

The Impact of Early Versus Late Amniotomy on Duration of Labor, Maternal and Neonatal Outcomes in Iraqi Primigravida with Spontaneous Labor

Faris Anwer Rasheed¹, Alyaa Aziz Ahmed², Saad Abdulrahman Hussain³

¹ 1 Department of Obstetrics and Gynecology, Al-Kindy Medical College, University of Baghdad, Baghdad, Iraq

² 2 Department of Obstetrics and Gynecology, Al-Elweyia Maternity Teaching Hospital, Baghdad, Iraq

³ 3 Department of Pharmacology and Toxicology, College of Pharmacy, University of Baghdad, Baghdad, Iraq

Abstract

Amniotomy is defined as the artificial rupture of the amniotic membrane for a primary aim to speed up contraction and shorten the length of labor. The present study aims to evaluate the impact of early vs. late amniotomy on duration of labor, neonatal and maternal outcomes in Iraqi primigravida with spontaneous labor. In this randomized, single blinded prospective study, that is carried out in Al-Elweyia Maternity Teaching Hospital from March to December 2011, 210 women admitted for spontaneous labor were randomized to early amniotomy (EA; n=105) and late amniotomy (LA; n=105) groups. Oxytocin was administered in both groups when inefficient uterine contractions present one hour after amniotomy. The primary outcome includes duration of labor and the rate of cesarean section, secondary outcomes included both maternal and neonatal outcomes. The results show that, EA shortens significantly the duration of 1st stage of labor (5.1 vs. 7.8 hr), increases C/S rate (33.3% vs. 15.2%) and the rate of chorioamnionitis (12.38% vs. 3.81%), with increase in frequency of oxytocin augmentation compared to LA group. Other parameters are not significantly affected. In conclusion, although early amniotomy was associated with increase in C/S and chorioamnionitis rates, it significantly decreases the total duration of labor compared to late amniotomy.

Key words: Amniotomy, labor induction, maternal outcome, neonatal outcome

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Corresponding Author: Saad Abdulrahman Hussain, Department of Pharmacology and Toxicology, College of Pharmacy, University of Baghdad, Baghdad, Iraq.
E-mail: saad_alzaidi@yahoo.com **Phone:** +9647901712624

Introduction

Prolonged labor is most common among nulliparous women and mostly attributed to excessive pain and absence of birth experiences [1,2]. It is also frequently associated with fetal distress and considered as one of the main indications for an emergency caesarean section [3,4]. Active management of labor includes early amniotomy, oxytocin augmentation, when the progress of labor deviates from the alert line and personal support to the laboring woman [5]. The active management decreases duration of labor and the incidence of labors that last more than 12 hours. It also thought to decrease the caesarean section rate, though not proved in previously reported data [6,7]. The rate of labor induction is increasing with time [8], and elective labor induction became more popular, and mostly associated with improved neonatal outcomes in certain circumstances. Accordingly, the overall rate of induction will unlikely decrease in the near future [9,10]. On the other hand, two to three fold increases in the risk of cesarean delivery was reported with induction of labor, and has contributed to the increase in cesarean rates over the last two decades [11]. Although many reports have offered evidence for the improvement in methods for labor induction [12,13], there is always a critical need for additional tools to refine induction practice. Amniotomy has been evaluated in the context of spontaneous labor, but the available data does not allow clear suggestions for its use [14]. Amniotomy is commonly used during induction of labor in combination with oxytocin infusion. However, there is a lack of data on both effectiveness and ideal timing of this procedure. Many studies compared early versus late amniotomy in combination with oxytocin infusion [15,16]; the results showed marked variations regarding the outcome, including shorter labor, risk of chorioamnionitis, and rate of cesarean delivery for dystocia. The specific aim of the present study was to compare between early and late amniotomy, defined as artificial rupture of the membranes, regarding both mother and fetal outcomes in Iraqi primigravida with spontaneous labor.

Materials and Methods

This prospective, single-blinded, randomized controlled study was performed at AL-Elweyia Maternity Teaching Hospital in Baghdad from March 2011 to December 2011. The Obstetrics and Gynecology committee of the Iraqi Board for Medical Specialization and the hospital administration approved the study protocol. Inclusion criteria for this clinical study were nulliparity, singleton, term gestation (37 completed weeks), vertex presentation, established spontaneous labor (defined as the presence of regular uterine contractions associated with

progressive cervical effacement and dilatation), 60-70% effacement and no contraindication to amniotomy. Exclusion criteria include induction of labor, preterm labor, premature rupture of membrane (PROM), chronic or pregnancy induces illness, intrauterine death and multiple pregnancies. The eligible patients asked to sign informed consent before participation. Patients who consented were randomly assigned to either early amniotomy group (EA), defined as artificial rupture of the membrane done at ≤ 3 cm, or late amniotomy group (LE), where rupture performed at ≥ 4 cm cervical dilatation. Random assignment was accomplished centrally. We used a permuted block randomization procedure to formulate assignment lists to assure close to equal numbers of subjects in each treatment group. A uniform block size of 5 was used. In EA group (n =105), ARM was performed when cervical dilatation ≤ 3 cm and oxytocin infusion performed if no efficient contractions occur 1 hr after amniotomy. In the LA group (n =105), AMR was done when cervical dilatation ≥ 4 cm, while oxytocin infusion started also when no efficient contractions detected 1.0 hr after amniotomy. We used oxytocin infusion according to the obstetric ward protocol, when inefficient uterine contractions present 1.0 hr after amniotomy. Progress of labor was followed according the WHO partograph adopted in our labor ward. Women who were assigned to EA group had artificial rupture of the membranes immediately after randomization; the progress in labor was considered inadequate when no efficient uterine contraction were noticed during 1.0 hr after membrane rupture. Augmentation with oxytocin was initiated at a rate of 2 mU/min. The rate of infusion was increased by 2 mU/min every 30 min, until at least 3 contractions/10 min appeared, or a change in cervical examination occurs up to 40 mU/min. Women who were assigned to LA group were started oxytocin infusion at a dose similar to that utilized in EA group. Vaginal examination was repeated every 2 hrs or less to assess the progress of labor, cervical dilatation and effacement, station of the head and liquor color. Vital signs and fetal heart rate were also recorded. The main outcome of the study includes both mother and fetal outcomes. Mother outcome includes duration of 1st, 2nd and 3rd stages of labor, rate of C/S, post-partum hemorrhage (PPH), chorioamnionitis (which is diagnosed clinically in the setting of maternal fever, uterine tenderness, maternal and fetal tachycardia), and the need for blood transfusion. Meanwhile, fetal outcome includes the Apgar score (at 1 minute and 5 minutes), weight of baby and the need for neonatal intensive care unit (NICU) admission.

Statistical analysis

The analysis of data was performed by intention to treat using the Chi-square test and Fisher's exact test for comparison of proportions and Student's t-test for comparison of means. The

MINITAB version 13 software was utilized for statistical analysis. P value <0.05 was considered significant.

Results

Table 1 shows the patient characteristics of both groups; they were comparable with no significant differences regarding maternal age (P= 0.190), body weight (P= 0.599), gestational age (P= 0.451) at delivery and cervical dilatation on admission (P= 0.21). However, only the requirement for augmentation with oxytocin infusion was significantly greater in the EA group (90.5% vs. 76.2%, P= 0.005) compared with LA group. Table 1 also shows that the total duration of labor in LA group was significantly longer (35.1%, P= 0.007) compared to that reported in EA group. Similarly, the duration of 1st stage of labor in the LA group was also significantly longer (53%, P= 0.01) compared to that reported in the EA group. Meanwhile, Table 1 shows that duration of the 2nd and 3rd stages of labor are not significantly different in both groups (P= 0.07).

Table 1. The characteristics and duration of different stages of labor of the pregnant women in the two study groups

Characteristic	Early Amniotomy (n=105)	Late Amniotomy (n=105)	P value
Maternal age (years)	21.01±4.79	21.89±4.86	0.190
Maternal weight (Kg)	74.96±7.68	74.41±7.53	0.599
Gestational age at delivery (weeks)	37.46±2.48	38.01±2.88	0.451
Cervical dilatation on admission (cm)	2.27±0.64	2.45±0.59	0.21
Oxytocin augmentation needed	95 (90.5%)	80 (76.2%)	0.005
Total duration of labor (hrs)	6.33±1.65	8.55±1.30	0.007
Duration of 1 st stage of labor (admission-full dilatation) (hrs)	5.10±1.73	7.80±1.32	0.01
Duration of 2 nd stage of labor (hrs)	0.65±0.242	0.48±0.30	0.07
Duration of 3 rd stage of labor (min)	6.33±1.65	8.55±1.30	0.07

Values are presented as mean±SD; n=number of patients.

In Table 2, the total rate of cesarean section (C/S) in EA group was significantly higher compared to that reported in LA group (33.3% vs. 15.2%, P= 0.002). Regarding the causes of the requirement for C/S, Table 2 shows that when failure to progress considered, the rate of C/S was

significantly higher in EA group (20.9% vs. 9.5%, $P= 0.044$) compared to LA group. However, when the factor of fetal distress was considered, no significant differences were reported in the rate of C/S between the two groups ($P= 0.14$).

Table 2. The C/S rate in the two pregnant women study groups

Characteristics	Early Amniotomy (n=105)	Late Amniotomy (n=105)	P value
Cesarean Section (Total)	35 (33.33%)	16 (15.24%)	0.002
Cesarean section due to failure to progress	22 (20.95%)	10 (9.53%)	0.044
Cesarean section due to fetal distress	13 (12.38%)	6 (5.71%)	0.14

Values are presented as number and %; n=number of subjects; ROM: Rupture of Membrane.

Regarding the maternal outcome, Table 3 shows that the rate of post-partum hemorrhage (PPH) was not significantly different in both EA and LA groups (14.2% vs. 6.7%, respectively; $P= 0.104$). Meanwhile, the rate of chorioamnionitis was significantly higher in EA group compared to that reported in LA group (12.4% vs. 3.8%, respectively; $P= 0.036$). Similarly, there is no significant difference regarding the requirement for blood transfusion in both groups ($P= 0.102$).

Table 3. Maternal outcomes in the two study groups of pregnant women

Characteristics	Early Amniotomy (n=105)	Late Amniotomy (n=105)	P value
PPH	15 (14.3%)	7 (6.7%)	0.104
Chorioamnionitis	13 (12.4 %)	4 (3.8%)	0.036
Blood transfusion	12 (11.4%)	5 (4.8%)	0.102

Values are presented as number and %; n=number of subjects; PPH: post-partum hemorrhage.

Table 4. Neonatal outcomes (Apgar score and NICU admission) in the two study groups

Characteristics	Early Amniotomy (n=105)	Late Amniotomy (n=105)	P value
Apgar score (1 min)			
≥ 7	67(63.8%)	78(74.3%)	0.101
< 7	38(36.2%)	27(25.7%)	
Apgar score (5 min)			
≥ 7	84(80%)	87(82.9%)	0.594
< 7	21(20%)	18(17.2%)	
NICU admission	23(21.9%)	21(20%)	0.784

Values are presented as number and %; n=number of subjects; NICU: Neonatal Intensive Care Unit.

Concerning neonatal outcomes, Table 4 shows that the Apgar score values (1 min and 5 min) were not significantly different in both groups ($P= 0.101$ and 0.594 , respectively). Moreover, the rate of admission to the NICU in both groups was also not significantly different ($P= 0.784$).

Discussion

The primary aim of amniotomy is to speed up uterine contraction and therefore shortens the length of labor [17]. In the present study, we assess the influence of EA versus LA on the duration of labor, maternal and neonatal outcomes in primigravida with spontaneous labor. According to the available literatures, there are discrepancies regarding the influence of amniotomy on the duration of labor. Our results indicated that the total duration of labor was shortened by about 2 hrs, mostly within the 1st stage of labor, in EA group compared to those reported in LA group. This finding was in tune with that reported by others, where 2-4 hr decrease in duration of labor was obtained in larger scale trials [15,18]. Moreover, the decrease in the duration of 1st stage confirms that reported by Li et al., who achieved a 1.5 hr decrease in the duration of 1st stage after early amniotomy [19]. Meanwhile, Levy et al. and Smyth et al. indicated that duration of labor during early amniotomy was not significantly different compared to that reported after late amniotomy [16,20]. One can explain such discrepancies on the bases of the modifications that may be followed during the process of spontaneous delivery in each study. Although these differences in duration of labor may seem to be an intermediate outcome, it can

be considered (in certain circumstances) as a good surrogate for both maternal and neonatal outcomes. In this regard, it has been well reported that the length of labor is correlated directly with maternal chorioamnionitis, postpartum fever, and neonatal infection [21,22], and a 2-hr difference in duration of labor could be of significant importance for resource utilization at the institutional level. This difference in time to delivery across many inductions may encourage a decrease in the staff of a labor and delivery unit, in addition to the expected enhancement in patient satisfaction with shorter labors. Oxytocin augmentation of uterine contractions is widely used to treat slow labor, although the exact timing of initiation varies widely. In the present study, augmentation with oxytocin was considered for all participants only when inefficient uterine contractions present 1.0 hr after amniotomy. The results showed that requirement for oxytocin in EA group was significantly higher than that in LA group. This result was in tune with the finding of Lee et al., where more frequent oxytocin augmentation was reported during early amniotomy [23]. In the present study, the rate of C/S was higher in EA group compared to LA group. This may be primarily due to higher frequency of arrest of dilatation and descent, which affect the natural progress in the late phase of labor. This result was compatible with the other observations, where the rate of C/S was significantly higher in EA than LA approach [19,23]. This can be explained in that the absence of hydrostatic pressure of the fetal membranes after early amniotomy could result in slow progress of labor, or the EA procedure itself may be associated with CPD. However, our data in this regard did not confirm the previous results that indicate either a decrease in the rate of C/S [24] or no significant changes [25]. The shorter duration of labor must be weighed against both maternal and neonatal safety concerns. Regarding the maternal outcomes, the reported rate of chorioamnionitis in the present study was significantly higher in EA group than LA group. Although the level of significance was very low ($P=0.036$), other investigators reported even higher rate during EA [15]. Meanwhile, there are many other reports disagreed with the present finding, where the rate of chorioamnionitis was not significantly changed at the different approaches of performing amniotomy [18,23]. Taken together, the reported numeric difference in chorioamnionitis did not associated with an increase in the rate of suspected neonatal sepsis or NICU admission, and there were no serious maternal or neonatal consequences because of chorioamnionitis. However, future studies should emphasize on the expected occurrence of chorioamnionitis with EA. In developed countries, many trials did not recommend amniotomy to accelerate labor [6,14]. However, in developing countries like Iraq, the practice of amniotomy seems to be justified, especially in public hospitals, where labor rooms filled with patients with limited number of medical staff. This

situation creates many difficulties for medical and paramedical staff when doing proper patient monitoring for long periods. In these circumstances, amniotomy may be advantageous in decreasing overall monitoring time. In conclusion, although early amniotomy was associated with increase in C/S and chorioamnionitis rates, it significantly decreases the total duration of labor compared to late amniotomy.

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References

1. Waldenstrom U, Hildingsson I, Rubertsson C, Radestad I. A negative birth experience: prevalence and risk factors in a national sample. *Birth*. 2004;31(1):17-27.
2. Nystedt A, Hogberg U, Lundman B. Some Swedish women's experiences of prolonged labor. *Midwifery*. 2006;22(1):56-65.
3. Florica M, Stephansson O, Nordstrom L. Indications associated with increased cesarean section rates in a Swedish hospital. *Int J Gynaecol Obstet*. 2006;92(2):181-5.
4. Bugg GJ, Stanley E, Baker PN, Taggart MJ, Johnston TA. Outcomes of labors augmented with oxytocin. *Eur J Obstet Gynecol Reprod Biol*. 2006;124(1):37-41.
5. World Health Organization Partograph in Management of Labor. World Health Organization Maternal Health and Safe Motherhood Program. *Lancet*. 1994;343(8910):1399-404.
6. Sadler LC, Davison T, McCowan LM. A randomized controlled trial and meta-analysis of active management of labor. *BJOG*. 2000;107(7):909-15.
7. Fraser W, Vendittelli F, Krauss I, Bréart G. Effects of early augmentation of labour with amniotomy and oxytocin in nulliparous women: a meta-analysis. *Br J Obstet Gynaecol*. 1998;105(2):189-94.
8. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Menacker F, Kirmeyer S, Mathews TJ. Births: final data for 2006. *Natl Vital Stat Rep*. 2009;57(7):1-102.
9. Heffner LJ, Elkin E, Fretts RC. Impact of labor induction, gestational age, and maternal age on cesarean delivery rates. *Obstet Gynecol*. 2003;102(2):287-93.
10. Nicholson JM, Caughey AB, Stenson MH, Cronholm P, Kellar L, Bennett I, Margo K, Stratton J. The active management of risk in multiparous pregnancy at term: association between a higher preventive labor induction rate and improved birth outcomes. *Am J Obstet Gynecol*. 2009;200(3):250.e1-250.e13.

11. Taher SE, Inder JW, Soltan SA, Eliahoo J, Edmonds DK, Bennett PR. Prostaglandin E2 vaginal gel or tablets for the induction of labor at term: a randomized controlled trial. *BJOG*. 2011;118(6):719-25.
12. Gelber S, Sciscione A. Mechanical methods of cervical ripening and induction. *Clin Obstet Gynecol*. 2006;49(3):642-57.
13. Zhang J, Branch DW, Ramirez MM, Laughon SK, Reddy U, Hoffman M, Bailit J, Kominiarek M, Chen Z, Hibbard JU. Oxytocin regimen for labor augmentation, labor progression and perinatal outcomes. *Obstet Gynecol*. 2011;118(2 Pt 1):249-56.
14. Smyth RM, Markham C, Dowswell T. Amniotomy for shortening spontaneous labor. *Cochrane Database Syst Rev*. 2013;6:CD006167.
15. Mercer BM, McNanley T, O'Brien JM, Randal L, Sibai BM. Early versus late amniotomy for labor induction: a randomized trial. *Am J Obstet Gynecol*. 1995;173(4):1321-5.
16. Levy R, Ferber A, Ben-Arie A, Paz B, Hazan Y, Blickstein I, Hagay ZJ. A randomised comparison of early versus late amniotomy following cervical ripening with a Foley catheter. *BJOG*. 2002;109(2):168-72.
17. Fraser WD, Turcot L, Krauss I, Brisson- Carrol G. Amniotomy for shortening spontaneous labor. *Cochrane Database Syst Rev*. 2007;(3):CD000015.
18. Macones GA, Cahill A, Stamilio DM, Odibo AO. The efficiency of early amniotomy in nulliparous labor induction: a randomized controlled trial. *Am J Obstet Gynecol*. 2012;207(5):403.e1-5.
19. Li N, Wang Y, Zhou H. Effects of routine early amniotomy on labor and health status of fetus and neonate: a meta-analysis. *Zhonghua Fu Chan Ke Za Zhi*. 2006;41(1):16-9.
20. Smyth RMD, Alldred SK, Markham C. Amniotomy for shortening spontaneous labor. *Cochrane Database Syst Rev*. 2007;(4):CD006167.
21. Herbst A, Källén K. Time between membrane rupture and delivery and septicemia in term neonates. *Obstet Gynecol*. 2007;110(3):612-8.
22. Tran SH, Cheng YW, Kaimal AJ, Caughey AB. Length of rupture of membranes in the setting of premature rupture of membranes at term and infectious maternal morbidity. *Am J Obstet Gynecol*. 2008;198(6):700.e1-5.
23. Lee SM, Lee KA, Lee J, Park CW, Yoon BH. Early rupture of membranes after the spontaneous onset of labor as a risk factor for cesarean delivery. *Eur J Obstet Gynecol Reprod Biol*. 2010;148(2):152-7.
24. Wei S, Wo BL, Xu H, Luo ZC, Roy C, Fraser WD. Early amniotomy and early oxytocin for prevention of, or therapy for, delay in first stage spontaneous labor compared with routine care. *Cochrane Database Syst Rev*. 2009;(2):CD006794.
25. Cammu H, Van Eeckout E. A randomized controlled trial of early versus delayed use of amniotomy and oxytocin infusion in nulliparous labor. *Br J Obstet Gynaecol*. 1996;103(4):313-8.