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IMPACT OF LABOR INDUCTION TECHNIQUES ON MATERNAL AND FETAL WELL-BEING IN WOMEN WITH PREVIOUS CESAREAN SECTION: A COMPARATIVE ANALYSIS OF FOLEY'S CATHETER AND CERVICAL RIPENING BALLOON

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Abstract
Introduction: The study examines labour induction techniques in women who have had prior caesarean surgeries in order to assess the safety and efficacy of vaginal birth after caesarean section (VBAC).
Aim and Objective: Examining the effects of labour induction methods (such as Foley's catheter and CRB) on the health of the mother and foetus in women who have undergone prior caesarean sections is the main goal. Among the objectives include evaluating baby outcomes, infection risks, and acceptability and feasibility for women who have had previous caesarean sections.
Background: Studies on the safety and efficacy of Foley's catheter induction in women who have had prior caesarean sections demonstrate that the procedure has a low risk of morbidity and a high success rate for vaginal births. It is imperative that every patient be chosen separately.
Method and Material: The Single Balloon Foley Catheter and the Cook Cervical Ripening Balloon have different applications and designs. Because of its double-balloon design, the Cook CRB provides a secure and patient-friendly alternative to VBAC for women with one LSCS.
Result: When women with one LSCS undergo a VBAC, a comparison of the Foley catheter and the Cervical Ripening Balloon demonstrates baseline cervical anomalies, potential CRB superiority in cervical ripening, and favourable newborn outcomes.
Discussion: According to the study, women with a single LSCS may find that the Cervical Ripening Balloon (CRB) induces labour more well than the Foley catheter.
Conclusion: The study highlights the need of making individualised decisions by comparing the use of the Foley catheter and the Cervical Ripening Balloon (CRB) for inducing labour in women who have undergone prior caesarean procedures.
Keywords: VBAC, Foley catheter, Cervical Ripening Balloon (CRB), Caesarean section, Labour induction, Maternal and fetal outcomes

I. INTRODUCTION

In cases of prior lower segment caesarean section (LSCS), this study examines the effectiveness and foeto-maternal effects of inducing labour using Foley's catheter and cervical ripening balloon (CRB). Induced labour occurs in 20–30% of pregnancies; 10% of inductions involve women who had previously had a caesarean delivery. The increasing number of caesarean deliveries worldwide is increasing the necessity for labour induction in subsequent pregnancies resulting in uterine scarring [1]. If given the chance, research indicates that 60–80% of women who have had previous caesarean deliveries can deliver a baby vaginally without risk. However, there are worries about how induced labour may raise morbidity and death in mothers and newborns, particularly in women with damaged uteruses [2]. Studies in the past have shown that prostaglandin-induced labour following a caesarean has an increased risk of uterine ruptures. Transcervical Foley catheter-assisted cervical ripening has become popular as a prostaglandin substitute due to safety concerns. Similar [3] success has been achieved with this strategy in delivering vaginal births without the alleged hazards associated with the use of prostaglandins. The average rate of caesarean sections in India is 17.2%, although state-by-state variances exist. In certain countries, the percentage of repeat caesarean sections might rise to 87.44% [4].

Cervical [5] ripening is recommended using mechanical methods like Foley catheters to prevent scar dehiscence during labour. But, concerns have been raised regarding the [6]

possibility of infection because of the foreign body passing through the cervix. Recent Cochrane reviews indicated no increase in severe maternal morbidity with Foley catheter use, contrary to Heineman et al.'s finding of greater maternal infectious morbidity in women without a history of caesarean sections. Further research on the safety and effectiveness of transcervical Foley [7] catheters is necessary because the evidence supporting their use in women who have undergone caesarean deliveries is scant. This study aims to bridge this gap by comparing the foeto-maternal outcomes and efficacy of CRB versus Foley's catheter for labour induction in women with a history of one LSCS. The ultimate goal is to obtain a more profound comprehension of the factors influencing the efficacy and safety of mechanical induction in this specific patient population [8].

II. AIM AND OBJECTIVE

Aim:

This study's main objective is to evaluate and compare the effects of labour induction methods on the health of the mother and foetus in women who have previously undergone caesarean sections (CS), with a particular emphasis on Foley's catheter and cervical ripening balloon (CRB).

Objective:

- Assess Foetal Outcomes: The goal is to comprehend how labour induction techniques affect the health of the neonates in this particular group.
- Evaluate Infection Risks: Examine whether the risk of infectious morbidity is increased when foreign bodies pass through the cervix, and evaluate the general safety of each technique.
- Evaluate Acceptability and Feasibility: For women who have previously had a caesarean section, evaluate the acceptability and feasibility of using CRB and the Foley's catheter as labour induction techniques.

III. BACKGROUND

In a Dutch teaching hospital, [10] carried out a retrospective cohort research, examining data from 208 women having a Foley's catheter induction. In a hospital in India, [9] investigated the use of Foley's catheter for cervical ripening in 96 women. Their results showed that there was no maternal or perinatal mortality, only one scar dehiscence, and a 40% success rate for vaginal births. The efficacy and safety of Foley's catheter in this particular demographic were highlighted in the study.

The [11] study found that induction can be safely carried out in carefully chosen cases of prior caesarean section utilising Foley's balloon, with an 83% success rate for induction with Foley's catheter. According [12] to the study, there is a minimal incidence of problems for both the mother and the foetus and a success rate of 69.1% for vaginal birth following caesarean delivery. A prospective research [13] involving 35 women showed a 60% success rate for induction using Foley's catheter. The study emphasised the affordability and user-friendliness of Foley's catheter while highlighting its efficacy in cervical ripening. 130 women who had previously had a caesarean section were compared between oral mifepristone and the Foley catheter for labour induction [14]. In comparison to Foley catheter induction, the study indicated that mifepristone produced a greater rate of vaginal delivery and a more favourable Bishop score. A randomised controlled trial comparing Foley catheter versus controlled-release dinoprostone for induction in women who had previously had a caesarean section was carried out in Malaysia [15]. Variations in success rates and results, however, emphasise how crucial it is to choose patients individually and to follow them closely throughout the induction procedure.

IV. METHODS AND MATERIAL

The Single Balloon Foley Catheter, on the other hand, entails the insertion of a catheter for cervical ripening that has a single balloon filled with saline, followed by the application of light traction. By applying consistent pressure to the inside and external os, the Cook CRB facilitates a progressive and regulated dilatation process. Its silicone balloons conform to the shape of the cervix canal, enabling a drug-free, organic process of cervical ripening. Crucially, the CRB provides a safe substitute for patients undergoing vaginal birth after caesarean (VBAC) who have previously had one lower segment caesarean section (LSCS) and reduces the possibility of side effects related to pharmacological agents, such as prostaglandins.

Research, like that done by [16], [17] has shown that Foley's catheter is safe and effective for induction in women who have previously had a caesarean section. On the other hand, it is hypothesised that the Cook CRB causes more cervical ripening than the Foley catheters. With an external balloon outside the cervix and an internal balloon inside the uterus, the CRB's double-balloon design applies pressure to both sides of the cervix, possibly increasing its effectiveness. Unlike prostaglandin-induced labour, the Cook CRB approach involves putting the catheter without the patient needing to relax in bed. This more patient-friendly method is made possible by the 12-hour catheter stay in situ. The procedure entails guiding the catheter with a pliable stylet, and the gradual dilatation of the cervix is aided by the constant and regulated pressure exerted by both balloons. When compared to prostaglandin E2, this approach has been linked to lower rates of tachysystole and higher rates of vaginal delivery within 24 hours, demonstrating its effectiveness in producing successful vaginal births.

Figure 1: The CCRB is a double-balloon catheter made of silicone.

A randomised [18] controlled trial comparing the use of CRB against the Foley catheter for cervical ripening closely examines patient outcomes, including birth style, overall success rates, and mother and foetal well-being. This study aims to shed light on the relative safety and effectiveness of these two cervical

ripening methods for women who have already had one LSCS. The results of this study will add to the corpus of existing knowledge, impacting clinical practises and maybe assisting obstetricians in selecting the most effective cervical ripening method for this specific patient population.

Table 1: Summary of sample size

Study Group	Calculated Sample Size	Additional 10% (approx.)	Final Sample
CRB Group	57	6	63
Foleys Group	57	6	63

Method:

- Patients were admitted to the hospital's maternity unit after being chosen at random from the cases sent to the tertiary care centre.
- All cases were evaluated for eligibility, and those found to be qualified were given comprehensive information about the study and requested to provide written consent.
- This procedure was carried out repeatedly until the required sample size was reached.
- The included cases, who had undergone one LSCS in the past, matched the VBAC criteria, and were willing to have a VBAC, were split into two groups at random for labour induction.

Group 1: Foley's induction was used to initiate half of the cases
Group 2: Cervical ripening balloon was used to induce the other half.

- Every case was monitored till delivery to ascertain the result for the mother and foetus as well as the mode of delivery.

V. RESULT

The following tables 2 provide a detailed comparison of the pre-induction Bishop scores, post-catheter Bishop scores, and infant outcomes comparing the two study groups that underwent induction using the Cervical Ripening Balloon (CRB) and the Foley catheter. Examining these findings can provide crucial information regarding the effectiveness and safety of these two cervical ripening methods for women undergoing vaginal birth after caesarean section (VBAC) after having one lower segment caesarean section (LSCS).

Table 2: Bishop pre-induction scores for the two study groups are compared.

Preinduction Bishop score	CRB group (n=63)		Foleys Group (n=63)	
	No of Cases	%	No of Cases	%
Less than equal to 6	52	82.5%	53	84.1%
Greater than 6	11	17.5%	10	15.9%
Total	63	100.0%	63	100.0%
Median (IQR)	3.5 (1-6)		4 (0-6)	

The pre-induction Bishop scores in Table 2 show that 82.5% of the CRB group's cases and 84.1% of the Foley group's cases had scores of less than or equal to 6. This implies that the group that was chosen had cervical abnormalities, which is consistent with the difficulty of causing labour in patients who have a history of LSCS. As opposed to the Foley group (4), the CRB group's median pre-induction Bishop score was marginally lower (3.5), suggesting a possible baseline variation in cervical favorability.

Table 3: Bishop ratings following catheter induction are compared between the research teams

Preinduction Bishop score	CRB group (n=63)		Foleys Group (n=63)	
	No of Cases	%	No of Cases	%
Less than equal to 6	14	22.2%	25	39.7%
Greater than 6	49	77.8%	38	60.3%
Total	63	100.0%	63	100.0%
Median (IQR)	9 (5.3-12.0)		7 (3-11)	

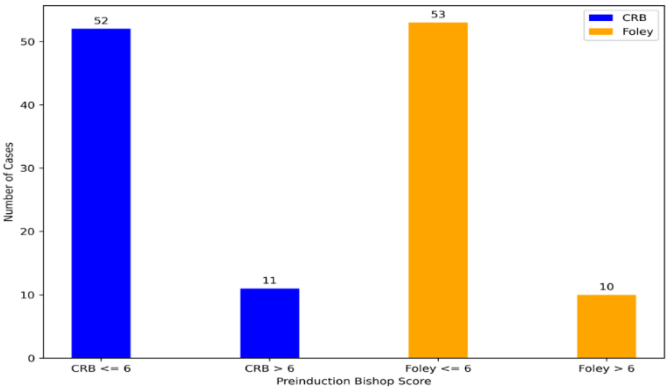

Figure 2: Representation of Preinduction Bishop Score Distribution

A comparison of Bishop scores after catheter induction is shown in Table 3. In this instance, the Foley group had a higher percentage (39.7%) of instances with scores less than or equal to 6, whereas the CRB group has a higher percentage (77.8%) of patients with post-catheter Bishop scores greater than 6. In addition, the CRB group's median post-catheter Bishop score (9) is higher than the Foley group's (7). These results imply that, in comparison to the Foley catheter, the CRB may be more successful in producing cervical ripening and higher Bishop scores.

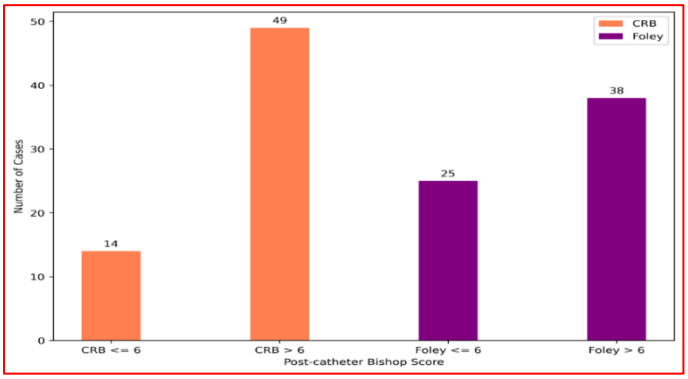

Figure 3: Post-catheter Bishop Score Distribution

Table 4 focuses on neonatal outcomes and offers information about how the induction techniques may affect newborns' health. The CRB and Foley groups are compared for rates of respiratory distress, meconium aspiration, intrapartum stillbirth, transient tachypnea of the infant (TTN), neonatal death, and the necessity for admission to the Neonatal Intensive Care Unit (NICU). The comparatively modest percentages for each

complication displayed by both groups highlight the general safety of cervical ripening with any technique. The slight variations in neonatal outcomes between the two groups indicate that there is no significant predisposing factor for adverse occurrences in neonates using either approach.

Table 4: Summary of Neonatal outcome: contrasting the two research groups

Neonatal complications	CRB group (n=63)		Foleys Group (n=63)	
	No of Cases	%tage	No of Cases	%tage
Respiratory Distress	3	4.8	4	6.3
Meconium Aspiration	3	4.8	2	3.2
Transient tachypnea of new-born (TTN)	1	1.6	1	1.6
Intra partum Still birth	0	0.0	0	0.0
Neonatal Death	1	1.6	1	1.6
NICU Admission required	5	7.9	7	11.1

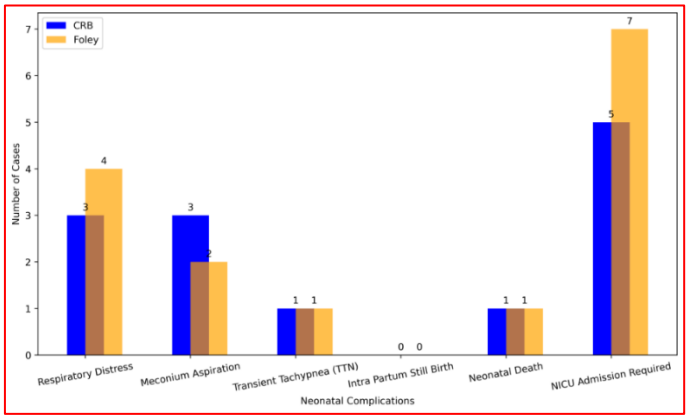

Figure 4: Neonatal Complications Distribution

As compared to the Foley catheter, the Cervical Ripening Balloon may be linked to higher post-catheter Bishop scores, suggesting more successful cervical ripening. Both groups' neonatal outcomes are generally good, with very little variation. These results highlight how crucial it is to provide tailored patient care and give careful thought to the cervical ripening technique in women who have had one LSCS. To confirm and generalise these results, greater investigation and larger-scale research could be necessary, giving clinicians making VBAC decisions a stronger basis.

VI. DISCUSSION

Examining the mother's grounds for induction, the study found no statistically significant changes in the number of cases with gestational diabetes mellitus (GDM) or reduced foetal movement between the CRB and Foley groups. This suggests that there was no discernible bias when the two induction techniques were used on a range of maternal indications. Prior to induction Bishop scores were similar across the groups, confirming that the randomization was successful and guaranteeing that the initial cervical circumstances of both cohorts were similarly unfavourable. The CRB group had a higher percentage of instances with scores greater than 6 than the Foley group, according to the post-catheter Bishop scores, which revealed a significant difference between the groups. This implies that, in comparison to the Foley catheter, CRB may be more successful in producing cervical ripening. By contrasting the CRB and Foley catheter in the particular setting of women with a history of one LSCS, the study makes a significant contribution to the body of current literature. The results are consistent with earlier studies suggesting that CRB may be more successful in causing cervical ripening, which may have an impact on the induction technique selected in this population. However, the study emphasises the ongoing efforts in the scientific community to develop clear recommendations for labour induction in the difficult circumstance of a scarred uterus and emphasises the need for bigger, multicentric trials to better validate and generalise these findings.

VII. CONCLUSION

The results show that, for women who have previously had a caesarean section, both Foley's catheter and CRB are reasonable options for inducing labour; yet, each technique has some advantages. Post-catheter Bishop ratings showed that CRB was far more effective at achieving cervical ripening, indicating that it may be the best option for encouraging vaginal births. But it's important to recognise that a thorough assessment of each patient's unique characteristics, induction indications, and clinical setting should inform the decision between the two approaches. The fact that both approaches show similar rates of newborn problems further emphasises the significance of taking neonatal outcomes into account. Clinicians can ensure a comprehensive approach to maternal and foetal safety by using this knowledge to analyse the advantages and hazards of each induction procedure. This study adds important information to the continuing conversation about labour induction procedures following a caesarean section, which is currently taking place in the medical community. To improve the generalizability of the results and deepen the evidence foundation, the authors sagely note the necessity for larger, multicentric trials. In the end, this comparative analysis acts as a springboard for additional study and cooperation to improve the care given to women experiencing labour induction who have previously had a caesarean section.

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