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Original Research Article

THE ROLE OF CERVICAL LENGTH MEASUREMENT BY TRANSVAGINAL ULTRASOUND IN THE SUCCESS OF LABOUR INDUCTION

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Abstract

Background: Induction of labour (IOL) is a common procedure aiming to secure vaginal delivery. Traditional methods, like the Bishop score, are subjective and may not predict successful induction. Transvaginal ultrasonographic measurement could be a more accurate and objective assessment, but more clinical evidence is needed. This study aimed to compare the predictive value of the Bishop score and transvaginal ultrasonography measurement of cervical length for successful labour induction. **Materials and Methods:** This study included 126 patients at the Government Virudhunagar Medical College and Hospital, Tamil Nadu from September 2023-May to 2024. Women undergoing labor induction had their cervical length measured via transvaginal ultrasound and Bishop scores assessed blindly before receiving Prostaglandin E2 gel. Success was defined as reaching active labor within 12 hours post-induction, with failure criteria including insufficient cervical dilation or fetal descent, leading to potential caesarean delivery. **Result:** The average time taken from induction to delivery among the patients with Bishop score ≤ 3 was 20.3±1.8 hours and for Bishop > 3 was 17.24±2.1 hours respectively, with a significant p-value of < 0.01. The average time taken for induction and delivery among the patients with cervical length ≤ 2.5 cm was 19.85±2.6 hours and those with cervical length > 2.5 cm were 16.11±2.5 hours with significant intra-group difference. **Conclusion:** TVS for cervical length measurement was not completely replaced by the Bishop score, but it can be used as an additional tool for better predictability of induction to the duration of labour.

INTRODUCTION

Induction of labour (IOL) is defined as the process of artificial initiation of uterine contractions, at any time after the attainment of foetal viability, by a method that aims to secure vaginal delivery. It is currently one of the most common procedures in the present era, accounting for approximately 20% of the global incidence.[1,2] Evidence has suggested that the induction of labour has helped reduce maternal and foetal morbidity and mortality.[3-5] Labour induction with a low cervical score has been associated with failure of induction, prolonged labour, and a high rate of caesarean deliveries. With the developed evidence, predicting whether induced labour will result in successful vaginal delivery relies on the pre-induction favourability of the cervix. One of the traditional methods uses the Bishop score. However, this assessment is subjective, and hence, there will be wide variation in subjective prevalence. Therefore, the chances of poor predictive value for the outcome of induction, especially among women with a low Bishop score, might be high.[6] Hence, the most accurate method, the measurement of transvaginal cervical length, has been used to detect cervical changes in women at risk of preterm delivery. However, the same cervical changes can also be used to predict the success of labour induction. Theoretically, transvaginal ultrasonographic measurement of cervical length could represent a more accurate and objective assessment of the cervix than a digital examination. Since the supra-vaginal portion of the cervix usually comprises approximately 50% of the overall cervical length, it is very difficult to assess digitally in a closed cervix.[7] In addition, the assessment of effacement which starts at the internal OS will be difficult to predict in a closed cervix.

In contrast to Bishop, transvaginal sonographic measurement of cervical length is a quantitative and

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easily reproducible method for assessing the cervix which can be achieved easily with minimal discomfort to the patient; hence, there is a need for more clinical evidence in this regard.[8] Therefore, this study was performed to determine whether transvaginal ultrasound, with the ability to objectively measure cervical length, could predict the outcome of induction better than the clinical assessment obtained by the Bishop score. If so, transvaginal ultrasonographic measurement of cervical length can be used as an adjunct tool to the traditional Bishop score and can add yet another dimension of information in the field of successful induction of labour.

Aim

This study aimed to compare the predictive value of the Bishop score and transvaginal ultrasonography measurement of cervical length for successful labour induction.

MATERIALS AND METHODS

This study was conducted with 126 patients at the Government Virudhunagar Medical College and Hospital, Tamil Nadu from September 2023-May to 2024. The study was approved by the Institutional Ethics Committee before initiation, and informed consent was obtained from all patients.

Inclusion Criteria

Women at a gestational age of 37–40 weeks with a singleton foetus, intact membranes, and cephalic presentation were included in the study.

Methods

For vaginal ultrasonography, the women were asked to empty their bladders before transvaginal ultrasound examination. Sonography was performed, and the cervical length was measured by keeping the probe 3 cm away from the posterior fornix. Cervical length was defined as the length between the internal and external OS in a straight line. Digital examination for Bishop score, after sonography the Bishop Score was determined by the digital examination by the resident obstetrician responsible for the induction. The obstetrician was blinded to the cervical length measurements, and Bishop scores were assessed.

Labour was induced according to the standard protocol of our hospital. Prostaglandin E2 gel is inserted into the cervical canal within 1 hour of cervical assessment. The patient was reassessed after six hours. If the patient did not exhibit regular uterine contractions or cervical changes, a second dose of PG E2 was administered intraoperatively. A maximum of two doses were repeated. The subsequent dose is withheld if the patient is in active labour, rupture of the membrane, cervical effacement is > 60%, OS ≥ 3 cm, and regular uterine contractions 2-3 in 10 minutes. Augmentation of labour is done according to the labour room protocol. The active phase of labour is diagnosed as 3-4 contractions every 10 min, each lasting for 45–60 s. The cervix was dilated by ≥ 3 cm, and the effacement of the cervix was 80% or greater.

Successful induction of labour was defined as active labour occurring at the end of the induction protocol (12 h from the last dose). Failed induction was defined as an inability to achieve the active phase of labour corresponding to cervical dilatation of ≥ 3 cm within 12 h from the last dose of PG E2. Failure to progress was defined as no cervical dilation during the active phase of labour for the last 2 hours or no descent of the foetal head during the second stage of labour for at least 1 h despite adequate uterine contractions. This is considered an indication of caesarean delivery due to failure to progress.

Statistical analysis

Descriptive and inferential statistical analyses were performed. The chi-square or Fisher's exact test has been used to determine the significance of study parameters on a categorical scale between two or more groups, a non-parametric setting for qualitative data analysis. Fisher's exact test was used when the cell samples were very small. Statistical software SPSS 22.0, and R environment Version 3.2.2 were used for data analysis, and Microsoft Word and Excel were used to generate graphs, tables, and ROC.

RESULTS

A total of 126 primigravidas with gestational ages between 37 and 41 weeks were admitted for induction of labour. The average gestational age according to LMP was 37.6±2.3 weeks and based on USG, it was 38.32±1.5 weeks. There was no significant difference in gestational age between the two methods.

Of the 126 women recruited, 94 (74.6%) were aged 21-25 years, 30 (25.5%) were aged > 25 years, and 2 (1.6%) were 18-20 years. Indications for labour induction included postdated pregnancy (54.76%), gestational hypertension (23.08%), and gestational diabetes (22.22%). Most patients had a Bishop score of five (42.1%). The transcervical length was < 2.5 cm in 60.3% of patients. Vaginal delivery occurred in 107 (84.9%) cases, which was significantly higher than that in the LSCS group (15.1%). Higher Bishop scores correlated with increased vaginal delivery rates [Table 1].

Bishop score > 3 and cervical length < 2.5 cm were positively associated with the incidence of vaginal deliveries. A higher incidence of developing vaginal births was predicted according to the guidelines suggested. Hence, a cutoff Bishop score of 3 and a cutoff transvaginal cervical length of < 2.5 cm could predict the outcome of normal vaginal delivery. Therefore, induction of delivery should be considered [Table 2].

The average time taken from induction to delivery among the patients with Bishop score ≤ 3 was 20.3±1.8 hours and for Bishop > 3 was 17.24±2.1 hours respectively, with a significant p-value of < 0.01. Hence, we can observe that the women with Bishop score ≤ 3 are at risk of prolonged labour and hence the need for LSCS. The average time taken for

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induction and delivery among the patients with cervical length ≤ 2.5 cm was 19.85±2.6 hours and those with cervical length > 2.5 cm were 16.11±2.5 hours with significant intra-group difference [Table 3].

Of the 19 women who required LSCS, 7 (36.84%) had no progression of labour even after induction, and 6 (31.57%) each were due to foetal distress and thick meconium as the indication for LSCS. The average weight of the neonates was 2.9±0.8 kg and 3.1±0.5 kg among those with normal vaginal delivery and LSCS respectively. All newborns had APGAR scores≥ 7, and none of them developed any complications. There was no need for ventilatory support or NICU admission but only five neonates from the LSCS group and 2 neonates from the vaginal delivery group required observation for 2 h [Table 4].

Table 1: Demographic details.

		Frequency (%)
Age in years	18-20	2 (1.6%)
	21-25	94 (74.6%)
	> 25	30 (25.5%)
Transcervical length	< 2.5 cm	76 (60.3%)
	≥ 2.5 cm	50 (39.7%)
Bishop score	1	7 (5.6%)
	2	9 (7.1%)
	3	21 (16.7%)
	4	36 (28.6%)
	5	53 (42.1%)
Induction of labour (post-dated)		69 (54.76%)
Gestational hypertension		30 (23.08%)
Gestational diabetes		28 (22.22%)
Vaginal delivery		107 (84.9%)
LSCS		19 (15.1%)

Table 2: Comparison of Bishop score and mode of delivery

Bishop score	Mode of delivery	
	Vaginal	LSCS
1	1 (14.3%)	6 (85.6%)
2	1 (11.1%)	8 (88.9%)
3	16 (81%)	5 (19%)
4	35 (97.2%)	1 (2.8%)
5	52 (98.1%)	1 (1.9%)

Table 3: Comparison between Bishop score, cervical length and outcome

		Vaginal delivery (Successful induction)	LSCS (Failed induction)	P value
Bishop score	≤ 3	2	14	< 0.001
	> 3	105	5	
Cervical length (cm)	≤ 2.5	32	18	< 0.001
	> 2.5	75	1	

Table 4: Induction-delivery interval

	Scoring system	Average duration	P value
Bishop score	≤ 3	20.3±1.8 hours	<0.01
	> 3	17.24±2.1 hours	
Cervical length (cm)	≤ 2.5	19.85±2.6 hours	<0.01
	> 2.5	16.11±8.3 hours	

DISCUSSION

In the present study, the majority of patients had a Bishop score of 5, accounting for approximately 53 (42.1%), followed by 36 (28.6%) with a Bishop score of 4. The study found that the average time from induction to delivery was 20.3±1.8 hours for patients with a Bishop score ≤ 3 and 17.24±2.1 hours for those with a Bishop score > 3, with a significant p-value of < 0.01, indicating a higher risk of prolonged labour and increased likelihood of LSCS for those with lower scores. Additionally, the average time for patients with a cervical length ≤ 2.5 cm was 19.85±2.6 hours, compared to 16.11±2.3 hours for those with a cervical length > 2.5 cm, showing significant intra-group differences.

In our study, the incidence of vaginal delivery was 107 (84.9%) which was significantly higher than that in patients who underwent LSCS, accounting for approximately 19 (15.1%) of the recruited study population. Khandelwal et al. reported that out of 66 patients in their study, 55 (83.3%) underwent normal vaginal delivery and 11 (16.7%) were delivered by caesarean section.[8] Whereas Abdullah et al. reported that the incidence of vaginal delivery was 70.4% and LSCS was 29.6%.[10]

In the present study, as the Bishop score increased, the incidence of vaginal delivery also increased. We observed that patients with a Bishop score of 3 or

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more had a higher incidence of vaginal delivery. Of the seven women with a Bishop score of 1, six (85.6%) underwent LSCS, followed by 8/9 (88.9%) with a Bishop score of 2. Five (19%) of the 21 patients in the Bishop Score 3 group required LSCS. Whereas 1 each from Bishop scores of 4 and 5 required LSCS. A similar observation was found in Khandelwal et al. where the mean cervical length was 25.59 + 6.07 and the Bishop score was highly significant ($p < 0.0001$) in predicting the active phase of labour as compared to cervical length ($p = 0.004$).[8]

Bishop score > 3 and cervical length < 2.5 cm were positively associated with the incidence of vaginal deliveries. A higher incidence of developing vaginal births was predicted according to the guidelines suggested. Hence, a cutoff Bishop score of 3 could predict the outcome of normal vaginal delivery. Therefore, induction of delivery should be considered. However, there was a negative association between Bishop score and cervical length, with a correlation value of -8.3, $p < 0.001$.

Neonatal outcome

The average weight of the neonates was 2.9±0.8 kg and 3.1±0.5 kg among those with normal vaginal delivery and LSCS respectively. All newborns had an APGAR score of 5 min ≥ 7. There was no need for ventilatory support or NICU admission among neonates born to the women included in our study. Five neonates from the LSCS group and two neonates from the normal vaginal delivery group required close monitoring for 2 h.

Similar to our study, Tollon et al. also found that there was no significant difference in the APGAR score between those who underwent vaginal and LSCS mode of delivery.[11] Also, the average neonatal weight of all newborns was within the normal range. Contrary to our study, Eid et al. found that the women with failed induction had significantly higher weight of the neonates but it was under the normal range 3616±632 kg among failed induction versus 3221±394 kg among those who underwent normal delivery, p=0.010).[12]

CONCLUSION

The average gestational age of the women included in our study was 39.32±1.5 weeks. Postdated pregnancy is the major indication for induction. According to our observations, women with a Bishop score of ≥ 3 and cervical length ≤ 2.5 cm had a significant chance of vaginal delivery and a significantly shorter duration of induction to delivery. We observed that the Bishop score and transvaginal cervical length scan both had similar sensitivity, specificity, and accuracy in predicting the outcome of labour induction. Hence, TVS for cervical length measurement was not completely replaced by the Bishop score, but it can be used as an additional tool for better predictability of induction to the duration of labour.

Strength

All 126 patients participated in the study, which had a large dataset compared with other studies; however, oligohydramnios, a major independent risk factor, was not included.

Limitations

Neonatal outcome was not the aim of our study, and the association of other factors, such as maternal weight and maternal age, was not considered. This can be an independent predictor of successful labour induction.

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