


Research Article

Comparing Effects of Amniotomy and Spontaneous Rupture of Membrane on Duration of Labor in Primigravida at Term Pregnancy

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Abstract

Purpose: Early amniotomy is one of the most important procedures for improving labor progress and preventing dystocia in pregnant women. The study compared the effects of amniotomy and spontaneous rupture of membrane (in early labor in primigravida at term) on the duration of labor.

Methodology: Randomized Controlled Trial was conducted at the Department of Obstetrics and Gynecology MTI, Lady Reading Hospital, Peshawar, Pakistan. A total of 80 pregnant women with a single cephalic fetus in early labor were included in the study. Group A included 40 women in whom amniotomy was performed; while group B had 40 women who had spontaneous rupture of membranes. Duration of labor was noted in both groups.

Results: The average age of Group A females in labor was 27.17 years and 26.2 years in group B. Gestational age and weight of mothers averaged 38 weeks and 67 kg in both groups respectively. The duration of labor was 5.7 hours in Group A and was prolonged at 7.1 hours in Group B. The mean duration of labor was 5.7 hours in Group A and 7.15 hours in Group B (P-value = 0.01). Regardless of the age of the mothers in either group, the mean duration of labour was 5.7 hours (18- 30 years) and 5.5 hours (above 30 years) in Group A, compared to Group B, 7.1 hours (18-30 years) and 7.0 hours above 30 years). Significant differences (P- value: 0.01) existed between each age group, gestational age, and weights in groups A (amniotomy) and B (spontaneous rupture of membranes) concerning the duration of labor.

Conclusion: Artificially rupturing the membranes during active labor in primigravida reduces the length of labor considerably.

Keywords: Amniotomy; Duration of Labor; Pregnancy; Primigravida; Spontaneous Rupture of Membranes

Introduction

Labor is once-in-a-lifetime experience for women; it is a physiological but painful experience. It is a dynamic and ongoing process that culminates with the delivery of a healthy baby, followed by the ejection of the placenta and membranes [1]. When a hole or tear forms in the sac, the membranes burst. The majority of women describe this as "breaking water." The membranes are capable of rupturing on their own. This is known as spontaneous membrane rupture. It usually occurs after active labor has begun. It might be difficult to know whether the membranes have ruptured. As the due date approaches, the uterus exerts increased pressure on the bladder. Urine may flow as a result of a severe Braxton Hicks contraction or sneeze. This might be misinterpreted

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Citation: Tanveer Shafqat, Laila Zeb, Sumaira Yasmin. Comparing Effects of Amniotomy and Spontaneous Rupture of Membrane on Duration of Labor in Primigravida at Term Pregnancy. *Obstetrics and Gynecology Research* 5 (2022): 181-186.

Received: May 26, 2022

Accepted: June 18, 2022

Published: September 14, 2022

as a rupture of the membranes. Also, amniotomy has been a tool for more than 50 years and is described as the artificial breach of the amniotic membrane with the primary goal of accelerating contraction and shortening the duration of labor [2, 3]. One of the most prevalent interventions in obstetrics is the intentional artificial rupture of the amniotic membranes during labor known as amniotomy or 'breaking of the waters.' The primary goal of amniotomy is to accelerate uterine contractions and, as a result, decrease the duration of labor. However, there are also worries about unforeseen consequences for the mother and infant [4].

The present study compared the effects of amniotomy and spontaneous rupture of membrane (in early labor in primigravida at term) on the duration of labor. Artificial membrane rupture can be used as an intervention to shorten the duration of labor without altering the fetomaternal outcomes. When used in primigravida, it is a safe, dependable, and cost-effective technique that may be regarded as a low-cost, easily available intervention to prevent protracted labor and its associated problems [5]. Battarbee et al.

[6] investigated the relationship between amniotomy at various stages of labor induction and mother and newborn outcomes in a term, nulliparous women. Amniotomy was related to decreased or equivalent probabilities of cesarean delivery and other unfavorable outcomes in a recent cohort of nulliparous women undergoing term labor induction, compared to no amniotomy.

A meta-analysis looked at the efficacy and safety of early amniotomy during labor augmentation. Early amniotomy during labor progress is related to a shorter time to delivery and no indication of poor perinatal outcomes. Induction of labor (IOL) is a frequently performed obstetrical procedure accounting for roughly 25.7 percent of all births in 2017. With recent trial results suggesting that IOL in low-risk nulliparous women at 39 weeks of gestation did not increase infant morbidity while lowering cesarean birth rates, the number of patients offered IOL is projected to grow. It is therefore vital to continue evaluating strategies and therapies that are both safe and effective at accelerating induced labor [7]. Amniotomy is a frequent and low-cost way of inducing labor; nevertheless, the ideal timing of amniotomy during labor induction is debatable. Early amniotomy was linked to an increased risk of cesarean section in obese women. The link between early amniotomy and severe maternal morbidity varied according to maternal factors, while early amniotomy was not linked to newborn morbidity. Early amniotomy during labor induction may be beneficial in certain populations, notably non-obese women who require mechanical ripening [8]. A retrospective cohort analysis of all patients undergoing indicated preterm induction (23–34 weeks) at a single tertiary care facility was carried out. Chorioamnionitis and a composite of maternal and neonatal adverse outcomes were secondary outcomes.

Early ARM (artificial rupture of membranes) was linked to a low risk of cesarean section [9].

Artificial membrane rupture is frequently utilized during IOL in conjunction with other medications to increase uterine contractions. Amniotomy, when performed after cervical ripening, can release accumulated endogenous prostaglandins in the amniotic membrane and nearby uterine decidual tissue, dramatically increasing contractility and labor progression as they stimulate positive feedback release of local prostaglandins and contraction-associated proteins [10]. The amniotic cavity is an enclosed sac within the uterus where the fetus grows and is protected throughout pregnancy. The amniotic cavity is made up of a dual-layer membrane with an inner layer called the amnion and an exterior layer called the chorion. During the first several weeks of pregnancy, this potential space develops and is filled with serous fluid. As the fetus develops, particularly the fetal urinary system, the fluid in this potential area grows as the developing fetus excretes urine. The majority of amniotic fluid is made up of fetal urination [11, 12]. The two main reasons for artificial membrane rupture are to induce or augment labor or to aid in the insertion of internal fetal monitoring equipment to give a direct evaluation of the fetal condition. External monitoring systems make it simple to monitor the fetal heart rate and uterine activity. Therefore, to get the fresh local evidence this study was conducted to compare the outcomes of amniotomy and spontaneous rupture of the membrane in early labor in primigravida at term. Results of this study will not only provide the local data but also pave the way to selecting the right intervention for our general population.

Material and Methods

A Randomized Controlled Trial (RCT) was conducted at the Department of Obstetrics and Gynecology, Lady Reading Hospital, Peshawar, from 1st February 2021 to 1st August 2021. A total of 80 (40 in each group) patients were enrolled. Group A included the women in whom amniotomy was performed, while group B women waited for spontaneous rupture of membranes. The Sample size was calculated with the following assumptions: Confidence Level =95% Power = 80% Margin of error= 5% Using the mean DOL of 6.66 ± 1.4 hours in amniotomy and 7.66 ± 1.75 hours in spontaneous rupture of membrane. A Non-probability consecutive sampling technique was used. Women included were between the ages of 18 and 40, primigravida, had a singleton cephalic fetus on ultrasonography, had a gestational age of more than 37 weeks on LMP (last menstrual period), and were in labor according to the operational criteria. Documented cases of pregnancy-induced hypertension, diabetes mellitus, and antepartum hemorrhage were eliminated.

Patients fulfilling the inclusion criteria from the Department of Obstetrics and Gynecology, MTI, LRH,

Peshawar were included in the study after ethical approval from the Hospital ethical committee. Baseline demographic information of patients (age, gestational age, and weight on weighing scale) was taken. Informed consent was taken from women, ensuring confidentiality and explaining the risk/benefits to the patient who agreed to be part of this study. In every case, a partograph was maintained to track the progress of labor. The duration of labour was recorded from both groups in accordance with the operational definition and on a specifically developed proforma.

Clinical and surgical management

Membranes were ruptured in Group A using Kocker's forceps in a controlled way under aseptic conditions with prophylactic antibiotics treatment at 4cm cervical dilatation. The liquor was allowed to drain while two fingers were placed in the vagina to ensure that the fluid drained gently, preventing cord prolapse and placental abruption. The color of the liquor, whether colorless/meconium or blood-stained, was observed. Patients were excluded from the trial if the liquor was green or blood-stained, and fetuses were strictly monitored with continuous CTG. If the liquor was clear, the patient was enrolled in the trial, and labor was monitored by maintaining a record of fetal heart sounds (FHS) and a vaginal examination was done every 3 hours to assess how labor progressed. In every patient, a partogram was maintained, and in suspicious cases, continuous CTG monitoring was performed. An emergency C-section was done in non-reactive CTG patients, whereas labor monitoring was prolonged in reactive CTG cases.

In group B, patients were allowed to go through labor with intact membranes for as long as feasible, i.e., until complete cervical dilation or if there was any fetal tachycardia or bradycardia. Patients were placed on CTG monitoring to detect any signs of distress, such as reduced variability or any decelerations, and fetal heart rate less than 110 or greater than 160. If there was no sign of distress, they were permitted to labor with intact membranes; otherwise, membranes were ruptured to determine if a patient required emergency delivery based on the color of the liquor.

Data analysis

Data was analyzed with the statistical analysis program SPSS version 26. Mean ± SD was presented for quantitative variables like age, gestational age, weight, and duration of labor. Frequency and percentage were computed for categorical variables like age groups. Both groups were compared for the duration of labor. The differences in the mean DOL of the two groups were statistically tested using the independent sample t-test taken with $p \leq 0.05$ as significant. Duration of labor was stratified among age, gestational age, and weight. Post-stratification independent sample t-test was applied for both groups. A Chi-square test was conducted to

see the significant difference between age groups falling in both groups (A and B). The value $p \leq 0.05$ was considered statistically significant.

Results

The amniotomy group, or group A, consisted of forty women, whereas the spontaneous rupture of membranes group, or group B, consisted of forty women. Table 1 shows the average age of Group A females in labor was 27.175 years and 26.2 years in group B. Gestational age and weight of mothers averaged at 38 weeks and 67 kg in both groups respectively. The duration of labor was 5.7 hours in Group A and was prolonged at 7.1 hours in Group B. Table 2 shows that 36 women were in the age group of 18-30 years. Only 4 were older than 30 years in Group

A. In Group B, there were 37 mothers between 18-30 years of age and only 3 were older than 30 years. The mean DOL was 5.7 hours in Group A and 7.15 hours in Group B; this difference was significant at P-value = 0.001.

Stratification of mean duration of labor w.r.t ages, gestational ages, weights

Table 3 shows that regardless of the age of the mothers in either group, the mean DOL was fewer hours 5.7 hours (18-30 years) or 5.5 hours (above 30 years) in Group A, compared to Group B, 7.1 hours (18-30 years) or 7.0 hours above 30 years). A significant difference (p-value: 0.01) existed between each age group with patient age groups A (amniotomy) and B (spontaneous rupture of membranes). Table 4 shows Group A mothers who were 37-39 weeks pregnant had a mean DOL of 5.79 hours compared to 7.15 hours in Group B mothers of the same gestational age (P-value =0.01). The Group A mothers

Table 1: Information on age, gestational age, weight, and duration of labor in both groups (n=80).

Demographics	Group A n=40	Group B n=40
	Mean ± SD	Mean ± SD
Age (years)	27.175 ± 2.39	26.275 ± 2.57
Gestational age (Kg)	38.500 ± 1.08	38.400 ± 1.15
Weight (Kg)	67.025 ± 3.58	67.900 ± 3.01
Duration of labor (hours)	5.725 ± 0.59	7.150 ± 0.48

Table 2: Age groups and mean duration of labour in both groups.

Age group (years)	n=40	n=40	p-value
	Group A (Amniotomy)	Group B (Spontaneous Rupture of Membrane)	
18-30	36 (90%)	37 (92.5%)	0.01
>30	4 (10%)	3 (7.5%)	
Total	40 (100%)	40 (100%)	
Mean Duration of Labor (hours)	n=40	n=40	p-value
	Group A	Group B	0.01
	5.725 ± 0.59	7.150 ± 0.48	

Table 3: Stratification of mean duration of labor with respect to age in both groups.

Gestational Age (weeks)	Groups	Mean duration of labor (hours)		p-Value
		Mean	SD	
37-39	A (n=34)	5.794	0.59	0.01
	B (n=33)	7.151	0.50	
>39	A (n=6)	5.333	0.51	0.01
	B (n=7)	7.142	0.37	

Table 4: Stratification of mean duration of labor with respect to gestational age in both groups.

Weight (Kg)	Groups	Mean duration of labor (hours)		p-Value
		Mean	SD	
≤70	A (n=35)	5.771	0.59	0.01
	B (n=37)	7.162	0.50	
>70	A (n=5)	5.400	0.54	0.01
	B (n=3)	7.000	0.00	

Table 5: Stratification of mean duration of labor with respect to weight in both groups.

Weight (Kg)	Groups	Mean duration of labor (hours)		p-Value
		Mean	SD	
≤70	A (n=35)	5.771	0.59	0.01
	B (n=37)	7.162	0.50	
>70	A (n=5)	5.400	0.54	0.01
	B (n=3)	7.000	0.00	

who were more than 39 weeks pregnant had a mean DOL of 5.33 hours compared to 7.14 hours in Group B mothers above 39 weeks of pregnancy (P-value =0.01). Table 5 shows Group A mothers under 70 kg weight had a mean DOL of 5.77 hours compared to 7.16 hours in Group B mothers of the same weight category (P-value =0.01). Group A mothers who were more than 70 kg weight had a mean DOL of 5.4 hours compared to 7.0 hours in Group B mothers above 70 kg weight (P- value =0.01).

Discussion

During the active period of labor, an early amniotomy is performed. When compared to the practice of leaving the membranes intact until the second stage, significantly minimizes the duration of labor. Amniotomy does not raise the likelihood of a negative result in the infant. It reduces the likelihood of protracted labor, as well as the risks of obstructed labor, uterine rupture, and septicemia, all of which contribute significantly to maternal mortality and morbidity. Amniotomy is a type of active labor management. In certain

circumstances, this less expensive intervention approach may aid in reducing total duration of labor and the incidence of prolonged labor, hence lowering maternal morbidity and mortality [13]. Amniotomy hastens the onset of labor. It generates a local surge in prostaglandins, which interact with the cervix's collagenous framework and matrix, transforming it from a stiff to a soft distensible organ. The discharge of amniotic fluid shortens myometrium muscle bundles, increasing contraction strength and duration and resulting in a more rapid contraction sequence [14].

The present research examined the effects of amniotomy and spontaneous membrane rupture (in early labor in primigravida at term) on labor length. The average age of females in Group A was 27.175 years, and 26.2 years in Group B. Mothers' gestational age and weight averaged 38 weeks and 67 kg in both groups. Group A's labor time was 5.7 hours, whereas Group B's labor time was 7.1 hours. Labor took an average of 5.7 hours in Group A and 7.15 hours in Group B. The average duration of labor in each group was 5.7 hours (18-30 years) and 5.5 hours (>30 years) in Group A against 7.1 hours (18-30 years) or 7.0 hours over 30 years in Group B. There were significant variations in labor length between each age group, gestational age group, and weights in groups A (amniotomy) and B (spontaneous rupture of membranes). According to Macones et al. [15] an early amniotomy reduces the time to birth by more than 2 hours and boosts the proportion of induced nulliparous women who deliver within 24 hours. These gains in labor outcomes did not come at the price of additional complications. Labor was much shorter in multiparous women than in nulliparous women, according to Chen et al [16]. Increase fetal birth weight lengthened the active period and the second stage significantly in nulliparous moms. Age, artificial membrane rupture, labor analgesia, and birth weight all contribute to extending the first stage of labor and total labor time, however oxytocin may shorten it. Jyothi et al. [1] investigated the efficacy of amniotomy and oxytocin in terms of labor time, mode of delivery, maternal and fetal outcomes. A non-randomized comparative study of the accelerating impact of oxytocin and amniotomy on patients aged 19 to 30 admitted to an obstetric hospital was conducted. There were 200 primigravidae investigated, including 100 in the control group and 100 in the study group. When compared alone, 93 patients in the research series had labor lasting less than 4 hours. The average total time of labor is lowered by 204 minutes in the study group. When compared to the control group, the amount and duration of blood loss in the study group is much reduced. In seemingly typical situations, oxytocin infusion coupled with amniotomy is safe and beneficial in quickening the first and second stages of labor. There were no statistically significant negative effects associated with oxytocin infusion and amniotomy [1].

Ghani et al. [14] Assessed cases in terms of indication, establish amniotomy delivery interval, analyze amniotomy

in labor outcome, identify instances requiring intervention throughout the process, and detect any maternal and fetal problems that may develop as a result of amniotomy. These patients had amniotomies with a mean cervical dilation of 3.9 cm. In 88 instances, just an amniotomy was performed. The average amniotomy-delivery interval was 4 hours 54 minutes, and 90 patients (81.8 percent) delivered properly; 89.1 percent of newborns were healthy. Kausar et al. [17] investigated the duration of the first stage of labor with and without amniotomy in primigravidas at term presenting in the labor room. In patients who arrive in the labor room, the mean length of the first stage of labor is shorter with amniotomy than without amniotomy. We discovered a substantial variation in the duration of the first stage of labor between the two groups. Many studies have shown that amniotomy is quite successful at shortening the duration of labor. Many obstetricians agreed that the amniotomy is highly advantageous and effective in decreasing the duration of labor and also in minimizing maternal risk factors. When internal monitoring of the fetus is necessary, the amniotomy procedure is employed to retrieve amniotic fluid for visual inspection. It is often used to expedite labor and was originally expected to reduce cesarean section rates. Routine early amniotomy appears to have both advantages and hazards. Beneficial effects include shorter labor length and a reduction in the incidence of abnormal APGAR scores at one minute. This strategy also reduces the rate of cesarean section for dystocia and dysfunctional labor in nulliparous women. Elderly primigravidae may experience prolonged or difficult labor, most typically due to a lack of uterine activity (dystocia). When labor progress is delayed, early treatment with amniotomy and oxytocin is particularly successful in increasing the frequency and intensity of uterine contractions (augmentation). They concluded that among patients arriving in the labor room, the mean length of the first stage of labor is shorter with amniotomy than without amniotomy. The difference between the two groups was statistically significant [17]. A protracted latent phase of labor is linked to poor maternal and newborn outcomes. Preliminary studies suggest that inducing labor during a prolonged latent period may lessen the need for cesarean birth. Induction of labor did not lower Cesarean delivery rates, but it did shorten the time from intervention to delivery and discharge from hospital. Induction of labor during a lengthy latent phase of labor can be conducted without obvious disadvantage to speed delivery [18]. Bala et al. [19] investigated the impact of early amniotomy against late amniotomy in induced labor. Initiating IOL with amniotomy in women with a favorable cervix sped up delivery, but it resulted in a greater cesarean section (CS) rate. The increased CS rate was attributable in part to meconium discovered as a result of early amniotomy.

The effectiveness of amniotomy has not been much validated by labor-related indices and outcomes, and it

remains a point of contention. Zandvakili et al. [20] looked at how early amniotomy affected labor indices and outcomes in nulliparous women. When compared to controls, labor indices such as first and second phase duration, APGAR scores one and five minutes after birth, and frequency of protracted labor, fetal distress, and postpartum hemorrhage were dramatically improved in the early amniotomy group. Early amniotomy dramatically reduced overall labor length while not affecting the risk of maternal and newborn problems. Prospective observational research was carried out in Mymensingh Medical Hospital, Mymensingh, Bangladesh, to determine the efficacy and safety of a regular amniotomy to decrease the duration of labor (prolonged or not). Major outcomes were mother demographics, labor length, and maternal and perinatal outcomes. The majorities (49.0 percent) of the patients were between the ages of 21 and 25, were primigravida, and had intermediate socioeconomic status. Moreover three-quarters of the patients (89.0 percent) had their heads engaged. In this study, there was a significant reduction in amniotomy-delivery interval time, which was 3 hours 40 minutes, and mean cervical dilatation was 4cm during amniotomy. Amniotomy considerably decreased the duration of the first stage of labor without changing oxytocin demand, cesarean section rate, or neonatal outcome [21, 22].

According to practitioners, artificial membrane rupture can either aid in inducing labor or augment spontaneous labor. While many practitioners hold these beliefs, the evidence to justify amniotomy for these reasons is dubious. Some studies have provided evidence in favor of the strategy, whereas others have demonstrated that it does not provide any of these benefits. According to a meta-analysis, amniotomy to shorten spontaneous labor produces no discernible change as compared to no amniotomy. However, when labor is delayed, the meta-analysis showed a modest reduction in the frequency of cesarean section when membrane rupture along with oxytocin injection is used as an early intervention [23].

Conclusion

Our findings suggest that artificially rupturing the membranes during active labor in primigravida reduces labor length considerably. Mothers' gestational age, age, and weight have no influence on the duration of labor. Amniotomy can boost labor contractions and reduce the duration of labor. Though it may reduce labor by augmentation and help to lower maternal morbidity and mortality, there is a risk of cord prolapse, placental abruption, and infection, thus it should only be done in a hospital under expert supervision.

Conflict of Interest

Author and coauthors have no conflict of interest. Study was done in Department of Obstetrics and Gynaecology without any funds and grants.

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