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การลงแผลผ่าตัดแนวขวางที่ยอดมดลูกระหว่างการผ่าตัดคลอดและตัดมดลูกสำหรับสตรีที่มีภาวะรกเกาะแน่นผิดปกติ

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Transverse Uterine Fundal Incision During Cesarean Hysterectomy for Women with Placenta Accreta Spectrum Disorder

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บทคัดย่อ

หลักการและวัตถุประสงค์: การลงแผลผ่าตัดแนวขวางที่ยอดมดลูก (transverse uterine fundal incision) ถูกแนะนำให้ใช้สำหรับสตรีที่มีภาวะรกเกาะแน่นผิดปกติ (placenta accreta spectrum disorder) การศึกษานี้ประเมินความเป็นไปได้ของการลงแผลผ่าตัดรูปแบบนี้โดยเปรียบเทียบกับการลงแผลผ่าตัดแบบ classical incision ซึ่งเป็นการลงแผลแนวตั้งที่ตัวมดลูก

วิธีการศึกษา: เป็นการศึกษาแบบตามรุ่นย้อนหลัง (retrospective cohort study) ซึ่งทบทวนเวชระเบียนของสตรีตั้งครรภ์ที่มีภาวะรกเกาะแน่นผิดปกติและได้รับการตัดมดลูกออกระหว่างการผ่าคลอด (cesarean hysterectomy) ที่คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น ระหว่างเดือน มกราคม พ.ศ. 2558 ถึงเดือนธันวาคม พ.ศ. 2564 ข้อมูลที่ต้องการ ได้แก่ ลักษณะพื้นฐาน (ความรุนแรงของโรค ชนิดแผลผ่าตัด ชนิดของการผ่าตัดมดลูก) และผลลัพธ์ของมารดาและทารก

ผลการศึกษา: สตรีจำนวน 32 และ 15 รายได้รับการลงแผลผ่าตัดแนวขวางที่ยอดมดลูกและแผลแนวตั้งที่ตัวมดลูก ตามลำดับ สัดส่วนของสตรีที่มีแผลผ่าตัดแนวขวางที่ยอดมดลูกพบรอยโรคของรกเกาะแน่นระยะที่ 3 สูงกว่าสตรีที่มีแผลผ่าตัดแนวตั้งที่ตัวมดลูก (ร้อยละ 75.0 และ 66.7 ตามลำดับ) เมื่อเปรียบเทียบกับกลุ่มที่มีแผลผ่าตัดแนวตั้งที่ตัวมดลูก แม้ว่าสตรีในกลุ่มแผลผ่าตัดแนวขวางที่ยอดมดลูกจะมีระยะเวลาผ่าตัดยาวนานกว่า (215 และ 160 นาที ตามลำดับ) แต่อัตราการได้รับเลือดปริมาณมาก (massive blood transfusion) กลับต่ำกว่า (ร้อยละ 28.1 เปรียบเทียบกับร้อยละ 46.7) การศึกษานี้ไม่พบความแตกต่างอัตราการรับไว้ที่หอผู้ป่วยวิกฤตสำหรับทารกของทั้งสองกลุ่ม แต่ทารกที่คลอดจากสตรีในกลุ่มแผลผ่าตัดแนวขวางที่ยอดมดลูกจะมีโอกาสที่จะเกิดภาวะขาดออกซิเจนแรกเกิด (birth asphyxia) ต่ำกว่า (ร้อยละ 15.6 เปรียบเทียบกับร้อยละ 26.7)

สรุป: การลงแผลผ่าตัดแนวขวางที่ยอดมดลูกการผ่าตัดคลอดและตัดมดลูกในภาวะรกเกาะแน่นผิดปกติมีความเป็นไปได้ทางคลินิก เนื่องจากไม่ได้ส่งผลเสียต่อผลการผ่าตัด

คำสำคัญ: แผลผ่าตัดแนวขวางที่ยอดมดลูก, แผลแนวตั้งที่ตัวมดลูก, ภาวะรกเกาะแน่นผิดปกติ

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Abstract

Background and Objective: Transverse uterine fundal (TUF) incision, a transverse incision made in the uterine fundus, has been proposed for women with placenta accreta spectrum (PAS) disorder. This study assessed the feasibility of TUF incision compared with classical incision (a midline vertical uterine incision).

Methods: This retrospective cohort study reviewed medical records of pregnant women with PAS disorder undergoing cesarean hysterectomy during January 2015 to December 2021 at Faculty of Medicine, Khon Kaen University. Abstract data included baseline characteristics (i.e. PAS grading, types of uterine incision, hysterectomy technique) and maternal and neonatal outcomes.

Results: Thirty-two and fifteen women underwent TUF incision and classical incision, respectively. There was a higher proportion of women in TUF group who had grade 3 PAS than those in classical incision group (75.0% versus 66.7%, respectively). Compared to women undergoing classical incision, although women undergoing TUF incision carried longer operative time (215 min versus 160 min), the rate of massive transfusion were lower (28.1% versus 46.7%). The rate of admission to neonatal intensive care unit were comparable between the two groups. Neonates born to mothers who underwent TUF incision were less likely to experience birth asphyxia (15.6% versus 26.7%).

Conclusion: TUF incision performed during cesarean hysterectomy for PAS disorders appeared to be clinically feasible as it did not increase adverse perioperative outcomes.

Keywords: transverse uterine fundal incision, classical uterine incision, placenta accreta spectrum

Introduction

Placenta accreta spectrum (PAS) disorder is a condition in which the placenta is unable to deliver after second stage of labor due to abnormally invasive placentation.[1] The major risk factor associated with PAS is a previous cesarean delivery (CD).[1] In a secondary analysis of World Health Organization Multicountry Survey on Maternal and Newborn Health assessing 173,124 multiparous women, women with previous CD were 2.6 times more likely to encounter PAS in their subsequent pregnancies compared to those without history of CD.[2] As worldwide rates of CD have been on the rise, a substantial increase in the incidence of PAS is anticipated.[3-5]

PAS mostly occurs along with placenta previa.[1] The recommended route of delivery for women with PAS diagnosed prenatally is a planned CD. As the incision in the uterus made during CD should avoid the placenta, abnormal placentation occurring in PAS disorders often makes a nontraditional uterine incision imperative.[6]

Transverse uterine fundal (TUF) incision, an incision that made transversely in the uterine fundus, has been proposed for PAS to avoid catastrophic hemorrhage secondary to transecting the placenta.[7,8] In a case series reported by Kotsuji et al[8] who assessed 34 pregnant women undergoing CD for anterior placenta previa with clinically suspected PAS, TUF incision may lessen the risk of maternal perioperative complications.

The present study was undertaken to assess the feasibility of TUF incision for PAS with comparison with a midline vertical uterine incision (classical incision), the commonly used uterine incision for pregnancy complicated by abnormal placentation.[9]

Materials and Methods

This retrospective cohort study was conducted at Faculty of Medicine, Khon Kaen University, Thailand. Records of women who were antenatally diagnosed with PAS disorder undergoing cesarean hysterectomy during January 2015 to December 2021 were reviewed . The study protocol was approved by the Khon Kaen University Ethics Committee for Human Research (HE661410).

Abstract data included baseline characteristics (i.e. gestation age, comorbidity, PAS grading), surgical procedure characteristic (i.e. types of uterine incision, hysterectomy technique, preoperative intervention), and maternal and neonatal outcomes. Prolonged intensive care unit (ICU) stay was defined as a total duration of ICU stay of 3 days or more postoperatively, including ICU readmissions.[10] Massive transfusions was defined as transfusion of ≥5 units of blood or packed red cells.[11] Data of women undergoing transverse uterine fundal incision was compared to those who underwent classical uterine incision.

TUF incision was performed as described by Kotsuji et al[8]. Briefly, a sharp transverse incision is made in the uterine fundus until the uterus was entered. The incision site was opened with fingers wide 12-14 cm to allow fetal delivery without difficulty. The membranes, bulging through the incision, were artificially ruptured (Figure 1). The infant was grasped and delivered. Uterine incision was immediately closed with interrupted sutures to achieve hemostasis. The placenta was left in situ while hysterectomy was carried out.

In our institution, women with PAS were managed by multidisciplinary surgical team. Cesarean hysterectomy was performed by gynecologic oncologists. Prophylactic pre-operative ureteric catheter insertion or surgical hemostatic procedures (i.e. hypogastric arterial ligation, arterial embolization) may be performed based on surgeon preferences.

Baseline maternal and neonatal characteristics, and operative outcomes were summarized as number (percentage), mean and standard deviation, or median and interquartile range, as appropriate. To determine the difference of patients' characteristics across the comparison groups (TUF incision vs. classical incision), we applied the Fisher's exact test or the Chi-squared test for categorical variables and the Student's t-test or Mann-Whitney U test for continuous variables. Statistical analyses were performed with STATA version 15.1 (StataCorp LLC, College Station, TX, USA)

1A 1B

Figure 1 Transverse uterine fundal incision. A sharp transverse incision is made in the uterine fundus until the uterus was entered (1A). The membranes, bulging through the incision (1B)

Results

This study reviewed medical records of 47 women who were eligible for study inclusion. One woman was pregnant with twins. Almost (46 women; 97.9%) had previous history of CD. Thirteen women (27.7%) had previous history of uterine curettage. Thirty-two and fifteen women underwent TUF incision and classical incision, respectively. Table 1 displays the baseline characteristics of women included in this study stratified by the type of uterine incision performed. There was a higher proportion of women in TUF incision group who had grade III PAS than those in classical incision group (75.0% versus 66.7%, respectively).

The majority of women (37 women; 78.7%) underwent total hysterectomy. Preoperative ureteric catheter insertion was performed in 31 women (66.0%). Preoperative arterial embolization was performed in 25 women (53.2%). Table 2 shows surgical characteristics stratified by the type of uterine incision performed. There was a higher proportion of women in TUF incision who underwent total hysterectomy than those in classical incision group (81.3% versus 73.3%, respectively).

Compared to women undergoing classical uterine incision, although women undergoing TUF incision carried longer operative time (215 min versus 160 min, respectively), nevertheless, the amount of estimated blood loss and rate of massive transfusion among women undergoing TUF incision were lower (Table 3, Figure 2). The rates of prolong ICU stay and surgical site infection were slightly higher among women in TUF incision (12.5% versus 6.7% and 18.8% versus 13.3%, respectively). The rate of urinary bladder injury was comparable between the two comparison groups (15.6% versus 13.3%).

Table 4 reports the neonatal outcomes. Mean birthweight and rate of admission to neonatal intensive care unit were comparable between the two groups. Neonates born to mothers who underwent TUF incision were less likely to experience birth asphyxia determined by Apgar score at 5 minutes following delivery.

Table 1 Baseline clinical characteristics

Characteristics	All women (n=47) N (%)	Type of uterine incision		p-value
		Transverse fundal incision (n=32) N (%)	Classical incision (n=15) N (%)	
Mean maternal age, SD (years)	33.5 (4.3)	34.2 (4.2)	32.1 (4.3)	0.135
Median GA, IQR (weeks)	34 (33 – 36)	34 (33 – 36)	35 (32 – 36)	0.954
Previous CD	46 (97.9)	31 (96.9)	15 (100.0)	1.000
Previous uterine curettage	13 (27.7)	11 (34.4)	2 (13.3)	0.175
Co-morbidities				
DM	7 (14.9)	4 (12.5)	3 (20.0)	0.664
Obesity	3 (6.4)	3 (9.4)	0 (0.0)	
Severe preeclampsia	1 (2.1)	1 (3.1)	0 (0.0)	
Advanced age	9 (19.1)	7 (21.9)	2 (13.3)	
Fetal omphalocele	1 (2.1)	1 (3.1)	0 (0.0)	
Hypothyroid	1 (2.1)	1 (3.1)	0 (0.0)	
Polyhydramnios	1 (2.1)	1 (3.1)	0 (0.0)	
Twins	1 (2.1)	1 (3.1)	0 (0.0)	
FIGO category of PAS				
Indefinitive	1 (2.1)	1 (3.1)	0 (0.0)	0.257
NO PAS	3 (6.4)	2 (6.3)	1 (6.7)	
Grade I	6 (12.8)	2 (6.3)	4 (26.7)	
Grade II	3 (6.4)	3 (9.4)	0 (0.0)	
Grade III	34 (72.3)	24 (75.0)	10 (66.7)	

Data are presented as number (percentage) unless stated otherwise

SD, standard deviation; IQR, interquartile range; GA, gestational age; CD, cesarean delivery; DM, diabetic mellitus; FIGO, the *International Federation of Gynecology and Obstetrics;* PAS, placenta accrete spectrum

Table 2 Baseline surgical characteristics

Characteristics	All women (n=47) N (%)	Type of uterine incision		p-value
		Transverse fundal incision (n=32) N (%)	Classical incision (n=15) N (%)	
Operative setting				
Elective	34 (72.3)	25 (78.1)	9 (60.0)	0.295
Emergency	13 (27.7)	7 (21.9)	6 (40.0)	
Type of abdominal incision				
Low-transverse	3 (6.4)	2 (6.3)	1 (6.7)	1.000
Midline	44 (93.6)	30 (93.8)	14 (93.3)	
Type of hysterectomy				
Total hysterectomy	37 (78.7)	26 (81.3)	11 (73.3)	0.704
Supracervical hysterectomy	10 (21.3)	6 (18.8)	4 (26.7)	
Performing prophylactic pre-operative ureteric catheter insertion	31 (66.0)	25 (78.1)	6 (40.0)	0.023
Performing prophylactic hypogastric ligation	5 (10.6)	1 (3.1)	4 (26.7)	0.009
Performing prophylactic arterial embolization	25 (53.2)	18 (56.3)	7 (46.7)	0.388

Data are presented as number (percentage)

Table 3 Maternal outcomes

Characteristics	All women (n=47) N (%)	Type of uterine incision		p-value
		Transverse fundal incision (n=32) N (%)	Classical incision (n=15) N (%)	
Median operative time, IQR (minutes)	210 (135 – 275)	215 (145 – 280)	160 (118 – 235)	0.209
Median estimated blood loss, IQR (mL)	1,000 (500 – 2,500)	1,000 (575 – 2,250)	1,500 (500 – 4,000)	0.672
Massive transfusion (≥ 5 units of PRC)	16 (34.0)	9 (28.1)	7 (46.7)	0.211
Prolong ICU stay (> 3 days)	5 (10.6)	4 (12.5)	1 (6.7)	1.000
Bladder injury	7 (14.9)	5 (15.6)	2 (13.3)	1.000
Postoperative febrile morbidity	1 (2.1)	0 (0.0)	1 (6.7)	0.319
Surgical site infection				
Superficial	8 (17.0)	6 (18.8)	2 (13.3)	1.000
Deep	0 (0.0)	0 (0.0)	0 (0.0)	

Data are presented as number (percentage) unless stated otherwise

IQR, interquartile range; PRC, packed red cell; ICU, intensive care unit

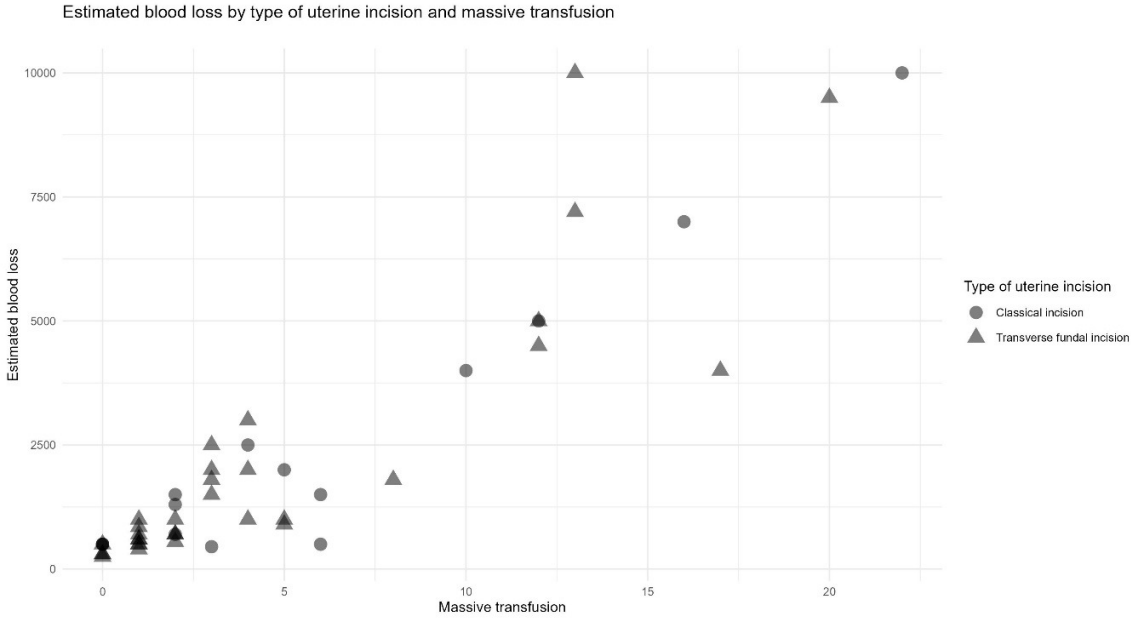

Figure 2 Estimated blood loss and massive blood transfusion by type of uterine incision

Table 4 Neonatal outcomes

Characteristics	All neonates (n=48) N (%)	Type of uterine incision		p-value
		Transverse fundal incision (n=33) N (%)	Classical incision (n=15) N (%)	
Birthweight; mean (SD) [a]	2291.9 (522.2) g	2,312.4 (514.9) g	2,248.3 (553.2) g	0.700
Apgar score at 5 minute <7 [a]	9 (19.2)	5 (15.6)	4 (26.7)	0.438
Admission to NICU	28 (58.3)	19 (57.6)	9 (60.0)	0.875

Data are presented as number (percentage) unless stated otherwise
SD, standard deviation; NICU, neonatal intensive care
[a] data was not available in one record

Discussion

PAS is one of the most devastating complications in the current obstetrics practice. A planned CD, followed by hysterectomy is a standard approach for pregnancy complicated by PAS disorders. A uterine incision made during operation should be made in an area where there is no placenta. Therefore, TUF incision would be an ideal uterine incision for PAS as it can lessen the risk of transecting the placenta during operation. However, TUF incision generally require a mid-line incision during abdominal approach and is made by incising through the thickest portion of uterus, concerns thus have been raised regarding whether this procedure increase perioperative morbidity, particularly perioperative bleeding complication.

In this study, various perioperative outcomes of pregnant women with PAS disorder who underwent TUF incision were determined and compared to women undergoing classical uterine incision. To our knowledge, this is the first study assessing outcomes of TUF incision compared to a classical uterine

incision, a traditionally used uterine incision in cases with abnormal placentation.

Compared to those in classical uterine incision group, women who underwent TUF incision experienced longer operative time (Table 3). The longer operative time among women undergoing TUF incision might be due to the higher rate of total hysterectomy performed in this group. Although the operative time among women in TUF incision group was longer than that in women undergoing classical uterine incision, the amount of blood loss and rate of massive transfusion were lower. The results of this study may indicate that TUF incision is clinically feasible as it does not increase risk of perioperative bleeding complication. Nevertheless, the rates of prolong ICU stay and surgical site infection was slightly higher among women in TUF incision. These findings merit further assessment regarding whether they were related to TUF incision.

Previous study noted an association between the extent of myometrial involvement and risk of perioperative bleeding complication during surgical management of PAS disorder.[12] Interestingly, despite a higher proportion of women in the TUF incision group in this study was diagnosed with grade 2-3 PAS, risk of bleeding complication did not increase. Our finding therefore may reaffirm the safety of TUF incision in term of no increase in the risk of perioperative bleeding complication even among those who had PAS with extensive myometrial involvement.

It should be noted that, in this study, TUF incision was performed during CD followed by hysterectomy. The favorable results of TUF incision therefore could not be extrapolated to those who underwent TUF incision during uterus-preserving surgery for PAS disorder. There was a report of uterine rupture in a pregnant woman who underwent TUF incision during her previous CD.[13] The pregnant woman in this report suffered from cardiac arrest and multi-organ dysfunctions following catastrophic hemorrhage due to uterine rupture.[13] TUF incision results in a large defective uterine scar in the contractile portion of the uterus, risk of uterine rupture in subsequent pregnancy thus may be higher than that noted in other types of uterine incision. TUF incision for CD among women who desire future fertility therefore should be used with caution.

This study was conducted in Tertiary Hospital. All cases were managed by multidisciplinary care team. Operations were performed by gynecologic oncologist. More than half of pregnant women underwent ureteric catheter insertion and prophylactic uterine artery embolization. Despite all these efforts, the rate of adverse maternal outcomes remained high. Approximately one-third of the cases experienced massive blood transfusion. Urinary bladder injury during hysterectomy was noted in approximately 15% of the cases. Pregnant women with suspected PAS therefore should be managed by a multidisciplinary team in a specialist center to improve outcomes.[14]

Some limitations of this study are worthy of consideration. First, sample size of women included in this study was relatively small. The small sample size however was secondary to the rarity of PAS disorder. In the recent literature, incidence of PAS is approximately 3 per 1,000 deliveries.[14] Second, data regarding time from uterine incision performed to delivery of the fetus which might directly indicate the time needed in delivering the fetus by each incision technique, were not routinely recorded in our hospital. Third, all cases in this study were managed by multidisciplinary care team in a specialist center. Extrapolation of these findings to settings of different facilities may be limited. In spite of these limitations, our study is the first to determine the feasibility of TUF incision among women undergoing CD, followed by hysterectomy for PAS compared to a classical uterine incision, a traditionally used uterine incision in cases with abnormal placentation.

Conclusion

TUF incision performed during CD, followed by hysterectomy for PAS disorders seemed to be feasible as this procedure did not increase risk of perioperative complication when compared to a classical uterine incision.

Author contributions

Conceptualization; Methodology; Formal analysis; TP and CK, Resources: Data curation; CK, Writing—original draft; TP and CK, Writing—review & editing; Supervision; CK, Project administration: CK

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Conflict of interest statement

The authors report no conflict of interest.

Data availability statement

Research data available on request from the authors.

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