Comparative Study of Postoperative Pain between Maylard Incision and Pfannenstiel Incision in Gynecologic Surgery: A Randomized Controlled Trial

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Background: *Postoperative pain has many adverse effects for the patients with laparotomy operation. There are few studies that compare between Maylard and Pfannenstiel incision in term of pain and wound complication after operation.*
Objective: *To compare the postoperative pain and wound complications between the muscle-cutting Maylard incision and the Pfannenstiel incision in women who needed benign gynecologic surgery.*
Material and Method: *This randomized controlled trial study compared two laparotomy techniques, Maylard and Pfannenstiel method. Ninety cases of benign gynecologic conditions were recruited and randomly assigned to receive either Maylard or Pfannenstiel incision from August 2014 to October2015 at Thammasat University Hospital, Thailand. Visual analogue scale (VAS) was applied to measure postoperative pain. Baseline characteristics of the study groups and postoperative outcomes were analyzed.*
Results: *From the planned 90 recruited cases, there were 81 cases for complete analysis, 41 in Maylard and 40 in Pfannenstiel group. There were no difference in age, body mass index, education level, previous abdominal surgery and type of operation between Maylard and Pfannenstiel group. Duration of operation, type of anesthesia and dosage of analgesic drug were not statistically significant between both groups. Length of surgical wound was longer in Maylard than in Pfannenstiel group (17.27±0.6 vs. 14.13±0.8 cm, p = 0.04). Postoperative pain score (VAS) at 3, 6, 12, 24 and 48 hours were not statistically different between two groups. Pain score at 72 hours and 7th day in Maylard group showed significantly less than in Pfannenstiel group (0.51±0.5 vs. 1.10±1.0 p = 0.04, 0.12±0.3 vs. 0.23±0.4, p = 0.01, respectively). The numbers of participants with moderate to severe pain (VAS >4) in Maylard group were less than in Pfannenstiel group at 3, 6, 12 and 24 hours but after that there was no statistically difference. There were no postoperative wound complications such as disruption, infection or hematoma in all participants in this study.*
Conclusion: *Postoperative pain up to 48 hours in both Maylard and Pfannenstiel group showed similar VAS but after 48 hours; the Maylard group showed less pain. Even though the surgical wound length in Maylard group was longer than Pfannenstiel group, numbers of cases with VAS >4 within 24 hours in Maylard were less than in Pfannenstiel group.*

Keywords: *Gynecologic surgery, Maylard incision, Pfannenstiel incision, Postoperative pain*

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The gynecologic surgery is one of the most commonly performed surgical procedures and it is the second most frequently performed major surgical procedure[1]. However, the guidelines for choosing which type of incision for gynecologic surgery to use have not been well defined. The choice depends on the gynecologist's preference and experience skill.

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When selecting the method of incision, gynecologists would consider the indications for surgery, the underlying pathology, the suspicion of malignancy, previous surgical scar and underlying co-morbidities. For the last 30 years, the most used incision was a transverse incision. Pfannenstiel incision is now the preferred method of gynecologic operations, compared to midline incision[2]. Most of gynecologists are familiar with this famous technique during training and practice. It offers a cosmetic scar, less operative pain and complications such as wound dehiscence, surgical hernia and postoperative adhesion[3].

The trend for Pfannenstiel incision rate is

increasing, so there is increasing number of patients with gynecologic disease who carried the Pfannenstiel scar and need pelvic surgery. However, this technique provides limited surgical field exposure. Maylard incision is a transverse incision that combines the advantages of a cosmetic incision and provides good pelvic and abdominal exposure[4]. The differences in the technique of Maylard incision and Pfannenstiel are that Maylard incision technique involves the transection of the rectus abdominis muscle while the Pfannenstiel method retracts this muscle.

Transverse incision may affect nerve supply of skin and subcutaneous tissue. Iliohypogastric and ilioinguinal nerve in pelvic area may be injured from transection or entrapment and postoperative pain or loss of sensation possibly occurred, lasting as long as two years[5]. The Maylard incision usually has a longer length of surgical scarring than Pfannenstiel incision and this technique seems to make more traumatic tissue than separation technique as in Pfannenstiel. Postoperative pain affects many aspects of patients such as quality of life, dosage of analgesic drug requirement, ambulation, respiration status and days of hospital stay. The more pain they got the more adverse outcomes could occur. Many techniques have been developed to reduce postoperative pain. Minimal invasive surgery such as laparoscopic approach can minimize postoperative pain but the cost of operation and the small number of well-trained gynecologist make this technique not available for all patients. Therefore, the conventional laparotomy is still necessary for patients who need gynecological surgery. Habib et al[2] compared postoperative pain between midline and Pfannestiel incision but there are few studies comparing Maylard and Pfannenstiel incisions. Manusook et al showed comparable postoperative pain between these two techniques but this is a retrospective study[6]. This randomized controlled trial study was designed to compare the postoperative pain and surgical wound complication between Maylard and Pfannenstiel incision in women who had benign gynecologic surgery at Thammasat University Hospital, Thailand.

Material and Method

This randomized controlled trial study was conducted from August 2014 to October 2015 in the Thammasat University Hospital, Thammasat University, Thailand. The study was approved by the Human Research Ethic Committee of Thammasat University (No. 1), Faculty of Medicine and the clinical trial registration number was TCTR20160119001.

We enrolled the patients who met all eligibility criteria: ages of 20-60, having benign gynecologic disease such as myoma uteri, adenomyosis, benign ovarian cyst, requirement for myomectomy, hysterectomy, and/or salpingo-oophorectomy. They were excluded if they were in emergency state, had an unstable hemodynamic condition, had suspected malignant disease, received anticoagulant therapy, a patient with reoperation, and patient having controlled analgesia (PCA) on request.

The sample size was calculated from the study of Ghanbari et al[7] to achieve 80% power to detect pain difference with significant level of 0.05. By calculation, 40 participants in each group were needed, so the minimal number of participants in this study was 80. Ten percent compensation for data loss or unexpected condition was prepared, so 45 participants in each group were recruited.

All the participants who met the eligible criteria were informed about the study protocol and signed informed consent forms before randomly assigned to either the Pfannenstiel or Maylard incision on the date of admission.

We generated 90 allocation codes using table of random numbers, 45 for each group. All codes were sealed in sequentially numbered opaque envelops. Until induction of anesthesia was performed allocation concealment maintained.

Anesthetic type depended on characteristics and underlying disease of the patients. General anesthesia or combined general and spinal anesthesia were applied on decision of anesthetists.

The operative procedure and postoperative care were followed the standard technique in both groups. All operations were performed by the team of staffs of Obstetrics and Gynecology Department, Faculty of Medicine, Thammasat University. The operative team composed of one of the three senior staffs, second or third year resident, and intern or sixth year medical student. All staffs had more than 10 years experience in gynecologic operation.

25 mg of Tramadol was injected intravenously every 6 hours to participants with combine spinal anesthesia and for all within first 24 hours who needed analgesia. Meperidine 25 mg intravenously every 6 hours was used for participants with general anesthesia and for all participants after 24 hours.

Postoperative pain was assessed at hour 3, 6, 12, 24, 48, 72 and day 7 after surgery by using the visual analogue scale (VAS) ranging from 0-10 (0 = no pain, 1-4 = mild pain, 5-10 = moderate to severe pain).

The investigators who assessed the VAS of the patients were blinded to the type of incision until data were analyzed.

The data of patient's characteristics, such as age, height, weight, BMI, underlying disease, previous surgery and diagnosis were collected. All the relevant operation data such as operative time, surgical wound length, type of anesthesia, VAS score, numbers of participants with VAS >4 and postoperative complications were recorded.

Data was analyzed using SPSS version 23 software for the statistical analysis. Continuous data between two groups were compared using mean, median and unpaired t-test. Fisher exact and Chi-square test were used in categorical data. Level of statistical significant was considered at $p \leq 0.05$.

Results

Recruitment was started from August 2014 to October 2015 at Thammasat University Hospital, 90 participants were randomly allocated into two groups (45 per each group) after signed consent form. 4 and 5 participants did not come for follow-up and evaluation at day 7 postoperatively, so the number of analysed participant was 41 and 40 in Maylard and Pfannenstiel group, respectively. Baseline characteristic data are shown in Table 1.

There was no difference in age, body mass index, education level, previous abdominal surgery and type of operation between Maylard and Pfannestiel group. Most of the underlying diseases in both groups were hypertension, diabetes mellitus and anemia.

The common type of operation in both groups were hysterectomy with or without bilateral salpingo-oophorectomy (78% and 70% in Maylard and Pfannenstiel group respectively). All of gynecologic diseases in this trial were benign condition. All removed specimens were sent for pathologic examination. Most of them were myoma uteri, adenomyosis and ovarian cyst.

Table 2 showed postoperative outcomes. Duration of operation, type of anesthesia and dosage of analgesic drug were not statistically significant between both groups. Length of surgical wound was longer in Maylard than in Pfannenstiel group (17.27±0.6 vs. 14.13±0.8 cm, $p = 0.04$).

Postoperative pain score (VAS) at 3, 6, 12, 24 and 48 hours were not statistically different between the two groups. However, pain score at hour 72 and day 7 in Maylard group showed significantly less than in Pfannenstiel group (0.51±0.5 vs.1.10±1.0 $p = 0.04$, 0.12±0.3 vs. 0.23±0.4, $p = 0.01$, respectively).

The numbers of participants with moderate to severe pain (VAS >4) in Maylard group were less than

Table 1. Baseline characteristics of the study group

	Maylard (n = 41)	Pfannenstiel (n = 40)	*p*-value
Age (year)*	43.50±8.3	40.20±10.5	0.14
Body mass index (kg/m^2)*	23.90±3.3	22.30±2.9	0.47
Body weight (kg)*	59.30±7.9	56.70±6.6	0.10
Height (m)*	1.57±0.1	1.60±0.1	0.10
Education**			0.24
Primary school	1 (2.4)	1 (2.5)	
High school	13 (31.7)	7 (17.5)	
Bachelor degree	27 (65.9)	32 (80.0)	
Underlying disease**			0.29
No	33 (80.5)	35 (87.5)	
Yes	8 (19.5)	5 (12.5)	
Previous surgery**			0.43
No	13 (31.7)	11 (27.5)	
Yes	28 (68.3)	29 (72.5)	
Type of operation**			0.45
Hysterectomy ± SO	32 (78.0)	28 (70.0)	
SO	9 (22.0)	12 (30.0)	

* Mean ± standard deviation, ** n (%)
SO = salpingo-oophorectomy

in Pfannenstiel group at hour 3, 6, 12 and 24 post operatively [25 (60.9%) vs. 38 (95.0%); $p<0.01$, 28 (68.3%) vs. 38 (95.0%); $p<0.01$, 16 (39.0%) vs. 25 (62.5%); $p = 0.04$, 5 (12.2%) vs. 13 (32.5%); $p = 0.03$]; but after that there were no statistical differences.

There were no postoperative wound complications such as disruption, infection or hematoma in any participants at day 7 of postoperation.

Discussion

Transverse incision in gynecologic surgery is the procedure of choice for the patients who need cosmetic result and the complication after surgery is lower than midline incision in terms of wound dehiscence and pelvic adhesion[8].

The most common transverse incision nowadays is Pfannenstiel, which is easier to perform in obstetric and gynecologic cases. Loos MJ et al presented a slightly higher incidence of abdominal nerve injury from this operation[5]. Seven percent of patients with Pfannenstiel incision reported moderate to severe pain 2 years after surgery. Sharp et al recommend curving the fascial incision cephalad to avoid the injury to the iliohypogastric and ilioinguinal nerve[8].

Maylard incision improves the limitation of Pfannenstiel by allowing more exposed cavity with reduced complication rates[9]. In the study of Manusook et al, operative time in Maylard was longer than in Pfannenstiel group[6], compared to this study which was not different. They, however, included more cases of malignancy in the Maylard incision for which the data were collected from operations done between January 2010 and December 2013. It is possible that the team of surgeons was familiar and had gained more experience with this Maylard technique so that the operative time in this trial was not different.

In this study, the surgical wound length in Maylard group was slightly longer than in Pfannenstiel group. If only the length of wound has effect on

Table 2. Post operative outcomes

	Maylard (n = 41)	Pfannenstiel (n = 40)	*p*-value
Operative time (minute)*	121.60±30.2	89.50±32.2	0.87
Surgical wound length (cm)*	17.27±0.6	14.13±0.8	0.04
Anesthesia (n,%)			0.45
General anesthesia	20 (48.8)	18 (45.0)	
Combined anesthesia	21 (51.2)	22 (55.0)	
Analgesia (n, %)			0.16
Meperidine	11 (26.8)	15 (37.5)	
Tramadol	21 (51.2)	22 (55)	
No need	9 (22)	3 (7.5)	
Post operative pain score*			
3 hour	4.85±1.9	7.00±1.8	0.37
6 hour	4.88±2.0	6.38±1.9	0.64
12 hour	3.93±1.6	4.65±1.9	0.22
24 hour	2.83±1.4	3.73±1.6	0.39
48 hour	1.54±1.2	2.08±1.2	0.84
72 hour	0.51±0.5	1.10±1.0	0.04
Day 7	0.12±0.3	0.23±0.4	0.01
Post operative moderate to severe pain** (n, %)			
3 hour	25 (60.9)	38 (95.0)	<0.01
6 hour	28 (68.3)	38 (95.0)	<0.01
12 hour	16 (39.0)	25 (62.5)	0.04
24 hour	5 (12.2)	13 (32.5)	0.03
48 hour	0	1 (2.5)	0.49
72 hour	0	0	-
Day 7	0	0	-
Wound complication	0	0	-

* Mean ± standard deviation, ** Moderate to severe pain: VAS 5-10

postoperative pain, participants in Maylard group should have more pain than Pfannenstiel group. On the other hand, VAS was not different between the two groups within the first 48 hours and the number of participants with moderate to severe pain in Maylard were less than in the Pfannenstiel group. An explanation for this result is that during the procedure of the Maylard incision there was no separation of rectus abdominis muscle from anterior rectus sheath; thus, the injury of the peripheral nerve may not have been affected[5].

The authors could not compare wound complication between these two groups because there was no case of complications in either group.

The strength of this study is that this is one of the few randomized controlled trial studies that compared postoperative pain between Maylard and Pfannenstiel incision in gynecologic disease. Previous RCT study compared Maylard and Pfannenstiel incision for cesarean delivery[10]. The factors that possibly affected postoperative pain could be controlled. The surgeons who operated all cases in this study were in the same team with same experience.

There are still several limitations in this study. The type of anesthesia could not be completely controlled. This depended on decision-making of the anesthetists in charge, but our data showed that the number of participants and type of anesthesia were not different between the two groups. Even in our team of surgeons, composed of only three staff, there may be a bit of difference among them. In addition, the last aspect, the authors studied 81 participants for only 7 days after operation; the more cases and longer-term follow-up should be studied in the future.

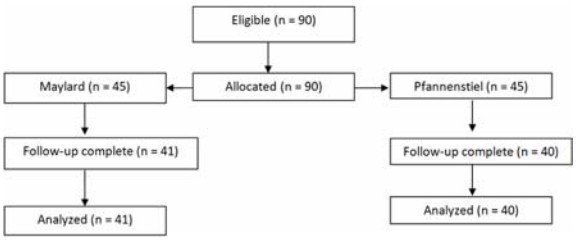

Fig. 1 CONSORT diagram of participants.

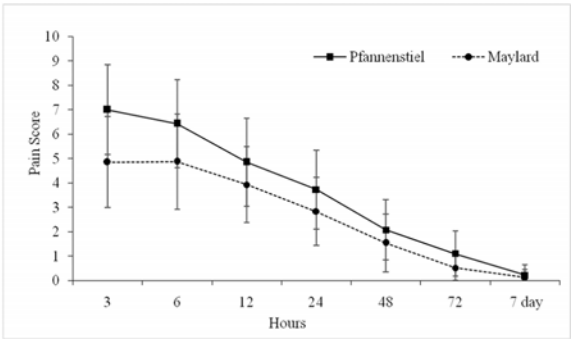

Fig. 2 Postoperative pain score of Maylard and Pfannenstiel incision. Value are mean ± SD.

Conclusion

It seemed that there were no differences in operative time, analgesic consumption, postoperative pain scores within 48 hours after surgery or any complication between Maylard and Pfannenstiel incision in benign gynecologic operations except for slightly longer length of surgical scar in Maylard incision. In Maylard participants, pain score at hour 72 and day 7 postoperatively and the number of patients with moderate to severe pain within first 24 hours were less than in Pfannenstiel incision.

What is already known on this topic?

Maylard and Pfannenstiel incision are the incision of choice for patients who need cosmetic scar and favorable outcome. Most gynecologists are familiar with Pfannenstiel technique because they were trained and practiced day by day with this incision, especially for cases of cesarean section. Even though Alfred Ernest Maylard presented the Maylard incision in 1907, there is still only a small number of gynecologists who know and perform this technique. This operative type requires transection of the rectus abdominis muscle so it was believed that the surgeon might need more time for abdominal approach than the other type of incision.

What this study adds?

Many studies showed no different outcome between Maylard and Pfannenstiel incision in cesarean delivery. In this randomized controlled trial that the authors studied in benign gynecologic conditions, we found favorable outcomes in term of postoperative pain from Maylard incision. The length of scar may be longer than in Pfannenstiel incision, but the surgeons can start from the minimal incisional length that they can perform the operation effectively; if it is not long enough, they could extend incision laterally without detrimental effect as in Pfannenstiel incision.

Acknowledgements

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Potential conflict of interests

None.

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การศึกษาเปรียบเทียบความเจ็บปวดหลังการผ่าตัดชนิด Maylard กับ Pfannenstiel ในผู้ป่วยที่ได้รับการผ่าตัดทางนรีเวชชนิดสุ่มแบบมีกลุ่มควบคุม

ฉัตรชัย ชายวิริยางกูร, สกล มนูสุข, เด่นศักดิ์ พงศ์โรจน์เผ่า, จรินทร์ทิพย์ สมประสิทธิ์, กรณ์กาญจน์ ภมรประวัติธนะ, คมสันต์ สุวรรณฤกษ์

ภูมิหลัง: ความเจ็บปวดหลังการผ่าตัดมีผลเสียต่อผู้ป่วยที่ได้รับการผ่าตัดเปิดหน้าท้องเป็นอย่างมาก แต่การศึกษาเรื่องความเจ็บปวดและภาวะแทรกซ้อนของแผลหลังการผ่าตัดที่ลงแผลแบบ Maylard เปรียบเทียบกับ Pfannenstiel ยังมีจำนวนน้อย

วัตถุประสงค์: เพื่อเปรียบเทียบความเจ็บปวดและภาวะแทรกซ้อนของแผลผ่าตัดระหว่างการลงแผลแบบ Maylard กับ Pfannenstiel

วัสดุและวิธีการ: ศึกษาโดยสุ่มตัวอย่างประชากรที่จะได้รับการผ่าตัดทางนรีเวช และแบ่งตัวอย่างประชากรเป็นกลุ่มที่ได้รับการผ่าตัดแบบ Maylard กับ Pfannenstiel ทั้งหมด 90 ราย ในระหว่างเดือนสิงหาคม พ.ศ. 2557 ถึงเดือนตุลาคม พ.ศ. 2558 โดยทำการศึกษาและเก็บข้อมูลที่โรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติ และใช้แบบประเมินความเจ็บปวดในการประเมินภาวะเจ็บปวดหลังการผ่าตัด รวมถึงภาวะแทรกซ้อนหลังการผ่าตัด

ผลการศึกษา: จากการสุ่มตัวอย่างประชากรจำนวน 90 ราย มีทั้งหมด 81 รายที่ถูกนำข้อมูลมาวิเคราะห์โดยเป็นกลุ่ม Maylard 41 ราย และกลุ่ม Pfannenstiel 40 ราย ไม่พบความแตกต่างระหว่างอายุ ดัชนีมวลกาย ระดับการศึกษา ประวัติการผ่าตัดก่อนหน้า และชนิดของการผ่าตัด นอกจากนี้ไม่พบความแตกต่างกันของระยะเวลาในการผ่าตัด ชนิดของการระงับความรู้สึก ปริมาณยาแก้ปวดที่ใช้ จากทั้งสองกลุ่ม แต่ความยาวแผล พบว่ากลุ่ม Maylard มีความยาวของแผลมากกว่ากลุ่ม Pfannenstiel (17.27±0.6 vs. 14.13±0.8 cm., p = 0.04) คะแนนความเจ็บปวดหลังการผ่าตัดที่ 3, 6, 12, 24, 48 ชั่วโมง พบว่าไม่แตกต่างกันทั้งสองกลุ่มแต่คะแนนความเจ็บปวดหลังการผ่าตัดที่ 72 ชั่วโมงและ 7 วัน พบว่าในการผ่าตัดชนิด Maylard มีคะแนนความเจ็บปวดที่น้อยกว่า (0.51±0.5 vs. 1.10±1.0; p = 0.04, 0.12±0.3 vs. 0.23±0.4; p = 0.01) ถ้าหากแบ่งระดับความเจ็บปวดเป็นระดับเล็กน้อย และระดับปานกลางถึงรุนแรง จะพบว่าหลังการผ่าตัดที่ 3, 6, 12, 24 ชั่วโมง การผ่าตัดชนิด Maylard จะมีผู้ป่วยที่มีอาการปวดระดับปานกลางถึงรุนแรงจำนวนน้อยกว่าการผ่าตัดชนิด Pfannenstiel อย่างมีนัยสำคัญทางสถิติ และทั้งสองกลุ่มไม่พบภาวะแทรกซ้อนของแผลผ่าตัด

สรุป: คะแนนความเจ็บปวดหลังการผ่าตัดภายใน 48 ชั่วโมงแรก ไม่พบความแตกต่างระหว่างกลุ่มที่ได้รับการผ่าตัดชนิด Maylard และชนิด Pfannenstiel แต่หลังจาก 48 ชั่วโมง พบว่ากลุ่มที่ได้รับการผ่าตัดชนิด Maylard จะมีคะแนนความเจ็บปวดหลังผ่าตัดน้อยกว่า แม้ว่าในการผ่าตัดชนิด Maylard จะมีแผลผ่าตัดที่ยาวกว่าแต่จำนวนผู้ป่วยที่มีระดับความเจ็บปวดปานกลางถึงรุนแรงจะพบในกลุ่ม Maylard น้อยกว่ากลุ่ม Pfannenstiel ในช่วงเวลา 24 ชั่วโมงแรก หลังผ่าตัด