Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Obstetrics and Gynecology Research

Journal homepage: www.ijogr.org

Original Research Article

Comparative effectiveness of traction versus non-traction methods in foley catheter-Induced labor induction

Nachiketha S.V[1], Suvarna Makam[1]*, Ashwini Raju Sowrirajalu[1]

[1]Dept. of Obstetrics and Gynecology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India

Abstract

Background: Labor induction is a common obstetric intervention, with mechanical methods like the Foley catheter gaining popularity due to their safety profile and effectiveness. This study aimed to compare the efficacy and safety of traction versus non-traction methods in Foley catheter-induced labor induction.
Materials and Methods: This randomized controlled trial, conducted at Karnataka Institute of Medical Sciences, Hubli, over 12 months, involved 200 pregnant women with singleton pregnancies. Participants were randomly allocated into two groups of 100 each: Group A (traction method) and Group B (non-traction method) for Foley catheter-induced labor. Inclusion criteria encompassed primigravidae, multigravidas with previous vaginal deliveries, singleton cephalic pregnancies, previous LSCS >18 months, and gestational age 37-41 weeks. Exclusion criteria included premature membrane rupture, multiple pregnancies, malpresentations, intrauterine death, previous 2 LSCS, polyhydramnios, fetal compromise, and gestational age <37 or >41 weeks. Outcome measures included Bishop scores, mode of delivery, complications, infection rates, APGAR scores, and NICU admissions. Data collected was entered in excel sheet and analysed using SPSS version 20. Chi-square test and independent t test was used to study the significance.
Results: The traction group demonstrated significantly shorter induction-to-expulsion time (median 6 vs 12.5 hours, $p<0.001$) and induction-to-delivery time (median 16 vs 20 hours, $p<0.001$) compared to the non-traction group. The mean change in Bishop score was higher in the traction group (2.3 vs 2.04, $p=0.02$). While the traction group showed a trend towards higher rates of vaginal deliveries (76% vs 70%) and successful VBAC (33% vs 22%), these differences were not statistically significant. No significant differences were observed in maternal and fetal complication rates between the groups. The traction group had slightly higher 5-minute APGAR scores (8.93 ± 0.24 vs 8.84 ± 0.39, $p=0.03$).
Conclusion: The traction method in Foley catheter-induced labor induction may lead to faster cervical ripening and shorter induction-to-delivery intervals without compromising safety, although further large-scale studies are needed to confirm these findings.

Keywords: Labor induction, Foley catheter, Traction method, Non-traction method, Maternal outcomes, Neonatal outcomes.

Received: 03-08-2024; **Accepted:** 26-05-2025; **Available Online**: 18-11-2025

1. Introduction

In contemporary obstetric practice, labor induction is a frequently used obstetric intervention.[1] Induction refers to the stimulation of contractions prior to the commencement of labor on its own, whether or not the membranes are ruptured. Cervical ripening frequently precedes labor induction when the cervix is closed or uneffaced.[2] Induction of labor occurs about 20% of the time. When the advantages of induction for the woman or the fetus exceed the advantages of continuing the pregnancy, it is recommended.[2] A number of maternal or fetal conditions, such as post-term pregnancy, hypertension, intrauterine growth restriction, or premature rupture of membranes, may need the induction of labor. Finding and implementing the safest and most efficient techniques for labor inductions is essential given the rising rate of these procedures.[3]

Induction of labor can be achieved using mechanical, pharmaceutical, or non-pharmacological techniques. The use of mechanical techniques includes extra amniotic saline infusion, transcervical foley's catheter, and membrane

*Corresponding author: Suvarna Makam
Email: suvarnamakam6@gmail.com

https://doi.org/10.18231/j.ijogr.85483.1763451304

sweeping. Medication techniques employ PGE2, oxytocin, and misoprostol. Breast stimulation and sexual activity are examples of non-pharmacological techniques.[4]

The use of a Foley catheter has become more common among the labor induction techniques accessible since it is comparatively safe, economical, and less likely to cause uterine hyperstimulation than pharmaceutical techniques.[5] Originally intended for bladder emptying, the Foley catheter is now used as a mechanical technique for cervical ripening and inducing labor. It works by exerting pressure on the internal os of the cervix, which causes prostaglandins to be released and cervical dilatation to be encouraged.[6]

When using Foley catheters to induce labor, two main approaches have emerged: the traction method and the non-traction method. The non-traction method permits the catheter to stay in place without additional tension, whereas the traction method includes providing constant stress to the catheter by attaching a weight or taping it to the inner thigh. Although both treatments are widely used, opinions differ as to which is better for accomplishing a successful induction of labor and enhancing the results for mothers and newborns.[7]

Regarding the relative effectiveness of traction and non-traction techniques, earlier research has produced contradictory findings. Application of traction may result in shorter induction-to-delivery durations and faster cervical dilation, according to some research.[8] In contrast, other research has not discovered any appreciable variation between the two techniques in terms of mother satisfaction or induction success rates. These discrepancies in the literature emphasize the need for more research to identify the best method for inducing labor with a Foley catheter.[9]

The consequences of discovering a better approach could be enormous. Reduced rates of unsuccessful inductions, a decline in the need for cesarean sections, and better outcomes for mothers and newborns could result from more efficient induction techniques.[10] By minimizing the duration of hospital stays and the need for extra procedures, maximizing the use of Foley catheters for labor induction may also have financial advantages.[11]

2. Materials and Methods

This randomized controlled trial was conducted at the Karnataka Institute of Medical Sciences, Hubli, over a 12-month period. The study population consisted of pregnant women with singleton pregnancies attending the antenatal clinic at KIMS, Hubli, Karnataka. Inclusion criteria encompassed primigravidae, multigravida with previous vaginal deliveries, singleton pregnancies, cephalic presentations, previous LSCS >18 months, and gestational age between 37-41 weeks. Exclusion criteria included premature rupture of membranes, multiple pregnancies, malpresentations, intrauterine death, previous 2 LSCS, polyhydramnios, fetal compromise, deteriorating maternal condition, and gestational age <37 or >41 weeks.

The study recruited 200 participants from the Department of Obstetrics and Gynecology, randomly allocated into two groups of 100 each. Group A (study group) received induction of labor with Foley's catheter using the traction method, while Group B (control group) used Foley's catheter without traction. After obtaining informed consent, randomization was conducted by chit method. Cervical assessment was performed by the principal investigator using the modified Bishop Score. An 18G Foley's catheter was inserted under aseptic conditions and inflated with 60ml normal saline. For the traction group, a scale was attached to the catheter and pulled down to 750g traction, then anchored to the right thigh. The catheter was either spontaneously dislodged or removed within 24 hours, followed by cervical reassessment. A Bishop score >6 was considered favorable, leading to artificial rupture of membranes. Women with unfavorable cervixes after failed Foley's induction received PGE2 if necessary. The sample size of 200 was calculated based on a 13.6% prevalence of labor induction,[12] with a permissible error of 7%.

Participants were monitored for side effects of mechanical induction. Neonatal outcomes, including APGAR scores at 1 and 5 minutes and NICU admissions, were recorded. Post-delivery, women were monitored for signs of infection. Outcome measures included pre and post-induction Bishop scores, number of favorable cervixes following induction, mode of delivery, intrapartum maternal and fetal complications, maternal and neonatal infection rates, APGAR scores, and NICU admissions.

2.1. Statistical analysis

The Data was entered into Microsoft Excel, and statistical analysis was done using SPSS software version 20.0. All the Qualitative variables were presented as frequency and percentages and the Quantitative variables like modified bishop score, induction to expulsion and induction to delivery were presented as mean with SD or median with IQR, depending on the data distribution. Chi-square test and independent t test were used to test the significance. A p-value of <0.05 was considered statistically significant.

3. Results

Two hundred women were recruited, with 100 women in each group. Group A (study group) received induction of labor with Foley's catheter using the traction method, while Group B (control group) used Foley's catheter without traction. **Table 1** presents the baseline characteristics of the study participants. The age distribution was similar in both groups, with the majority (70% in cases, 67% in controls) falling in the 19-25 years age range. There was no statistically significant difference in age distribution between the groups (p=0.20), indicating that the randomization process was

effective in creating comparable groups. Parity was also similarly distributed, with slightly more than half of the participants being primigravida in both groups (57% in cases, 59% in controls). The proportion of women with a previous Lower Segment Cesarean Section (LSCS) was slightly higher in the case group (12% vs 9%), but this difference was not statistically significant (p=0.48).

The mean Modified Bishop Score at the start of induction was comparable between the two groups (2.93 in cases vs 3.01 in controls, p=0.50), suggesting that both groups had similar cervical conditions at the beginning of the study. The indications for induction were also similarly distributed between the groups, with postdates being the most common reason in both (56% in cases, 52% in controls). Other indications included hypertension, gestational diabetes mellitus (GDM), intrauterine growth restriction (IUGR), and previous LSCS willing for vaginal birth after cesarean (VBAC).

Table 2 reveals significant differences in the outcomes between the two methods. The traction method (cases) showed notably shorter induction to expulsion time (median 6 hours vs 12.5 hours, p<0.001) and induction to delivery time (median 16 hours vs 20 hours, p<0.001) compared to the non-traction method (controls). Moreover, the mean change in Bishop score was significantly higher in the traction group (2.3 vs 2.04, p=0.02). These results strongly suggest that the traction method is more effective in promoting cervical ripening and expediting the labor process. The shorter induction to expulsion and delivery times could have important clinical implications, potentially reducing the overall duration of labor and associated risks.

While the traction group had a higher rate of vaginal deliveries (76% vs 70%) and successful VBAC (33% vs 22%), these differences were not statistically significant (p=0.3 and p=0.5 respectively). Although not statistically significant, the trend towards higher rates of vaginal deliveries and successful VBAC in the traction group is clinically relevant. This suggests that the traction method might be particularly beneficial for women attempting VBAC, though larger studies would be needed to confirm this observation. (**Table 3**)

Table 1: Maternal demographic details

Variable	**Study (n=100)**	**Controls (n=100)**	**p value**
Age in years			0.20
19-25	70 (70%)	67 (67%)	
26-30	27 (27%)	24 (24%)	
>30	3 (3%)	9 (9%)	
Parity			0.78
Primigravida	57 (57%)	59 (59%)	
Multigravida	43 (43%)	41 (41%)	
Previous LSCS	12 (12%)	9 (9%)	0.48
Modified Bishop Score (mean)	2.93	3.01	0.50
Indication For Induction			
Postdates	56 (56%)	52 (52%)	0.512
Hypertension	10 (10%)	17 (17%)	
GDM	7 (7%)	10 (10%)	
IUGR	11 (11%)	8 (8%)	
Previous LSCS willing for VBAC	16 (16%)	13 (13%)	

Table 2: Bishop scores according to time to expulsion, delivery and its change

	Cases Median (IQR)	**Controls Median (IQR)**	**p value**
Induction to Expulsion time (in hours)	6 (4-8)	12.5 (12-16)	p<0.001
Induction to Delivery Time (in hours)	16 (12-20)	20 (18-25)	p<0.001
Mean Change in BS	2.3	2.04	0.02

Table 3: Number of vaginal deliveries and VBAC in cases and controls

	Cases Frequency (%)	**Controls Frequency (%)**	**p-value**
Vaginal Delivery	76 (76%)	70 (70%)	0.3
VBAC	33 (33%)	22 (22%)	0.5

The rates of NICU admission (88% vs 86%, p=0.67), intrapartum complications (19% vs 12%, p=0.17), and maternal complications (2% in both groups, p=1) were similar between the two groups, with no statistically significant differences. The similarity in complication rates suggests that the traction method does not increase the risk of adverse outcomes compared to the non-traction method. This is an important finding for the safety profile of the traction method. (**Table 4**)

Table 4: Feto-maternal complications in cases and controls

	Cases Frequency (%)	**Controls Frequency (%)**	**p-value**
NICU admission	88 (88%)	86 (86%)	0.67
Intra-partum complications	19 (19%)	12 (12%)	0.17
Maternal complications	2 (2%)	2 (2%)	1

The APGAR scores at 1 minute were similar between the two groups (8.85 ± 0.44 vs 8.78 ± 0.48, p=0.28). However, at 5 minutes, the traction group had slightly higher APGAR scores (8.93 ± 0.24 vs 8.84 ± 0.39, p=0.03), and this difference was statistically significant. The higher 5-minute APGAR scores in the traction group, although the difference is small, might indicate slightly better immediate neonatal outcomes. This could be a result of the shorter labor duration in the traction group, which might reduce fetal stress during labor.

Table 5: APGAR scores at 1 minute and 5 minutes

APGAR Score	**Cases Mean ± SD**	**Controls Mean ± SD**	**p-value**
At 1 min	8.85 ±0.44	8.78 ± 0.48	0.28
At 5 min	8.93 ±0.24	8.84 ± 0.39	0.03

4. Discussion

The induction of labor is a common obstetric intervention, with mechanical methods like the Foley catheter gaining popularity due to their safety profile and effectiveness. This study aimed to compare the efficacy and safety of traction versus non-traction methods in Foley catheter-induced labor induction. Our findings suggest that the traction method may offer several advantages over the non-traction method, including faster cervical ripening, shorter induction-to-delivery intervals, and potentially improved neonatal outcomes, without increasing the risk of maternal or fetal complications.

The results of our study showed that the traction group had much lower induction-to-expulsion and induction-to-delivery periods than the non-traction group. This conclusion is consistent with that of Fruhman et al.'s research,[8] which showed that there was no statistically significant difference in the median time between the no-tension group and the tension group (16.2 vs. 16.9 hours; P=.814). However, the tension group had a considerably shorter median duration from catheter insertion to expulsion (2.6 vs 4.6 hours; P<.001) than the no tension group. In a similar vein, Lutgendorf et al[13] found that the traction approach reduced the induction-to-delivery interval (mean 1.59 vs. 4.62 hours, p<0.01). These consistent results from various studies imply that traction treatment may really quicken the labor induction process. Gibson et al[14] conducted a second randomized controlled experiment on 197 women to evaluate the efficacy of inner thigh taping in conjunction with traction using a 500 cc weighted bag. Without changing the delivery time, traction did reduce the time to spontaneous catheter expulsion (p < 0.001). Bishop score change and pain score change were comparable across groups.

In our traction group, the mean change in Bishop score was substantially larger (2.3 vs. 2.04, p=0.02), suggesting more successful cervical ripening. This result differs from that of Ismail et al,[15] who found that the mean change in Bishop Score was comparable for both approaches. Women had little pain when utilizing either approach. The reduced induction-to-delivery intervals shown in our study and others could be explained by the traction method's increased cervical ripening impact.

Although the traction group had a tendency toward greater rates of vaginal deliveries and successful VBACs, these differences were not statistically significant, according to our analysis. This is in contrast to the results of Fruhman et al[8] who found that the traction group had a considerably greater vaginal delivery rate (79% vs. 71%, p=0.365). Our findings, however, are more consistent with those of Lutgendorf et al who discovered no discernible variation in vaginal delivery rates between traction and non-traction techniques.[13] Larger, multi-center studies are necessary to conclusively determine the effect of traction on mode of delivery, as these inconsistent results make clear.

The lack of substantial variations in the rates of maternal and fetal complications between the two groups was a key finding of our study. This confirms that the traction method does not raise the likelihood of unfavorable outcomes and is consistent with the safety profiles reported in other studies.[8,9,13] It is still debatable if using a Foley catheter to induce cervical ripening increases the risk of chorioamnionitis.[16] Nonetheless, McMaster et al.'s meta-analysis of 26 randomized trials 17 found that the incidence of chorioamnionitis is comparable when cervical ripening is achieved with a Foley catheter compared with PGE2 (relative risk [RR] 0.96; 95% confidence interval [CI] 0.66-1.38). There was no difference in the risk of maternal infection or newborn outcomes, according to a study by Ismail et al.[15]

Our traction group had marginally higher 5-minute APGAR scores than the control group, but the difference was not statistically significant. Despite this, the majority of research has not found any appreciable variations in newborn outcomes between traction and non-traction techniques.[8,9] It is plausible that the abbreviated labor period linked to the traction technique could potentially mitigate fetal stress and lead to improved immediate neonatal outcomes.

Although the traction method has demonstrated encouraging results in our work and others, it is vital to take into account potential downsides. Concerns regarding patient comfort and movement when using the traction approach have been brought up by certain studies. Despite the fact that our study did not explicitly measure patient comfort, anecdotal evidence did not point to any serious problems. In order to give a more thorough assessment of the two approaches, future research should incorporate metrics for patient comfort and satisfaction.

In conclusion, our study adds to the growing body of evidence suggesting that the application of traction to Foley catheters during labor induction may lead to faster cervical ripening and shorter induction-to-delivery intervals without compromising safety. While questions remain regarding its impact on mode of delivery and patient comfort, the traction method appears to be a promising technique for optimizing the efficiency of labor induction. Further large-scale, multi-center randomized controlled trials are needed to confirm these findings and explore their implications for specific patient populations, such as those attempting VBAC.

5. Conclusion

The traction method applied to Foley catheters during labor induction demonstrates promise in accelerating cervical ripening and reducing induction-to-delivery intervals without increasing maternal or fetal complications. Although further large-scale studies are needed to confirm these findings and explore its impact on specific populations, such as those attempting VBAC, the traction method holds potential for optimizing labor induction and improving maternal and neonatal outcomes in clinical practice.

6. Limitations

In this study the constant pressure on the foley's catheter could not be maintained. Most cases of mechanical induction needed an additional pharmacological method to enter established labour.

7. Source of Funding

None.

8. Conflict of Interest

The author does not report any conflicts of interest.

9. Ethical Approval

Ethical No.: KIMS:ETHCS COMM:318:2022-23.

References

1. World Health Organization. WHO recommendations: induction of labour at or beyond term [Internet]. Geneva: World Health Organization; 2018. [cited 2025 Sep 4]. Available from: https://www.who.int/publications/i/item/9789240052796
2. Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BL. *Williams Textbook of Obstetrics*. 26th ed. McGraw Hill; 2022.
3. Mozurkewich EL, Chilimigras JL, Berman DR, Perni UC, Romero VC, King VJ, et al. Methods of induction of labour: a systematic review. *BMC Pregnancy Childbirth*. 2011;11:84. https://doi.org/10.1186/1471-2393-11-84.
4. Arulkumaran S, Arjun G, Penna LK. The management of labour. 3rd ed. India: Universities Press; 2011.
5. Chen W, Xue J, Peprah MK, Wen SW, Walker M, Gao Y, et al. A systematic review and network meta-analysis comparing the use of Foley catheters, misoprostol, and dinoprostone for cervical ripening in the induction of labour. *BJOG*. 2016;123(3):346–54. https://doi.org/10.1111/1471-0528.13456.
6. Sciscione AC. Methods of cervical ripening and labor induction: mechanical. *Clin Obstet Gynecol*. 2014;57(2):369–76. https://doi.org/10.1097/GRF.0000000000000023.
7. Delaney S, Shaffer BL, Cheng YW, Vargas J, Sparks TN, Paul K, et al. Labor induction with a Foley balloon inflated to 30 mL compared with 60 mL: a randomized controlled trial. *Obstet Gynecol*. 2010;115(6):1239–45. https://doi.org/10.1097/AOG.0b013e3181dec6d0.
8. Fruhman G, Gavard JA, Amon E, Flick KVG, Miller C, Gross GA. Tension compared to no tension on a Foley transcervical catheter for cervical ripening: a randomized controlled trial. *Am J Obstet Gynecol*. 2017;216(1):67.e1–67.e9. https://doi.org/10.1016/j.ajog.2016.09.082.
9. Patabendige M, Jayawardane A. Foley catheter for cervical priming in induction of labour at University Obstetrics Unit, Colombo, Sri Lanka: a clinical audit with a patient satisfaction survey. *BMC Res Notes*. 2017;10(1):155. https://doi.org/10.1186/s13104-017-2478-z
10. Jozwiak M, Bloemenkamp KWM, Kelly AJ, Mol BWJ, Irion O, Boulvain M. Mechanical methods for induction of labour. *Cochrane Database Syst Rev*. 2012;(3):CD001233. https://doi.org/10.1002/14651858.CD001233.pub2.
11. Alfirevic Z, Keeney E, Dowswell T, Welton NJ, Medley N, Dias S, et al. Methods to induce labour: a systematic review, network meta-analysis and cost-effectiveness analysis. *BJOG*. 2016;123(9):1462–70. https://doi.org/10.1111/1471-0528.13981.
12. Tripathy P, Baby P. Review of induction labour and foetal outcomes – A retrospective analysis. *Asian J Nurs Educ Res*. 2014;4(1):35–8. https://doi.org/10.5958/2349-2996.
13. Lutgendorf MA, Johnson A, Terpstra ER, Snider TC, Magann EF. Extra-amniotic balloon for preinduction cervical ripening: a randomized comparison of weighted traction versus unweighted. *J Matern Fetal Neonatal Med*. 2012;25(6):581–6. https://doi.org/10.3109/14767058.2011.587063.
14. Gibson KS, Mercer BM, Louis JM. Inner thigh taping vs traction for cervical ripening with a Foley catheter: a randomized controlled trial. *Am J Obstet Gynecol*. 2013;209(3):272.e1–7. https://doi.org/10.1016/j.ajog.2013.05.028.
15. Ismail SM, Nusee Z, Noh NH, Ismail H. Induction of labour using Foley catheter: traction versus non-traction technique, a randomized prospective study. *J Med Res*. 2018;4(6):258–62. https://doi.org/10.31254/jmr.2018.4602.
16. Jozwiak M, Oude Rengerink K, Benthem M, van Beek E, Dijksterhuis MGK, de Graaf IM, et al. Foley catheter versus vaginal prostaglandin E2 gel for induction of labour at term (PROBAAT trial): an open-label, randomised controlled trial. *Lancet*.

2011;378(9809):2095–103. https://doi.org/10.1016/S0140-6736(11)61484-0.

17. McMaster K, Sanchez-Ramos L, Kaunitz AM. Evaluation of a Transcervical Foley Catheter as a Source of Infection: A Systematic Review and Meta-analysis. *Obstet Gynecol*. 2015;126(3):539–51. https://doi.org/10.1097/AOG.0000000000001002.

Cite this article: Nachiketha SV, Makam S, Sowrirajalu AR. Comparative effectiveness of traction versus non-traction methods in foley catheter- Induced labor induction. *Indian J Obstet Gynecol Res*. 2025;12(4):680–685.