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## Original Research Article

## Assessing the effectiveness of membrane sweeping combined with cervical massage for term pre-induction cervical ripening: A single experimental study

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## ABSTRACT

**Background:** Massage of the cervical region entails applying light pressure to the cervix to trigger the uterine contractions. Membrane sweeping, often called cervical sweeping or membrane stripping, releases hormones that may start labor by removing the amniotic sac from the uterine wall. Although membrane sweeping is helpful in several clinical trials, no studies have examined how effective cervical massage is when combined with membrane sweeping.

**Objective:** This research compared the effectiveness of membrane sweeping and cervical massage as cervical ripening techniques in post-dated pregnancies before labor induction in specialized clinics.

**Materials and Methods:** A total of 150 low-risk singleton pregnancies with a Modified Bishop Score (MBS) of fewer than five at 38 weeks of gestation were included. The experimental group received membrane sweeping with cervical massage, and the control group, which just received membrane sweeping, was randomly allocated to the participants. 48 hours after the intervention, changes in the MBS were used to gauge cervical favorability. Neonatal morbidity, membrane rupture, intrapartum and postpartum infections, and other complications were assessed.

**Results:** The mean ages and MBS of the primigravidae in the two research groups at induction were similar. After the intervention, the trial group's mean MBS was significantly higher than the control groups. Because of this, primigravidae observed a substantial change in the MBS after the operation. The experimental group's adverse effects and neonatal morbidity were comparable, except cardiocotographic abnormalities were observed more often in the control group.

**Conclusion:** In some cases, when membrane sweeping cannot be conducted because of a closed cervical os, cervical massage combined with membrane sweeping appears successful and secure. A significant choice for obstetric care, this technique may aid cervical softening in post-dated pregnancies.

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## 1. Introduction

The first stage of labor using artificial means instead of natural means is called induction of labor (IOL). The most frequent obstetrics operation is this one. In recent years, the rate has sharply increased. Pregnant women with diabetes mellitus, postdate pregnancies, preeclamptic

patients, IUGR, and PPROM all undergo it.<sup>1</sup> The technique employed should be efficient financially and have minimal negative effects since it is the most prevalent operation. Uterine pressure is more needed for an immature cervix than a ripe one. Induced labor is associated with failure to progress, prolonged labor, fetal distress, and a rise in cesarean sections when the cervix is not mature enough to allow for a successful vaginal birth. Bishop scoring

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measures the ripening of the cervical papilla.<sup>2</sup> When the bishop score is less than, cervical ripening treatments are suggested. Bishop's scoring method for predicting vaginal delivery in multiparas at term while receiving IOL has been effective repeatedly. Although we recognize its general simplicity and use, it may be time to reconsider the Bishop Score assessment's usefulness in predicting vaginal delivery in contemporary practice, especially in light of its expanding usage with nulliparous and preterm patients.<sup>3</sup> Finding biomolecular, imaging, or other signals that predict the cervix's preparation for vaginal delivery after IOL is difficult. Theoretically, various measures might be used to correlate significance indicators to inflammatory processes linked to the emergence of structural remodeling of the cervix during gestation. In this sense, attempts to combine current data with more recent discoveries may enhance current IOL algorithms and legitimize a wider use of the MBS.<sup>4</sup> The ultimate goal would be to time IOL surgeries specifically to get the greatest outcomes for each pregnancy. It is common knowledge that pregnancies over the due date may result in issues for the fetus, the newborn, and the mother. Risks rise after 40 weeks of pregnancy and dramatically after 41 weeks, making this the most frequent reason for inducing labor in the hopes of a vaginal birth. The cervical ripening and labor induction procedures ideally call for hospital admission. However, individuals often choose against medical advice to wait for spontaneous labor pains because they feel uncomfortable.<sup>5</sup> However, government hospitals are often overrun with patients in a growing nation like India. It is thus desirable to use any procedure that is both safe and efficient that might reduce hospital stays and monetary costs without endangering the health of the pregnant woman or the fetus. Membrane Sweeping (MS), a straightforward technique that is used all around the globe to encourage cervical ripening, is quite popular. It's still unclear when membrane sweeping should be done to guarantee efficacy. Though studies have shown that MS is good in post-term pregnancies, it is a typical way of inducing labor in patients who are not inside.<sup>6</sup> According to a Cochrane analysis, women carrying post-term pregnancies may benefit from regular MS usage between 38 and 40 weeks, even if it does not seem to have any clinically significant advantages. An inexpensive and efficient cervical ripening and medical induction medication is misoprostol, a PGE1 analog. The aforementioned components could be taken orally or systemically, which is advantageous in tropical nations with few resources. Pregnant women's particular requirements and worries are the main focus of cervical massage during pregnancy.<sup>7</sup> This specific massage method is intended to lessen the stresses of bearing the additional weight, hormonal changes, and postural changes intrinsic to the prenatal period to improve physical and emotional well-being. Cervical massage develops as a complete method

for encouraging relaxation, alleviating pain, and fostering peace for both the mother and the developing baby by fusing expert touch with a thorough knowledge of the pregnant body.<sup>8</sup> The efficiency of cervical ripening may be increased, and labor to begin spontaneously before a formal induction treatment is required by combining membrane sweeping with cervical massage. This study compares the efficacy of membrane sweeping with cervical massage in terms of effectiveness. This study's secondary goal is to compare the maternal and newborn morbidity connected to the two methods.

## 2. Related Works

Cervi ripen is stimulated by cytokines, interleukins, oestrogen, and prostaglandins. It begins slowly during pregnancy and quickens before arrival. Proteoglycan degradation enhances collagen solubility. The cervix can ripen using surgical, mechanical, pharmaceutical, or combination procedures. For twenty-four hours, a controlled-release dinoprostone vaginal pessary releases 0.3 mg/hour. More vaginal deliveries and larger Bishop Score changes were observed when intracervical gel was compared to a vaginal pessary. While there have been no such trials, misoprostol and Foley catheters can function more effectively together. 115 women were randomly assigned to receive misoprostol plus either pessary or Foley in this trial. Every six hours, trans-cervical Foley insertion and intrauterine injections 25 mcg, up to a maximum dose of 100 mcg, were administered to the Foley plus misoprostol group. For a full day, the pessary was implanted.<sup>9</sup> This study<sup>10</sup> examined the efficacy (hours to delivery) and perinatal outcomes of two cervical ripening techniques. The first dose of 50 g misoprostol reduced delivery time and oxytocin requirement compared with 25 g misoprostol treatment at all doses. The objective of the research<sup>11</sup> proved to ascertain the efficiency and security of combining misoprostol and mifepristone as a cervical ripening drug prior to induction of labour. The research was conducted from January to June 2020 at the teaching hospital of the Department of Obstetrics and Gynecology, Nepal Medical College. The experimental group consisted of 120 patients in total, 60 subjects underwent misoprostol and mifepristone inductions, and 60 underwent misoprostol inductions only. In the 48 hours after the membrane is swept, there may be a higher chance of spontaneous labor. In the third trimester, prostaglandins act as a good induction agents.

The research<sup>12</sup> aimed to determine how membrane sweep affected the induction of full-term labor at 39 to 40 weeks. The research was conducted as a randomized controlled trial at Benha University Clinic. There are between 4 and 18% of protracted pregnancies. Adverse effects for the mother and the baby are linked to prolonged pregnancy. To evaluate whether repeated (weekly) or single (once-a-week) membrane sweeping reduces the likelihood

of extended pregnancy. The research<sup>13</sup> assigned controlled trial was carried out over two years. The lower uterine segment and inferior pole of the membranes are manually separated from one another by a healthcare professional continually brushing in a circular motion while inserting one or two fingers into the cervix. As a result, hormones are produced that promote elimination and contraction, perhaps promoting labor. The research<sup>14</sup> sought to ascertain the success rate and effects of membrane sweeping in postdate pregnant women at Alhasahesa Teaching Hospital. Even though additional research is needed to determine its effectiveness and safety, induction massage is only offered by a few massage therapists in Australia. “The information presented to clients on the websites of Australian massage specialists that provide induction massage” was chosen by the publication.<sup>15</sup> Using an exploratory evaluative content analysis method that involved the examination of manifested and latent material, the websites of Australian massage professionals that provide induction therapy were investigated. The main contributions of the paper are,

1. The research compared the efficacy of membrane sweeping alone and membrane sweeping combined with cervical massage as two cervical ripening treatments.
2. According to the study’s findings, the mean Modified Bishop Score (MBS) significantly increased in the experimental group after the intervention, including membrane sweeping and cervical massage.
3. This implies that when cervical massage was combined with membrane sweeping, cervical favorability for labor induction was increased compared to membrane sweeping alone.

The remaining research is prepared as follows: Part 3 suggests a methodology, Part 4 discusses the findings, and Part 5 concludes the paper.

### 3. Materials and Methods

In this investigation, a single-blind experimental study was carried out. 150 people are selected gradually for the study and split into two groups at randomization. Group I was the experimental group, with n=75, whereas Group II was the control group, with n=75. The experimental group had cervical massage and membrane-sweeping techniques before labor was induced. Before labor induction, the control group had a simple membrane-sweeping treatment.

#### 3.1. Inclusion criteria

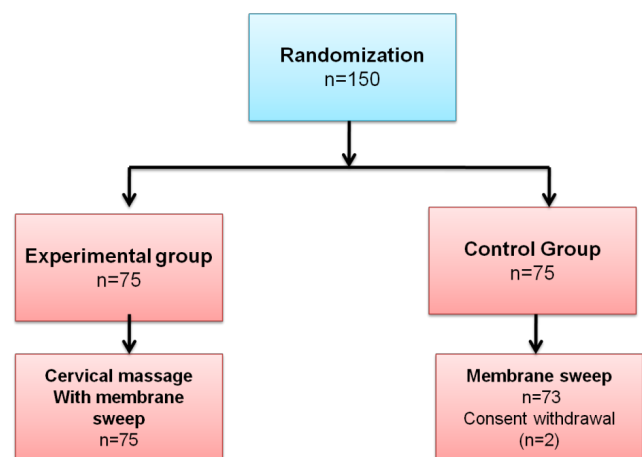
1. Participants must be 38 weeks pregnant.
2. 20-30 years of age
3. Uncomplicated singleton pregnancy with vertex presentation
4. Cephalic presentation

5. Intact membranes
6. Bishop score  $\leq 5$
7. Low-risk pregnancies

#### 3.2. Exclusion criteria

1. Participants below 38 weeks of pregnancy
2. Multiple pregnancies
3. Previous cesarean deliveries
4. Fetal growth restriction.
5. Contraindications to vaginal delivery
6. Bishop score  $> 6$
7. High-risk pregnancies

Using a random number table and stratified randomization, randomization was performed. A study participant uninformed in the treatments throughout the trial created sequentially numbered opaque envelopes. Figure 1 depicts the process of randomization to analysis.



**Figure 1:** Participant flowchart for the research

The first investigator, who was not blinded, performed the first intervention (membrane sweeping with cervical massage). Women assigned to the cervical massage group got the treatment using a method published in previous research that included pressing and massaging movements around the vaginal fornices for 15 seconds, while those assigned to the control group underwent (membrane sweeping) intervention. Membrane sweeping was performed using proper gender randomization. All interventions used the aseptic method. According to the unit’s regular practice, the fetus’s health was monitored. A cervical evaluation was carried out, and the MBS was recorded 48 hours after the intervention by a second researcher unaware of it. Following the unit’s usual methodology, the second investigator also identified the next action necessary to induce labor. Mothers who went into labor 48 hours after the first intervention were said to have had a spontaneous delivery.

### 3.3. Statistical analysis

In this work, we employed the chi-square test and an ANOVA for statistical analysis. The ANOVA method was used to examine the basic demographic features, mean MBS, frequency of fever, and birth weight in each of the three groups. These data were presented as means and 95% confidence

Intervals (CI). The chi-square test assessed other maternal and newborn outcomes, including method of birth, prelabour membrane rupture, cardiotocograph abnormalities, admission to the Preterm Infants Unit (PBU), and neonatal intensive care unit admission.

## 4. Results and Discussion

For the research, a total of 150 people were selected. From the analysis, two contestants were disqualified. After the control group was randomly assigned, two subjects withdrew their permission. As a result, 75 individuals were randomly assigned to the experimental group and 73 to the control group. When comparing the two groups of primigravidae in Table 1, there was no discernible variation in the distribution of fundamental demographic factors (Z), including age, MBS at recruitment and all thought calculating the 95% of CI because in the statistical research, the 95% CI is a crucial notion that offers a range of values that are likely to include the true population parameter. It supports the process of making decisions in the treatment with sweep cells, comparing outcomes, and determining statistical significance. It also helps to guarantee dependability and communicate outcomes in an efficient manner. Calculating 95% CI using the below formula

$$CI = \bar{X} \pm Z(S/\sqrt{n}) \quad (1)$$

$$S = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2} \quad (2)$$

Where  $\bar{X}$  is the sample mean for the membrane-sweeping patient, at Z is roughly 1.96. The number of patients receiving the membrane-sweeping treatment is n, the sample standard deviation is S, and the data point for each membrane-sweeping patient is represented by  $x_i$ .

**Table 1:** At-baseline population statistics (n=148)

Primigravidae	Experimental (n=75)	Control (n=73)	p Value
Age in years Range	20-30	18-28	0.29
Mean $\bar{X}$	22.5	20.7	
MBS at recruitment Mean	3.9	4.17	0.30
95% CI	3.12-4.20	3.82-4.53	

Even though the cervical massage with membrane sweeping group had statistically more individuals who

looked to have had a spontaneous commencement of labor within 48 hours of the intervention than the control group, Table 2 displays the findings after the intervention was carried out for 48 hours. The proportion of primigravidae with spontaneous onset of labor is shown in Table 2 for the groups for experimentation and supervision. The Table 2 shows data on spontaneous labor onset between the groups for experimentation and supervision. In the experimental group, 50.7% of women experienced labor, while in the control group, 31.50% experienced it. The p-value of 0.22 is not statistically significant.

**Table 2:** Results within 48 hours of intervention

Primigravidae	Experimental (n=75)	Control (n=73)	p Value
Spontaneous onset of Labor (%)	38 (50.7)	23 (31.50)	0.22

Primary result analyses 48 hours following treatments are listed in Table 3. When the mean MBS of the control group and the experimental group was compared 48 hours after the treatment was given, a statistically important distinction between the two sets was found. Regarding the probability of labor induction, a more significant percentage of participants in groups 1 and 2 were primigravidae, which increased the likelihood of labor induction. However, neither the experimental nor the control group's primigravidae found this difference statistically significant. The Table 3 compares the mean Modified Bishop Score (MBS) of an experimental group and a control group, with "Primigravidae" denoting the group of first-time pregnant women. The experimental group had a mean MBS of 8.9, while the control group had a mean of 6.3. In the experimental group, 53.7% of women had a favorable cervix for induction, while 35.6% had a control group's cervix. The p-values are 0.22 and 0.07, respectively, suggesting no significant differences at the 5% significance level.

**Table 3:** Bishop score at 48 hours (n=87, eliminating moms who had begun spontaneous labor)

Primigravidae	Experimental (n=45)	Control (n=42)	p Value
Mean MBS (95% CI)	8.9 (6.8-8.0)	6.3 (5.0-7.5)	0.22
Cervix favorable for Induction (%)	9(53.7)	7(35.6)	0.07

In Table 4, the mean MBS after a 48-hour intervention was compared. After 48 hours of intervention, the mean Modified Bishop Score revealed a statistically significant difference between Groups 1 and 2. The progression of MBS in the experimental or control groups was not significantly different from each other. The table presents data from a study involving primigravidae, comparing two

groups, "Group 1" and "Group 2," and their p-values. There is no statistically significant variance between the two groups in the first batch of data, with a p-value of 0.2. The existence of a statistically significant distinction between the two groups is indicated by the second batch of data's p-value of 0.96. The ranges in the data may represent confidence intervals or other estimations related to the measurements. The p-values indicate the significance level of the statistical test.

**Table 4:** Analyses of the mean MBS in each group 48 hours after the intervention

Primigravidae	Experimental (n=75)	Control (n=73)	p Value
Group 1 vs Group 2	0.98	-3.21-0.63	0.2
Group 1 vs Group 2	0.96	-0.71-3.1	0.02

Table 5 display the secondary outcome metrics. A pregnancy or childbirth study's experimental and control groups are compared in the table. The experimental group (75) needed 15.3% more vaginal PGE2 than the control group (73). 12.7% of experimental participants (75) had intrapartum fever, compared to 8.9% of control participants (73). The experimental group (75 participants) had 8.6% postpartum fever compared to 5.5% in the control group (73 participants). 6.7% of experimental participants (75) had CTG abnormalities, compared to 3.4% of control participants (73). PROM was 5.3% more common in the experimental group (75 participants) than in the directing group (1.4%). In primigravidae, individuals in the experimentation group (10/75) had a statistically significant greater number of Cardiotocogram (CTG) abnormalities than in the control groups (50/73). The number of individuals with pyrexia in labor or PROM varied significantly according to whether they were primigravidae. Additionally, the newborn outcomes in the two arms of the control group's experimental groups did not differ significantly.

**Table 5:** Measures of secondary outcomes for each group

	Experimental n=75	Control n=73	p Value
Need of vaginal PGE2 (%)	23 (15.3)	21 (14.3)	0.16
Intrapartum fever (%)	19 (12.7)	13 (8.9)	0.18
Postpartum fever (%)	13 (8.6)	8 (5.5)	0.74
CTG abnormalities (%)	10 (6.7)	5 (3.4)	0.01
PROM (%)	8 (5.3)	2 (1.4)	0.35

Before labor induction, a method for cervical ripening in post-dated pregnancies has been suggested that combines

membrane sweeping with cervical massage. Utilizing this combined strategy has the following benefits shown in Table 6.

The Table 6 compares an experimental group to a control group in a study focusing on advantages such as enhanced cervical ripening, wider applicability, and reduced need for medical intervention. The experimental group showed 126.7% improvement in cervical ripening, while the control group had 119.2% improvement. The experimental group had 110.7% wider applicability, while the control group had 98.6%. The experimental group experienced 105.3% reduced need for medical intervention. However, the percentages are over 100%, suggesting that the experimental group had more advantages. Cervical ripening is thought to be promoted more efficiently by combining membrane sweeping and massage than by membrane sweeping alone. The cervix may soften and enlarge due to the stimulation of blood flow to the area by cervical massage. Combining membrane sweeping with cervical massage might provide fewer options to existing cervical ripening techniques.

**Table 6:** Comparison of the advantages for each group

Advantages	Experimental n=75	Control n=73
Enhanced Cervical Ripening	95	87
Wider Applicability	83	72
Reduced Need for Medical Intervention	79	61
Cost-effective	96	92
Providing Prolonged Pregnancy	89	90

Compared to membrane sweeping alone, cervical massage is often a non-invasive therapy with no extra risk or potential for consequences. Therefore, the experimental group (membrane sweeping with cervical massage) compares more accurately to the control group. (membrane sweeping).

## 5. Discussion

The results of the present investigation revealed that whereas spontaneous labour did not vary in a quantitatively meaningful way following the intervention, cervical massage is just as efficient as membrane sweeping in attaining cervical ripening for labor induction at term in primigravidae. This result is likely due to the present study's insufficient sample size and cervical massage time, which made it challenging to identify the underlying difference. The study aimed to ripen the cervix enough to facilitate induction using the commonly used technique of artificial membrane rupture and oxytocin infusion. Therefore, 15 seconds of massage time was chosen in this preliminary investigation as the authors had no previous experience with cervical massage to ripen the cervix and no data on the

length of the cervical massage. It was noted that, compared to the control group, the change in mean MBS after 48 hours of cervical massage and membrane sweep was statistically significant. Further, evidence that neither intervention is ineffective for pre-induction cervical ripening comes from the fact that the mean MBS of the experimental group were not significantly different for the control groups after 48 hours. According to the present research, both intervention groups' mean MBS values after 48 hours of intervention were higher than those advised for labor induction. This will allow people to consider cervical massage a substitute for membrane sweeping when the cervical os is closed. Prelabor Rupture of Membrane (PROM) occurred in the experimental group of women at a slightly higher rate (6%) than in the control group (2.4%). Additionally, there were no significant differences among the various intrapartum or postpartum fever groups.

## 6. Conclusion

Cervical massage combined with membrane sweeping is an alternative to membrane sweeping that might be a suitable choice for pre-induction cervical ripening in term mothers. This is particularly true when the cervical os is closed, and membrane sweeping cannot be performed due to the lack of access. In addition, the findings of the present research demonstrated that cervical massage and membrane sweep would not have a negative impact on the outcomes for the neonates. This research shows a possible decrease in the time needed for labor induction in the experimental group. This discovery is important because it may result in less medical intervention and more effective labor. Therefore, there was insufficient evidence to conclude that cervical massage amplifies the adverse outcomes for the mother or the newborn in the present investigation. As a result, this research demonstrated that membrane sweeping and cervical massage had similar effects on maternal and newborn outcomes. Thus, cervical massage is a safe intervention regarding the danger of infection and prelabor membrane rupture. Although the findings of this study are encouraging, it is important to acknowledge the need for more investigation. To completely demonstrate the effectiveness and safety of this intervention, larger sample sizes, different demographics, and long-term follow-ups are required. It would also be beneficial to look at any variances in results depending on unique patient characteristics.

## 7. Source of Funding & Conflict of Interest


None.

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