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E Cervical ripening: Intravaginal Misoprostol in Compare to Intracervical Foley Single Balloon Catheter, A Randomized Clinical Trial

Tajossadat Allameh, Zahra Sadat Seyed-Hoseini, Zahra Allameh, Maryam Dehghan*

Department of Obstetrics and Gynecology, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

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Corresponding Information:
Maryam Dehghan,
Department of Obstetrics and Gynecology, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

Email:
maryamdehghan.1367md@gmail.com

ABSTRACT

Background & Objective: The aim of this study was to compare the efficacy of vaginal misoprostol with Foley balloon catheter for cervical ripening in women with singleton pregnancies and an unfavorable cervix.

Materials & Methods: Eighty pregnant women with unfavorable cervix were randomly divided in two groups of Foley catheter or misoprostol modes. Cervical ripening in Foley catheter group was done with transcervical Foley catheter 18, and in misoprostol group with 25 µg single dose vaginal misoprostol (The maximum allowed dose for patients was 6 doses.). Bishop score, Apgar score, active phase duration, stage 2 duration and insertion to delivery interval were the main outcomes.

Results: The mean time of ripening and the active phase in vaginal misoprostol group was significantly shorter than in Foley catheter group (2.32 versus 5.11 hours respectively, P-value = 0.0001). After intervention, Bishop score in vaginal misoprostol group was significantly more than Foley catheter group (8.70 versus 6.68 respectively, P-value = 0.0001). Insertion to delivery interval in vaginal misoprostol group was 9.54 hours and in Foley catheter group was 12.88 hours (P-value = 0.0001). The hospitalization time in Foley catheter group was significantly more than vaginal misoprostol group (P-value = 0.0001). The other outcomes were similar between groups.

Conclusion: By the decreasing in the total time from insertion to birth, vaginal misoprostol was more effective than Foley catheter, as a cervical ripening method in our study.

Keywords: Cervical ripening, Misoprostol, Delivery, Catheter

Introduction

Induction of labor is a common obstetric intervention when continuation of the pregnancy could endanger the mother or baby situation. Nearly, one in four of all deliveries need induction of labor **(1, 2)** In order to increase the success of induction, a variety of mechanical devices and pharmacological agents have been developed to induce cervical ripening before induction of labor **(3)**.

Over the past decade, the use of misoprostol to induce cervical ripening, as a pharmacological agent, has been prevalent, particularly in developing countries. It is a synthetic prostaglandin E1 analog that has been proposed for the prevention and treatment of peptic ulcer disease **(4)**. But, also is used in obstetrics for medication abortion, induction of labor, preparation of cervix before surgery, and treatment of postpartum hemorrhage **(5)**. However, misoprostol is not approved by the FDA for childbirth, it is widely used worldwide for this procedure **(6)**. Low cost, longer duration of action and easier maintenance are the main advantages of misoprostol over other prostaglandins **(5)**. Despite the effectiveness of misoprostol, there are apprehensions that some side effects such as hyperstimulation and fetal distress even occur with small doses of misoprostol **(6, 7)**. Uterine rupture is also one of the rare but life-threatening maternal complications attributed to use of misoprostol **(8)**.

Foley single balloon catheter that is used for the mechanical ripening of the cervix is reported to be effective in pregnant women under 24 weeks of gestation along with misoprostol, compared to misoprostol alone **(3, 9)**. It is shown that Foley catheter had similar vaginal birth rate compared with prostaglandin E2 gel with less postpartum hemorrhage and less asphyxia **(10)**, but in compare to misoprostol, different findings are repotted. In some previous studies the effect of misoprostol and Foley catheter was similar **(11-13)**. Some studies show that Foley catheter is more effective than misoprostol **(10, 14-16)**. On the other hand, some studies show the superiority of

misoprostol in compare to Foley catheter **(17-20)**. So, this study was designed to compare the efficacy of vaginal misoprostol treatment with Foley balloon catheter for cervical ripening in women with singleton pregnancies and an unfavorable cervix.

Methods

The present study was an open-label, randomized controlled trial that was conducted on term pregnant women at a women's hospital in Isfahan, Iran. The study was approved by the Institutional Review Board and Ethics Committee of Isfahan University of Medical Sciences (ethics code: IR.MUI.REC.1395.3.770). Participants were informed about the study and informed consent was obtained from all of them. Eligibility criteria were; age ≥ 18 years, Gestational age of 38 weeks or above (according to the date of the first day of the last menstrual period and was confirmed by an ultrasound scan), Bishop Score < 7, singleton living pregnancy, cephalic presentation, and intact membranes. The exclusion criteria were; known allergy to latex or prostaglandin, any surgical operation on the uterus, previous cesarean delivery, fetal macrosomia, an evidence of chorioamnionitis, unexplained vaginal bleeding, fetal distress, and polyhydramnios.

Using Random Allocation software, eligible women were allocated into intervention groups to receive either cervical ripening with vaginal misoprostol or transcervical Foley catheterization. Women in the misoprostol group were induced with vaginal misoprostol (25 µg single dose misoprostol was placed intravaginally). Patients were visited after 6 hours and the dose was repeated in the absence of effective uterine contractions. The maximum allowed dose for patients was 6 doses. Four hours after the last dose, if there were no effective spontaneous and frequent contractions, oxytocin prescription was considered. Women in the Foley catheter group underwent the insertion of a transcervical Foley catheter 18. The Foley catheter was inserted into the endocervical canal, then the balloon was filled with 50mL of sterile saline solution and the catheter was taped to the inner thigh. The catheter was remained in place for maximum 12 hours until the balloon was expelled spontaneously and labor augmentation was started. Otherwise, the patients were considered as failure, and oxytocin prescription was considered. Due to the nature of the interventions, blinding of the participants and the care provider was not possible.

Collected data were demographic characteristics and clinical outcomes of interest. Demographic characteristics included; mother age, gestational age, parity, and birthweight birth weight. Clinical outcomes included; baseline cervical dilatation, Bishop score and Apgar score, duration of active phase, duration of stage 2, insertion to delivery interval, hospitalization time, bleeding volume after-intervention Bishop score, and maternal and fetal side effects. To measure the bleeding volume, a disposable pad was placed under the mother's buttocks, and after delivery, the pad containing blood was weighed with a standard scale. Then, after reducing the weight of the pad, each gram of the weight of the pad was equivalent to 1 cc of blood.

Based on previously published data (Henry), a sample size of 80 women (40 in each group), will be needed **(3)** Data were analyzed by SPSS version 25 (SPSS, Inc., Chicago, IL, USA). Descriptive data were reported as mean ± SD, median [IQR] or number (%) as appropriated. Independent sample t-test, Chi square test and Mann–Whitney U test were used to compare studied variable between groups as appropriated. The level of significance is considered to be less than 0.05.

Results

Figure 1 shows the trial profile. 96 women were reviewed for eligibility, 11 were ineligible (3 with Bishop score > 7, 2 with previous cesarean delivery, 1 had uterine scar, 3 with antepartum bleeding, 2 had multiple gestation) and five women refused informed consent. 80 women randomly allocated to intervention groups. All women in both groups were included in the final analysis.

Table 1 shows the baseline characteristics of studied women by groups. Age, gestational age, parity and cervical dilatation were similar between groups (P-values > 0.05). Apgar score at first minute in vaginal misoprostol group was significantly higher than Foley catheter group (P-values = 0.004) but at fifth minute was similar between groups. Birth weight in vaginal misoprostol group was significantly more than Foley catheter group (P-values = 0.001).

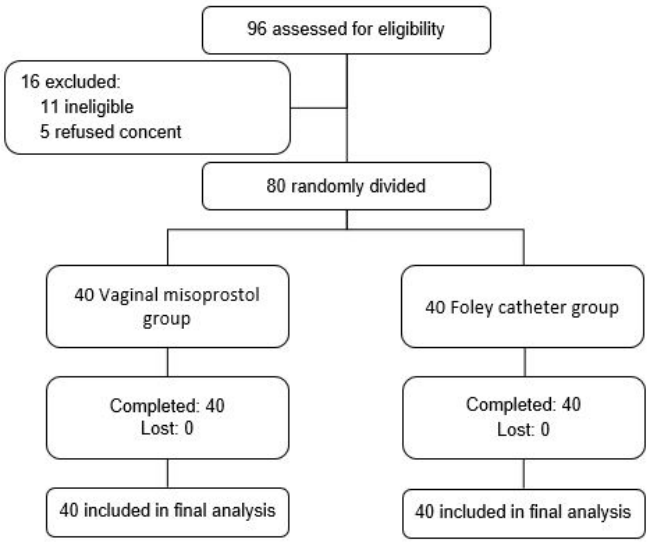

Figure 1. Trial profile

Table 1. Baseline characteristics of studied patients by groups

Characteristics	Group		P-value
	Vaginal misoprostol	Foley catheter	
Age, year	27.6 ± 6.3	27.5 ± 5.3	0.985*
Gestation age			
38 weeks	21 (52.5)	21 (52.5)	
39 weeks	16 (40)	14 (35)	0.729+
40 weeks	3 (7.5)	5 (12.5)	
Parity			
0	25 (62.5)	22 (55)	
1	10 (25)	15 (37.5)	0.429+
2	5 (12.5)	3 (7.5)	
Cervical dilatation (cm)	1.5 [1-2]	2 [1-2]	0.086++
Apgar score, baseline	10 [9-10]	9 [9-9]	0.004++
Apgar score (fifth minute)	10 [10-10]	10 [10-10]	1++
Birth weight (gr)	3093.5 ± 263.3	2912.0 ± 182.2	0.001*

Data are mean ± SD, median [IQR] or number (%)
P-values calculated by *Independent sample t-test, + Chi square test or ++Mann–Whitney U test

Comparison of outcomes between interventions groups are reported in table 2. The mean of time from induction to the active phase of labor in vaginal misoprostol group was significantly shorter than in Foley catheter group (2.32 versus 5.11 hours respectively, P-value = 0.0001). Time of stage 2 was similar in both intervention groups (P-values = 0.888). Bishop score before intervention was similar between groups (2.65 versus 2.60 respectively, P-value = 0.768), but after intervention, Bishop score in vaginal misoprostol group was significantly more than Foley catheter group (8.70 versus 6.68 respectively, P-value = 0.0001). Time from insertion to birth in vaginal misoprostol group was 9.54 hours and in Foley catheter group was 12.88 hours (P-value = 0.0001). The hospitalization time in Foley catheter group was significantly more than vaginal misoprostol group (P-value = 0.0001). Also, bleeding volume between groups was not significantly different (P-value = 0.205).

Table 2. Comparison of outcomes between studied groups

Characteristics	Group		P-value
	Vaginal misoprostol	Foley catheter	
Time of active phase (hours)	2.32 ± 0.88	5.11 ± 1.27	0.0001
Time of stage 2 (min)	22.55 ± 13.56	22.92 ± 9.77	0.888
Bishop Score			
Before intervention	2.65 ± 0.80	2.60 ± 0.71	0.768
After intervention	8.70 ± 1.04	6.68 ± 1.02	0.0001
insertion to delivery interval (hours)	9.54 ± 2.25	12.88 ± 2.77	0.0001
Hospitalization time (day)	1.40 ± 0.49	1.98 ± 0.48	0.0001
Bleeding volume (ml)	372.00 ± 60.43	387.75 ± 49.33	0.205

Data are mean ± SD
P-values calculated by independent sample t-test

Before intervention, Bishop score in all women in both group was lower than 7. After intervention, all women in vaginal misoprostol group had Bishop score equal or more than 7 whereas, in Foley catheter group, Bishop score in 17 women (42.5%) remained less than 7 (P-value = 0.0001; table 3). Also, changes in Bishop score after intervention in compare to before intervention in vaginal misoprostol group was significantly more than vaginal misoprostol group Foley catheter group (6.05 ± 0.81 versus 4.07 ± 0.92 respectively, P-value = 0.0001; figure 2).

Table 3. Comparison of frequency of Bishop Score < 7 between studied groups

Bishop Score	Group		P-value
	Vaginal misoprostol	Foley catheter	
< 7	0	17 (42.5)	0.0001
≥ 7	40 (100)	23 (57.5)	

Data are number (%)
P-value calculated by Chi-square test

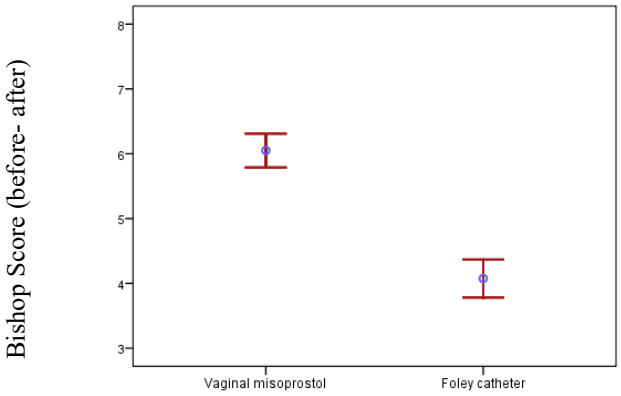

Figure 2. Change in Bishop Score after compare to before intervention between studied groups by independent sample t-test (P-values = 0.0001).

Discussion

The superiority of one method of cervical ripening remains controversial. In this study, 25 µg of vaginal misoprostol was compared with Foley catheter when used for cervical ripening. The findings from this study demonstrated that, vaginal misoprostol and transcervical Foley catheters both have comparable safety profile, and all studied women in both groups had vaginal delivery. With the superiority that the vaginal misoprostol group experienced a quicker labor than the Foley catheter group. Rate of maternal and fetal complication were low in both groups, and only in Foley catheter group one case of hematoma was occurred.

In the present study, vaginal misoprostol at 25 µg was more effective than to the Foley catheter for

cervical ripening and vaginal delivery occurred sooner in this group. This finding was comparable with previously published data. Chavakula et al. show that 25 µg of vaginal misoprostol was more effective than a Foley catheter for inducing labor **(21)**. Filho et al. used 25 µg misoprostol, and showed the superiority of misoprostol compared to Foley catheter **(14)**. Noor and colleagues showed that vaginal misoprostol was associated with a shorter induction for delivery interval in comparing to Foley's catheter **(22)**. Also, some other studies suggested the superiority of misoprostol for cervical ripening in compare to Foley catheter **(17-20)**.

In contrast to the present study, a meta-analysis showed that intravaginal misoprostol and a transcervical Foley catheter had similar effectiveness. Most of the included studies in this meta-analysis have used divided 100 µg misoprostol tablets which can lead to inaccuracies, because the tablets can shatter and crumble **(23)**. Kandil et al. showed that the induction fordelivery interval was shorter in the Foley group than intravaginal misoprostol **(9)**. Hill and colleagues reported no differences between Foley catheter and vaginal misoprostol for induction of labor **(12)**. Also, other studies reported the superiority of Foley catheter for induced labor in compare to misoprostol **(14-16)**. In Abdi et al. study, there wasn't any significant difference in frequency of normal vaginal delivery, Cesarean section, meconium-stained amniotic fluid, and neonatal intensive care unit admission between groups but placental abruption and uterine tachysystole occurred more frequently in the misoprostol group and oxytocin need occurred more in Foley catheter group **(24)**. Shoja et al.'s study showed the average of labor speed and the number of women with vaginal delivery was higher in Foley catheter group **(25)**. In our study, duration of labor was significantly higher in the Foley catheter group. The differences between these studies and the present study can be explained by the difference in pregnant women and different doses of misoprostol.

Conclusion

The difficulty of balancing inadequate stimulation and hyperstimulation make the induction of labor as a hazardous process. Misoprostol can cause uterine contractions, whereas Foley catheter has not directly caused uterine contractions during the cervical ripening phase, and oxytocin infusion is needed to induce uterine contraction after cervical ripening by Foley catheter. But need to proceed to an oxytocin infusion can make following Foley catheter for cervical ripening that in settings with few facilities can be more dangerous. So, the main potential safety benefit of misoprostol is vaginal birth without requiring an oxytocin infusion. In the present study, although vaginal birth was similar in both studied groups, but quicker labor in vaginal misoprostol group shows the superiority of misoprostol compared to the Foley catheter for to induce labor. This study had some limitations. First, it was not possible for the Intervention lists to blind the study. Second, Because of the small sample size, maternal complications could not be considered in our study. In conclusion, the present study showed that vaginal misoprostol is more effective than Foley catheter as a cervical ripening method because it decreases the total time from insertion to birth. Although, further studies with larger sample size may be warranted to confirm the findings of this study.

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Conflict of Interest

The authors have no conflicts of interest to declare.

Statement of Ethics

The patient had assigned the informed consent in the aim of reporting present article.

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Author Contributions

Providing article and comparing the result of several articles and choosing the appropriate one in addition to designing the mentioned surveillance study has been done by all colleagues.

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