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Original Research Article

Foley catheter for induction of labour in women with one previous caesarean section and an unfavourable cervix

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ABSTRACT

Background: Vaginal birth after caesarean (VBAC) reduces the morbidity of repeat caesarean delivery, but inducing labour in a scarred uterus with an unfavourable cervix is challenging, since mechanical methods are preferred over pharmacological agents because of a lower risk of uterine rupture. The aim of this study was to assess Foley catheter induction in this setting.
Methods: This prospective observational study was conducted at a tertiary hospital in Hyderabad, India, over two years. Women with one previous caesarean section, a singleton pregnancy ≥36 weeks, an unfavourable cervix, and consent for trial of labour after caesarean received an intracervical Foley catheter (60 ml) retained for 12 hrs. Bishop score change, mode of delivery, and maternal-neonatal outcomes were recorded.
Results: Of 152 women, the mean pre-induction Bishop score was 1.32±0.83, improving to >6 in 96 (63.2%) after catheter removal. Vaginal birth was achieved in 21 women (13.8%); the remaining 131 (86.2%) underwent repeat caesarean section, chiefly for failed induction (32%) and non-progress of labour (19%). Prior vaginal delivery was significantly associated with successful vaginal birth (p=0.0001). Postpartum haemorrhage occurred in 6 women (3.9%) and surgical site infection in 10 (6.6%), with one scar dehiscence and no uterine rupture. No adverse neonatal outcomes were observed.
Conclusions: Foley catheter induction is safe and feasible in women with one previous caesarean section and an unfavourable cervix, with no uterine rupture or adverse neonatal outcomes despite a high-risk cohort. VBAC success was modest, and prior vaginal delivery was the strongest predictor of success, informing patient counselling and selection.

Keywords: Fetal distress, Hypertension in pregnancy, Stillbirths

INTRODUCTION

Edwin Cragin's century-old dictum, ‘once a caesarean, always a caesarean’, has been replaced by ‘once a caesarean, always an institutional delivery’.[1] Caesarean section remains one of the most performed obstetric surgeries, with rates in India rising from 17.2% in 2016 to 21.5% in 2021.[2] As primary caesarean rates increase, so does the number of women enter subsequent pregnancies with a scarred uterus. Repeat caesarean sections carry higher risks of prolonged surgery, adhesion formation, blood transfusion, morbidly adherent placenta, and caesarean hysterectomy compared with a first caesarean.[3]

Trial of labour after caesarean (TOLAC), aiming for vaginal birth after caesarean (VBAC), is therefore encouraged in appropriately selected women to reduce the cumulative morbidity of repeat surgery.

Spontaneous labour offers the best chance of successful VBAC, but induction may still be required for maternal or fetal indications such as hypertensive disorders, diabetes,

post-dated pregnancy, or fetal growth concerns. Cervical status at the time of induction strongly influences the likelihood of vaginal birth; when the cervix is unfavourable, a ripening agent is generally used before oxytocin to shorten the induction process.

Cervical ripening in a scarred uterus is more difficult, because pharmacological agents such as prostaglandins carry a higher risk of uterine rupture and are not recommended by most professional bodies in this setting.[4,5] Mechanical methods, particularly the transcervical Foley catheter, are considered the safer alternative: they are inexpensive, widely available, and ripen the cervix through direct mechanical pressure and the Ferguson reflex without directly stimulating uterine contractions.

However, published data on Foley catheter induction specifically in women with one previous caesarean section and an unfavourable cervix remain limited, and reported VBAC success rates vary widely with induction protocol and patient selection. This study was undertaken to assess the efficacy of the Foley catheter as a method of labour induction in women with one previous caesarean section and an unfavourable cervix, and to describe the associated maternal and neonatal outcomes.

METHODS

Study design and setting

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology at Fernandez Hospital, a tertiary care perinatal center in South India, between January 2024 and January 2026. Institutional Ethics Committee approval was obtained prior to data collection (EC reference no. 15_2024).

Study population

All pregnant women booked for antenatal care who met the eligibility criteria and consented for TOLAC were recruited. Inclusion criteria were one previous caesarean section (delivered at >36 weeks), a singleton pregnancy, and consent for VBAC. Women were excluded if they had a contraindication to vaginal birth or a fetal growth disorder (severe Doppler compromise, estimated fetal weight >95th centile for gestational age, or polyhydramnios with amniotic fluid index >95th centile).

Sample size

Assuming a 40% prevalence of successful vaginal birth after Foley catheter induction, based on prior literature,6 a 5% two-sided alpha error, and an 8% margin of error, the calculated sample size was 144; allowing for a 5% non-response rate, 152 women were enrolled.

Procedure

After written informed consent, a 16G Foley catheter was inserted into the cervical canal under aseptic precautions. The balloon was inflated with 20 ml saline, gently withdrawn to rest against the internal os, and then further inflated to a total of 60 ml. The catheter was strapped to the thigh and retained for 12 hours, with a non-stress test performed on insertion and 3-hourly thereafter. After 12 hours, or earlier if spontaneously expelled or clinically indicated, the catheter was removed and the bishop score reassessed. If the Bishop score was >6, amniotomy was performed; oxytocin augmentation (maximum 35 mIU/l) was started if adequate contractions did not follow within 2 hours. Continuous cardiotocography was used after amniotomy, with monitoring for scar tenderness, meconium-stained liquor, and vaginal bleeding.

Outcomes

The primary outcomes were the change in Bishop score to >6 after induction and the mode of delivery. Secondary outcomes were adverse maternal events (uterine rupture, severe postpartum haemorrhage, prolonged ICU admission, puerperal sepsis, bladder injury, maternal death) and adverse neonatal events (5-minute Apgar score <7, umbilical cord arterial pH<7.10, NICU admission for birth asphyxia, neonatal death).

Statistical analysis

Categorical variables are presented as frequencies and percentages, and continuous variables as mean ± SD or median (interquartile range), as appropriate. The chi-square or Fisher's exact test was used for categorical comparisons, and the independent t-test or Mann-Whitney U test for continuous variables, depending on distribution. A $p<0.05$ was considered statistically significant. Analyses were performed using RStudio.[7]

RESULTS

A total of 152 women met the eligibility criteria and were included in the analysis.

Baseline characteristics

The mean maternal age was 31.9±4.3 years and mean BMI was 30.1±4.8 kg/m². Most women (81.6%) were para 1, and 28 (18.4%) had a previous vaginal birth. The mean gestational age at induction was 38.4±0.9 weeks (Table 1). Gestational diabetes mellitus was the leading indication for induction (27.0%), followed by decreased fetal movements (11.2%), advanced maternal age (10.5%) and gestational hypertension, post-dated pregnancy and oligohydramnios (9.9% each).

Induction outcomes

The mean pre-induction Bishop score was 1.32±0.83. The Foley catheter was retained for a mean of 11.4±1.8 hours; it was removed after the full 12 hours in 136 women (89.5%) and expelled or removed earlier in 16 (10.5%). After catheter removal, the bishop score improved to >6 in 96 women (63.2%). Oxytocin augmentation was required in 73 women (48.0%), at a mean dose of 17.5±9.8 mIU and mean duration of 4.6±2.6 hours. The mean induction-to-delivery interval was 16.5±5.5 hours (Table 2).

Mode of delivery and predictors

Vaginal birth was achieved in 21 women (13.8%) 15 spontaneous and 6 instrumentals while 131 (86.2%) underwent repeat caesarean section. The induction-to-delivery interval was significantly longer in women who delivered vaginally than in those who underwent caesarean section (median 20 vs 16 hours, p<0.001), as was the proportion with a prior vaginal delivery (57.1% vs 12.2%, p=0.0001); maternal age, BMI, and gestational age at induction did not differ significantly between the groups (Table 3). Among women who underwent repeat caesarean section, the leading indications were failed induction (32.0%), non-progress of labour (19.0%), and presumed fetal compromise (17.6%).

Maternal and neonatal outcomes

Postpartum haemorrhage occurred in 6 women (3.9%), with one blood transfusion; the mean estimated blood loss was 577±249 ml. Intrapartum maternal fever occurred in 10 women (6.6%), and surgical site infection after caesarean section in 10 women (6.6%), all managed conservatively without re-suturing. One case of intraoperative scar dehiscence was noted; there was no uterine rupture, bladder injury, prolonged ICU admission, puerperal sepsis, or maternal death. The mean birth weight was 2.95±0.37 kg. No adverse neonatal outcomes NICU admission, ventilatory support, 5-minute Apgar score <7, or umbilical cord arterial pH <7.10 (mean 7.22±0.06) were observed in this cohort (Table 4).

Table 1: Baseline demographic and obstetric characteristics (n=152).

Parameters	Values
Age, years (mean±SD)	31.9±4.3
BMI, kg/m² (mean±SD)	30.1±4.8
Parity-para 1	124 (81.6%)
Parity-para ≥2	28 (18.4%)
Previous vaginal delivery	28 (18.4%)
Gestational age at induction, weeks (mean±SD)	38.4±0.9

Table 2: Induction and labour outcomes (n=152).

Parameters	Values
Pre-induction bishop score (mean±SD)	1.32±0.83
Duration of foley catheter in situ, hours (mean±SD)	11.4±1.8
Post-induction bishop score >6	96 (63.2%)
Oxytocin augmentation required	73 (48.0%)
Induction-to-delivery interval, hours (mean±SD)	16.5±5.5
Mode of delivery-vaginal birth	21 (13.8%)
Mode of delivery-repeat caesarean section	131 (86.2%)

Table 3: Comparison of maternal characteristics between mode of delivery.

Parameters	Vaginal birth (n=21)	LSCS (n=131)	P value
Age, years (mean±SD)	32.3±3.7	31.8±4.4	0.574
BMI, kg/m² (mean±SD)	30.6±5.5	30.1±4.7	0.699
Induction-delivery interval, hrs (median, IQR)	20 (18–20)	16 (12–19)	<0.001
Previous vaginal delivery	12 (57.1%)	16 (12.2%)	0.0001
Gestational age at induction, weeks (median, IQR)	38 (37–39)	38 (38–39)	0.193

Table 4: Maternal and neonatal outcomes (n=152).

Outcomes	Values
Postpartum haemorrhage	6 (3.9%)
Blood transfusion	1 (0.7%)

Continued.

Outcomes	Values
Intrapartum maternal fever	10 (6.6%)
Surgical site infection	10 (6.6%)
Scar dehiscence	1 (0.7%)
Uterine rupture	0 (0%)
ICU admission, bladder injury, puerperal sepsis, maternal mortality	0 (0%) each
Mean birth weight, kg (mean±SD)	2.95±0.37
NICU admission, ventilatory support, 5-min Apgar <7, cord pH <7.1, neonatal mortality	0 (0%) each

DISCUSSION

In this prospective observational study of Foley catheter induction in 152 women with one previous caesarean section and an unfavourable cervix, catheter induction achieved a favourable Bishop score (>6) in 63.2% of women, but the overall VBAC success rate was 13.8% which is lower than most published series. Mohana et al in a study of 96 women at a tertiary institute in South India, reported a substantially higher success rate of 83%; their protocol retained the Foley catheter for 24 hours (versus 12 hours in the present study) and their population had a more favourable baseline Bishop score (3.3±0.88 versus 1.32±0.83 in our cohort).[6] Similarly, Gonsalves et al reported a VBAC rate of 69% with a 24-hour catheter protocol and oxytocin escalation as needed.[8] The shorter, 12-hour retention protocol used at our centre, combined with a more unfavourable baseline cervix, may partly explain the lower success rate observed here.

A history of previous vaginal delivery was significantly associated with successful VBAC in our cohort (57.1% versus 12.2%, p=0.0001), consistent with Bashirudin et al who identified the absence of prior vaginal delivery, a prior caesarean for failure to progress, and an unfavourable Bishop score as key predictors of unsuccessful TOLAC.[9] In contrast to their finding that obesity and shorter maternal stature independently predicted emergency caesarean section, maternal age and BMI were not significantly different between our vaginal birth and caesarean section groups (p=0.574 and p=0.699, respectively), suggesting that obstetric history, rather than anthropometric factors, was the dominant predictor of success in our population.

Safety outcomes in this high-risk cohort were reassuring. There was no uterine rupture and only one case of scar dehiscence; postpartum haemorrhage occurred in 3.9% of women. Huisman et al, in a larger cohort of 993 women undergoing balloon catheter induction after one previous caesarean section, reported a composite adverse maternal outcome rate of 7.4% and uterine rupture in 11 women.[10] Our smaller cohort recorded no uterine rupture, though the sample size limits firm conclusions about rare events. Hemalatha and Swetha, in a case series of Foley induction after one previous caesarean section, reported a 60% VBAC rate with no major maternal complications, using a 24-hour protocol.[11] Taken together with our findings, this pattern suggests that longer catheter retention, rather than the mechanical method itself, may account for much of the difference in reported VBAC rates across studies.

Evidence specific to catheter-retention duration in previous caesarean section continues to accumulate. In a randomised trial comparing 6 versus 12 hours of Foley balloon placement in women with one previous caesarean section and an unfavourable cervix, Yogamoorthy et al found that the 6-hour protocol more often required re-insertion to achieve an adequate Bishop score, supporting the inference above that longer retention improves outcomes.[12]

Comparative trials of the foley catheter against pharmacological ripening in this population remain few; Sulaiman et al in a randomised trial after one previous caesarean delivery, found a shorter induction-to-delivery interval with controlled-release dinoprostone but a higher rate of uterine hyperstimulation than with the foley catheter.[13] This safety pattern is consistent with broader evidence from mixed obstetric populations: balloon catheters have shown delivery rates similar to misoprostol and dinoprostone but a lower risk of hyperstimulation and fetal hypoxia and in nulliparous women with an unfavourable cervix, single- and double-balloon catheters showed no significant difference in caesarean delivery rates, with uterine hyperstimulation confined to the PGE2-gel arm.[14,15] Neonatal outcomes were uniformly reassuring, with no NICU admissions, low Apgar scores, or umbilical cord acidaemia, consistent with the non-pharmacological nature of mechanical induction, which avoids the uterine hyperstimulation risk associated with prostaglandins.

Strengths and limitations

Strengths of this study include its prospective design, a clinically focused high-risk population, and a standardised definition of failed induction. Limitations include its single-centre design, a relatively short 12-hour catheter protocol compared with most comparator studies (which used 24 hours), slightly higher infection and postpartum haemorrhage rates than some published series, and short-

term neonatal follow-up only. Larger multi-centre studies directly comparing catheter-retention durations are needed to optimise induction protocols in this population.

CONCLUSION

Foley catheter induction is a safe and clinically feasible option for women with one previous caesarean section and an unfavourable cervix, with no uterine rupture and no adverse neonatal outcomes in this cohort despite a high-risk population. The VBAC success rate achieved with a 12-hour catheter protocol was modest, and a history of previous vaginal delivery was the strongest predictor of successful VBAC. These findings support the safety of mechanical cervical ripening in a scarred uterus while highlighting the importance of patient selection and counselling based on obstetric history. Larger multi-centre studies comparing catheter-retention durations are warranted to optimise induction protocols and VBAC success in this population.

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