

Original Article

Effect of intraumbilical vein oxytocin injection on third stage of labor[☆]Anisodowleh Nankali^a, Farahnaz Keshavarzi^a, Taravat Fakheri^{a,*}, Shamsy Zare^b,
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Abstract

Objective: Manual removal of placenta is performed in 1–3% of cases, and although it is a well-established and relatively safe procedure, it is not without complications. We carried out this study to determine whether intraumbilical vein oxytocin injection reduces the need for manual removal of placenta and shortens the third stage of labor, in comparison with placebo.

Materials and Methods: In this randomized clinical trial, 178 women with singleton pregnancy and normal delivery were studied in 1 year. Immediately after fetus delivery, oxytocin infusion (20 IU/L) was started in both groups. Moreover, 10 IU oxytocin and 1 mL normal saline were injected into the umbilical vein of women in the experimental and control groups, respectively. The duration of third-stage labor, need for manual delivery of placenta, and drug side effects were evaluated in both groups. With regard to the mean level of hemoglobin before and after delivery, the two groups were compared using the Levene test and independent *t* test, and other qualitative variables of the two groups were compared using the χ^2 test.

Results: The women who received intraumbilical vein oxytocin had a shorter third stage of labor as compared with the placebo group (4.24 ± 3.27 min vs. 10.66 ± 7.41) ($p < 0.001$) and there was less need for manual delivery of placenta in the experiment group (1.1% vs. 5.1%) ($p = 0.024$).

Conclusion: It was concluded that intraumbilical vein administration of 10 IU (1 mL) oxytocin immediately after fetus delivery was clinically effective in shortening the third stage of labor.

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Keywords: intraumbilical vein injection; oxytocin; third-stage labor

Introduction

The third stage of labor is defined as the period of time between delivery of the fetus and delivery of the placenta. The most common complication accompanying this stage is postpartum hemorrhage (PPH), and prolonged third stage of labor owing to placenta retention and uterine atony are among the underlying cause of most cases of PPH. The duration of the third stage of labor is 5–15 min; however, in 2–5% of cases,

placenta retention occurs and if immediate treatment is not undertaken, these women are at risk of hemorrhage.

Currently, placenta retention is treated with manual delivery of placenta, which is safer to perform in an operating room by an obstetrician assisted with anesthesia. When these conditions are not met, the mortality rate can reach as high as 10% [1–3]. Next to oxytocin, ergot alkaloids and prostaglandins are, respectively, the second and third line of treatment in the active management of the third stage of labor [1]. Pitocin (USP oxytocin) is a synthetic colorless, transparent solution of oxytocin, which is found in hypophysial extract of mammals. It has a half life of 3–5 min and can be administered intravenously or intramuscularly [4]. The World Health Organization (WHO) recommends active management of the

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third stage of labor, which consists of prophylactic administration of 10 IU oxytocin in 2 min after delivery of the fetus, immediate clamping of the umbilical cord, and controlled traction of the umbilical cord to prevent PPH. Injection of additional oxytocin into the umbilical vein directs the drug to the placental bed and uterine wall, leading to early uterine contraction and placental detachment. Nevertheless, the papers published on the effect of routine intraumbilical vein administration of oxytocin for management of the third stage of labor are limited [2]. In 1995, the effect of intraumbilical vein administration of oxytocin on the duration and blood loss of the third stage of labor was studied in Rohtak Hospital, India. They carried out the study on two groups of 50 pregnant women. In the experimental group, 10 IU oxytocin diluted in 20 mL normal saline was administered via the umbilical vein immediately after umbilical cord clamping. The women in the control group underwent conventional placenta removal. The third stage of labor was recorded at 1.48 and 3.27 min in the experimental and control groups, respectively. The decrease in the duration of the third stage of labor in the experimental group was statistically significant. The hydraulic effect of injected solution can contribute to placental detachment by applying mechanical pressure [5].

According to the results obtained from evaluating 291 women with placenta retention, the need for manual removal of placenta 30 min after fetus delivery was similar in the group that received intraumbilical vein oxytocin and the group that received only normal saline [6]. In spite of the availability of placebo-controlled studies, there has been no strong result on the effectiveness of the method, thus, further study with respect to the determination of the appropriate dosage of oxytocin and the effects of new techniques of modification of oxytocin transport to placental bed needs to be conducted.

The aim of the present study was to evaluate the effect of intraumbilical vein oxytocin on reducing the duration of the third stage of labor and the need for manual delivery of placenta, in comparison with normal saline administration.

Materials and methods

The study was approved by the Ethical Committee of Kermanshah University of Medical Sciences. It was a randomized clinical trial, carried out over 1 year at Emam Reza Teaching Hospital, Kermanshah, Iran. We included women with singleton pregnancy, beyond 32 weeks of gestation, with a living fetus and cephalic presentation, who underwent normal delivery. The exclusion criteria were history of previous PPH, history of cesarean section, any uterine scar, antepartum hemorrhage, placental separation, placenta previa, prolonged labor (>20 h), accelerated labor (<3 h), multiple gestations, polyhydramnios, chorioamnionitis, and instrumental delivery (forceps and vacuum). Moreover, pregnant women who took anticoagulants, or those with thrombocytopenia, and the women who underwent painless labor with epidural anesthesia were also excluded.

The mean duration of the third stage of labor was 6.55 and 9.7 min in the experimental and control groups, respectively,

with a standard deviation of 7.5 min. Based on other studies the minimum required sample size for each group was determined to be 89 [5,7–9]. Using the mean comparison formula for two groups, with the confidence level of 95% and power of test at 80%.

The third stage of labor was actively managed in the two groups by infusion of 20 IU oxytocin (Abou Rayhan, Tehran, Iran) in 1 L Ringer's lactate solution at a rate of 100 mL/min, immediately after delivery of the fetus. In the control group, 1 mL normal saline was injected into the umbilical vein at the most proximal site to the placenta after clamping and cutting of the umbilical cord. In the experimental group, instead of normal saline, 10 IU (1 mL) oxytocin was injected at the same site. We waited 30 min for the symptoms of placenta delivery (i.e., the uterus became firmer and more globular and was displaced upward, a gush of blood occurred, and the umbilical cord was elongated). Spontaneous delivery of the placenta was achieved by touching the fundus and applying pressure on the symphysis pubis by a finger and slight traction of the umbilical cord. For each participant, the duration of the third stage of labor (the time period between the delivery of the fetus and the delivery of the placenta) was recorded. The two groups were compared in terms of the duration of the third stage of labor, hemoglobin (Hb) difference before and 6 h after delivery, mean decrease in Hb level, and the need for manual delivery of the placenta. Manual removal of the placenta was commonly carried out under general sedation in the operating room, if the placenta was not delivered 30 min after fetal delivery and there were side effects of oxytocin (nausea and vomiting). The injection of oxytocin and normal saline was performed by a 3rd-year obstetrics assistant.

Data collection included age, parity, gestational age, Hb level before and 6 h after labor, and duration of placenta delivery to the need for manual delivery of placenta. Comparison of the two groups regarding the duration of the third stage of labor, other qualitative variables, equal variance, and homogeneity was performed by Levene's test and the mean comparison was carried out by independent sample *t* test. Moreover, the qualitative variables of the two groups (need for placenta manual delivery) were compared using the χ^2 test. A *p* value <0.05 was considered as significant. Data analysis was carried out using SPSS version 16.0 software.

Results

Thirty minutes after delivery of the fetus, the need for manual delivery of the placenta was 1.1% and 5.1% in the experimental and control groups, respectively, which was a significant difference (*p* = 0.034). The duration of placental delivery was 4.24 ± 3.27 min in the experimental group, which was significantly shorter than in the control group (10.66 ± 7.41 min) (*p* < 0.001). Hb level before labor was comparable in the experimental and control groups, 12.45 ± 0.78 g/dL and 12.49 ± 0.85 g/dL, respectively (*p* = 0.782). The Hb level 6 h after labor was higher in the experimental than the control group (12.32 ± 0.88 g/dL vs.

11.58 \pm 0.86 g/dL), but the difference was not significant ($p = 0.23$). Hb decrease after labor was less in the experimental than the control group (0.13 g/dL vs. 0.91 g/dL), but the difference was not significant. Also, the mean age of the participants did not differ significantly between the experimental and control groups (26 \pm 6.33 years vs. 25.57 \pm 5.62 years) ($p = 0.21$). However, with regard to mean gestational age at delivery, there was a significant difference: 38.47 \pm 1.47 weeks and 39.05 \pm 1.12 weeks in the experimental and control groups, respectively ($p = 0.03$). Considering parity, 87.7% of the experimental group and 87.8% of the control group were in first and second parity. Mean parity of the experimental and control groups was 1.47 \pm 0.70 compared with 1.49 \pm 0.69, which was not a significant difference ($p = 0.83$). Regarding drug side effects, only one case of nausea (1.1%) and one case of vomiting (1.1%) were observed in the experimental group, but there were no side effects noted in the control group (Table 1).

Discussion

The results of our study showed that intraumbilical vein injection of oxytocin was effective at shortening the duration of the third stage of labor and reducing the need for manual placental removal, but the impact on Hb concentration before and after delivery was not obvious.

Many studies that have agreed with ours have cited the effects of oxytocin injection on the duration of third-stage labor, indicating a positive effect in reducing the time for placental delivery or the third stage of labor [5,7–9]. The time interval for placental delivery recorded in the study of Dahiya et al was shorter than that in our two groups, which could probably be attributed to the greater amount of fluid injected (20 mL in their study vs. 1 mL in ours), thereby generating larger hydraulic and mechanical effects [5].

In contrast, in a study carried out in Bangkok, Thailand in 1995, the two groups did not show a significant difference in the third stage of labor [7]. The results of a study demonstrated that the intraumbilical vein Oxytocin injection versus normal saline group did not differ significantly with regard to spontaneous expulsion of the placenta within 45 minutes of delivery [10].

In a study carried out in Florida, USA, it was concluded that the duration of the third stage of labor was not significantly different between the groups receiving intravenous oxytocin or additional intraumbilical vein oxytocin on top of the intravenous dose. However, in the same hospital, another study conducted on 50 patients in March 1998 found that the duration of the third stage of labor was significantly shorter in the experimental group [11].

In the aforementioned studies [5,9], there was a significant fall in the mean postpartum Hb level, from 1.96 g/dL to 1.2 g/dL in the case and control groups, which showed a positive effect of intraumbilical vein oxytocin injection. The reason why our study did not show a similar positive effect on Hb change might be the active management of the third stage of labor for both groups with uterotonics and appropriate procedures.

We chose a waiting period of 30 min after fetal delivery before proceeding with manual placental removal. Some have recommended a time interval of 30 min [12], whereas others have stated a range of 15–60 min [13]. Many studies have focused on the effects of oxytocin injection in manual delivery of the placenta, and have reported using different doses and volumes and methods of infusion in patients with retained placenta [14,15–17]. In a systematic review, Carroli et al [6] have declared the positive effects of intraumbilical vein oxytocin injection. However, Sivalingam and Rogers have concluded that this kind of injection is not clinically useful for the removal of retained placenta [16,17] citing reasons like oxytocin passage to radial and uterine vein and not to capillaries to effect myometrial contraction and another with possible link to oxygenase activity [15]. Our study similar to that conducted by Gazvani et al showed the beneficial effects of intraumbilical oxytocin injection in reducing manual delivery of the placenta [10]. According to our results, the need for manual removal of the placenta was 1.1% and 5.1% in the case and control groups, respectively.

It seems that intraumbilical vein administration of oxytocin is an effective and practical method in shortening the duration of the third stage of labor and decreasing the rate of manual delivery of the placenta. However, the intervention does not produce a similar beneficial effect in significantly reducing Hb. Thus, further larger studies may be needed to address this issue.

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Table 1
Evaluated variables of the case and control group patients.

Variables	Cases		Controls		Total		<i>p</i>
Parity ^a	No.	%	No.	%	No.	%	
1	58	65.2	55	61.8	113	63.5	0.83
2	20	22.5	24	27	44	24.7	
3	11	12.4	10	11.2	21	11.8	
Need for manual placental removal ^a	Yes	1	1.1	8	9	5.1	
	No	88	98.9	81	91	94.9	0.034
Nausea and vomiting ^a	Yes	1	1.1	0	0	0.6	0.76
	No	88	98.9	89	100	99.4	
Mean preoperative Hb (g/dL) ^b	12.45 \pm 0.78		12.49 \pm 0.85				0.782
Mean postoperative Hb (g/dL) ^b	12.32 \pm 0.88		11.58 \pm 0.86				0.23
Difference in mean Hb (g/dL) ^b	0.13		0.91				—
Mean length time of placental separation (min) ^b	4.24 \pm 3.27		10.66 \pm 7.41				<0.001
Total	<i>n</i> = 89		<i>n</i> = 89				178

^a χ^2 test; ^b Independent sample *t* test.

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