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The effect of early and late amniotomy on the success of induction of labour in postdated nulliparous women

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Abstract

Background: Induction of labour (IOL) is defined as the process of artificial initiation of uterine contractions, prior to their spontaneous onset with intention to make progressive effacement and dilatation of the cervix. There are many ways of induction of labour like Pharmacological methods as prostaglandins, non-pharmacological methods for an example hot baths, enemas and surgical method like amniotomy. In this study amniotomy has been used with the aid of oxytocin. Induction of labour is useful to reduce maternal and fetal mortality and morbidity. Early amniotomy is defined as rupture of membrane when the cervix dilatation is (≤ 4 cm) whereas late amniotomy when cervix dilatation is (> 4 cm). According to most literatures late amniotomy is safer to the mother and fetus, because it reduces the mortality and morbidity rates more than early amniotomy.

Aims of the study

- To study the effect of early and late amniotomy on success of induction of labour in postdated nulliparous women.
- To explore relation between the time of rupture membrane and mode of delivery.
- To find out an association between the time of rupture of membrane and fetal heart abnormality and early neonatal outcome (Apgar score).

Patients and methodology: This is an Observational study performed at Sulaymaniyah Maternity Teaching Hospital from December 2014 to June 2015. Two hundred nulliparous ladies with postdated pregnancy had been admitted to labour room for induction of labour by oxytocin who were randomly assigned and consented verbally to either early amniotomy group (EA) or late amniotomy group (LA).

Inclusion criteria: For this clinical study were nulliparity, singleton, postdated pregnancy (> 40 completed weeks), vertex presentation, bishop score ≥ 5 .

Exclusion criteria: Include preterm labor, premature rupture of membrane (PROM), IUGR, chronic or pregnancy induces illness, intrauterine death and multiple pregnancies.

Results: The majority of postdated nulliparous women were (40-40+6^d) weeks gestational age EA group 64% and LA group 67%. Most of the ladies had no history of (abortion, infertility, gestational diabetes and gestational hypertension). The mean age was 25 years in both groups. Bishop score mean is 6.0 in both groups. Duration of the 1st stage mean was 12.6 in LA group and 11.1 in EA group it was statistically significant, $p=0.003$. Duration of 2nd stage mean was the same in both group 1.8. The majority had no meconium staining of liquor, no postpartum hemorrhage. The mode of delivery was normal vaginal 59.0% in EA group and 81.0% in LA group; Cesarean section 38.0% of EA group and 17.0% of LA group the effect on mode of delivery was statistically significant. The most common indication of C/S in EA group was abnormal fetal heart tracing and primary failure of progress 39.4% and Secondary failure of progress in LA group 47. Apgar score at 1 minute < 7 was 47.0% in EA group and 7.0% in LA group.

Conclusion

- Early and late amniotomy had effect on the success of induction of labour.
- Late amniotomy is promoting vaginal delivery while in early amniotomy the possibility of cesarean section is more.
- Early neonatal outcome is better in early amniotomy than late amniotomy.

Keywords: early and late amniotomy, induction of labour, nulliparous

Introduction

Amniotomy (rupturing of the amniotic membrane) has been either hind-water or fore-water. Prior to any amniotomy, an abdominal palpation must be performed to confirm the fetal lie and presentation, as well as to allow auscultation of the fetal heart, the cervix is examined to confirm that the fore-water is intact, the station of the presenting part is noted and the membrane is ruptured. This releases amniotic fluid, the quantity and color of which should be noted (absence

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or presence of meconium)^[1]. A check is made to ensure that the presentation/position of the presenting part remains unchanged and that there is no prolapsed of the umbilical cord. The success of the amniotomy is dependent upon the state of the cervix (dilation and effacement), the parity of the woman and the station of the presenting part at the time of the intervention^[2].

Early amniotomy: Defined as rupture of membrane before the onset of active labour (cervical dilatation less than 4 cm)^[3].

Late amniotomy: Defined as rupture of membrane after the onset of active labour (cervical dilatation 4 cm or more)^[3].

III-Mechanical methods: Mechanical procedures (balloon catheters and laminaria tents) should not be used routinely for induction of labour^[4]. Including: 1- laminaria tents synthetic equivalents such as Dilapan, 2 Foley catheters, and other types of balloon catheter for induction of labor. Mechanical methods are less likely to result in uterine hyper stimulation than PGE2 or vaginal misoprostol, but may be associated with increased maternal and neonatal infectious morbidity^[5].

Investigational Methods

- 1. Extra-amniotic prostaglandins:** Data are insufficient to recommend extra amniotic prostaglandins.
- 2. Intravenous prostaglandins:** Intravenous prostaglandins have no advantages and increase maternal side effects compared to other methods of induction. This method of induction of labour has not entered into general use and is of historical interest only^[4].
- 3. Oral prostaglandins (excluding misoprostol):** Oral prostaglandins are associated with increased maternal vomiting and diarrhea compared with IV oxytocin^[6].

Contraindications: Induction should be avoided if there are any contraindications to labour or vaginal delivery. These include, but are not limited to the following:

- Placenta previa or cord presentation
- Abnormal fetal lie or presentation (e.g. transverse lie or footling breech)
- Prior classical or inverted T uterine incision
- Significant prior uterine surgery (e.g. full thickness myomectomy)
- Active genital herpes
- Pelvic structural deformities
- Invasive cervical carcinoma
- Previous uterine rupture.^[6, 7]

Complications of induction of labour

- 1. Uterine hyper stimulation:** More than five contractions in 10 minutes for 2 consecutive 20 minute periods, associated with abnormal fetal heart rate pattern.
- 2. Uterine Tachysystole:** Defined as more than 5 uterine contractions per 10 minutes for two consecutive 20 minute periods, without fetal heart rate abnormalities.
- 3. Uterine Hyper systole:** Defined as one uterine contraction with a duration of >90 seconds^[8].
- 4. Failed induction:** The criteria for failed induction are not generally agreed. It is estimated that a failed induction in the presence of an unfavorable cervix is found in 15% of cases^[6].
Failed induction of labour must be differentiated from failure of labour progress due to cephalopelvic disproportion of malposition. It may also applied to cases in

which the cervix fails to dilate beyond 3 cm with appropriate stimulation with oxytocin commonly quoted at 6 hours after the maximal infusion rate of syntocinon^[1]. If induction fails, healthcare professionals should discuss this with the woman and provide support. The woman's condition and the pregnancy in general should be fully reassessed, and fetal wellbeing should be assessed using electronic fetal monitoring. The subsequent management options include:

- A further attempt to induce labour (the timing should depend on the clinical situation and the woman's wishes)
 - Caesarean section^[6].
- 5. Cord prolapse:** Prolapsed cord is always a potential risk at the time of membrane rupture, especially when the membranes are ruptured artificially.
 - 6. Placental abruption:** May occur if rapid uterine decompression complicates an amniotomy, care should be taken if polyhydramnios is suspected^[1].
 - 7. Maternal:** Hyponatremia, Uterine hyperstimulation, Uterine rupture and Postpartum hemorrhage^[1].
 - 8. Fetal:** Prematurity, hyperbilirubinemia and fetal distress^[1].

Monitoring during induction of labour: All authorities suggest that a cardiotocograph should be performed to confirm that the FHR is normal^[9]. Early detection of abnormal progress of labour and prevention of prolonged labour would significantly reduce the risk of postpartum hemorrhage and sepsis and eliminate obstructed labour, uterine rupture and its sequel. The partograph (or partogram) is a simple tool that has been used for this purpose^[10]. A partograph is a composite graphical record, of progress of labour and the condition of mother and fetus. Use of partograph is based on the assumption that it facilitates earlier recognition of dystocia thereby optimizing the timing of appropriate interventions such as amniotomy, oxytocin augmentation or most importantly Caesarean section. It serves as an early warning system and assists in early decision on transfer, augmentation and termination of labour^[10].

Patients and Methods: An observational study was adopted to achieve the study objectives. It carried out at Sulaymaniyah Maternity Teaching Hospital. The study included 200 postdated nulliparous ladies admitted for induction of labour who randomly assigned and consented verbally either to early amniotomy (EA), defined as artificial rupture of the membrane done at < 4 cm, or late amniotomy (LA), where rupture performed at ≥ 4 cm cervical dilatation. For the first 100 patients, EA was performed and for the second 100 patients LA was done.

Inclusion criteria: Include nulliparity, singleton, postdated pregnancy (>40 completed weeks), vertex presentation, bishop score >5.

Exclusion criteria: include preterm labor, premature rupture of membrane (PROM), IUGR, chronic or pregnancy induces illness, intrauterine death and multiple pregnancies.

Ethical consideration: Proposal was presented to the Obstetrics and Gynecology committee of the diploma for Medical Specialization and the hospital administration approved the study protocol before starting the research. Official permission was obtained from Sulaymaniyah maternity teaching hospital to do the research. Verbal consents were taken from the pregnant

ladies and all information was kept confidentially.

Data collection tools and techniques

- Pregnant ladies were selected in both study groups in convenience sampling method by direct interview.
- A constructed Questionnaire were used to collect data from targeted pregnant women, it is composed of age, obstetrical history (LMP, parity, gravidity), time of rupture of membrane, fetal heart abnormality, duration of 1st and 2nd stage of labour, mode of delivery, postpartum hemorrhage. Oxytocin infusion started immediately at a rate of 2 mU/min in both groups. The rate of infusion was doubled every 30 min until at least 3 contractions/10 min occurred, 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 to assess the progress of labour, 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 maternal and fetal outcomes. Maternal outcome includes duration of 1st, and 2nd stage of labour, mode of delivery, post-partum hemorrhage (PPH).

Meanwhile, fetal outcome includes the Apgar score (at 1 minute and 5 minutes) and the birth weight.

Statistical analysis: Data were entered into SPSS (statistical package for social science) version 22. Descriptive analysis was performed by using simple tables. Differences and association were found by using T-test and chi-square test. The p-value <0.05 was regarded as a significant.

Results

The study included 200 postdated nulliparous women that subdivided into two groups the first is for early amniotomy and the second one for late amniotomy. Table (1) shows the general characteristics of both groups and demonstrates that 64 ladies in EA group and 67 in LA group are below 40 weeks of gestational age, while 36 ladies EA group and 33 ladies in LA group are within 41-42 weeks. Nine women had history of abortion in EA group and 11 women in LA group. Concerning the history of infertility, 2 women in EA group and only one woman in LA group had history of infertility. Moreover, 4 and 2 women had history of gestational diabetes in EA and LA group respectively. Women with history of gestational hypertension are 7 in EA group and 6 in LA group.

Table 1: General characteristics of early and late amniotomy groups.

Variables	Early amniotomy (N =100)	Late amniotomy (N =100)
Gestational age (Weeks)		
<40 weeks	64(64.0%)	67(67.0%)
41-42 weeks	36(36.0%)	33(33.0%)
History of abortion		
Yes	9(9.0%)	11(11.0%)
No	91(91.0%)	89(89.0%)
History of infertility		
Yes	2(2.0%)	1(1.0%)
No	98(98.0%)	99(99.0%)
History of gestational diabetes		
Yes	4(2.0%)	2(2.0%)
No	96(96.0%)	98(98.0%)
History of gestational hypertension		
Yes	7(7.0%)	6(6.0%)
No	93(93.0%)	94(94.0%)

Table (2) demonstrates the difference between two groups regarding the age, bishop score, duration of 1st stage, and 2nd stage of labour and shows that mean duration of 1st stage (11.1±1.2) hour in EA and (12.6±1.8) hour in LA having

statistically significant difference with (p=0.003). The age, bishop score, and duration 2nd stage show non-significant difference between the study groups.

Table 2: The effect of early and late amniotomy in relation to Age, bishop score, Duration of 1st and 2nd stage of labour

Variables	Time of membrane rupture		p- values
	Early Mean ± S.D	Late Mean ± S.D	
Age (Years)	25.5± 4.1	25.3± 4.1	0.511
Bishop score	6.0± 0.88	6.1±1.0	0.558
Duration of 1 st stage (Hours)	11.1±1.2	12.6±1.8	0.003
Duration of 2 nd stage (Hours)	1.8±0.3	1.8±0.3	0.708

Table (3) shows the time of amniotomy in relation to presence of meconium, postpartum hemorrhage, mode of delivery and indication of caesarian section and reveals no meconium presents in 9(9.0%) in EA group and 7 (7.0%) in LA group. Postpartum hemorrhage occurs in 26(26.0%) in EA group and 19 (19.0%) in LA group but statistically non-significant. Moreover, among LA group vaginal delivery were 81(81.0%) and 59(59.0%) in EA group, while C/S were 17(17.0%) in LA

group and 38(38.0%) in EA group with statistically significant difference at (p=0.003). Concerning indications of C/S; Abnormal fetal heart tracing is 15(39.4%) in EA group and 3(17.6%) in LA group, primary failure of progress is 15(39.4%) in EA and 2(11.7%) in LA, Secondary failure of progress 3(7.9%) in EA group and 8(47.2%) in LA, prolonged 2nd stage 5(13.3%) in EA and 4(23.5%) in LA group (P<0.001).

Table 3: The effect of early and late amniotomy in relation to (presence of meconium & postpartum hemorrhage, Mode of delivery, Indication of C/S)

Variables	Early amniotomy (N =100)	Late amniotomy (N =100)	p-value
Presence of meconium			
Yes	9(9.0%)	7(7.0%)	0.398
No	91(91.0%)	93(93.0%)	
Presence of postpartum hemorrhage			
Yes	26(26.0%)	19(19.0%)	0.155
No	64(64.0%)	81(81.0%)	
Mode of delivery			
Normal vaginal	59(59.0%)	81(81.0%)	0.003
Instrumental vaginal	3(3.0%)	2(2.0%)	
Cesarean section	38(38.0%)	17(17.0%)	
Indications of Cesarean section			
Abnormal fetal heart tracing	15(39.4%)	3(17.6%)	0.001
Primary failure of progress	15(39.4%)	2(11.7%)	
Secondary failure of progress	3(7.9%)	8(47.2%)	
Prolonged 2nd stage	5(13.3%)	4(23.5%)	

Table (4): shows the association of early and late amniotomy with the fetal heart tracing and early neonatal outcome as well as birth weight and depicts that, at 1st minute APGAR score >7 are 47(47.0%) in EA group and only 7(7.0%) in the LA group. Apgar score ≥ 7 presents in 53(53.0%) babies of the EA group and 93(93.0%) babies in the LA group with statistical significant difference ($p < 0.001$). The Apgar at 5th minute is 1 (1.0%) in EA group and 2(2.0%) in LA group having <7 . 99(99.0%) in EA group and 98(98.0%) in LA group were having ≥ 7

($P = 0.510$). Fetal heart tracing is reassuring in 84(84.0%) in EA group and 89(89.0%) in LA group, non-reassuring is 16(16.0%) in EA group and 11(11.0%) in LA group but with statistically non-significant difference. Birth weight Less than 2.5 kg are only 2(2.0%) in LA group and none in EA group; (2.5-4) kg are 90(90.0%) neonates in EA group and 91(91.0%) in LA group, more than 4 kg are 10(10.0%) in EA group and 7(7.0%) in LA group with ($p = 0.283$).

Table 4: The effect of early and late amniotomy in relation to (Apgar 1(minutes), Apgar 5(minutes), Fetal heart tracing, and birth weight)

Variables	Early amniotomy (N =100)	Late amniotomy (N =100)	p- value
Apgar (1 minute)			
<7	47(47.0%)	7(7.0%)	<0.001
≥7	53(53.0%)	93(93.0%)	
Apgar (5 minutes)			
<7	1(1.0%)	2(2.0%)	0.510
≥7	99(99.0%)	98(98.0%)	
Fetal heart Tracing			
Reassuring fetal heart trace	84(84.0%)	89(89.0%)	0.255
Non reassuring fetal heart trace	16(16.0%)	11(11.0%)	
Birth weight (K.g)			
Less than 2.5	0(0.0%)	2(2.0%)	0.283
2.5-4	90(90.0%)	91(91.0%)	
More than 4	10(10.0%)	7(7.0%)	

Figure (1) shows that 140 women delivered vaginally where 81 of them in the LA group and 59 of them in EA group. While 55 women among the participated women delivered by cesarean sections; 38 of them EA group and 17 in the LA group. With

only 5 women were delivered by instrumental vaginal delivery, 3 EA group and 2 LA group. And this figure (1) showed high significance ($P = 0.003$).

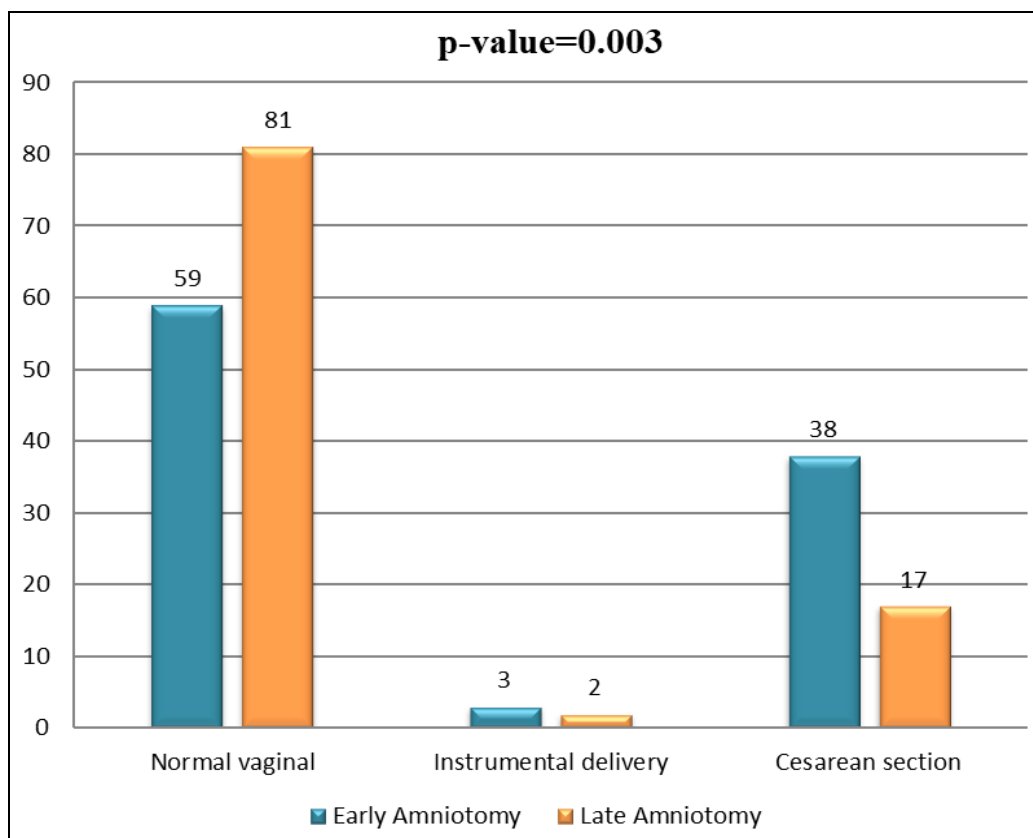


Fig 1: Early and Late Amniotomy in relation to the Mode of Delivery.

Figure (2) shows the indications of cesarean section; abnormal fetal heart tracing occurs in 15 women in EA group and in 3 women in LA group. The primary failure of progress is in 15 women in EA group and 2 women in LA group. The secondary failure of progress is in 15 women in EA group and 2 women in LA group. The secondary

failure of progress is in 3 women in E.A group and 8 women in L.A group. The prolonged 2nd stage of labour is in 5 women in E.A group and 4 women in L.A group.

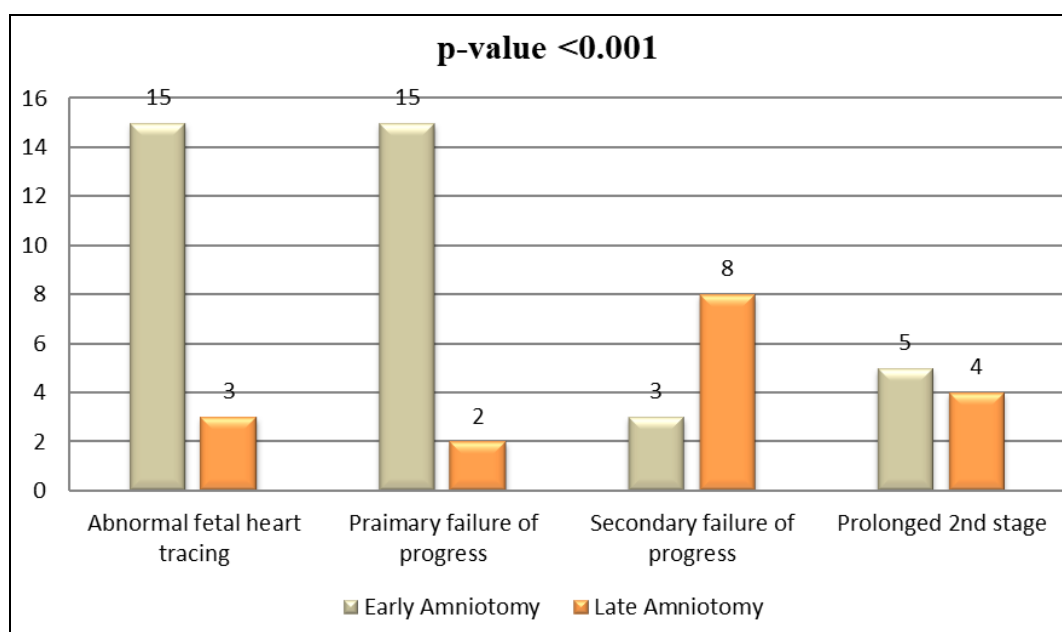


Fig 2: Early and Late Amniotomy in relation to the indications of Cesarean section

Discussion

In induction of labour, amniotomy is a step, where its primary aim is to speed up uterine contraction and therefore shortens the length of labour. It is commonly used as a primary method of induction in women with a ripe cervix. In this study the idea is to assess the effect of early and late amniotomy on the progress, success of labour, maternal and neonatal outcome. According to

the available literatures there are discrepancies regarding the influence of amniotomy on the duration of labour. In this study the duration of 1st stage of labour in LA group was longer than in EA group by 40 minutes and this gives significant association of early and late amniotomy regarding the 2nd stage of labour there is no significant difference between LA group and EA group and this agrees with the study done by Faris Anwar *et al.*,

^[11] stated that the duration of labour is longer, mostly within the 1st stage of labour, also agree with the study done by WD Fraser *et al.*, ^[12] stated that there is significant reduction of duration of 1st stage by 54 minutes and no difference in the length of the 2nd stage, another study done by Seung *et al.*, ^[13] this is possibly due to that in LA group more times was taken for dilatation of cervix may be due to absence of effect of prostaglandin release which induced in EA group. Regarding the effect of the early and late amniotomy on mode of delivery was highly significant where the majority of deliveries were by normal vaginal delivery, in late amniotomy about 81.0% and in early amniotomy 59.0% of normal vaginal deliveries. Then followed by cesarean section as the second frequent mode of delivery, the majority 38.0% were in early amniotomy and 17.0% in late amniotomy and this is statically significance to prefer late amniotomy on early and only 5 women, 3(3.0%) in EA group and 2(2.0%) had instrumental delivery and it was not significant and agrees with Fraser *et al.*, ^[12], Cammu *et al.*, ^[14] mentioned that the number of C/S in early amniotomy is more than in late amniotomy and the most common cause was abnormal fetal heart tracing and another study done by Levy *et al.*, ^[15] and Francosi *et al.*, ^[16] who stated that early amniotomy is a risk factor for c/s and the most common cause was fetal distress and the study done by Seung *et al.*, ^[13] stated that it is due to failure of progress, while study done by Masoomah *et al.*, ^[17], Wang *et al.*, ^[18] and Laura G *et al.*, ^[19] who said that the cause due to labour dystocia and this can be explained by the absence of hydrostatic pressure of membranes after amniotomy may result in slow progress of labor and a corresponding increased risk of cesarean delivery. During labour with intact membranes, uterine contractile forces exert pressure on the fetal membranes, resulting in centrifugal force on the cervix and cervical dilatation whereas in cases with early amniotomy this mechanism may be interrupted because of absent fetal membranes or due to higher frequency of arrest of dilatation and descent ^[13]. Regarding the effect of early and late amniotomy on indications of cesarean section was highly significance ($p > 0.001$) (where there were a lot of variations the most common indications were abnormal fetal heart tracing and primary failure of progress in the early while for the late the only most common indication was secondary failure of progress, where the most common cause was not reassuring fetal heart tracing and arrest of dilatation (primary failure) may be due to increase duration of oxytocin drip in EA group. Regarding the presence of postpartum hemorrhage no statistical significant effect of early and late amniotomy were found. Most of the patients had postpartum hemorrhage, in the late 81.0% of the women and early 64.0% of the ladies and this matches with the thesis done by Smyth ^[20] one trial involving 1132 women reported this outcome no statistically significant difference between the two groups in the incidence of postpartum hemorrhage. Regarding effect of early and late amniotomy on Apgar at 1st minute was found to be statistically highly significant $P > 0.001$ where 46 babies were born with > 7 in EA group and only 7 babies in LA group, while 93 babies were recorded to have < 7 in late and 53 babies in EA group were having < 7 , and this gives the late amniotomy more advantage statistically to be applied in pregnant ladies for the safety of neonates. Apgar score at 5th minute there was no significant difference between the two group where its ($p = 0.510$) with very slight variation. This variation in Apgar 1st minute and Apgar 5th minute was found to be similar with the research done by Faris *et al.*, ^[11] despite they recoded no statistical significance for both but they found that Apgar 1st minute < 7 were, 78 for the late, 67 for the early and in Apgar 5th minute > 7 were 87 babies for the

LA group and 86 for the EA group, in this study Apgar 5th minute was having no statistical significant difference and this agrees with study done by Laura *et al.*, ^[19]. Regarding the birth weight there is no significance difference between the two groups and this agrees with Levy *et al.*, ^[15]. In developed countries, many trials did not recommend early amniotomy to accelerate labor, 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 staff when doing proper patient monitoring for long periods. In these circumstances, amniotomy may be advantageous in decreasing overall monitoring time ^[11]. Induction of labour can place more strain on labour wards than spontaneous labour. Traditionally, induction is undertaken during day time when labour wards are often already busy. The policy of induction, including indications, methods and care to be offered, thus needs to be reviewed.

Conclusion

- Early and late amniotomy had effect on the success of induction of labour.
- Late amniotomy is promoting vaginal delivery while early amniotomy increase the possibility of cesarean section is more.
- Early neonatal outcome is better in early amniotomy than late amniotomy.

Recommendations

1. more studies including high numbers of pregnant women to reassure that LA group is better than EA group in the success of induction of labour.
2. Applying LA group to enhance more vaginal delivery in cases of induction of labour.
3. Continuous monitoring of fetal heart rate in every case of induction is necessary.

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