
OBSTETRICS

Comparison of Unintended Uterine Extension between Cephalad-caudad and Transverse Blunt Expansion Techniques for Low Transverse Cesarean Delivery

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ABSTRACT

Objective: To compare the incidence of unintended uterine extension of low transverse uterine incision during cesarean delivery between cephalad-caudad and transverse techniques.

Materials and method: A prospective randomized controlled, hospital- based study in pregnant women who underwent low segment transverse cesarean delivery was conducted. Pregnant women were randomized to the cephalad-caudad direction and the transverse direction group. The incidence of unintended uterine extension was designed as a primary outcome.

Results: There were 500 pregnant women in the present study which half of them were cephalad-caudad and the others were transverse groups. The incidence of unintended uterine extension in cephalad-caudad technique did not statistically significant decrease comparing with transverse group (RR 0.57, 95% CI 0.32- 1.03). Uterine vessels injury and additional stitches were significantly lower in cephalad-caudad group (RR 0.40, 95% CI 0.22- 0.72 and RR 0.60, 95% CI 0.43- 0.85). Duration of uterine suture, operative time and estimated blood loss were not significant difference between the two groups.

Conclusion: The incidence of unintended uterine extension was not different between both techniques.

Keywords: blunt expansion, cesarean delivery, unintended uterine extension

Introduction

Cesarean delivery is the most common obstetric operative procedure and cesarean rate has been continuously increase⁽¹⁾. This procedure has different techniques to minimize morbidity and to reduce complications. However, these techniques are individually performed based on clinical recommendation without evidenced base.

Over 90% of cesarean deliveries performed at the lower uterine segment because it is easier to enter the uterine cavity with lesser blood loss comparing with vertical incision. Extension of uterine incision is perform with either scissors or bluntly tear of the uterine wall with the surgeon's fingers. Sharp expansion was significantly increase risk of intra-operative postpartum hemorrhage⁽²⁾ while as blunt expansion is faster and

lesser myometrial bleeding from its edge. However, by the circularly myometrium arrangement of lower uterine segment⁽³⁾, blunt expansion technique tend to increase the risk of accidental injury of uterine vessels and unintended uterine extension.⁽⁴⁾ Blunt separation by transverse direction could cause sacculation-type defect of uterine wall and increase risk of repeated cesarean section⁽⁵⁾. Alternatively, cephalad-caudad technique explains mechanical resistance of tissue at the lateral margin of the uterus to protect unintended uterine incision may be a better option for lower uterine separation.⁽⁶⁾ The objective of this study was to compare the blunt expansion of low transverse uterine between transverse and cephalad-caudad directions.

Materials and methods

This prospective randomized controlled trial was conducted between November 2009 and August 2010 at Khon Kaen Hospital, Khon Kaen. Inclusion criteria included pregnant women who underwent low-transverse cesarean delivery at 30 weeks of gestation or more. This is because the lower uterine segment is well formed. Exclusion criteria was placenta previa. Five-hundred and twenty-eight pregnant women were recruited.

Before enrollment to the study, all participants were informed and written informed consent were given. They were randomized to cephalad-caudad group and transverse groups by computer generated using block of 4 and 6 with allocation concealment by sequentially opaque envelopes.

Either Pfannenstiel or low midline skin incision was used depends on many factors including clinical situation and preference of the surgeons. Uterine incision was initiated using the scalpel to incise the lower uterine segment transversely for 1-2 cm. and bluntly extended of the incision was performed with the operator's fingers. In the cephalad-caudad group, the uterine incision was bluntly separated in vertical direction while the transverse group was bluntly widened laterally and slightly upward direction. The other steps of cesarean section was performed in an usual way in both groups. The uterine incision was closed with a continuous double layer technique and followed by

continuous non-locking closure of the rectus sheath with delayed absorbable suture. Subcutaneous fat was sutured with absorbable material and closed skin by staplers or other non absorbable sutures. All cases were done by experience operators who have performed cesarean delivery for more than 100 cases.

The phrase "unintended uterine extension" was defined as an accidental separated of any uterine wall defect more than 1 cm either break up to the fundus or cervical direction. "Uterine vessels injury" was defined as disruption of the uterine vessels which required suture repairing. "Need more additional stitches" was defined as any additional suture stitches after complete double layers uterine suture. "Excessive bleeding" was defined as estimated blood loss more than 1,000 ml.

Trained operators recorded intra-operative information immediately after finished operation (unintended extension, uterine vessel injury, additional stitches, satisfaction) but duration of uterine suture, operative time, estimated blood loss or the number of blood transfusion were recorded by masked anesthetic nurses. Hemoglobin level was evaluated before and 24 hours after cesarean delivery.

Incidence of unintended uterine extension was the primary outcome. The sample size calculation was based on previous study⁽⁶⁾ which the incidence of unintended extension was 7.4%. We used the mean difference between both groups at least 6% with $\alpha = 0.05$ and power of 80%. The sample required was 224 cases per group.

Statistical analysis was performed with SPSS 10.0 software. Mean (SD) was used to describe continuous data. Proportion (%) was used to describe categorical data. The student t-test and Chi-square test were used to analyze the continuous, categorical characteristics and the outcomes of interest, as required. Risk ratios (RR) and 95% confidence intervals (CI) were calculated. p-value was statistically significant if less than 0.05. The current study was approved by the Khon Kaen Hospital Ethics Committee.

Results

A total of 528 pregnant women were enrolled to the study. We excluded 17 cases of emergency

cesarean delivery because of no informed consent (17 hospital and 5 private cases) while 6 women refused to participate. Finally, 500 pregnant women were randomized into two groups; 250 women in each group (Fig. 1). The baseline demographic characteristics were similar between both groups (Table 1). Previous cesarean delivery was the most common indication for cesarean delivery (36.4%). Most of women were delivered in first stage of labor. Low midline skin incision was performed more often than Pfannenstiel incision in both groups.

Unintended uterine extension occurred in 16 (6.4%) in cephalad-caudad group and 28 (11.2%) in transverse group (RR 0.57, 95% CI 0.32- 1.03). Uterine vessels injury and additional stitches were significant lower in cephalad-caudad group compared with transverse group (RR 0.40, 95% CI 0.22- 0.72) and (RR 0.60, 95% CI 0.43- 0.85), respectively (Table 2). One pregnant woman in each group required inverted-T

incision for widening uterine incision.

Duration of uterine suture, total operative time and intra-operative blood loss were not different between both groups. Excessive blood loss was occurred in four cases. Three of the cephalad-caudad group were due to uterine atony. Two of them were multifetal deliveries and other needed cesarean hysterectomy due to excessive blood loss and severe uterine atony which failed medical and other surgical treatments. One case of excessive blood loss was found in transverse group because of the right uterine vessels injury and large hematoma.

Mean difference of hemoglobin level between before and at 24 hours after the operation was not different between both groups. Surgeon's satisfaction was also the same (Table 2).

Neonatal outcomes, birthweight and APGAR score at one and five minutes were not different between both groups (Table 3).

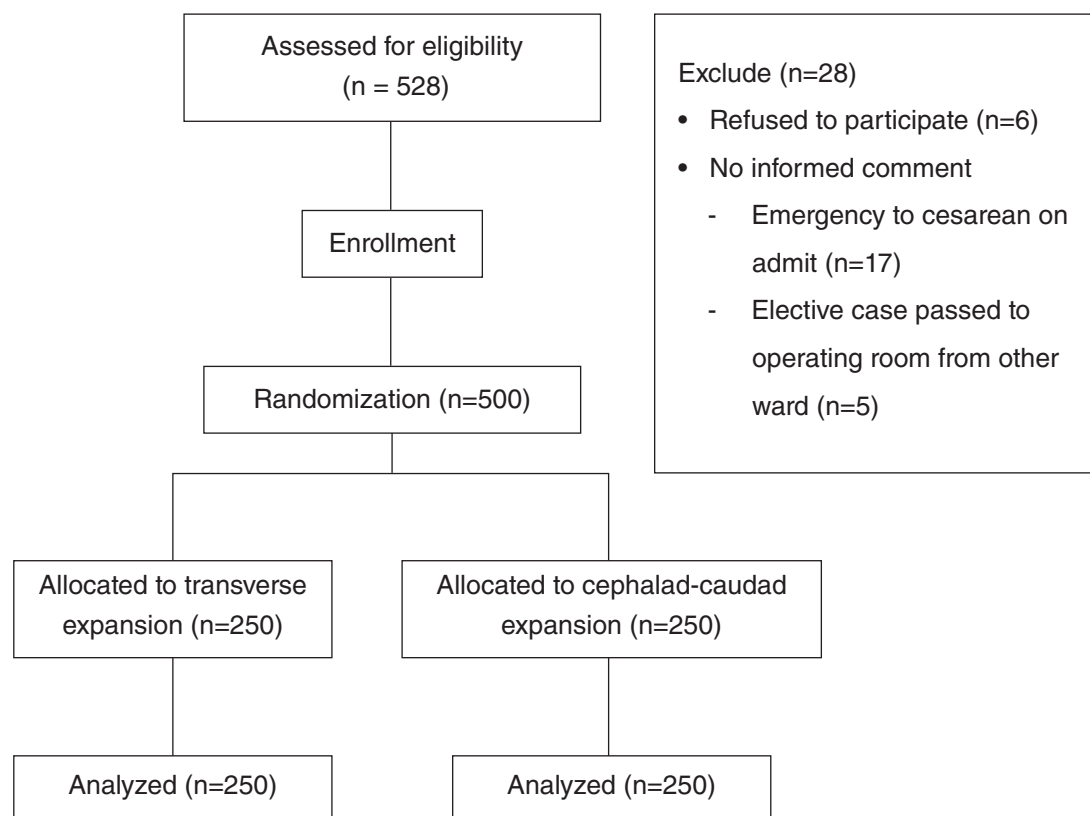


Fig. 1. Participant flowchart

Table 1: Demographic characteristics

Characteristics	Intervention	
	Cephalad-caudad group (n=250)	Transverse group (n=250)
Maternal age, yr, mean (SD)	26.3 (6.2)	26.4 (6.0)
GA*, wks, mean (SD)	38.5 (1.5)	38.2 (1.7)
BMI**, kg/m ² , mean (SD)	28.0 (3.7)	27.6 (3.5)
Stage of labor, n (%)		
Not in labor	54 (21.6)	58 (23.2)
First stage	163 (65.2)	164 (65.6)
Second stage	33 (13.2)	28 (11.2)
Indication for cesarean delivery, n (%)		
Malpresentation	42 (16.8)	31 (12.4)
Previous cesarean delivery	87 (34.8)	95 (38)
Cephalopelvic disproportion	79 (31.6)	77 (30.8)
Non-reassuring fetal heart rate	38 (15.2)	38 (15.2)
Others	4 (1.6)	9 (3.6)
Abdominal incision, n(%)		
Pfannenstiel	104 (41.6)	101 (40.4)
Low midline	146 (58.4)	149 (59.6)

* GA : Gestational Age

**BMI :Body Mass Index

Table 2: Outcome variables

Outcomes	Intervention		p-value
	Cephalad-caudad group (n=250)	Transverse group (n=250)	
Unintended extension, n (%)	16 (6.4)	28 (11.2)	0.058
Uterine vessel injury, n (%)	14 (5.6)	35 (14.0)	0.002*
Additional stitch, n (%)	43 (17.2)	71 (28.4)	0.003*
Estimated blood loss, ml mean (SD)	374.0 (272.00)	348.8 (132.69)	0.190
Duration of uterine suture, min mean (SD)	8.9 (4.38)	9.2 (5.95)	0.338
Total operative time, min mean (SD)	37.3 (13.96)	38.0 (14.28)	0.338
Decrease Hb level, g/dL mean (SD)	0.6 (0.75)	0.5 (0.68)	0.253
Operator's satisfactory, score 0-5 mean (SD)	4.1 (0.84)	4.1 (0.79)	0.598

* Significant difference

Table 3: Neonatal outcomes

Outcomes	Intervention		p-value
	Cephalad-caudad group (n=250)	Transverse group (n=250)	
Birth weight, mean (SD) gm	3047.6 (381.4)	3041.80 (412.52)	0.871
APGAR at 1 min \leq 7, n (%)	7 (2.8)	6 (2.4)	0.779
APGAR at 5 min \leq 7, n (%)	1 (0.4)	1 (0.4)	1.000

Discussion

Our results showed that blunt expansion with transverse technique associated with significantly higher uterine vessels injury and need more additional stitches comparing with cephalad-caudad technique. The incidence of unintended uterine extension was not different.

The conventional blunt expansion from medial to lateral (transverse technique) had higher incidence of extended incision through uterine vessels if the surgeon separated the incision too far apart⁽⁴⁾. The circularly transverse lining of muscle bundles can resist tissue dissection at the lateral margins providing force feedback to protect the uterine vessels injury when separation was performed in the vertical direction⁽⁶⁾. Additionally, vertical direction can avoid the accumulation of myometrium at the ends of uterine incision causing sacculum-type defects in the uterine wall⁽⁷⁾.

Unintended uterine extension was the primary outcome in this study. The incidence was comparable in both groups (11.2% vs. 6.4%), but higher compared with previous study⁽⁶⁾ (7.4% vs. 3.7%). This could be explained by the difference in definition of unintended uterine extension. We also included cases either with or without additional stitches.

The incidence of uterine vessel injury was statistically significant higher in transverse group than in cephalad-caudad group (14% vs. 5.6%). Cromi et al⁽⁶⁾ found that the incidence of uterine vessels injury was only 0.5% versus none in transverse and cephalad-caudad group. Since most of our pregnant women were in first stage of labor, the lower segment of uterus was thinner and softer than those without labor and easier

to separate too far, therefore this present study reported higher incidence than Cromi et al's report because they performed cesarean delivery after labor. This reason could also explain the higher incidence of additional stitches when compared with previous because of higher incidence of study unintended uterine extension and uterine vessel injury.

Estimated blood loss was not difference in both groups. In detail, we found three cases of cephalad-caudad group with postpartum hemorrhage due to uterine atony. Two of them were twins delivery and the other one needed cesarean hysterectomy because of severe uterine atony. Although in transverse group had only one case with postpartum hemorrhage due to tear uterine vessels and large hematoma. This could be prevented by proper surgical technique.

According to American Collage of Obstetricians and Gynecologists (ACOG)⁽⁸⁾, when the pregnant women decrease of hemoglobin level more than 10% during admission to postpartum period they will need blood transfusion. In our study, only 3 cases needed blood transfusion (0.6%).

The length of lower uterine segment was studied by ultrasound vary from 0.5 cm at 20 weeks' gestation, to 1 cm at 28 weeks, and 4 cm at 34 weeks⁽⁹⁾. Therefore, we decided to exclude the pregnant women who had gestational age less than 30 weeks due to poorly formed the lower uterine segment and insufficient space for low-transverse incision, particularly women without labor.

The limitation of this study was unable to blind the operators who performed the operations and evaluated the outcome. The standardized surgical

steps, strictly criteria of defining unintended uterine extension and no drop out of the participants were our strong points.

Although there was no difference in the incidence of unintended incision, we suggested that cephalad-caudad technique could be safely performed because of its, simplicity, low expense and high operator's satisfaction. Further studies are needed to evaluate postoperative complications such as pain, infection were not difference.

In conclusion, the incidence of unintended uterine extension cephalad-caudad and transverse techniques for blunt uterine expansion of the low transverse cesarean delivery were not difference.

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การฉีกมดลูกในแนวตั้งกับแนวนอนในการผ่าตัดคลอด

สุกานดา มหาวิวัฒน์, รุ่งฤดี จีระทรัพย์

วัตถุประสงค์ : เพื่อศึกษาอุบัติการณ์การเกิดแผลที่ไม่ตั้งใจ เมื่อฉีกมดลูกในแนวตั้งเปรียบเทียบกับแนวนอนในการผ่าตัดคลอด

วัสดุและวิธีการ : เป็นการศึกษาแบบ Prospective randomized controlled trial ในสตรีตั้งครรภ์ที่เข้ารับการผ่าตัดคลอด แบ่งเป็นกลุ่มฉีกมดลูกในแนวตั้งและแนวนอน โดยศึกษาอุบัติการณ์การเกิดแผลที่ไม่ตั้งใจ

ผลการวิจัย : สตรีตั้งครรภ์ 500 คน โดยแบ่งเป็นกลุ่มศึกษาละ 250 คน ไม่มีความแตกต่างอย่างมีนัยสำคัญในอุบัติการณ์การเกิดแผลที่ไม่ตั้งใจ (RR 0.57, 95% CI 0.32- 1.03) พบการฉีกขาดของ uterine vessels และการเย็บมดลูกเพิ่มลงในกลุ่มฉีกแนวตั้งอย่างมีนัยสำคัญ (RR 0.40, 95% CI 0.22- 0.72 และ RR 0.60, 95% CI 0.43- 0.85) โดยที่ทั้งสองวิธีระยะเวลาการเย็บมดลูก การเสียเลือดระหว่างการผ่าตัดทั้งสองกลุ่มไม่ต่างกัน

สรุป : ไม่มีความแตกต่างในการการเกิดแผลที่ไม่ตั้งใจในกลุ่มฉีกมดลูกในแนวตั้งและแนวนอน