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Research Article

Bishop score and transvaginal ultrasound for preinduction cervical assessment: a randomized clinical trial

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ABSTRACT

Background: The objective was to compare transvaginal ultrasound with the Bishop score for preinduction cervical assessment and for choice of induction agent.
Methods: 150 women were randomized to have preinduction cervical assessment for choice of induction agent based on either Bishop score or transvaginal ultrasound. The primary outcome measure was the percentage of women who were administered prostaglandin as a preinduction agent. The criteria for considering the cervix as unripe and thus for using prostaglandin were either a Bishop score <6 or cervical wedging of <30% of the total cervical length. Secondary outcome measures included interval to active phase, interval to delivery and rate of Caesarean section and fetal outcome.
Results: While 85% of women received prostaglandin in the Bishop score group, only 53% of them did in the transvaginal ultrasound group (p =0.001). The interval to active phase, interval to delivery, rate of Caesarean section for failed induction and fetal outcomes were similar in both groups.
Conclusions: With the suggested cut-off values of a Bishop score <6 and wedging <30%, the use of transvaginal ultrasound instead of Bishop score for preinduction cervical assessment to choose induction agent significantly reduces the need for intracervical prostaglandin treatment without adversely affecting the success of induction.

Keywords: Bishop score, Induction of labor, Prostaglandin, Transvaginal ultrasonography, Cervical wedging

INTRODUCTION

Induction of labour, an Obstetric technique practiced since antiquity, is being used with increasing frequency for improving fetal outcome.[1] For many generations digital palpation of the pregnant cervix has been the corner stone of evaluating the labouring patient. Even the most experienced clinician cannot digitally evaluate the upper half of cervix (area immediately adjacent to the internal os) and this is significant in detecting incipient labour. Digital examination consistently underestimate the length by more than 13mm. In contrast ultrasonic measurement of cervix correlated well with that obtained using ruler on the post-operative specimen.[2]

The classical digital examination is subjective and have intra- and inter observer variability.[3,4] Transvaginal ultrasound has been used successfully for cervical assessment to predict duration of labour and obstetric outcome after labour induction.[5-7] Several reports[8,9,10] have compared this method with the Bishop score, achieving controversial results. On the one hand it has been reported that the length of the uterine cervix, measured by transvaginal ultrasound, is a better predictor of the risk of Caesarean section after induction of labour for medical reasons than is the Bishop score.[8] On the other hand it has been stated that transvaginal ultrasound does not improve on the prediction of cervical inducibility obtained by the Bishop score.[9,10]

Hence this study was undertaken to compare transvaginal ultrasound with the Bishop score for assessment of cervical ripening and choice of induction agent using a randomized approach. The primary outcome measure was the percentage of women who had prostaglandin as a preinduction agent.

METHODS

The study was conducted from May 2006 to 30 April 2008 in Holy Family Hospital. 150 booked women between 37-40 weeks of POG coming to labour room for induction due to some obstetric reason were enrolled in the study after informed written consent. Exclusion criteria were non-vertex presentation, placenta previa and premature rupture of membranes.

Subjects who gave informed consent were assigned by a computerized random-number generator to have preinduction cervical assessment and choice of induction agent based on either the Bishop score or transvaginal ultrasound. Assignments were concealed by sequentially numbered opaque envelopes prepared by a medical student not involved in the clinical care of the subjects. All women underwent cervical assessment by both transvaginal ultrasound and Bishop score, but a woman who was randomized to one method was treated on the basis of that method only. Sonography was performed first and the person who assessed the cervix to make the clinical decision was blinded to the result. The protocol was approved by the ethical and research committee of our hospital.

All women underwent cervical assessment by both transvaginal ultrasound and Bishop score, but a woman who was randomized to one method was treated on the basis of that method only. Sonography was performed first and the person who assessed the cervix to make the clinical decision was blinded to the result.

A modified Bishop score,[11] which uses five parameters and 0–10 points was used. All transvaginal ultrasound examinations, using a Toshiba Sonolayer SSA 250 (Toshiba, Tokyo, Japan) ultrasound machine equipped with a 5-MHz transvaginal probe, were performed by people, trained on this technique and who were involved in the study. The cervix was considered unripe or unfavourable when the Bishop score was <6 and the transvaginal ultrasound measurement of cervical wedging was <30%. In cases with an unripe cervix, 0.5 mg dinoprostone was administered intracervically every 6 h for a maximum of three doses. No further induction agents were administered when uterine contractions reached a frequency of three in 10 min. If cervical ripening was not achieved, oxytocin was given after the third dose. In cases with a ripe cervix or favourable cervix, oxytocin infusion was commenced directly, and given for a maximum of 12 h. If the woman had not reached the active phase by the end of this period, Cesarean section for failed induction was performed. Active phase was defined as complete cervical effacement and dilatation of at least 3 cm. Once in labor, women were cared for according to current obstetric practices. Labor was augmented with oxytocin in the active phase if progress was arrested for longer than 1 hour. Membranes were ruptured when the cervix was at least 80% effaced and dilated at least 3 cm. Continuous electronic fetal heart rate monitoring and tocodynamometry were used with all women.

The primary outcome measure was the percentage of women who were administered prostaglandin as a preinduction agent. Other outcome measures were: 1) interval from start of induction to any type of delivery; 2) interval from start of induction to vaginal delivery; 3) need for oxytocin augmentation; 4) interval from start of induction to beginning of active phase;5) Caesarean delivery; 6) Fetal outcome (Birth weight, Apgar scores at 1 and 5 minutes and admission to NICU).

For statistical analysis the Statistical Package for Social Sciences (SPSS); (SPSS Inc., Chicago, IL, USA) program was used. When a variable was normally distributed, the results are presented as mean and SD; otherwise, results are shown as median and interquartile range. Qualitative variables are expressed as number and percentage. Groups were compared using an unpaired Student's *t*-test; when a variable was not distributed normally, the Mann–Whitney *U*-test was used. To compare proportions (qualitative variables), chi-square and Fisher's exact tests (when expected numbers were fewer than five) were used. For correlations, Spearman's correlation coefficient was used.

RESULTS

The demographics of women and indication for induction of labour were comparable in both the groups as shown in Table 1 and 2, respectively.

Table 1: Characteristics of the study population.

Characteristic	Bishop score (n=75)	Transvaginal ultrasound (n=75)	P
Gestational age (weeks, median(IQR))	40(38-40)	40(39-40)	NS
Maternal age (years, mean ± SD)	25.4±3.0	26.2±3.6	NS
Nulliparous (n(%))	39(52.0)	43(57.3)	NS

IQR, interquartile range; NS, not significant

Initial cervical assessment did not differ between groups (Table 3). Both groups showed similar Bishop scores and the percentages of women with a Bishop score<6 in each group were very similar (92% vs. 88% for Bishop score

group and Transvaginal ultrasound group, respectively). However, while 85% of women received prostaglandin in the Bishop score group only 53% of them had this medication in the Transvaginal ultrasound group (P = 0.001).

Table 2: Indications for labor induction.

Indication	Bishop score (n=75) (n(%))	Transvaginal ultrasound (n=75) (n(%))	P
Term	53(70.7)	50(66.7)	NS
GDM	3(4.0)	5(6.7)	NS
PTH	5(6.7)	7(9.3)	NS
Obstetric	4(5.3)	7(9.3)	NS
NRNST	10(13.3)	6(8.0)	NS

Table 3: Initial cervical assessment and choice of induction agent.

Cervical assessment	Bishop score (n=75)	Transvaginal ultrasound (n=75)	P
Bishop score (mean ± SD)	3.2 ±1.3	3.6 ±1.4	NS
Bishop score <6 (n(%))	69 (92.0)	66 (88.0)	NS
Cervical length (mm, mean ± SD)	44.7±9.9	42.8±10.0	NS
Cervical wedging (mm, mean ± SD)	17.8±8.8	17.8±9.1	NS
Percentage of wedging when present (mean ± SD)	46.1±10.3	44.9±9.7	NS
Wedging present (n(%))	51 (68)	66 (88)	NS
Cervical wedging <30%	33(44)	40(53)	NS
Patient having prostaglandins n(%)	64 (85)	40(53)	0.001

One hundred and thirty five women of the 150(90%) women participating in the study had a Bishop score <6, while only 73(48%) had unripe cervix according to the Transvaginal ultrasound criteria. When studying the distribution of the initial Bishop score according to the results of the Transvaginal ultrasound measurements, it was noticed that women considered as having an unripe cervix according to ultrasound had scored less than 4 in all of cases and none had Bishop score ≥ 4.

There were no difference in the obstetric outcome apart from a greater need of oxytocin augmentation needed in the Transvaginal ultrasound group though not significant and significantly more assisted vaginal deliveries in Transvaginal ultrasound group due to the significantly higher birth weight in the transvaginal ultrasound group (p=0.002) (Table 4).

Table 4: Obstetric outcomes.

Outcome	Bishop score (n=75)	Transvaginal ultrasound (n=75)	P
Augmentation (n(%))	66 (88.0)	72 (96.0)	NS
Interval to active labour (mean ± SD)	11.4 ± 7.1	10.0 ± 5.0	NS
Interval to vaginal delivery (mean ± SD)	16.7±6.6	16.7±7.1	NS
Mode of delivery			
Total vaginal delivery (n(%))	57 (76)	60 (80)	NS
Assisted (n(%))	6 (8)	21 (28)	0.002
Cesarean (n(%))	18 (24)	15 (20)	NS
Caesarean for failed induction	5(6)	3 (4)	NS

Intervals from induction to active phase and to vaginal delivery were similar in both groups. The rates of Cesarean section and Cesarean section due to failed induction were similar, although the numbers were too small to draw conclusions.

Perinatal outcome measurements were similar in the two groups apart from birth weight which was more in the Transvaginal ultrasound group (Table 5). Admissions to NICU were also comparable in both the groups but the number was more as we keep more babies for observations if initial Apgar score <6 and baby weight >3 kg.

Table 5: Perinatal outcome.

Outcome	Bishop score (n=75)	Transvaginal ultrasound (n=75)	P
Birth weight (kg, mean ± SD)	2.8 ± 0.4	3.0 ±0.3	0.000
Apgar score (n(%))			
at 1 min	8.0 ±0.7	7.8 ±1.1	NS
at 5 min	8.8 ±0.4	8.6 ±0.8	NS
Admission to NICU (n(%))	54 (72)	51 (68)	NS

NICU, neonatal intensive unit; NS, not significant.

DISCUSSION

Uterine cervix undergoes considerable physiological, biological and anatomical changes during the transition between the antenatal and intranatal and intrapartum period.[3] Various methods have been developed in last few decades, to assess cervix before induction and yet an appropriate method awaits elucidation. Various studies conducted comparing transvaginal and digital examination to find out which one is better for pre-induction cervical assessment and the results achieved were controversial.[8,9]

Several groups have evaluated the usefulness of transvaginal ultrasound in the prediction of successful induction of labor and all have reached the same conclusion: cervical length is a good predictor of the duration of labor.[5-9] Yet it remains unknown whether it is clinically useful, whether it could replace the Bishop score, or whether both methods should be used together. We investigated the impact of using ultrasound criteria to make the clinical decision and we found that the percentage of women allocated to the 'unripe' group and, therefore, being administered prostaglandin, was significantly decreased using our ultrasound thresholds than the standard criterion of a Bishop score <6. Local prostaglandins are used widely to achieve cervical maturation. Despite its effectiveness and safety, this medication may cause excessive myometrial activity, and therefore hospitalization and fetal monitoring are recommended.[8] In addition, most protocols include intervals of time between doses (6–12 h) that may delay the initiation of labor. Therefore, it is important to find the best criterion with which to decide if this medication is really needed.

If the Bishop score had been the criterion with which to make the clinical decision in all the cases in our study, 90% of the women would have received prostaglandin. Instead, only 48% of the women fulfilled the ultrasound criteria for administration of this medication. So, if transvaginal ultrasound had been used as the only method to choose the induction agent, the proportion of women receiving prostaglandin would have reduced by half. Despite this, the Obstetric outcomes were similar in both groups. There were no differences in the interval to active labour and vaginal delivery.

Our study suggests that, around 40-45% of patients receive prostaglandin with no added benefit if the criterion of a Bishop score of < 6 is used. Bartha et al when compared the Bishop score with Transvaginal ultrasound also found the similar results.[12] Our transvaginal ultrasound criterion was broadly equivalent to a Bishop score of <4 in deciding whether intracervical prostaglandin gel was needed. Previously, Pandis et al using receiver–operating characteristic curves, found that the best cut-off point for the prediction of successful induction was 28 mm for cervical length and 3 for the Bishop score.[7]

Theoretically the advantage of the Bishop score is that it can evaluate parameters such as consistency or station that may influence the outcome and can hardly be assessed by transvaginal ultrasound. In addition, the Bishop score does not require any special equipment. On the other hand, transvaginal ultrasound is thought to be less subjective compared with the Bishop score and our study demonstrates that transvaginal ultrasound may be used successfully to make clinical decisions before induction of labor.

In conclusion, this study has demonstrated that the use of transvaginal ultrasound instead of the Bishop score for preinduction cervical assessment to choose induction agent significantly reduces the need for intracervical prostaglandin in treatment without adversely affecting the success of induction or neonatal outcome.

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