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Original Research Article

A Randomized Comparative Assessment of the Effectiveness of Low Dose Versus High Dose Oxytocin Regimen for Induction of Labor

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Abstract

Aim: To evaluate effectiveness of low dose versus high dose regimen for induction of labor.

Material and Methods: A total of 160 antenatal patients who were admitted for induction of labor were enrolled in the study. All patients were randomized by block randomization into two groups i.e. Group I and Group II, each consisting of 100 patients. A detailed history, thorough clinical examination and relevant investigations were done for all the women. Per vaginal examination was done to know the cervical status and the bishop score. High dose regimen was started with 4mu/min with increment of 4mu/min up to a maximum of 32mu/min and low dose regimen was started with 2mu/min with increment of 2mu/min up to a maximum of 32mu/min.

Results: Women induced with high dose oxytocin regimen had shorter induction delivery interval as compared to low dose oxytocin interval by 2 hours 9 minutes. The incidence of various maternal outcomes in the high dose and low dose oxytocin regimen were similar. The most common indications for LSCS in the two groups were fetal distress and failed induction. A special consideration is required for the incidence of tachysystole, which was more in high dose regimen as compared to low dose oxytocin regimen but the difference was not statistically significant.

Conclusion: High dose oxytocin regimen can be considered for induction of labor as it has same effects as that of low dose regimen with lesser induction to delivery interval.

Keywords: Labor, oxytocin, tachysystole, uterine contraction

Introduction

Induction of labor (IOL) refers to artificial stimulation of uterine contractions before the true onset of spontaneous labor in order to achieve vaginal delivery. [1] The goal of labor induction is always to ensure the best possible outcome for mother and newborn. IOL should be performed only when there is a clear medical indication for it and the

expected benefits outweigh its potential harms. Wherever possible, it has to be carried out in facilities where caesarean section can be performed.[2]

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Use of Oxytocin for labor induction is one of the most frequently used medications in obstetrics. This synthetic polypeptide hormone has been used to stimulate uterine contractions since 1950s after synthesized for the first time in 1953 by Vincent du Vigneaud [3,4].

Oxytocin regimen can be classified as high-dose or low-dose based on different parameters. These are amount of starting dose, rate of incremental dose and intervals of escalation [5,6].

The Royal College of obstetricians and gynaecologists (RCOG) recommends an initial dose of 1-2mu/min with arithmetic increments at 30min intervals until a maximum of 32mu/min [4]. The American college of obstetricians and gynaecologists (ACOG) recommends an initial dose of 1-2mu/min with increments of 1-2mu/min at 30 minute intervals until every 2-3min contractions, up to a maximum of 42mu/min.[7]

High dose oxytocin has also been associated with decrease in caesarean section [8]. However, study by Prichard N *et al*. have shown no significant difference in the rates of caesarean section between both the oxytocin regimens [9]. High dose oxytocin has high risk of excessive uterine contraction or tachysystole. The regimen has been found to be associated with several maternal adverse effects like hyponatremia, hypotension, arrhythmia, tachysystole and neonatal adverse effects such as seizures, hyperbilirubinemia, retinal haemorrhage's, and fetal distress.[10] Low dose regimen has prolonged induction delivery interval with better safety profile with fewer episodes of hyper stimulation[9].

Current induction of labor regimens include both high and low dose regimens but evidence is not strong enough to recommend low dose or high dose regimen for routine induction of labor. Thus, further research is required to be carried out for the betterment of maternal and neonatal outcomes along with successful induction rates.9 hence, this study is an attempt to evaluate effectiveness of low dose versus high dose regimen for induction of labor.[11]

Material and Methods:

A total of 160 antenatal patients who were admitted for induction of labor were enrolled in the study In the Department of Obstetrics and Gynecology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India for 15 month . All patients were randomized by block randomization into two groups i.e. Group I and Group II, each consisting of 100 patients.

Inclusion criteria:

Admitted for induction of labor

Exclusion Criteria:

Pregnant mothers with Intra Uterine Fetal Death (IUFD), critically ill pregnant mothers, pregnant mothers with lethal congenital anomaly, pregnancies complicated by cord prolapse.

Methodology

Primary outcome was estimation of Induction delivery interval. Secondary outcomes were rates of caesarean section, tachysystole with or without fetal distress, failed induction, maternal outcomes like incidence of instrumental vaginal delivery, PPH, chorioamnionitis, neonatal outcomes like admission to NICU, Apgar score at 1 minutes and 5 minutes, umbilical cord pH and perinatal morbidity and mortality.

A detailed history, thorough clinical examination and relevant investigations were done for all the women. Vital signs of patient were obtained. Per vaginal examination was done to know the cervical status and the bishop score. If bishop score was less than 6, pre-induction cervical ripening was done using dinoprostone gel (0.5mg) up to a maximum of 2 doses. If bishop was more than 6, they were induced with Oxytocin according to the regimen assigned to her after block randomization.

Group I women received high-dose oxytocin regimen starting with 4mu/min with increment of 4mu/min every 30 min until adequate contractions (3-4 in 10 min) were established or up to a maximum of 32mu/min. Group II women received oxytocin at 2mu/min with increment of 2mu/min every 30min until adequate contractions were established or up to a maximum of 32mu/min. Uterine contractions and fetal heart rate were monitored by palpation and auscultation, respectively, with intermittent cardiotocographic (CTG) monitoring to identify fetal distress. If vaginal delivery was not achieved within 24 hours of oxytocin administration, induction was considered as 'failed' and further management was decided depending upon indication of induction. In case of tachysystole (>5 contractions per 10 minute period averaged over 30 minutes) with non-reassuring FHR pattern, oxytocin was discontinued, left lateral positioning was advised, IV bolus of 250-300ml ringer lactate and oxygen by mask at 8-10liters/min was given.

If tachysystole occurred with reassuring fetal heart rate, then oxytocin was reduced to previous dose. If uterine activity did not return to normal, then oxytocin was stopped. If oxytocin had been stopped for 20min, FHR was reassuring and no tachysystole was present, then oxytocin was started at half the previous rate at which the tachysystole occurred and was thereafter increased every 30 minutes until adequate uterine contractions were achieved or up to the maximum rate. All the events of induction of labor were recorded in excel sheet. Neonates were further followed for the adverse outcomes.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results:

Participant's basic characteristics such as mean age, parity, gestational age, indications for IOL, bishop's score, and cervical dilatation were similar between the two groups as shown in Table 1 below. All women were nulliparous. The most common indication for IOL in both groups was IHCP. Other indications are listed in Table 2.

Women induced with high dose oxytocin regimen had shorter induction delivery interval as compared to low dose oxytocin interval by 2 hours 9 minutes. The outcome was found to be statistically significant ($p \leq 0.05$) as shown in Table 3. However,

there was no difference in the duration of second stage of labor among the two regimens.

Table 1: Comparison of demographic data and bishop's score in high dose and low dose oxytocin regimen:

Variable	Group-I: 4mu/min (n=80)	Group-II:2mu/min (n=80)	P value
Age (year)	27.22±4.01	29.20±3.91	0.1
Gestational age (weeks)	39.27±0.70	40.21±1.90	0.52
Pre-induction agent (required)	55 (68.7%)	51 (63.7%)	0.28
Post-induction bishop's score	6.29±0.57	7.20±1.81	0.10
Cervical dilatation(cm)	2.81±0.52	2.29±0.22	0.61

Statistically significance at $p \leq 0.05$

Table 2: Comparison of indication of IOL between high dose and low dose oxytocin regimen:

Indication of IOL	High dose oxytocin regimen (n=80) (%)	Low dose oxytocin regimen (n=80) (%)	Total N (%)	P value
FGR	11 (13.7)	11 (13.7)	22 (13.7)	0.50
Gestational diabetes mellitus	7 (8.7)	7 (8.7)	14 (8.7)	
Gestational hypertension	5 (6.2)	6 (7.5)	11 (6.8)	
IHCP	29 (36.2)	26 (32.5)	55 (34.3)	
Postdated pregnancy	10 (12.5)	14 (17.5)	24 (15)	
Preeclampsia	8 (10)	8 (10)	16 (10)	
PROM	10 (12.5)	8 (10)	18 (11.2)	
Total	100 (100)	100 (100)	160 (100)	

Statistically significance at $p \leq 0.05$

Table 3: Comparison of induction delivery interval (in hours) between high dose and low dose oxytocin regimen:

Induction delivery interval (in hours)	High dose oxytocin regimen (n=78)	Low dose oxytocin regimen (n=80)	Total	P value
Mean± Std. dev	7.29±3.90	10.42±5.72	8.22±5.29	0.01*

* indicates statistically significance at $p \leq 0.05$

Discussion:

Active management of labor is a very delicate process in obstetrics. It requires utmost attention in order to reduce maternal and neonatal morbidity and mortality along with high success rates. In the present era, there exists considerable controversy and lack of evidence about oxytocin administration and dosage.[12]

The primary outcome of the study, induction to delivery interval, was found to be statistically shorter in high dose oxytocin regimen as compared to low dose oxytocin regimen by 2 hours 9 minutes ($p \leq 0.05$). In a

systemic review (2010) Wei SQ *et al*, decrease in labor duration along with a small increase in spontaneous vaginal delivery was observed with high dose oxytocin regimen as compared to low dose oxytocin regimen.[13]

Rintaro Mori et al in 2011 and A. Ghidini et al in 2012 reported significant reduction in length of labor duration in high dose oxytocin regimen when compared with that of low dose oxytocin regimen. [14, 15]

Cochrane systemic reviews and met analysis (2016) showed that removal of high bias studies revealed a significant detailed reduction of induction to delivery interval (MD -1.94 hours, 95% CI -0.99 to -2.89 hours, 489 women). [11]

Rate of failed induction was generally higher in our study compared to those studies. This might be due to the fact that the studies were following different protocols in relation to total duration of hours waited to diagnose failed induction. In this study failure to acquire either adequate uterine contraction or failed to show favorable cervical changes despite being on oxytocin drip for a period of six to 8 hours was used to diagnose failed induction. But other centers in literatures used to give more time ranging from 12 to 24 h as latent phase can usually be prolonged but ended in vaginal delivery [16].

Delivering to normal birth weight neonate compared to macrosomic neonate has increased success by 4 times. This might be justified by the fact that macrosomia is associated with labor dystocia and cephalo-pelvic disproportion thus ending in cesarean delivery. Our finding however, was not consistent with different literatures of the similar settings in Ethiopia that showed no association between neonatal birth weight outcome and induction success. [17-19]

In the present study, high dose oxytocin regimen had increased incidence of uterine tachysystole, but the difference was not statistically significant. In a Cochrane review by A.Budden *et al*. significant increase in hyper stimulation was reported without specifying fetal heart rate changes in the high-dose group [11]. Also, B. G. Manjula *et al*. (2014) reported an increased rate of tachysystole in patients induced with high dose oxytocin regimen (p value 0.0040). [20]

Conclusion:

On the basis of present study, high dose oxytocin regimen can be considered for induction of labor as it has same effects as that of low dose regimen with lesser induction to delivery interval.

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