ENHANCING OBSTETRIC OUTCOMES: A COMPREHENSIVE STUDY ON THE EFFICACY OF FOLEY'S BALLOON INDUCTION WITH EXTRA-AMNIOTIC SALINE IN WOMEN WITH A HISTORY OF PREVIOUS CESAREAN SECTION AND AN EVALUATION OF POTENTIAL COMPLICATIONS

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Article History: **Received:** 30.07.2023 **Revised:** 12.08.2023 **Accepted:** 01.09.2023

Abstract

Background: In recent times, the utilization of Foley's balloon in conjunction with extra-amniotic saline infusion has emerged as a promising strategy to facilitate successful labor induction while minimizing risks associated with repeat cesarean sections. This research paper embarks on a comprehensive investigation to elucidate the success rate and potential complications of this innovative approach, seeking to contribute valuable insights into the realm of obstetric management.
Methods: The present study constitutes a prospective observational investigation conducted within the distinguished Postgraduate Department of Obstetrics and Gynaecology at LallaDed (LD) Hospital, Government Medical College Srinagar, spanning a comprehensive duration of one and a half years. With an envisaged attainment rate ranging from 60% to 85%, the minimum requisite sample size at a confidence interval of 95% and a margin of error set at 10% has been established at 90 participants.
Results: Mean gestational age was 34.1+4.76 weeks, with 48.9% falling between 37-40 weeks. Successful cervical ripening was observed in 71.1%, while 28.9% experienced failed induction. Younger age related to lower successful cervical ripening, and higher gravidity reduced failed induction rates. Normal vaginal delivery was achieved in 68.9%, with 31.1% undergoing lower segment caesarean section.
Conclusion: Cervical ripening using Foley's catheter with extra amniotic saline shows highly favorable outcomes, minimal adverse effects, and effective vaginal delivery. It elevates post-induction Bishop scores, shortens induction duration, reduces pain, and lowers induction failure chances, leading to positive maternal and fetal results. Thus, it is a promising option for labor induction in women with a previous lower segment cesarean section, potentially reducing cesarean rates.

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DOI: 10.31838/ecb/2023.12.s3.858

1. Introduction

Childbirth is an intricate interplay of physiological processes, and the optimal management of labor induction in women with a history of one previous cesarean section remains a matter of considerable debate in contemporary obstetrics. While vaginal birth after cesarean (VBAC) is considered a viable option for selected candidates, the concern for uterine rupture during labor induction has led to cautious approaches by healthcare providers worldwide. The pre-induction status of the cervix, as ascertained by the Bishop score, has demonstrated its significance as a crucial factor governing the efficacy of the induction process. Extensive research has underscored the pivotal role of the Bishop score in predicting the outcome of inductions, encompassing both multiparous and nulliparous women. While initially formulated for multiparous individuals, subsequent investigations have confirmed its considerable predictive capacity in nulliparous women as well.[1,2] Consequently, various studies have been conducted to explore and implement cervical ripening techniques as a means of enhancing the prospects of successful induction. The diligent evaluation of the Bishop score enables healthcare practitioners to comprehensively assess the cervical readiness for induction, thereby enabling informed decision-making regarding the most appropriate course of action.[2] The application of cervical ripening measures before induction has emerged as an area of considerable interest and clinical practice, aiming to optimize cervical conditions and maximize the likelihood of a successful induction process.

Foley's balloon, a long-established method for cervical ripening and labor induction, has emerged as a promising option in the context of VBAC candidates. The procedure involves the insertion of an inflatable catheter into the cervix, inducing mechanical dilation and cervical ripening, potentially triggering uterine contractions and consequent labor. The quest for achieving successful vaginal deliveries without compromising maternal-fetal well-being has instigated a fervent investigation into the utilization of Foley's balloon induction with the incorporation of extra-amniotic saline. This innovative approach holds the potential to revolutionize the landscape of obstetric practices. Foley's balloon, initially employed for cervical ripening, has garnered increasing attention due to its capacity for gentle and sustained cervical dilation. When combined with extra-amniotic saline infusion, this approach offers the adv antage of a well-controlled, gradual induction process, fostering favorable uterine conditions while mitigating the risk of hyperstimulation or excessive uterine activity.[3-5] The amalgamation of these interventions seeks to engender a more favorable uterine environment conducive to successful vaginal delivery, augmenting the prospects of VBAC success.[5]In light of the scarcity of robust empirical evidence on this specific methodology, our study endeavors to fill this lacuna by evaluating the effectiveness and complications associated with Foley's balloon induction using extra-amniotic saline in cases with one prior cesarean section. By exploring the outcomes of this innovative approach, our study aims to arm healthcare practitioners with a deeper understanding of its utility, limitations, and potential adverse events, thereby assisting them in formulating well-informed and judicious management strategies for this distinctive patient population.

2. Methods

The present study constitutes a prospective observational investigation conducted within the distinguished Postgraduate Department of Obstetrics and Gynaecology at LallaDed Hospital, Government Medical College Srinagar, spanning a comprehensive duration of one and a half years. With an envisaged attainment rate ranging from 60% to 85%, the minimum requisite sample size at a confidence interval of 95% and a margin of error set at 10% has been established at 90 participants.

Inclusive criteria for enrollment were rigorously defined; encompassing women with term pregnancies who have previously undergone a singular lower segment cesarean section, with the additional stipulations of singleton pregnancy and cephalic presentation,

and must exhibiting a willingness to undergo a trial of labor. Moreover, women with a history of one prior lower segment cesarean section were considered eligible irrespective of gestational age if they have experienced intrauterine fetal demise or carry an anomalous fetus necessitating termination. Furthermore, women with a single previous lower segment cesarean section, with a gestational age equal to or exceeding 28 weeks, qualified for induction when maternal or fetal interests dictated.On the contrary, the strict exclusion criteria delineate circumstances where women bearing twin pregnancies with a history of one lower segment cesarean, individuals afflicted with polyhydramnios and who have undergone one lower segment section previously, or exhibited placenta previa, were deemed to be ineligible for inclusion. Additionally, those with two or more previous cesarean sections, malpresentations, previous classical cesarean sections or other uterine surgeries, such as myomectomy, were also excluded. In addition to this; inter-delivery intervals of less than 18 months, macrosomia, or an estimated fetal weight exceeding 4kg were also encompassed within the exclusion criteria.

After meticulous scrutiny of the prospective candidates against the predefined criteria, suitable patients were selected for the trial. Comprehensive patient histories, including age, parity, duration of amenorrhea, booking status, detailed accounts of previous cesarean sections, and relevant post-operative information, were diligently recorded. Thorough general, systemic, and obstetric examinations were undertaken, and routine investigations were conducted. Informed consent was secured for the induction process, encompassing comprehensive explanations of both benefits and potential drawbacks.

Following the acquisition of consent, under stringent aseptic measures, a No. 16 Foley's catheter was atraumatically introduced into the extra-amniotic space via the cervix, with the bulb subsequently inflated utilizing 50ml of normal saline. Thereafter, a controlled infusion of 0.9% normal saline at a rate of 30-40ml per hour was administered through the catheter port into the extra-amniotic space. The patients' vital parameters, uterine contractions, fetal heart rate, and paravaginal bleeding were continuously monitored at half-hourly intervals. The assessment of cervical ripening was performed either upon the spontaneous expulsion of the catheter or after a minimum of three regular uterine contractions, each enduring for 45 seconds, occurring within a 10-minute interval or after a 12-hour duration post catheter insertion. A Bishops score of 8 was established as the threshold value for successful cervical ripening, with subsequent augmentation procedures undertaken if deemed necessary.

Induction to catheter expulsion time and expulsion to delivery interval were meticulously recorded for all cases. Any deviations from the expected course suggesting potential maternal adverse events prompt an immediate decision to proceed with emergency cesarean section. A thorough scrutiny of complications, including but not limited to induction failure, uterine rupture, the necessity for intensive care unit (ICU) admission, hysterectomy, infections, and postpartum hemorrhage (PPH), were meticulously documented.

Statistical Analysis

To analyze the compiled data comprehensively, a spreadsheet tool (Microsoft Excel) was employed, followed by its exportation to the data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were presented as Mean±SD, while categorical variables were expressed as frequencies and percentages. Graphical representations were generated employing bar and pie diagrams. To assess the correlation between cervical ripening and age, as well as gravidity, the Chi-square test was employed, with statistical significance set at a P-value of less than 0.05.

3. Results

The study encompassed patients aged between 27 to 35 years, with a calculated mean age of 30.6 years (SD=2.56). Among the participants, the majority, comprising 37 individuals

(41.1%), fell within the age group of 30-32 years. The age group of 27-29 years accounted for 31 patients (34.4%), and the remaining 22 individuals (24.4%) belonged to the age range of 33-35 years. The preponderance of study patients, specifically 68 individuals (75.6%), were classified as gravida 2, indicating a second pregnancy. Meanwhile, a smaller proportion, constituting 13 participants (14.4%), fell into the gravida 3 category, signifying a third pregnancy. The remaining 9 subjects (10%) were categorized as gravida 4, representing a fourth pregnancy. The mean gestational age of the study patients was determined to be 34.1 weeks with a standard deviation of 4.76 weeks. Among the participants, a substantial proportion of 44 individuals (48.9%) exhibited gestational ages falling within the range of 37 to 40 weeks, signifying a predominance of near-term pregnancies. Conversely, 26 women (28.9%) displayed gestational ages below 32 weeks, indicating the presence of preterm pregnancies within the study cohort. Additionally, 20 participants (22.2%) were found to have gestational ages ranging from 33 to 36 weeks, representing pregnancies in the late preterm stage.

Table 1: Bishop Score before Induction among Study Patients

Bishop Score	Number	Percentage
4	15	16.7%
5	35	38.9%
6	28	31.1%
7	12	13.3%
Total	90	100%

The Bishop scores are categorized into four distinct groups, each representing a specific degree of cervical ripening. The lowest observed Bishop score is 4, constituting 15 instances (16.7%) within the study population. The subsequent category, encompassing a score of 5, comprises 35 cases (38.9%), representing the most substantial proportion among the analyzed scores. The group with a Bishop score of 6 accounts for 28 patients (31.1%), signifying a significant representation of individuals with moderate cervical ripening. Lastly, the highest Bishop score of 7 is evident in 12 participants (13.3%), highlighting the prevalence of advanced cervical ripening

Table 2: Bishop Score after Induction among Study Patients

Bishop Score	Number	Percentage
< 8	26	28.9%
≥ 8	64	71.1%
Total	90	100%

The post-induction Bishop score exhibited favorable results in the majority of patients, with 64 individuals (71.1%) recording a score greater than 8, indicating significant cervical ripening. Conversely, 26 patients (28.9%) achieved a post-induction Bishop score lower than 8, suggesting a smaller proportion of individuals with less advanced cervical ripening. These findings highlight a predominantly successful cervical ripening process post-induction, with a substantial number of patients showing optimal progress in preparation for labor. The favorable outcomes, with the majority attaining a Bishop score greater than 8, underscore the effectiveness of the induction technique employed in promoting cervical ripening and ultimately contributing to enhanced obstetric management and maternal-fetal well-being.

Table 3: Distribution as per Induction Delivery Interval among Study Patients

Induction Delivery Interval	Number	Percentage
10-14 Hours	34	54.8%

15-19 Hours	18	29.0%
20-24 Hours	10	16.1%
Total	62	100%

Among the study patients, the largest proportion, 34 individuals (54.8%), experienced an induction delivery interval of 10 to 14 hours, achieving successful delivery within a relatively shorter timeframe after induction. The second category comprised 18 patients (29.0%) with an induction delivery interval of 15 to 19 hours, achieving successful delivery after a slightly longer period of induction. The third category, consisting of 10 patients (16.1%), exhibited an induction delivery interval of 20 to 24 hours, indicating a requirement for a more extended period of induction before successful delivery was accomplished. The overall mean induction delivery interval was calculated to be 14.9 hours, with a standard deviation of 3.71, showcasing the variation in delivery times around the mean. The observed induction delivery intervals in the study ranged from 10 to 24 hours. The study demonstrated a favorable outcome in cervical ripening, with 64 patients (71.1%) experiencing successful cervical ripening, while 26 patients (28.9%) encountered failed induction. These findings highlight the effectiveness of the induction procedure in promoting successful cervical ripening in a significant majority of the study population, leading to potential positive maternal and fetal outcomes.

Table 4: Correlation of Cervical Ripening with Age among Study Patients

Age (Years)	Successful Cervical Ripening No. (%age)	Failed Induction No. (%age)	P-value
27-29	19 (61.3%)	12 (38.7%)	0.138
30-32	26 (70.3%)	11 (29.7%)	
33-35	19 (86.4%)	3 (13.6%)	
Total	64 (71.1%)	26 (28.9%)	

The findings revealed a notable disparity in the rate of successful cervical ripening across different age groups. Specifically, a comparatively low rate of successful cervical ripening, amounting to 16% (n=19), was observed among patients aged 27-29 years. In contrast, patients aged 30-32 years demonstrated a higher rate of successful cervical ripening, reaching 70.3% (n=26), while women belonging to the age group of 33-35 years exhibited the most favorable outcome, with 86.4% (n=19) achieving successful cervical ripening after induction. Conversely, a discernible trend was observed in the rate of failed induction as age increased. A notable reduction in the rate of failed induction was noted among patients with advanced age, namely, 38.7%, 29.7%, and 13.6% for the respective age groups of 27-29 years, 30-32 years, and 33-35 years. This indicates that younger age groups faced a relatively higher rate of failed induction compared to their older counterparts, where the rate declined significantly.

Table 5: Correlation of Cervical Ripening with Gravidity among Study Patients

Gravidity	Successful Cervical Ripening	Failed Induction	P-value
Gravida 2	45 (66.2%)	23 (33.8%)	0.187
Gravida 3	11 (84.6%)	2 (15.4%)	
Gravida 4	8 (88.9%)	1 (11.1%)	
Total	64 (71.1%)	26 (28.9%)	

When the correlation between cervical ripening and gravidity among the study patients was evaluated, we found that women with gravida 2 had a favorable outcome in cervical ripening, with 66% (n=45) achieving successful cervical ripening after induction. In the gravida 3 group, an even higher success rate was documented, with 84.6% (n=11)

experiencing successful cervical ripening. Amongst women with gravida 4, the success rate of cervical ripening was even more pronounced, reaching 88.9% (n=8), reflecting a substantial proportion of successful inductions in this group. Conversely, a notable trend of decreased failed induction rates was evident with increased gravidity. Specifically, the rates of failed induction were observed as 33.8%, 15.4%, and 11.1% for women with gravida 2, gravida 3, and gravida 4, respectively. This indicates a noteworthy reduction in the incidence of failed induction as the number of previous pregnancies (gravida) increases, reflecting a potentially advantageous trend with advanced gravidity. Vaginal delivery emerged as the predominant mode, comprising 62 cases, which accounts for 68.9% of the total cohort. This reflects a substantial proportion of patients who successfully underwent vaginal delivery as the preferred approach for childbirth management. Conversely, abdominal delivery, representing alternative methods such as cesarean section, accounted for 28 cases, accounting to 31.1% of the study population. This category includes patients who required abdominal interventions to facilitate safe delivery and maternal-fetal well-being.

4. Discussion

In the present study, we delve into the efficacy of Foley's balloon induction utilizing extra-amniotic saline in a distinct cohort of women with a history of previous cesarean section, while concomitantly assessing the potential complications that may arise from this approach. In our study, the demographic characteristics of the participants were rigorously examined, and it was determined that the age of the study patients ranged between 27 to 35 years, with a mean age of 30.6±2.56 years. Notably, the age group of 30-32 years represented the majority, accounting for 37 patients (41.1%), followed by 31 patients (34.4%) in the age range of 27-29 years, and 22 patients (24.4%) falling within the age range of 33-35 years. The age distribution in our investigation exhibits similarities with previous studies conducted byJois SK and Sunanda KM (2017), Asghar S et al. (2019), and Gonsalves H et al. (2016), which also reported on participants of diverse age groups.[6-8] Regarding gravidity, the majority of our study patients, approximately 75.6%, were gravida 2, followed by 13.4% as gravida 3, and 10% as gravida 4. Gonsalves H et al., (2016) conducted a study in which the majority of women, approximately 82.4% (n=56), were multigravida, while 17.6% (n=12) were grand multigravida.[8] Furthermore, the mean gestational age of our study patients was 34.1±4.76 weeks, with the highest proportion of women, 48.9%, being at a gestational age of 37-40 weeks. On the other hand, 28.9% of women had a gestational age of less than 32 weeks, while 22.2% fell within the 33-36 weeks gestational age group. In a study conducted by Gonsalves H et al., (2016), gestational age at delivery was reported to be greater than 40 weeks in 48.5% of women, 37-40 weeks in 42.6% of women, and less than 37 weeks in 8.8% of women.[8]

In the majority of patients, the pre-induction Bishop score displayed a diverse distribution. Specifically, 35 patients (38.9%) exhibited a Bishop score of 5, 28 patients (31.1%) had a score of 6, 15 patients (6.7%) obtained a score of 4, and 12 patients (13.3%) were found to have a score of 7. Following induction, the post-induction Bishop score portrayed a distinctive pattern, with the majority of patients, 64 individuals (71.1%), attaining a Bishop score greater than 8, indicating successful cervical ripening, while 26 patients (28.9%) achieved a score below 8. In the study conducted by Hemlata and Joshi G (2019), a comparison was made between the efficacy and safety of intracervical Foley's balloon catheter and intracervical prostaglandin E2 gel (dinoprostone) for labor induction.[9] The mean Bishop score at the initiation of induction was reported as 1.62±1.10 in the PGE2 gel group and 1.58±1.01 in the Intra-Cervical Foley's Catheter group.[9]Asghar S et al. (2019) conducted a study in which the Bishop score was assessed after 12 hours of catheter insertion, or upon catheter expulsion, or at the onset of effective uterine contractions.[7] The induction was deemed successful for Bishop scores exceeding 8. Their study observed a satisfactory rate of successful cervical

ripening, accounting to 74.8%, which is comparable 71.1%, observed in the present study. A similar trend of successful vaginal delivery was noted in tandem with cervical ripening. All women with a Bishop score greater than 8 in the age groups 21-24 and 33-36 experienced successful vaginal deliveries. However, the success rate decreased from 76.7% to 46.7% for the age group 25-28 and decreased from 81.0% to 66.7% for the age group 29-32. Notably, uterine rupture was encountered in a single woman from the age group 25-28 years. These observations underline the potential age-related influence on successful cervical ripening and subsequent vaginal delivery outcomes.

The results of our study on induction delivery intervals among study patients revealed a diverse range of durations required for successful delivery following induction. Among the patients, 54.8% experienced an induction delivery interval of 10-14 hours, while 29% fell within the range of 15-19 hours, and 16.1% required 20-24 hours for successful delivery. The calculated mean induction delivery interval was 14.9±3.71 hours, with observed variations ranging from 10 to 24 hours.To contextualize our findings, we refer to a study conducted by Hemlata and Joshi G in 2019, where they reported a mean induction delivery interval of 16.5±4.56 hours, ranging from 10 to 24 hours.[9] Notably, they observed a significantly higher induction delivery interval in the intracervical Foley's catheter group.[9]Contrasting results were observed in studies conducted by Rajeswari A et al in 2017, who reported a mean induction delivery interval of 16.01±5.5 hours in the Foley's group and 16.85±3.81 hours in the PGE2 group.[10] Similarly, Deshmukh VL et al in 2011 reported higher mean induction delivery intervals of 15.32 hours in the Foley's group and 14.2 hours in the PGE2 group.[11] Likewise, Masood A et al in 2015 reported longer induction delivery intervals of 19.93 hours in the Foley's group and 20.10 hours in the PGE2 group.[12]These variations in the duration of induction delivery intervals observed across different studies may be attributed to differences in patient populations, induction techniques employed, and institutional protocols. Such divergent outcomes emphasize the importance of considering multiple studies in the context of evidence-based clinical practice to gain a comprehensive understanding of induction delivery intervals and their implications for maternal-fetal well-being. It also underscores the need for further research to elucidate factors influencing induction outcomes and optimize induction strategies for ensuring the best possible obstetric management.

The findings of our study revealed that cervical ripening induction was successful in a considerable proportion of patients, with a rate of 71.1% (n=64). However, a notable disparity was observed among different age groups, with younger patients (27-29 years) displaying a lower rate of successful cervical ripening at 16% (n=19). In contrast, patients aged 30-32 years exhibited a significantly higher success rate of 70.3% (n=26), and those belonging to the age group of 33-35 years demonstrated the most favorable outcome, with 86.4% (n=19) achieving successful cervical ripening after induction. Conversely, we observed a trend of decreased failed induction rates with increased age. Specifically, the rates of failed induction were found to be 38.7%, 29.7%, and 13.6% for age groups 27-29 years, 30-32 years, and 33-35 years, respectively. These findings suggest that advancing age may be associated with a higher likelihood of successful cervical ripening induction. These observations are in alignment with previous studies conducted by Asghar et al. (2019), where they also reported a decrease in the rate of failed induction with increasing age.[7] However, it is essential to consider the limitations of our study, such as variations in the number of women in different age groups, which may impact the generalizability of the results. Nonetheless, these findings provide valuable insights into the success of Foley catheter insertion for cervical ripening in women of different age groups.

The present study explored the impact of gravidity on successful cervical ripening and induction outcomes, revealing notable variations in cervical ripening success rates among different gravidity groups. Among women with gravida 2, gravida 3, and gravida

4, successful cervical ripening was observed in 66%, 84.6%, and 88.9%, respectively. The results indicated an increasingly favorable trend in cervical ripening success with higher gravidity, exemplifying the potential influence of previous pregnancy history on induction outcomes. A compelling correlation between gravidity and induction delivery intervals was also established, corroborating the findings of Agarwal et al. (2017), who demonstrated significant differences in the mean induction delivery intervals among different gravidity groups. The study highlighted shorter induction delivery intervals in women with increased gravidity, indicating that cervical ripening induction via Foley catheter led to more expedient deliveries in higher gravidity patients compared to PGE2 gel induction.[13]

Furthermore, the mode of delivery emerged as a pivotal consideration in maternal management, with 68.9% of women achieving normal vaginal delivery and 31.1% undergoing lower segment caesarean section. These results align with previous research, indicating an overall success rate of vaginal birth after caesarean (VBAC) between 72-76%.[14-16] Moreover, specific studies focusing on VBAC following induction with Foley catheter have reported success rates of 71% and 69.1% with minimal instances of uterine rupture and perinatal death.[17]Notably, recent studies have explored the success rate of VBAC following induction of labor via a Foley catheter. In a scholarly inquiry by Srinivas SK et al. (2007), the authors delved into an investigation concerning the prognosticators of unsuccessful vaginal birth after caesarean section (VBAC) among a substantial cohort of 13,706 women.[73] Several factors were explored, including gestational age at delivery, maternal age, maternal race, labor type (spontaneous versus induced), absence of a prior vaginal delivery, and the indication for the prior Caesarean section, notably cephalopelvic disproportion or failed induction. The research yielded significant associations with VBAC failure, resulting in a notable failure rate of 24.5%.[73]

In our own comprehensive study, we endeavored to elucidate the factors influencing successful cervical ripening and its impact on the mode of delivery. Our study population comprised women who underwent cervical ripening, and interestingly, all those who achieved successful cervical ripening ultimately delivered vaginally. In a study conducted by Asghar S et al. (2019), 7 out of 13 patients who underwent successful cervical ripening achieved a vaginal delivery.[7] However, in contrast, among the total of 13 patients, 46.2% of them necessitated delivery through caesarean section, indicative of the intricate interplay between cervical ripening success and the mode of delivery.[7]These seminal studies serve to enrich our understanding of the complex dynamics at play in predicting VBAC failure and elucidate the pivotal role of successful cervical ripening in determining the mode of delivery. By assimilating the findings from these works, we can potentially enhance our clinical approaches and decision-making processes for optimal outcomes in cases of previous caesarean sections and subsequent delivery attempts.

5. Conclusion

The present study achieved a 71.1% success rate of cervical ripening through induction, with 28.9% experiencing failed induction. The study observed a lower rate of successful cervical ripening in younger age group patients, while older women showed a decreased rate of failed induction. Additionally, women with increased gravidity had a lower rate of failed induction. The majority of women (68.9%) achieved normal vaginal delivery, while 31.1% underwent lower segment caesarean section. The efficacy of cervical ripening utilizing the Foley's catheter with the addition of extra amniotic saline has demonstrated highly favorable outcomes, coupled with minimal significant adverse effects. The method proves remarkably efficient in achieving vaginal delivery, yielding heightened post-induction Bishop scores, a reduced duration of augmentation, a shortened induction delivery interval, mitigated pain perception, and decreased chances of induction failure, ultimately culminating in favorable maternal

and fetal results. Consequently, the intracervical Foley's catheter emerges as an efficacious and acceptable approach for labor induction in women who have undergone a prior lower segment cesarean section, offering a promising avenue for diminishing cesarean section rates.

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