Induction of labour and its outcome in a teaching hospital

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Abstract

Introduction: A new guideline and a strict protocol of oxytocin infusion administered via an infusion pump was adopted for induction of labour (IOL) in the University Obstetric Unit, Teaching Hospital, Mahamodara, Galle, in 2006.

Objective: To describe IOL and its outcome before and after adopting this new guideline and strict protocol of oxytocin infusion at the University Obstetric Unit, Teaching Hospital, Mahamodara, Galle.

Methods: A prospective descriptive study. Using a pretested form data collected from 322 consecutive women who had IOL during a period of nine months commencing 15th June 2006, were compared with those obtained in the Teaching Hospital, Mahamodara, Galle in 2003 before the new guideline and strict protocol was implemented in the University Obstetric Unit, Galle.

Results: In the University Obstetric Unit the rate of IOL was 8.5% in 2006. The leading indications for IOL were past dates (45.8% in 2003 and 45% in 2006) and pre labour rupture of membranes (28.2% in 2003 and 35.4% in 2006). Successful vaginal deliveries showed a possible increase from 84.7% in 2003 to 90.4% in 2006 and failed inductions showed a possible reduction from 3.8% in 2003 to 2.2% in 2006 ($p = 0.09$). The mean induction delivery interval for a successful vaginal delivery was significantly shorter (318 min 95% CI 307 – 327, $p < 0.04$) in 2006 compared to that of 2003 (343 min 95% CI 333 – 370) . The mean dose of oxytocin used for a successful vaginal delivery showed a possible increase from 6.7 units (95% CI 5.8 – 7.4, $p = 0.11$) in 2003 to 10.4 units (95% CI 6.7 – 16.2) in 2006. Mean duration prior to a diagnosis of a failed induction markedly decreased from 932 min (95% CI 790 – 1073) in 2003 to 699 min (95% CI 590 – 809, $p= 0.005$) in 2006. Mean number of oxytocin units prior to a diagnosis of a failed induction markedly increased from 15 units (95% CI = 15) in 2003 to 25.8 units (95% CI 21-30, $p < 0.001$) in 2006. Caesarean sections after IOL showed a possible reduction from 15.3% in 2003 to 9.6% in 2006 ($p=0.09$). There was no significant change in neonatal outcome from 2003 to 2006.

Conclusion: After the adoption of the new guideline and oxytocin infusion protocol in 2006, IOL and its outcome have improved in the University Obstetric Unit, Galle.

Key words: Induction of labour, labour outcomes.

Introduction

Induction of labour (IOL) is the artificial initiation of uterine contractions leading to progressive effacement and dilatation of cervix with decent of the presenting part of the fetus. IOL is indicated if benefits of delivery outweigh the risk of continuing pregnancy. The rate of IOL varies by location, percentage of high risk pregnancies, fetal surveillance facilities available, and unit policies, and appears to be increasing[1]. In the United Kingdom, the rate of IOL ranges from 6 - 25% with the average being about 20%[2]. In USA the average rate of IOL is approximately 13%[3]. In a previous study carried out in 2003 at the Teaching Hospital, Mahamodara, Galle, an IOL rate of 11.6% was reported[4].

Approximately 25% of all parturients require oxytocin for either induction or augmentation of labour[5]. Although synthetic oxytocin is one of the most commonly used drugs in current obstetric practice, considerable controversy exists concerning its adminis-tration. If misused, oxytocin can lead to important complications such as uterine hyperstimulation, fetal distress, uterine rupture and rarely water intoxication.

The oxytocin regimen used until September 2005 in the University Obstetric unit of Galle had several deficiencies. As intravenous infusion pumps were not used, the rate of infusion varied due to kinking or bending of intravenous infusion sets, and there was

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no strict protocol of oxytocin dosage or increments. Therefore a new guideline and a strict protocol of Oxytocin infusion was implemented in October 2005. This new oxytocin regimen has 12 steps/stages and starts with 5 units of oxytocin in 500 ml of normal saline with an infusion rate of 5 miu/ml (0.5 ml/min) and increments varied from 5 miu/min to 10 miu/min. Dosage increments were made at 40 minute intervals. Maximum concentration in the protocol is 10 units/500 ml of normal saline and the maximum dose of oxytocin is 60 miu/min (3 ml/min). According to this new protocol the maximum duration of oxytocin infusion is 11 hours (Table 1).

The half life of oxytocin is thought to be approximately 10 to 12 minutes[6,10], and traditionally it was thought that a steady state of plasma concentration was reached within 15 to 20 minutes[10,11]. Therefore dose increments were carried out at 20 to 30 minute intervals[12,13]. Recent studies have shown that a steady state of plasma concentration is reached in approximately 40 minutes[6,7,8,9,13,14]. Therefore dose increments at 40 minute intervals has been recommended, and is being practiced in several centers[6-10,15].

The work of Seitchik et al between 1982 and 1984 raised many questions concerning the use of oxytocin and consequently this led many institutions to change their oxytocin protocols[6,13,16,17]. Several trials have compared various regimens of oxytocin dosage and time intervals between dose increments[18-30]. Starting doses have ranged from 0.5 to 2 miu/minute, with some as high as 6miu/minute. Increments of dose increase have ranged from 1 to 2 miu/minute up to 6 miu/minute, with adjustments for increased uterine activity[19,20,21]. Duration between dosage increments has varied from 15 minutes27 to 60 minutes[30]. Although Xenakis et al showed that the use of high dose Oxytocin for IOL was associated with a significant decrease in caesarean delivery rate (25.7% to 10.4%)[18], Lazort et al found that high dose oxytocin was not associated with any change in caesarean delivery rate or in the overall length of labour[27]. Several studies in USA have shown that active management of labour with high dose oxytocin regimens was associated with a significant shortening of labour[31,32,33].

Based on recent pharmacokinetic data[6,7,8,9,13,14] many centers have moved to a regimen whereby the dose of oxytocin is increased every 40 minutes. Advantages of this regimen derive from not increasing the oxytocin dose before steady-state levels of oxytocin have been reached.

There has been concern raised regarding a possible association between oxytocin induced labour and an increased incidence of neonatal jaundice. Many of the older studies which suggested that oxytocin led to neonatal jaundice failed to control for confounding variables such as the gestational age and infusion of large volumes of electrolyte free water. More recent studies have not detected any correlation between oxytocin induction and neonatal hyperbilirubinemia[34,35].

The likelihood of either successful induction or its failure may be most specifically ascertained by assessing the condition of cervix. A standardized method of semi quantitative clinical scoring of the cervix was described by Bishop and this scoring system has undergone several changes since then[36,37]. It has been shown that there is a high chance for successful IOL when the Modified Bishops Score (MBS) is > 6[38,39]. IOL is a common procedure and is carried out for a variety of reasons. Failure of IOL and the resulting increase of caesarean deliveries is of great concern.

Objective

To describe IOL and its outcome before and after adopting a new guideline and strict protocol of oxytocin infusion in an obstetric unit of a teaching hospital.

Materials and Methods

A prospective observational study was carried out at the University Obstetric Unit, Teaching Hospital, Mahamodara, Galle. Using a pretested form, data were collected from 322 consecutive women who were admitted to the labour ward of the University Obstetric Unit for elective IOL during a period of nine months commencing 15th June 2006. The indications for IOL, the total dose of oxytocin used, the induction delivery interval, the outcome of IOL, indications for operative delivery if vaginal delivery failed, the neonatal outcome, and maternal and fetal complications were studied. The data was stored in an ongoing computer data base and compared with the data obtained in 2003[4]. The statistical package SPSS version 13 was used for analysis. The t test was used to compare the means of continuous variables and the Chi Square test was used to compare the proportions of the dichotomous variables. A p value < 0.05 was considered as the significant level for potential associations.

Table 1. Intravenous oxytocin protocol for induction/augmentation of labour

Time Hrs. mins	500 ml N. Saline + Oxytocin units	Drops / min (ml / min)	Dose mIU / min	Vol. - ml	Total Vol. infused- ml	Stage
All						
0 - 0.40	5 units (10mIU/ ml)	10 (0.5)	5	20	20	I
0.40 – 1.20		20 (1)	10	40	60	II
1.20 – 2.00		30 (1.5)	15	60	120	III
2.00 – 2.40		40 (2)	20	80	200	IV
2.40 – 3.20		50 (2.5)	25	100	300	V
3.20 – 4.00		60 (3)	30	120	420	VI
4.00 – 4.40	7.5 units -New pack (15mIU /ml)	50 (2.5)	37.5	100	520	VII
4.4.0 - 5.20		60 (3)	45	120	640	VIII a
Increase rate of Oxytocin only to the point where good labour is established and maintain infusion at that rate						
Multip – If not in established labour with maximum dose above, continue maximum dose X further 3 hrs and review						VIII b
Primips – If not in established labour with maximum dose above, continue as below						
5.20 - 6.00	10 units - New Pack (20mIU /ml)	50 (2.5)	50	100	740	IX
6.00 - 6.40		60 (3)	60	120	860	X
6.40 - 8.15		60 (3)	60	280	1140	XI
Primips – If not in established labour with maximum dose above, Review if no problems , Continue as below						
8.15 -11.00	10 units - New pack (20mIU /ml)	60 (3)	60	500	1640	XII
If not in established labour by then LSCS = Failed induction						

Results

The rate of IOL in the University Obstetric Unit of the Teaching Hospital Mahamodara Galle was 8.5 % in 2006.

Table 2. Indications for induction of labour

	2003 (n = 131)	2006 : nine months (n = 322)	p
Past dates	60 (46%)	145 (45%)	NS
Prelabour rupture of membranes	37 (28%)	113 (35%)	NS
Pre eclampsia	22 (17%)	12 (4%)	< 0.001
Logistic / Social	0	9 (3%)	NS
Miscellaneous	8 (6%)	38 (12%)	0.07 NS

There was a significant reduction in the number of inductions due to pre eclampsia from 17% in 2003 to 4% in 2006. ($p < 0.001$). There were no significant changes in the other indications.

Table 3. Outcome of Induction of labour

	2003 (n = 131)	2006 : nine months (n = 322)	p
Successful vaginal Deliveriess	111 (85%)	291 (90%)	0.09 (NS)
Failed Induction of Labour	5 (4%)	7 (2%)	NS
Failure to progress	4 (3%)	4 (1%)	NS
Total Caesarean Sections	20 (15%)	31 (10%)	0.09 (NS)
Neonatal Outcome	No Significant Change		

Successful vaginal deliveries showed a possible increase from 84.7% in 2003 to 90.4% in 2006, and the total caesarean sections after IOL showed a possible reduction for 15% in 2003 to 10% in 2006 ($p = 0.09$).

Table 4. Mean dose of oxytocin used

	2003 (n = 131)	2006: nine months (n = 322)	p
Successful vaginal Deliveries	6.7 units (95% CI = 5.8 - 7.4)	10.4 units (95% CI = 6.7 - 16.2)	0. 11
Failed Induction of Labour	15 units (95% CI = 15)	25.8 units (95% CI = 21 - 30)	< 0.001

There was a possible increase in the mean dose of oxytocin units used for a successful vaginal delivery and a marked increase in the mean dose of oxytocin used prior to a diagnosis of failed IOL in 2006.

Table 5. Mean duration of labour

	2003 (n = 131)	2006: nine months (n = 322)	p
Successful vaginal Deliveries	343 min (95% CI = 333 - 370)	699 min (9% CI = 307 - 327)	0. 04
Failed Induction of Labour	932 min (95% CI = 790 - 1073)	25.8 units (95% CI = 590 - 809)	0.005

In 2006, there was a significant reduction in the induction delivery interval in those who successfully delivered vaginally after IOL, and a marked reduction in the mean duration of oxytocin infusion prior to a diagnosis of failed IOL.

There were no significant differences in the outcome of IOL for pre labour rupture of membranes and past dates.

In 2003, two women with MBS < 4 had IOL but both failed to establish labour. However 27 out of 40 women with MBS < 4 had successful IOL and delivered vaginally in 2006 (p=0.001).

Discussion

In the new strict protocol of oxytocin infusion adopted in 2006, higher doses of oxytocin were used and increments were made at 40 minute intervals. Furthermore the new guideline for IOL standardized clinical decision making. No adverse fetal or neonatal outcomes were observed with the use of this new guideline and protocol. During the period of study there was a concurrent study on pre induction ripening of the cervix carried out in the University Obstetric Unit. This too could have contributed to the improved maternal outcomes of IOL in the University Obstetric unit in 2006. The significant reduction in the rate of IOL for pre eclampsia in 2006 probably reflects a greater use of Caesarean delivery for pre eclampsia.

The possible reduction in the IOL rate in the University Obstetric Unit may reflect a greater awareness of the need of proper selection of women suitable for IOL. Although no women had IOL for social indications in 2003, there were 3% of women who underwent IOL for social reasons in 2006 and all of them had successful vaginal deliveries. The fact that 27 out of 40 women with MBS < 4 had successful IOL in 2006 probably reflects the advantage of the strict protocol and the higher doses of oxytocin used before resorting to a Caesarean delivery based on a diagnosis of failed IOL.

According to the new protocol in 2006, failed IOL was diagnosed after approx. 11 hours of adequate management with a maximum dose of 60 miu/min for approx three hours, Therefore not only were higher doses of oxytocin used for IOL, failed IOL was diagnosed earlier. In 2003, the total dose did not reach 20 units of oxytocin in any woman However in 2006, 20 mothers had successful IOL with the use of more than 20 units of oxytocin. No adverse neonatal out comes were noticed in spite of the higher doses of oxytocin used in 2006. There was a significant decrease of the induction delivery interval with the use of the new protocol in 2006. Active management of labour with high doses of oxytocin have been shown to be associated with a significant shortening of labour[31,32,33]. The possible reduction in Caesarean deliveries may also be due to the higher doses of oxytocin used in 2006. Similar results have been reported earlier[18].

Conclusions and recommendations

There was a significant reduction of the proportion of women having IOL for preeclampsia in 2006, compared to 2003. There was no significant change in the other indications.

After the adoption of the new guideline and oxytocin infusion protocol in 2006, there was a possible increase in the proportion of successful vaginal deliveries and a possible reduction in the caesarean sections for failed IOL with no change in neonatal outcome. The total dose of oxytocin used showed a possible increase in the women who had successful vaginal deliveries after IOL had a marked increase in those who required a Caesarean delivery for a diagnosis of failed IOL There was also a significant reduction in the induction delivery interval in those who successfully delivered vaginally after

IOL, and a marked reduction in the mean duration of oxytocin infusion prior to a diagnosis of failed IOL.

IOL and its outcome have improved in the University Obstetric Unit, Teaching Hospital Galle after the adoption of a strict protocol and guideline. If standardized oxytocin infusion protocols and guidelines are made available in labour rooms, the outcome of induction of labour could improve.

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