and the effacement of cervix was 80% or greater. Successful induction of labour is defined as active labour occurring at the end of induction protocol. Augmentation of labour was done as per labour room protocol. If needed amniotomy done. Intravenous oxytocin administration was started when there was an arrest of dilatation, according to the hospital protocol. For analgesia in required patient injection tramadole 100 mg or injection drotaverin 40 mg offered.

Failed induction is defined as an inability to achieve the active phase of labour corresponding to cervical dilatation of ≥3 cm within 12 hours from the last dose of PGE1.

Failure to progress is defined as no cervical dilation during the active phase of labour for the last 2 hours or no descent of the fetus head during the second stage of labour for at least 1 hour despite adequate uterine contractions. This is considered as an indication for caesarean delivery for failure to progress of labour.

Primary outcome measure assessed was induction to delivery interval <24 hours.

Secondary outcome measures assessed were induction-active phase interval <12 hours and number of vaginal deliveries <48 hours.

RESULTS

100 primigravida with gestational age between 37-42 weeks who admitted for induction of labour were enrolled in the study demographic variable (age distribution, gestational age and indication for induction) are summarized.

Table 1: Indication for induction.

Indication	N	%
Postdatism	31	31.00
Prolonged latent phase	28	28.00
PIH	22	22.00
Oligohydramnios	12	12.00
IUGR	5	5.00
Gestational diabetes	2	2.00
Total	100	100.00

Bishop score

Result shows that women with bishop score 1 were 3%, score 2 were 2%, score 3 were 17%, score 4 were 28%, score 5 were 29% and bishop score 6 were 21%.

Trans vaginal cervical length

Women with trans vaginal cervical length <2 cm were 3%, 41% of women were with cervical length between 2.1-2.5 cm and 56% were with cervical length of ≥2.6 cm.

Mode of delivery

Vaginal delivery occurred in 80% of women and out of 80, in 62% of women, delivery was within 24 hours of induction and in 18% delivery was within <48 hours of induction. There were 20% deliveries by caesarean section.

Indication for LSCS

Out of 100 study patients 80 delivered vaginally, and 20 underwent LSCS. Out of 20, 7 were for fetal distress and 8 were for non-progress of labour and 5 for PROM with NPOL (prolonged rupture of membrane with non-progress of labour).

Table 2: Fetal outcome.

Variables	Mean±SD	Range (min-max)
Birth weight (kg)	2.654±0.32	2-4
Apgar at 5 minutes	8.94±0.28	7-9
NICU admission	6	

Table 3: Outcome measures.

Outcome measures	N	%
Number of patients with induction to delivery interval <24 hours	62	62.00
Number of patients with induction to delivery interval >24 hrs and <48 hours	18	18.00
Number of patients with induction to active phase interval <12 hours	53	53.00
Out of 62, number of patients with induction to active phase interval <12 hours	43	69.4
Out of 62, of patients with induction to active phase interval >12 hours	19	30.6
Number of vaginal deliveries <48 hours	80	80.00

Table 4: Correlation of the outcome measures with mean bishop score and cervical length.

Outcome measures	Mean Bishop score	Mean cervical length (cm)
Number of patients with induction to delivery interval <24 hours	4.71±1.05	2.55±0.33
Number of patients with induction to delivery interval >24 hours and <48 hours	4.50±1.05	2.65±0.30
Number of patients with induction to active phase interval <12 hours	4.75±1.15	2.40±0.27
Out of 62, number of patients with induction to active phase interval <12 hours	4.79±1.15	2.46±0.27
Out of 62, of patients with induction to active phase interval >12 hours	4.70±1.15	2.52±0.27
Number of vaginal deliveries <48 hours	4.60±1.10	2.68±0.44

Table 6 shows that 6% of neonate required NICU admission, 5 for respiratory distress and 1 for congenital malformation. The mean bishop score was 4.41 and distribution shown in below figure.

There was a significant association between cervical length and the induction to delivery interval. The likelihood of vaginal delivery within 24 hours increased with decreasing cervical length.

Figure 2: Correlation between bishop score and induction to delivery interval.
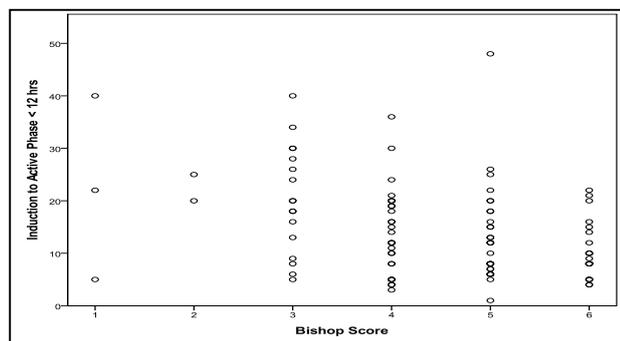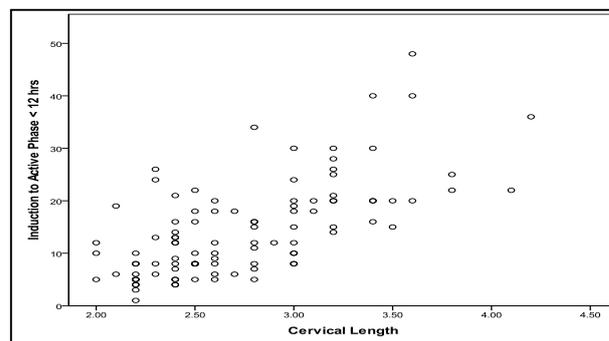
Figure 2: Correlation between cervical length and induction to delivery interval.

There was a significant association between bishop score and induction to delivery interval. Furthermore, the likelihood of vaginal delivery within 24 hours increased with increasing bishop score.

The mean transvaginal cervical length was 2.75 cm and the distribution is shown in Figure 3.

Bishop score around score 4 and transvaginal cervical length around 2.7 cm were found to be best cut-off values for the pre induction cervical condition. Taking Bishop score 4 and cervical length 2.7 cm as the cut off and taking successful induction of labour as delivery within 24 hours.

Table 5: Comparison of predictive values.

Variable	Sensitivity	Specificity	PPV	NPV	Predictive value
Bishop score ≥4	75.06%	55.55%	81.82%	27.78%	>0.05
TVS cervical length <2.7 cm	69.35%	77.78%	91.49%	42.42%	<0.001

Though Bishop score has more sensitivity than cervical length. Specificity and positive predictive value of the trans vaginal cervical length was 77.78% and 91.49% respectively. Predictive value for cervical length was <0.001 which was significant and predictive value for Bishop score was >0.05 which was not significant. So trans vaginal cervical length found to be better predictor of successful induction of labour in terms of delivery within 24 hours when compared to Bishop score.

DISCUSSION

This study has demonstrated that, in singleton pregnancies undergoing induction of labour with misoprostol at 37-42 weeks, successful vaginal delivery within 24 hours of induction occurred in 62%. The study has also demonstrated that induction to delivery interval is significantly associated with both the preinduction bishop score and the sonographically measured cervical length, higher the Bishop score and lesser the cervical length better the likelihood of vaginal delivery. TVS cervical length was a better predictor of successful labour induction in terms of delivery within 24 hours of induction.

Pandis et al conducted a study on 240 women with singleton pregnancies at 37-42 weeks of gestation vaginal delivery occurred in 194 (80.8%) women and in 142 (73.2%) of these delivered within 24 hours of induction.[15] Cubal et al study on 197 women and analysed that 166 women had vaginal delivery (84.3%) and 31 had cesarean section (15.7%).[16] In our study out of 100, 80% delivered vaginally and 62% delivered within 24 hours induction of labour and 18% delivered within 48 hours of induction of labour. Table 6 shows the comparison of the primary outcome measures in our study with the other study.

Table 6: Comparison of the primary outcome measures with other study.

Outcome Measures	Pandis et al[15] (n=240) N (%)	Cubal et al[16] (n=197) N (%)	Present study (Total 100) N (%)
Number of vaginal deliveries	194 (80.4)	166 (84.3)	80 (80)
Number of LSCS	46 (19.2)	31 (15.7)	20 (20)
Number delivered within 24 hours	142 (73.2)	135 (68.5)	62 (62)

In our study we defined successful induction of labour as vaginal delivery occurring within 24 hours. This end point has been traditionally used in several studies to examine the efficacy of an inducing method.

Both sonographic cervical assessment and the Bishop score successfully predicted vaginal delivery within 24 hrs. As the cervical length increases the likelihood of delivering within 24 hours decreases whilst, as Bishop score increase, the likelihood of delivering within 24 hours increases.

In our study though the sensitivity of the Bishop score in predicting the successful labour induction was higher (75.6%) compared with that of cervical length measured trans vaginally (69.35%). The specificity and positive predictive value for the cervical length was 77.78% and 91.49% compared with the Bishop score 55.55% and 81.82% respectively. Predictive value for cervical length was <0.001 compare to bishop score (p>0.05).

Gómez et al study included 177 women with a single pregnancy, 36-42 weeks of gestation, and a live fetus in cephalic presentation before induction with best cut-off points for predicting successful induction using receiver operating characteristic curves were 24 mm for cervical length and 4 for the Bishop score.[17] Cervical length was a better predictor than the Bishop score (sensitivity and specificity of 66 and 77% versus 77 and 56%, respectively.

Vallikkanu et al, a prospective study on 249 women, demonstrate transvaginal sonography was significantly less painful than digital examination for Bishop score assessment and optimal cut-offs for predicting cesarean delivery of >20 mm for cervical length and Bishop score ≤5.[18] Cervical length had superior sensitivity (80% versus 64%) and marginally better positive (30% versus 27%) and negative (89% versus 83%) predictive values. Transvaginal measurement of cervical length was better tolerated than digital examination for Bishop score assessment.

A recent randomized study comparing use of transvaginal sonographic assessment and Bihop score to guide preinduction cervical ripening with prostaglandins has shown a 50% reduction in prostaglandin use without affecting successful labour induction with trans vaginal ultrasonography cervical length.

The survival analysis demonstrated better discriminatory results in favour of cervical length without any women in short cervix (0-1.8 cm) remaining undelivered after 24 hours compared to 10% of women in the high Bishop score group (5-8). 67% of the long cervix group (3.2-5 cm) remained undelivered after 24 hours compared to 33% of women in the low Bishop score group. These findings suggest that sonographic cervical length is a better test than the Bishop score for predicting successful induction of labour.

But the limitations for obtain TVS cervical length are that the expensive equipment and also the technical expertise in measuring the cervical length in standard and reproducible manner is required, so as to avoid the errors in the measurement. It is also an expensive test.

In the setting where transvaginal sonographic measurement of cervical length can be achieved easily, correctly and with minimal discomfort to the patient, it provides a useful prediction of the likelihood of vaginal delivery within 24 hours of induction and of the induction to delivery interval. It helps in counseling the women regarding the outcome of labour induction length.

Women with a cervical length of less than 2.7 cm can be counseled that delivery will possibly occur within 24 hours of induction, whereas those with cervical length of >2.7 cm can be advised that they have a chance of remaining undelivered after 24 hours interval.

Bishop score still remains a useful test in the setting where the equipment and experts are not available as it is a simple, inexpensive test and does not require technical expert.

CONCLUSION

Bishop score and transvaginal cervical length both are good predictors of successful induction of labour. Transvaginal cervical length provides a better prediction of the likelihood of vaginal delivery within 24 hours of induction. Transvaginal measurement of cervical length is less painful compare to painful digital examination for Bishop score. TVS cervical length is objective method and Bishop score is subjective method so, subjective variations occur in Bishop score by different observers but not in TVS cervical length. So, transvaginal cervical length provides better prediction of successful vaginal delivery within 24 hours of induction compared to Bishop score. TVS cervical length could be used as a better alternative to Bishop score for successful labour induction in the setting where the appropriate equipment and expertise are available.

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