Post-Cesarean Pain Associated with Skin Incision: Vertical versus Pfannenstiel

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Objective: *The purpose of the present study was to determine post-cesarean pain in elective vertical cesarean delivery compared to Pfannenstiel incision.*
Material and Method: *This was the secondary data analysis from the primary study investigating the additional post-cesarean analgesia between ketorolac and meperidine. Parturients who had scheduled for elective cesarean delivery were recruited. All parturients underwent elective cesarean section via spinal anesthesia. Visual analogue scale (VAS) was used to evaluate postoperative pain at 3, 6, 12 and 24 hours. Rescue analgesia using either ketorolac or meperidine was applied when VAS was equal or more than 6. Type of skin incision was re-analyzed and compared to other parameters.*
Results: *A total of 580 pregnant women were recruited in the present study. There were 276 and 304 cases in vertical and Pfannenstiel groups, respectively. Both groups showed no statistical significant among body mass index, parity, gestation age, estimated blood loss, birth weight, history of prior cesarean delivery and underlying diseases. In primary cesarean delivery, VAS of vertical group was higher than Pfannenstiel group at 3, 12 and 24 hours after surgery. In repeated cesarean delivery, VAS of Pfannenstiel group was higher than vertical group at 6 and 12 hours after operation. There was no side effect, i.e., nausea, vomiting, itching, respiratory depression and allergic reactions, in the present study.*
Conclusion: *The postoperative pain after elective cesarean delivery of both vertical and Pfannenstiel incision were comparable.*

Keywords: *Cesarean section, Vertical incision, Pfannenstiel incision, Pain*

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Cesarean delivery is now a major surgery for modern obstetrics. Vertical and Pfannenstiel incisions are the choices for laparotomy. Pfannenstiel incision was the most frequently chosen incision for a good cosmetic result and low fascial wound dehiscence incidence[1]. However, vertical incision was commonly used especially in the parturient who needed the rapid neonatal delivery, high risk of infection and possible incision extension.

Pfannenstiel incision was popular with a long-held belief that it's after effect was less painful than that of the vertical incision[1]. However, only few studies compared postoperative pain between the two incision types and did not support the long-held belief[2,3]. There was no report that compared postoperative pain after cesarean delivery between two incisions in elective setting.

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Material and Method

This was the secondary data analysis from the primary study investigating the additional post-cesarean analgesia between ketorolac and meperidine. This prospective double-blind randomized controlled trial was approved by the Ethic Committee, Faculty of Medicine, Thammasat University. This study was conducted in Thammasat University Hospital. Pregnant women aged between 18 to 40 years old who had schedule for elective cesarean delivery between March and August 2016 were recruited in the present study. Written inform consent was signed after each patients counseling. The subjects who had underlying diseases, i.e., cardiovascular or renal disease, on anticoagulants, BMI (body mass index) >30 kg/m^2, immediate explore laparotomy within 24 hours postoperatively or refused

to participate in the present study, were excluded from this study. Demographics data including age, BMI, occupation, education, underlying diseases, parity, gestational age, history of cesarean section and skin incision type were all recorded.

All participants were divided into vertical and Pfannenstiel incision group. The choice of incision was discussed and chosen by together agreement before surgery. In case of prior cesarean section, the same incision was routine selected. Both groups underwent elective cesarean delivery via spinal anesthesia. The standard dose of anesthetic agent in study was 11 mg bupivacaine in a hyperbaric solution with the addition of 0.2 mg morphine via spinal anesthesia. Anesthesiologist staffs or supervised anesthesiology residents took responsibility of the anesthetic procedure.

Postoperative pain level was assessed by asking question followed by visual analog scale (VAS) (0 = no pain, 10 = worst possible pain). It was evaluated at 3, 6, 12 and 24 hours after surgery.

Five hundred milligrams of acetaminophen was orally administered every 6 hour if the VAS was equal or less than 5. When the VAS score was equal or greater than 6, the rescue intravenous analgesia was administered per protocol (ketorolac or meperidine). Pain assessment was continuously collected until 24 hour after surgery. Possible side effects, i.e., nausea, vomiting, itching, respiratory depression and allergic reactions, were also recorded.

Data were analyzed by using commercial statistical software SPSS (Chicago, IL, USA) version 17 for windows. Mean and standard deviation were used for continuous demographic data. Fisher's exact test or student's t-test was used for two groups' comparative statistics. Level of statistical significance was set at *p*-value less than 0.05.

Results

A total of 580 pregnant women who met the study criteria were recruited in this study. There were 276 and 304 cases in vertical and Pfannenstiel groups, respectively. Participants who had a Pfannenstiel incision were average 3 years older than vertical incision group.

Two third and one third of vertical and Pfannenstiel incision groups were daily employee, respectively. One third of both groups had education level of bachelor degree or higher. In education less than bachelor level, Pfannenstiel group had higher education level than vertical group with statistical different as presented in Table 1. While high school or lower education level was found in vertical than Pfannenstiel incision group.

Both groups showed no statistical significant among body mass index, parity, gestation age, estimated blood loss, birth weight, history of prior cesarean delivery and underlying diseases (Table 1).

After three hour postoperative period, around ten percent of vertical and Pfannenstiel incision group with VAS equal or more than six requested and received additional analgesia per protocol. The remained cases who had VAS equal or less than five was represented in Fig. 1 and 2. The subjects in both groups who underwent primary and repeat C/S with low pain (VAS $\leq$5) were showed in Fig. 3 and 4.

VAS of subjects who had pain score equal or less than 5 (low pain) was represented in Fig. 2. Both study and control groups in low pain category had no significant difference in their postoperative pain. Among primary cesarean delivery cases, VAS of vertical group was higher than Pfannenstiel group at 3, 12 and 24 hours after surgery with statistical different as represented in Fig. 3. While repeat cesarean delivery cases, VAS of Pfannenstiel was higher than vertical incision group at 6 and 12 hours after operation as shown in Fig. 4. There was no side effect, i.e., nausea, vomiting, itching, respiratory depression and allergic reactions, in the present study.

Discussion

The choice of abdominal incision was normally chosen by the attending physician based on adequacy of operative site's exposure for surgery, previous surgical scar and cosmetic result[1]. Cesarean delivery was normally performed in either elective or emergency condition. This study conducted in elective cesarean cases for controlling other cofactors.

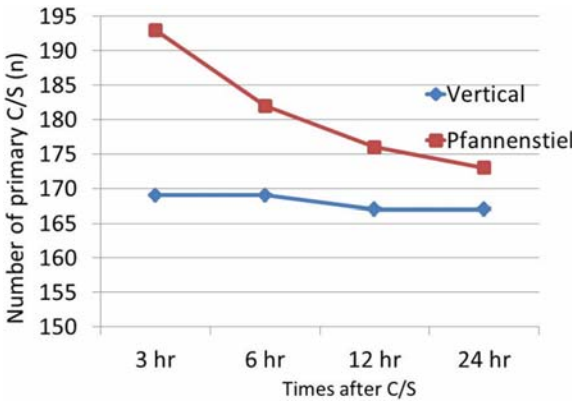
The strength of this study was the number of cases underwent elective cesarean delivery in a single university hospital during the study period. The limitation of this study was the secondary analysis from primary study that recruiting the subjects randomly for rescues analgesia after surgery.

The advantages of Pfannenstiel incision (transverse skin incision) were good cosmetic result and low incisional hernia incidence[1]. Vertical incision (low midline) was still a common practice in modern obstetrics, especially in emergency or difficult conditions. It gave a rapid abdominal entering and fast fetal delivery. However, the choice of abdominal incision depended on the surgeon's belief or past

Table 1. Demographic character of participants

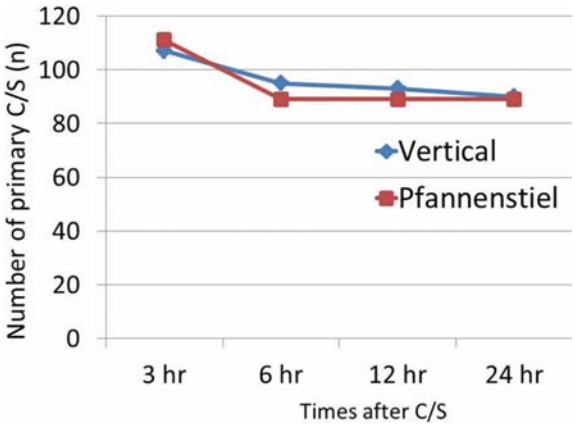
	Vertical (n = 276)	Pfannenstiel (n = 304)	*p*-value
Age (year)	30.9±4.8	33.0±5.1	<0.001
Height (cm)	157.1±6.0	159.2±5.4	0.27
Weight (kg)	65.5±7.1	66.1±5.9	<0.001
BMI (kg/m^2)	26.5±2.2	26.1±2.0	0.02
Occupation (%)			
Government officer	23.5	29.3	0.119
Daily employer	59.8	35.2	<0.001
Own business	13.8	27.9	<0.001
Other	2.9	7.6	0.013
Education (%)			
High school or less	25.4	7.9	<0.001
Under graduated	35.1	56.9	<0.001
Bachelor	39.5	35.2	0.285
Underlying diseases (%)*	5.4	8.9	0.46
History of C/S (%)	43.5	37.8	0.17
Parity			<0.001
Nulliparous	73	123	
Multiparous	203	181	
GA (week)	37.9±0.5	37.9±0.5	0.79
EBL (ml)	418.7±144.2	418.1±144.5	0.57
BW (g)	3,180.2±249.4	3,205.1±253.9	0.24

* Diabetes mellitus, hypertension, anemia, heart disease
BMI = body mass index; C/S = cesarean delivery; GA = gestation age; EBL = estimate blood loss; BW = birth weight



C/S = cesarean delivery; VAS = visual analog scale

Fig. 1 Number of primary C/S cases who had VAS ≤5.



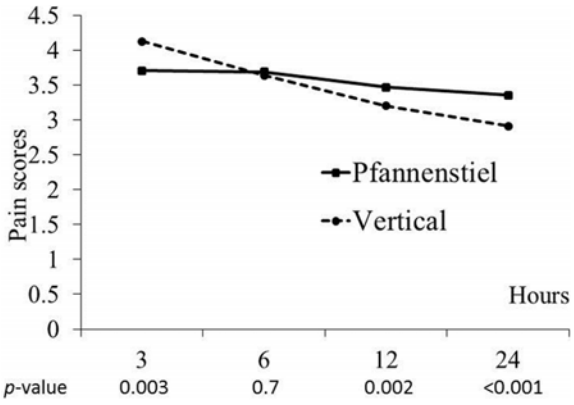
C/S = cesarean delivery; VAS = visual analog scale

Fig. 2 Number of repeat C/S cases who had VAS ≤5.

experience. Dandolu et al reported that 77 percent of obstetrics resident in US hospital used Pfannenstiel incision for urgent/emergency cesarean sections[4].

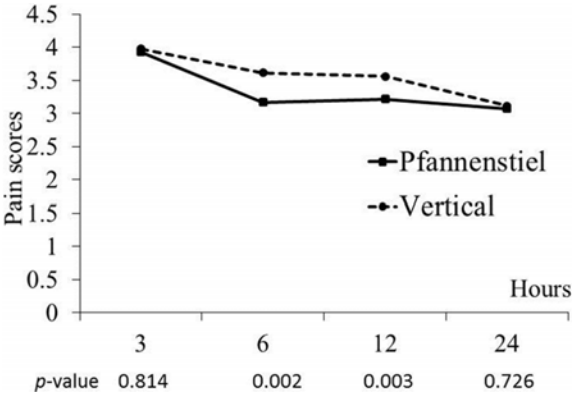
In year 2010, the large study from Wylie et al from USA reported that the vertical skin incision shortened median incision-to-delivery intervals by 1 and 2 minute in primary and repeated emergency cesarean delivery, respectively[5]. The neonatal outcome of vertical skin incision in Wylie's work was not better than Pfannenstiel group. The present study enrolled both primary and repeat elective cesarean cases. Both Wylie's and our work showed that both skin incisions had equal neonatal outcomes.

Hendrix et al from USA conducted a large case



C/S = cesarean delivery; VAS = visual analog scale

Fig. 3 Mean VAS of primary C/S cases who had VAS ≤5.



C/S = cesarean delivery; VAS = visual analog scale

Fig. 4 Mean VAS of repeat C/S cases who had VAS ≤5.

of controlled study that enrolled 8,950 cesarean deliveries. The incidence of fascial dehiscence of vertical incision was not higher than that of Pfannenstiel (6). Hendrix's literature did not support the long long-held belief that Pfannenstiel incision was stronger than vertical incision and reduced the risk for fascial dehiscence.

Pfannenstiel incision was assumed to be less painful than the vertical incision[1]. Cochrane review in year 2005 presented that transverse and oblique incision may be less painful than vertical incision in early postoperative period[7]. However, this review enrolled cases that underwent abdominal surgery except cesarean section. While the present study, the early postoperative of Pfannenstiel incision was equal and less painful than vertical incision in primary cesarean delivery. In contrast, the vertical incision was equal and less painful than Pfannenstiel incision in repeat cesarean delivery.

In the present study, standard doses of bupivacaine and morphine were given as standard analgesia for the duration of surgery between 90 to 150 minutes[8]. Around ninety percent of cases needed only oral acetaminophen for pain relief after the estimated time of spinal anesthesia effect.

McLean's study from the United States reported in year 2012 that the wound dehiscence rate was 13 percent in obese pregnant who had body mass index (BMI) more than 29. The vertical and Pfannenstiel groups had no significant wound complication incidence as reported by McLean's study[9]. The current study supported the McLean's work even though the mean BMI of our study was 26.

Marrs et al from the United States reported in year 2014 that the vertical skin incision in morbidly obese pregnant (BMI ≥40 kg/m^2) had lower wound complication rate than Pfannenstiel incision[10]. However Marrs' study had some selection bias during case recruitment that needed further study. The present study reported no morbidly obese pregnancy and no wound complication.

Puttanavijarn et al from Thailand reported that vertical and Pfannenstiel incisions were of comparable advantage according to the operative complications, operative time, postpartum complications and neonatal outcomes[11]. This study enrolled 320 cases of pregnant women with prior cesarean delivery who underwent elective cesarean delivery. Our present study recruited both primary and repeated cesarean delivery. This study reported no serious both maternal and neonatal complications. It might be the limitation of this study that enrolled the elective cesarean cases with low underlying diseases that underwent elective cesarean delivery. However, this study supported the Puttanvijarn's work.

Makoha's work from Saudi Arabia reported the vertical incision was associated with a higher risk of bladder and bowel injury than Pfannenstiel in repeated cesarean delivery[12]. This work was retrospective study in urinary bladder and bowel injuries in cesarean section during 4 years of study (3,164 cases). The number of cesarean delivery in Makoha's study varies between one to eight times. The urinary bladder and bowel injury incidences increased with the rising cesarean numbers. There was no serious complication like Makoha's work in this report. The number of cesarean section in this study was 2 or less. The work of Makoha originated from cases in Muslim country

that the permanent contraceptive method (tubal resection) given during the cesarean section was prohibited. The number of repeated cesarean section in Makoha's literature was higher than our study. This study could not support or argue with Makoha's work because the nature of repeat pregnancy in patients was very different.

Conclusion

The postoperative pain after elective cesarean delivery of both vertical and Pfannenstiel incision were comparable. Pfannenstiel or vertical incision should be selected as presenting condition, previous scar and experience of surgeon to commit the best result.

What already known on this topic?

In modern obstetrics, vertical and Pfannenstiel incisions are the choices for cesarean delivery. Pfannenstiel incision was the most frequently chosen incision for a good cosmetic result and low fascial wound dehiscence incidence. However, vertical incision was commonly used especially in emergency condition, high risk of infection and possible incision extension. Pfannenstiel incision was popular with a long-held belief that it's after effect was less painful than that of the vertical incision. There was no report that compared postoperative pain after cesarean delivery between two incisions in elective setting.

What this study adds?

The postoperative pain after elective cesarean delivery of both vertical and Pfannenstiel incision were comparable. Pfannenstiel or vertical incision should be selected as presenting condition, previous scar and experience of surgeon to commit the best result.

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Ethical approval

The study was approved by Ethics Committee, Faculty of Medicine, Thammasat University, and study protocol numbers MTU-EC-OB-6-209/58

Potential conflicts of interest

None.

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การปวดแผลหลังผ่าตัดคลอดบุตรระหว่างการลงแผลผ่าตัดแบบแนวกลางและแนวขวางแบบแฟนเนลสตีล

คมสันติ์ สุวรรณฤกษ์, ไพลิน เกษมสินธุ์, เด่นศักดิ์ พงศ์โรจน์เผ่า, อธิตา จันทเสนานนท์, สุภาเพ็ญ เลิศวุฒิวิวัฒน์, จรรยา ภัทรอาชาชัย กรณ์กาญจน์ ภมรประวัติธนะ

วัตถุประสงค์: *เพื่อศึกษาอาการปวดแผลหลังผ่าตัดคลอดบุตรแบบนัดหมายระหว่างการลงแผลผ่าตัดแบบแนวทางและแนวขวางแบบแฟนเนลสตีล*

วัสดุและวิธีการ: *เป็นการศึกษาครั้งที่สองจากข้อมูลของการเปรียบเทียบผลของคีโตโลแลคและเมเพอริดีน สตรีตั้งครรภ์ครบกำหนดที่เข้ารับการผ่าตัดคลอดบุตรแบบนัดหมายโดยการระงับความรู้สึกด้วยการฉีดยาชาเข้าช่องไขสันหลัง ภายหลังการผ่าตัดคลอดบุตร ผู้เข้าร่วมวิจัยจะได้รับการประเมินระดับความเจ็บปวด visual analog scale (VAS) ที่ระดับศูนย์ถึงสิบ โดยประเมินที่ 3, 6, 12 และ 24 ชั่วโมงหลังเข้ารับการผ่าตัดคลอด ถ้าคะแนนความเจ็บปวดมากกว่าหรือเท่ากับหก ผู้คลอดจะได้รับยาคีโตโลแลคหรือยาเมเพอริดีน โดยการฉีดเข้าหลอดเลือดดำ ชนิดของแผลผ่าตัดจะนำมาวิเคราะห์กับตัวแปรอื่น*

ผลการศึกษา: *มีผู้เข้าร่วมวิจัยทั้งหมด 580 คน แบ่งเป็น 276 และ 304 ในกลุ่มที่รับการลงแผลผ่าตัดแบบแนวกลางและแนวขวางแบบแฟนเนลสตีลตามลำดับ จากการศึกษาไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติทั้งดัชนีมวลกาย อายุครรภ์เฉลี่ย น้ำหนักทารกแรกเกิด จำนวนบุตร และเลือดที่เสียไปขณะการผ่าตัด ในการผ่าตัดคลอดบุตรครั้งแรก คะแนนความปวดของกลุ่มแผลแนวกลางมีมากกว่าแผลแนวขวางแบบแฟนเนลสตีลชั่วโมงที่ 3, 12 และ 24 หลังผ่าตัดในขณะที่การผ่าตัดคลอดบุตรครั้งหลัง คะแนนความปวดของกลุ่มแผลแนวขวางแบบแฟนเนลสตีลมีมากกว่าแผลแนวกลางชั่วโมงที่ 6 และ 12 หลังผ่าตัด โดยไม่พบผลข้างเคียงหรือข้อแทรกซ้อนในการศึกษานี้*

สรุป: *การปวดหลังผ่าตัดคลอดบุตรแบบนัดหมายของชนิดแผลแนวกลางและแนวขวางแบบแฟนเนลสตีลไม่มีความแตกต่างกัน*