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Comparison between Oxytocin and Dinoprostone in Labor Induction in Pregnancies with Premature Rupture of Membranes

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ABSTRACT

Background: Premature membrane rupture (PROM) remains one of the most difficult issues in obstetrics because of the increased morbidity and mortality of both mothers and fetuses. Several studies have looked at the best management techniques for these circumstances. **Objective:** This study aimed to compare between two protocols (oxytocin versus sustained release dinoprostone followed six hours later by oxytocin) for induction of labor in pregnancies with premature rupture of membranes at term. **Patients and Methods:** This prospective comparative study was conducted at Ain Shams Maternity Hospital and Obstetrics and Gynecology Department at El-Sahel Teaching Hospital during the period between May 2013 and August 2014. This study included 90 pregnant women with premature rapture of membranes at term (37-42 weeks of gestation, as determined by first day of LMP or by 1st or 3nd trimester ultrasound scan).

Results: Vaginal delivery within 24 hours of labor induction was significantly increased in dinoprostone-oxytocin group than oxytocin. (66.7% for oxytocin group vs. 80% for dinoprostone followed by oxytocin). Also, more cesarean sections were performed in the oxytocin group (33.3% for oxytocin group vs. 20% for dinoprostone-oxytocin group). Mean induction active phase and induction delivery intervals were significantly shorter in oxytocin group than dinoprostone-oxytocin group. **Conclusion:** With a significant increase in the rate of vaginal delivery within 24 hours in comparison with oxytocin alone and shorter induction active phase and induction delivery intervals in the oxytocin group than in the dinoprostone-oxytocin group. Sustained release dinoprostone followed by oxytocin six hours later is an alternative safe method for inducing labour in women with term PROM. There is no distinction between the two groups in terms of maternal and newborn outcomes.

Keywords: Oxytocin, Dinoprostone, Labor induction, PROM.

INTRODUCTION

The term "premature rupture of the membranes" (PROM) is defined as burst of foetal membranes before the start of typical uterine contractions [(1)]. Due to the increased morbidity and mortality of both mothers and foetuses, one of the most difficult issues in obstetrics is still PROM. Several studies have examined the best management practices for these circumstances. The main concern in treating patients with PROM is whether to induce labour or let them go into labour naturally. A systematic analysis in 2017 comparing the pregnancy outcomes of planned early intervention and expectant treatment in 23 randomised trials of women with PROM at or before 37 weeks of gestation indicated that induction of labour was more beneficial for patients than expectant management [(2)].

There is no agreement on the process of labour induction for women who are not prohibited from giving birth vaginally. The initial administration of any prostaglandin other than oxytocin has not shown clearly to be beneficial for women with PROM, even those with unfavourable cervixes, according to meta-analyses of randomised studies, however data for the latter subgroup are scarce [(3, 4)]. The use of oxytocin as the primary labour induction technique in PROM is supported by recent advice [(5)].Prostaglandin E2 (PGE2) vaginal inserts have been shown to be both safe and effective in promoting cervical softening in women with post-term pregnancies and poor Bishop scores. Nevertheless, there is a dearth of information about the efficiency and safety of PGE2 in term pregnancies complicated by PROM. Just a small number of studies have examined pre-induction cervical softening in women with PROM and an unfavourable cervix [(3, 4, 6)].

PATIENTS AND METHODS

This prospective comparative study was conducted at Ain Shams Maternity Hospital and Obstetrics and Gynecology Department at El-Sahel Teaching Hospital during the period between May 2013 and August 2014. This study included 90 pregnant women with premature rapture of membranes at term (37-42 weeks of gestation, as determined by first day of LMP or by 1st or 3rd trimester ultrasound scan).

Two groups of patients were formed; group A (conventional group) contained 45 patients who received an intravenous oxytocin infusion. There were 45 individuals in group B (the experimental treatment group) who received a dinoprostone pessary. There was a pool of fluid in the posterior fornix as amniotic fluid started to drain from the cervical OS during sterile speculum examination, confirming the existence of PROM at term.

Inclusion criteria: Women who have a live, single-term foetus, exhibiting a vertex, undergoing a reactive non-stress test, or experiencing an early membrane rupture

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without any spontaneous contractions and a Bishop score of less than or equal to 5 prior to the start of labour (less than 4 contractions within 20 minutes).

Exclusion criteria: Women in active labour, those who had previously undergone caesarean sections or other uterine surgeries, antepartum haemorrhage, chorioamnionitis, a condition that made vaginal delivery impossible (such as bronchial asthma or glaucoma), major foetal anomalies, and those whose foetuses weighed > 4.5 kg were all disqualified.

Procedure:

Immediately prior to labour induction, a single operator (student) conducted interviews with the women to gather demographic background information and obstetric history. After being admitted, each patient got a thorough clinical examination and a thorough medical history was taken. Each patient had a Case Record Form (CRF), which contained the following information: the patient's initials, age, height, weight, previous pregnancies and abortions, whether a caesarean delivery was indicated, previous medical and surgical history, the length of the leakage, and the colour and composition of the fluid.

A single operator (student) performed a clinical examination that included a general, abdominal, and vaginal sterile examination in order to get the Bishop score. To evaluate the foetal growth characteristics, amniotic fluid index, placental position and ultrasound was used. To evaluate the health of the foetus and ensure that there are no contractions, external cardiotocography was performed. Patients in group A received an intravenous infusion of oxytocin at a rate of 5 mU/min, which was doubled every 30 minutes, up to a maximum of 32 mU/min, or until 4 contractions in 10 minutes were attained. A regulated intravenous drip (20 drops = 1 ml) was used to administer the prescribed amount of oxytocin. The infusion rate was begun at 10 drops per minute and increased by 10 drops every 15 minutes until it reached a maximum of 60 drops per minute. Sustained release dinoprostone was administered as a single dosage to group B patients in the posterior vaginal fornix. In the current investigation, dinoprostone is PGE2; we employed a tablet form that was high in the posterior vaginal fornix. Each tablet had 3 mg of dinoprostone. Dinoprostone was delivered from this sustained-release medication at a modest but consistent rate of 0.3 mg per hour. Typical intravenous oxytocin infusion six hours after vaginal pill insertion unless otherwise stated, the oxytocin infusion was sustained until delivery. The analgesic for labour was pethidine. The dosage was between 50 and 100 mg. One of the supervisors went over each cardiogram to look for and classify any aberrant patterns.

When the patient is not in the active phase after 12 hours, the induction of labour has failed, according to our definition. Based on obstetric practice, the decision was taken to perform a Caesarean delivery. The inability to induce labour, failure to proceed in established labour, or an unsettling foetal state are some of the grounds for Caesarean section in this study (based on foetal heart rate patterns).

The majority of women who delivered vaginally within 24 hours of the protocol's start were the primary outcome measures. Secondary outcome measures included the frequency of excessive uterine contractions, the time from labour induction to delivery, the presence of meconium-stained amniotic fluid, the mode of delivery, the percentage of instrumental deliveries, maternal satisfaction, and complications for both the mother and the newborn. Findings were tallied and statistical analysis was performed.

Ethical approval: The protocol and related documentation were approved for ethical research by the Council of OB/GYN Department, Ain Shams University before to the study's start and in compliance with the local regulations that were followed. All participants provided written consent. The study was conducted out in line with the Helsinki Declaration.

Statistical analysis

IBM SPSS Statistics version 23 (IBM Corp., Armonk, NY) and MedCalc Statistical software version 20.104 were used for the statistical analysis. The Pearson chi-squared test or Fisher's exact test was used to compare intergroup differences for categorical variables, which are reported as counts and percentages.

Using the chi-squared test for trend, ordinal data were compared. The mean and standard deviation of numerical variables were shown, and differences were evaluated using the unpaired t-test. The repeated measures analysis of variance (ANOVA) was used to evaluate repeated measures in order to examine both within- and between-subject effects. The Kaplan-Meier (K-M) approach was used for time to event analysis. Several K-M curves were compared using the log-rank test. The impact of intermittent fasting on the incidence of GDM or prediabetes was examined using multivariable binary logistic regression analysis after controlling for confounding variables. P value ≤ 0.05 was considered significant.

RESULTS

Table (1) showed that the mean amniotic fluid index (AFI) in included women was 5.4 ± 2.2 for oxytocin group and 6.3 ± 2.1 for dinoprostone-oxytocin group. In group A, one had history of appendectomy, while in group B, 1 had appendectomy, 1 had cholecystectomy & 1 had eye operation.

Table (1): Comparison between group A and B as regards personal and obstetric characteristics

		Group				P	Sig
		Oxytocin		Oxytocin and dinoglandin			
		Mean	± SD	Mean	± SD		
Age (years)		27.2	3.0	26.6	3.6	.361	NS
BMI (kg/m^2)		28.8	2.6	27.3	1.8	.002	HS
Gestational Age (weeks)		38.9	1.3	39.5	1.1	.036	S
Bishop Score		3.6	.9	2.9	1.1	.001	HS
Amniotic fluid index (cm)		5.4	2.2	6.3	2.1	.051	NS
Parity	1 PG (n %)	11	24.4%	16	35.6%	.250	NS
	MG (n %)	34	75.6%	29	64.4%		
Medical Disorder	Yes (n %)	5	11.1%	3	6.7%	.714	NS
	No (n %)“	40	88.9%	42	933%		
Type of medical Disorder	Anemia (n %)	0	.0%	1	2.2%	.298	NS
	BA (n %)	2	4.4%	0	.0%		
	DM (n %)	0	.0%	1	2.2%		
	HTN (n %)	3	6.7%	1	2.2%		
	None (n %)	40	88.9%	42	93.3%		
Surgical	Yes (n %)	1	2.2%	3	6.7%	.616	NS
history	No (n %)	44	97.8% 1 42		933%		

Table (2) showed that vaginal delivery within 24 hours of labor induction was significantly increased in dinoprostone followed by oxytocin group than oxytocin only group (66.7% for oxytocin group vs. 80% for dinoprostone followed by oxytocin, P= 0.04).

Table (2): Comparison between group A and B as regard obstetric outcome

		Group				P	Sig
		Oxytocin		Oxytocin & dinoglandin			
		Mean	**± SD**	**Mean**	**± SD**		
Induction to active phase interval (hour)		1.8	1.0	3.1	1.8	.0001	HS
Induction to delivery interval (hour)		5.7	2.5	8.3	3.1	.0001	HS
	VD (n %)	50	66.7%	36	80.0%	.04	S
Mode of delivery	CS (n %)	15	33.3%	9	20.0%	.245	NS
Fetal distress	Yes (n %)	9	20.0%	4	11.1%	.242	NS
	No (n %)	36	80.0%	40	88.9%		
Failure of fetal descent	Yes (n %)	3	6.7%	0	.0%	1.0	NS
	No (n %)	42	93.3%n	45	100.0%		
Failure of labor progression	Yes (n %)	2	4.4%	2	4.4%	.242	NS
	No (n %)	43	95.6%	43	95.6%		
Failure of labor induction	Yes (n %)	0	.0%	3	6.7%		
	No (n %)	45	100.0%	42	93.3%		
Cord prolapse	Yes (n %)	1	2.2%	0	.0%	1.0**	NS
	No (n %)	44	97.8%	45	100.0%		

Table (3) showed that neonatal weight, Apgar score and NICU admission did not differ significantly between the two groups. All babies were discharged home with their mothers.

Table (3): Comparison between group A and B as regard neonatal outcome

		Group				P	Sig.
		Oxytocin		Oxytocin & dinoglandin			
		Mean	±SD	Mean	±SD		
Fetal Weight(gram)		3173.3	368.9	3225.6	325.9	.479*	NS
APGAR score 1 min		9.8	.5	9.9	.4	.329*	NS
APGAR score 5 min		10.0	.0	10.0	.0		
NICU admission	Yes	1	2.2%	0	.0%	1.0**	NS
	No	44	97.8%	45	100.0%		

Table (4) showed that there were no significant differences between the two study groups as regards meconium and postpartum hemorrhage.

Table (4): Comparison between group A and B primigravida cases as regards maternal adverse effects and complications

		Group				P	Sig
		Oxytocin		Oxytocin & dinoglandin			
		N	%	N	%		
Instrumental delivery	Yes	0	.0%	0	.0%	—	—
	No	11	100.0%	16	100.0%		
Tachysystole	Yes	0	.0%	0	.0%	—	—
	No	11	100.0%	16	100.0%		
Meconium	Yes	1	9.1%	1	6.3%	1.0**	NS
	No	10	90.9%	15	93.8%		
Postpartum hemorrhage	Yes	0	.0%	1	6.3%	1.0**	NS
	No	11	100.0%	15	93.8%		

DISCUSSION

The findings of this study were contrasted with those of **Güngördük *et al.*** [8], who examined the effectiveness of oxytocin against vaginal dinoprostone followed by oxytocin six hours later in bringing about vaginal birth in women with term PROM within 24 hours. Also, this study was contrasted with other studies.

Prostaglandin was found to be more successful than oxytocin at inducing labour and increasing the rate of vaginal deliveries, according to a recent Cochrane evaluation of vaginal prostaglandin for induction of labour at term [9].

Another randomised controlled trial examined the effectiveness of oxytocin alone with oxytocin combined in term PROM. Researchers discovered no discernible difference between the two groups with relation to caesarean delivery, labour induction, or patient satisfaction. However, the small sample size and the diverse trial participants limited the scope of this investigation [10]. Moreover, numerous regimens in the literature recommend combining oxytocin and cervical priming drugs for labour induction in patients with low Bishop scores [11].

The mean induction active phase intervals in the oxytocin group were shorter than those in the other group in the study by **Güngördük *et al.*** [8] (6.7 ± 2.8 versus 8.8 ± 3.1, p=.OOI), and our investigation supported this finding. The mean induction delivery intervals across the two groups, however, were comparable (12.7 ± 6.2 versus 13.6 ± 5.5, p=0.11).

The rate of vaginal deliveries within 24 hours was significantly higher in the sustained release dinoprostone-oxytocin group than in the oxytocin group in the study by **Güngördük *et al.*** [8] (72% vs 45%; P=.007 for nulliparous and 87.5% vs 63.3%; p=0.03 for multiparous), which is consistent with the nulliparous results in the current study.

According to reports, prostaglandins are useful when the cervix requires priming and oxytocin is only beneficial when the cervix is suitable for labour induction [12].

According to a conventional study, patients with a Bishop score of 6 had a Caesarean birth rate of 11.4% for multiparous patients and 22.3% for patients who were nulliparous. There is a wealth of information about the Caesarean delivery rate during induction of labour in the literature, although the majority of research contains

faults, such as failing to provide induction methods and comprehensive Bishop scores, defining study groups using variable cut-off Bishop scores, enrolling a limited number of participants, and solely examining uterotonic regimens for the stimulation of labour [13].

Three instances of induction failure were detected in group B, whereas none were found in group A. Contrary to **Güngördük *et al.*** [8] study, failure induction was the most frequent reason for Caesarean deliveries in the oxytocin group while foetal discomfort was the primary reason in the dinoprostone-oxytocin group.

Many researchers hypothesised that using PG instead of oxytocin to induce labour could lessen the negative effects of Caesarean section and failed induction. PGs encourage cervical ripening while requiring less delivery force. However, a recent meta-analysis suggested that using oxytocin to induce labour is associated with fewer side effects, such as nausea and vomiting, frequent vaginal examinations, chorioamnionitis, neonatal infections, and admission to the neonatal intensive care unit (N1CU), but more frequent use of epidural analgesia and foetal monitoring than using regular painkillers. Perinatal mortality, endometritis, and Caesarean birth are not different between the two groups [14].

Uterine tachystole has been observed to follow vaginally injected PGH2 in 1-5% of women, and there have been more hyperstimulation instances in the induction of labour category in the high-dose oxytocin group as well [15]. Women who only used dinoprostone pessaries experienced a uterine tachysystole incidence of 7.4%, according to **Kho *et al.*** [16].

Its rate was 10.7% in **Ozkan *et al.*** [17] study. In our study, 2.2% of women who used dinoprostone and oxytocin six hours later experienced uterine hyperstimulation. In the current investigation, oxytocin administered six hours after dinoprostone was linked with a rate of meconium-stained amniotic fluid that was similar to that of the oxytocin group. The results for mothers and newborns were statistically comparable between the two groups. These findings suggest that inducing labour in women with PROM using dinoprostone followed by oxytocin six hours later is safe.

Also, the results of our recent study and the study by **Güngördük *et al.*** [8] are comparable with regard to maternal and newborn outcomes.

CONCLUSION

Sustained release of dinoprostone followed by oxytocin six hours later is an additional safe way to induce labour in women with term PROM, with a significant increase in the rate of vaginal delivery within 24 hours compared to oxytocin alone and shorter induction active phase and induction delivery intervals in the oxytocin group than in the dinoprostone-oxytocin group. When it comes to mother and neonatal outcomes, there was no difference between the two groups.

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