THE EFFECT OF PARITY, BISHOP SCORE AND CERVICAL LENGTH BY TRANSVAGINAL ULTRASOUND IN PREDICTION OF INDUCTION TO DELIVERY INTERVAL

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ABSTRACT: AIM: To evaluate the role of parity, Bishop score, cervical length by transvaginal ultrasound in predicting the induction to delivery interval. METHODS AND MATERIALS: It is a prospective study done at Government general Hospital, Kurnool, Andhra Pradesh, India over a period of one year from August 2008 to July 2009. Hundred pregnant women with 37 to 42 weeks of gestation who underwent induction of labour for different indications were taken. Their parity according to obstetric history, Bishop Score followed by cervical length in centimeters by transvaginal ultrasound was assessed in all patients. RESULTS: Among the hundred pregnant women 57 were primigravidae, they had mean induction delivery interval of 17 hours and 18 minutes. Multigravidae were 43, they had 11 hours 45 minutes mean induction delivery interval. Bishop score of 5 and cervical length by transvaginal ultrasound of 2.8 cm were considered as cutoff values. Bishop score ≤5, cervical length above >2.8 cm were considered unfavorable. Among total 100 women, 76 women had Bishop score ≤5, in them 16 hours 12 minutes mean induction delivery interval was noted. Bishop score >5 was noted in 24 women who had 13 hours and 10 minutes mean induction to delivery interval. When cervical length was considered, among total 100 women, 45 women had cervical length >2.8 cm, in them mean induction to delivery interval was 21 hours and 4 minutes, whereas 55 women had cervical length ≤2.8 cm in them mean induction to delivery interval was 11 hours and 2 minutes. CONCLUSION: All the three parameters i.e. Parity, Bishop score and cervical length by transvaginal ultrasound are having significant predictability towards induction to delivery interval. Out of these three parameters parity and cervical length are having independent predictability. KEYWORDS: Parity, Bishop score, Cervical length, Induction delivery interval, Transvaginal ultrasound. MeSH Terms: Labour, Induced, Parity, Pregnancy, Ultrasonics.

INTRODUCTION: Labour and safe delivery of the newborn are one of the most important aspects of medical science. The prime objective of Obstetrics is that 'every pregnancy should culminate in healthy baby and healthy mother'. To achieve this objective in some cases we may need to induce labour instead of waiting for the spontaneous onset of labour for either maternal or fetal conditions.

Induction of labour means deliberate termination of pregnancy beyond 28 weeks i.e. period of viability, by various methods to achieve vaginal delivery by stimulating uterine contractions before its spontaneous onset.
Occasionally induced labour may end in instrumental delivery or cesarean section. Generally induction of labour is considered as a therapeutic option when the benefits of expeditious delivery outweigh the risks of continuing the pregnancy.[1]

Induction to delivery interval is the time period between inducing the labour and delivery. By predicting the induction delivery interval before induction, any delay in the process can be identified and necessary steps can be taken to prevent unwanted delay and untoward effects on fetus and mother. Induction to delivery interval can be predicted by using parameters like parity of the woman, Bishop score and cervical length by transvaginal ultrasound to access the cervical ripening.

Parity influences the induction to delivery interval as multiparous women have shorter induction to delivery interval and high success rate than nulliparous women.[2]

| Parameter     | 0       | 1       | 2       | 3       |
|---------------|---------|---------|---------|---------|
| Position      | Posterior | Intermediate | Anterior | -       |
| Consistency   | Firm    | Intermediate | Soft    | -       |
| Effacement    | 0 to 30% | 40 to 50% | 60 to 70% | ≥ 80% |
| Dilatation    | < 1 cm  | 1 to 2 cms | 2 to 4 cms | > 4 cms |
| Fetal station | - 3     | - 2     | -1 to 0  | +1 to +2 |

Table 1: Bishop Score

Before induction cervical ripening can be assessed by Bishop scoring which was introduced by Bishop in 1964.[3] Jodie et al.[4] and David PJ et al.[5] studies suggested that Bishop score of less than 5 requires further ripening, while a score of 9 or greater suggests that ripening is completed. Good Bishop score indicates shorter induction to delivery interval and the likelihood that induction of labour will be effective.

Nowadays measurement of cervical length by transvaginal ultrasonography for prediction of induction to delivery interval and success of induction of labour is being practiced which is having more reproducibility.[6] It has been investigated as a way of predicting the likely induction to delivery interval and the outcome of induced labour as an alternative to clinical digital examination described by Anderson in 1991.[7] and also by others.[8,9,10,11]

Induction of labour can be done in various methods. The use of intravenous oxytocin in induction of labour increased gradually since 1950 after the discovery of oxytocic effect of the posterior pituitary extract by Dale in 1906 and the synthesis of the uterotonin by Du vigneud in 1950.[12]

The first systemic study of prostaglandin was by Kurzork and Liebin in 1930. At present prostaglandins are used in big way in induction of labour.[13] We have taken Oxytocin and prostaglandins for induction of labour in this study as these are considered safe and effective.

Need for induction of labour may arise due to many maternal and fetal indications among them postdated pregnancy is probably the commonest indication.[13] We have taken past dates, pregnancy induced hypertension and post term as indications for induction in our study.

Sometimes problems like iatrogenic prematurity and associated perinatal mortality etc. may arise due to induction of labour but usually in properly selected cases gains will be on higher side.
The present study was undertaken to evaluate the role of parity, Bishop Score, cervical length by transvaginal ultrasound in predicting the induction to delivery interval by the use of oxytocin and misoprostol tablets.

AIMS AND OBJECTIVES: To evaluate the role of parity, Bishop Score and cervical length by transvaginal ultrasonography in predicting the induction to delivery interval.

To compare the clinical and sonographic variables in relation to parity in predicting the induction labour interval.

MATERIALS AND METHODS: The present study was carried out on 100 pregnant women admitted in Antenatal ward for induction of labour in government General Hospital, Kurnool during one year period that is August 2008 to July 2009.

INCLUSION CRITERIA:
- Primi and multigravidae with age between 20 to 30 years.
- Single live foetus in cephalic presentation with intact membranes.
- Gestational age from 37 to 42 weeks.
- Pregnancy induced hypertension.

A detailed history was taken from all patients along with obstetrical history and obstetrical formula of every patient was noted down. General and systemic examinations were done followed by and obstetric examination to assess the lie of the fetus and engagement of head, and per vaginal examination for cervical and pelvic assessments according to Bishop score was done followed by vaginal ultrasound assessment of cervical length. Bishop score ≤5 was taken as unfavourable score and cervical length by tranvaginal ultrasound of >2.8 centimeters was taken as unfavourable.

When Bishop Score and cervical length were unfavourable, induction was done with 25 micrograms of Misoprostol tablet vaginally repeating the dose in every 6 hours until maximum of four doses. Patients with favorable Bishop Score and cervical length were induced with oxytocin or misoprostol. All cases followed with partographic representation.

Induction to delivery interval in every patient was noted down in accordance to their parity, Bishop Score and cervical length by transvaginal ultrasound.

Statistical analysis: Information of cases under study was arranged in a systemic manner in MS Excel sheet. Statistical analysis was done by using logistic regression. Conclusion made as per the respective levels of significance.

RESULTS: Hundred pregnant women with gestational age between 37 weeks to 42 weeks admitted in Government General Hospital Kurnool during August 2008 to July 2009 for induction of labour were taken in the present study. In them 57 were primigravidae and 43 were multigravidae.
The indications for induction of labour were past dates (72%), pregnancy induced hypertension (20%) and post term (8%).

The range of induction to delivery interval for total 100 women was 6 hours 10 minutes to 34 hours 15 minutes with mean of 15 hours 28 minutes.

When parity was taken into consideration, among 100 women, 57 women were primigravidae. In them the range of induction to delivery interval was 6 hours 30 minutes to 34 hours 15 minutes with mean of 17 hours to 18 minutes. And 43 women were multigravidae, in them the range of induction to delivery interval was 6 hours 10 minutes to 27 hours 15 minutes with mean of 11 hours to 45 minutes. According to this induction to delivery period is shorter in multigravidae than primigravidae (11 hours 45 vs 17 hours 18 minutes).

| Parameters | No. of women | Induction delivery interval |
|------------|--------------|----------------------------|
|            |              | Range (hr. min) | Mean (hr. min) |
| Parity     |              |                |                |
| Primigravidae | 57           | 6.30 – 34.15   | 17.18          |
| Multigravidae | 43           | 6.10 – 27.15   | 11.45          |
| BS         |              |                |                |
| ≤5         | 76           | 6.15 – 34.15   | 16.12          |
| 5          | 24           | 6.10 – 24.45   | 13.10          |
| CL         |              |                |                |
| >2.8cm     | 45           | 9.10 – 35.15   | 21.04          |
| ≤2.8cm     | 55           | 6.10 – 27.30   | 11.02          |

Table 2: Comparing the parity, BS and CL by TVS in predicting induction delivery interval

*BS-Bishop score, CL- Cervical length, TVS-Transvaginal ultrasound

When Bishop Score was taken into consideration, Bishop Score of 5 was taken as cutoff value. Bishop score of ≤5 was considered as unfavourable score and >5 considered as favourable Bishop Score. Among the 100 women, Bishop Score ≤5 was seen in 76 women, in them the range of induction to delivery interval was 6 hours 15 minutes to 34 hours 15 minutes with mean of 16 hours to 12 minutes. Bishop score of >5 was seen in 24 pregnant women, in them the range of induction to delivery interval was 6 hours 10 minutes to 24 hours 45 minutes with mean of 13 hours 10 minutes.

When cervical length by transvaginal ultrasonography was taken into consideration, cervical length of 2.8cm was taken as cutoff value. Cervical length of >2.8cm was considered as unfavourable score and ≤2.8cm was considered as favourable cervical length. Among the 100 women, cervical length of >2.8cm was seen in 45 women, in them the range of induction to delivery interval was 9 hours 10 minutes to 34 hours 15 minutes with mean of 21 hours to 4 minutes.

Cervical length of ≤2.8cm was seen in 55 women, in them the range of induction to delivery interval was 6 hours 10 minutes to 27 hours 30 minutes with mean of 11 hours to 2 minutes.
According to the Bishop Score and cervical length measurements induction delivery interval was shorter in women with favourable values (13 hours 10 minutes vs. 16 hours 12 minutes and 11 hours 2 minutes vs 21 hours 4 minutes respectively).

When all unfavourable factors are taken into consideration induction delivery interval was more in women with unfavourable cervical length by tranvaginal ultrasound (21 hours 4 minutes) followed by parity (17 hours and 18 minutes) and Bishop score (16 hours 12 minutes).

| Parameter         | R     | t      | p        | Significance | r   |
|-------------------|-------|--------|----------|--------------|-----|
| Parity            | 22.30151 | 0.00001 | HS*      |              |     |
| Bishop score      | 2.94E-05 | -2.70856 | 0.00797 | S*           | -0.2639 |
| Cervical length   | 2.66E-05 | 8.088415 | 0.00001 | HS           | 0.632714 |

*HS – Highly significant, S- significant

By using logistic regression statistical analysis was done. According to the analysis, it is observed that all the three parameters, i.e. parity, Bishop Score and cervical length by transvaginal ultrasound were having significant relation with induction delivery interval (viz p=0.00001, 0.00797 and p=0.00001).

Out of these three parameters parity and cervical length had independent predictability.

In present study, 76 women had vaginal delivery within 24 hours, 16 women had vaginal deliveries after 24 hours and 8 women had cesarean sections. Vaginal deliveries after 24 hours and cesarean sections were more in women with unfavourable parameters.

**DISCUSSION**: This study primarily focused on detecting the effect of parity, Bishop Score and cervical length by transvaginal ultrasound in predicting the induction to delivery interval and comparing the efficacy of parameters.

This study has taken hundred pregnant women including both primigravidae(57%) and mutigravidae (43%) as in studies of Halil et al.\[14\] (primigravidae – 62.4%, mutigravidae-37.6%), Chandra et al.\[15\] (primigravidae – 64%, mutigravidae-36%), Gomes et al.\[16\] (primigravidae – 68.1%, mutigravidae-31.9%), Yang et al.\[17\] (primigravidae – 74%, mutigravidae-26%), Gabriel et al.\[18\] (primigravidae – 48%, mutigravidae-52%) and Ware et al.\[19\] (primigravidae – 42%, mutigravidae-58%).

In our study we have taken women with gestational age of 37 to 42 weeks like in studies of Yang et al and Halil et al. Whereas Gomes et al have taken women with gestational age of 37 to 41 weeks, Ware et al and Gabriel et al have taken women with gestational age of >37 weeks and Chandra et al have taken women with gestational age of >41 weeks in their studies. We have taken past dates, pregnancy induced hypertension and post term as the indications of induction as in studies of Yang et al, Gabriel et al, Halil et al and Gomes et al.

Bishop score of 5 was taken as cutoff value in present study like in studies of Gabriel et al and Gomes et al. Where as in studies of Ware et al, Yang et al and Halil et al cutoff was 4. In study of Chandra et al the cutoff was 7.
In present study cervical length of 2.8cm was taken as cutoff value, which is comparable with Halil et al and Gomes et al studies. Whereas in studies of Ware et al and Yang et al the cutoff was 3cm, in Gabriel et al study the cutoff was 2.6cm.

In present study the range of induction to delivery interval for total 100 women was 6 hours 10 minutes to 34 hours 15 minutes with mean of 15 hours 28 minutes, which is comparable with the studies of Gomes et al (induction delivery interval 15 hours 20 minutes), Chandra et al (induction delivery interval 15 hours 36 minutes), Ware et al (induction delivery interval 15.8±8.6 hours). Whereas in studies of Halil et al (induction delivery interval 17.97±11.5 hours) and Yang et al (induction delivery interval 19.4±16.17 hours), the interval was more comparatively, as they have taken Bishop score of 4 as cutoff and in Yang et al study the cervical length cutoff was 3cm.

In Gabriel et al study the induction to delivery interval was 11.0±6.7hrs with favorable cervical length and 18.6±7.1 with unfavorable cervical length, which is comparable with our study values i.e. 11 hrs. 02 minutes with favorable cervical length and 21hrs 04 minutes with unfavorable cervical length.

| Sl. No. | Study                     | Induction delivery interval | Statistical analysis | Better predictor |
|--------|---------------------------|-----------------------------|----------------------|-----------------|
| 1.     | Ware et al (2000)         | 15.8±8.6 hrs                | Logistic regression CL* (r²=0.43, p <0.001), BS* (r²=0.48, p<0.001), parity(p<0.001) | CL, BS, Parity  |
| 2.     | Chandra S et al (2001)    | 15 hr 36 min                | Logistic regression, BS (p <0.01)            | BS              |
| 3.     | Gabriel et al (2001)      | 11.0±6.7(CL<2.6cm)          | ROC, CL (p<10⁻⁵)      | CL              |
|        | 18.6±7.1(CL>2.6cm)        |                             |                      |                 |
| 4.     | S H Yang et al (2003)     | 19.4±16.17 hrs              | Logistic regression, CL, (p=0.001)            | CL              |
| 5.     | Gomes et al (2005)        | 15 hr 20 min                | Logistic regression, BS(r²=0.33, p=0.000) CL(r²=0.19, p=0.000), Parity (p=0.000) | CL, BS, Parity  |
| 6.     | Halil et Al (2006)        | 17.97±11.5 hrs              | Logistic regression CL (p=0.0101), Parity(p=0.0332) | CL              |
| 7.     | Present study (2008)      | 15 hr 28 min                | Logistic regression CL (r²=0.396, p=0.0001), BS(r²=0.06, p=0.00797), Parity(p=0.00001) | CL, Parity, BS  |

Table 4: Comparison of statistical analysis of similar studies

* BS-Bishop score, CL- Cervical length, VD-Vaginal delivery, CS-Cesarean section.

In present study all the three parameters i.e. parity, Bishop Score and cervical length by transvaginal ultrasound have shown significant predictability (p=0.00001, p=0.00797 and...
p=0.00001 respectively) towards induction delivery interval. Among the three, parity and cervical length have shown independent predictability.

In studies of Ware et al (p <0.001) and Gomes et al p=0.000) also, all the three parameters have shown significant predictability as in present study. Whereas in studies of Gabriel et al (p<10^-5), Yang et al (p=0.001) and Halil et al (p=0.0101) cervical length was shown as better predictor. The study of Chandra et al has shown Bishop Score (p <0.01) as better predictor.

CONCLUSION: Parity, Bishop Score and cervical length by transvaginal ultrasonography are proved to be better predictors of induction to delivery interval by having significant relation with the interval period.

Among the three, parity and cervical length by transvaginal ultrasonography are shown to have independent predictability towards induction to delivery interval.

Cervical length by transvaginal ultrasonography can be used as an adjuvant to parity and Bishop Score to predict the induction to delivery interval because of its higher predictive value and better tolerability. But cost of the equipment and experience in ultrasound are the drawbacks.

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