

The influence of Pfannenstiel and midline incisions to the wound condition on the third day post gynecologic surgery

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ABSTRACT

Many factors should be considered by a surgeon to choose an abdominal incision, such as incision extensibility, speed of operation, presence or absence of adhesions, hemostasis problems, possibility of postoperative complications such as infections, hernia or dehiscence, and wound healing. Midline or linea mediana incision makes the field operation seem wider, therefore the operations can be performed more quickly. Meanwhile, transverse incision such as Pfannenstiel incision is gaining popularity with the less incidence of infection, hernia, and wound dehiscence because this technique follows Langer's lines resulting in reduced traction at the skin edges and making better wound closure and approximation. This study aimed to evaluate the influence of Pfannenstiel and midline incisions to the wound condition on the third day post gynecologic surgery. This was an observational study using a prospective cohort study design. The subjects were patients with the indications for gynecologic surgery in Dr. Sardjito General Hospital Yogyakarta and affiliated hospitals who fulfilled the inclusion and exclusion criteria. Sixty subjects were divided into two groups i.e. 30 subjects who underwent Pfannenstiel incision as treatment group and 30 subjects who underwent linea mediana incision as control group. The characteristics of subjects of both group were not significantly different. No significant difference of the wound condition on the third day after surgery between subjects who underwent Pfannenstiel and linea mediana incisions was observed in this study ($p=0.212$). The risk of the wound being not dried yet on the third day after surgery on subjects who underwent linea mediana incision technique was 2.5 times higher compared to subjects who underwent Pfannenstiel incision technique. However, it was not statistically different ($p=0.212$; $RR=2.5$; $95\%CI=0.525-11.894$). In conclusion, there is no significantly different effect of Pfannenstiel and linea mediana incisions to the wound condition on the third day post gynecologic surgery.

ABSTRAK

Berbagai faktor harus dipertimbangkan oleh operator untuk memilih irisan operasi perut seperti kemungkinan perluasan irisan, kecepatan operasi, ada tidaknya perlengketan, masalah hemostasis, kemungkinan terjadinya komplikasi pasca operasi seperti infeksi, hernia, *dehiscence* dan penyembuhan luka. Irisan *midline* atau *linea mediana* membuat bidang operasi tampak lebih luas sehingga operasi dapat dilakukan lebih cepat. Sedangkan irisan transversal seperti irisan Pfannenstiel mulai banyak dilakukan karena rendahnya kejadian infeksi, hernia dan *dehiscence* luka. Hal ini terjadi karena teknik ini memotong bidang tubuh searah garis *Langer* yang menghasilkan berkurangnya tarikan tepi kulit dan membuat penutupan dan penyatuan luka lebih baik. Penelitian ini bertujuan untuk mengkaji pengaruh irisan Pfannenstiel dan linea mediana terhadap kondisi luka pada hari ketiga setelah operasi ginekologi. Penelitian ini merupakan penelitian observasional menggunakan rancangan penelitian kohort prospektif. Subjek penelitian adalah penderita dengan indikasi operasi ginekologi di RSUP Dr. Sardjito, Yogyakarta dan rumah

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sakit afilasi yang memenuhi kriteria inklusi dan eksklusi. Sebanyak 60 subjek dibagi menjadi dua kelompok yakni 30 subjek yang menjalani operasi dengan irisan Pfannenstiel sebagai kelompok perlakuan dan 30 subjek yang menjalani operasi dengan irisan linea mediana sebagai kelompok kontrol. Karakteristik subjek dari kedua kelompok tidak berbeda nyata. Kondisi luka pada hari ketiga setelah operasi antara kelompok subjek yang menjalani operasi dengan irisan Pfannenstiel dan kelompok yang menjalani operasi dengan irisan linea mediana tidak berbeda nyata ($p = 0.212$). Risiko luka tidak kering pada hari ketiga setelah operasi pada kelompok subjek yang menjalani operasi dengan irisan linea mediana 2,5 kali lebih tinggi dibandingkan kelompok subjek yang menjalani operasi dengan irisan Pfannenstiel. Namun demikian hal ini tidak berbeda secara bermakna ($p = 0,212$; $RR = 2,5$; $95\%CI = 0,525-11,894$). Dapat disimpulkan, tidak terdapat perbedaan nyata pengaruh irisan Pfannenstiel dan linea mediana terhadap kondisi luka pada hari ketiga setelah operasi ginekologi.

Keywords: Pfannenstiel incision - midline incision - wound healing - gynecologic surgery - complication

INTRODUCTION

Surgical operation is an invasive medical procedure that opens up and displays the part of the body to be operated.¹ Surgery will cause a wound in patients that will develop to be scarring. A wound is the loss of tissue continuity or tissue damage caused by trauma or surgical instrument, while a wound healing is a process occurred after tissue damage. In general, the wound healing process occurs through several stages consisting of inflammation, epithelization, fibroplasia and maturation.² Certain body tissues such as epithelial tissues, bone and nerves show wound healing process differently.³

Selection of incision technique plays an important role in gynecologic surgery. Each incision technique has its own advantages and disadvantages. Therefore, an operator should consider the factors that influence both the incision process and the outcome, such as incision extensibility, speed of operation, presence or absence of adhesions or infections, hemostasis problems, possibility of post-operative hernia or dehiscence, and wound healing.^{4,5}

Midline or linea mediana incision makes the field operation seem wider, so the risk of injury or trauma to other organs including blood vessels and nerves can be minimized. Furthermore, this type of incision results in a quicker operation,

which is good when used for patients with critical conditions.⁴ In terms of cosmetic scar, tissue will be obvious when linea mediana incision is used.^{4,6} Problems with the higher rate of hernia formation, wound dehiscence coughing, retching and straining were observed in linea mediana incision. However, it is difficult to make legitimate comparisons between linea mediana and transverse incisions since the linea mediana incision is more likely to be performed in the cases of hemorrhage, previous radiation therapy, and malignancy; all of which increase the likelihood of post-operative complications.^{7,8}

Transverse incision technique such as Pfannenstiel incision is currently gaining popularity with less incidence of infection, hernia and wound dehiscence. Their success lies in the fact that they cause less tension on the opposing wound edges because the incisions follow Langer's lines, unlike longitudinal incisions. Dehiscence and hernia have been reported to be performed on this technique but it is extremely rare. Moreover, this report is not conducted with randomization.⁹ Although Pfannenstiel incisions still have some problems, they provide several advantages over vertical incisions.⁴ For instance, Greenall *et al.*¹⁰ reported that transverse incision took longer time to make and caused

more bleeding, but there were less burst abdomen and incisional hernia because of the greater suture holding capacity of the musculo-aponeurotic layer when incised transversely.

In Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Gadjah Mada/Dr. Sardjito General Hospital, Yogyakarta, midline incision is still used for gynecologic surgery, although the size of the tumor is not too big. This study was conducted to evaluate the influence of Pfannenstiel and linea mediana incisions to the wound condition on the third day post gynecologic surgery. Invasive surgery would damage the structure of body tissue or wound. Therefore, monitoring of the wound conditions is important to prevent postoperative complications. The wound healing process after surgery depends on some factors including hypoalbuminemia conditions. Nutritional status of patients such as protein, vitamin and mineral deficiency will impair wound healing process.

MATERIALS AND METHODS

Subjects

This was an observational study using a prospective cohort study design. Subjects were divided into two groups i.e. subjects who underwent Pfannenstiel incision as treatment group and those undergoing linea mediana incision as control group. The study population was all patients with the indications for gynecologic surgery or laparotomy in the period between January and July 2010 in Dr. Sardjito General Hospital Yogyakarta and affiliated hospital, such as Sleman District Hospital, Panembahan Senopati District Hospital, Bantul, Yogyakarta Special Region, Muntilan District Hospital, Soeradji Tirtonegoro General Hospital, Klaten, Saras Husada District Hospital Purworejo, and Banjarnegara District Hospital, Central Java.

The subjects were patients with the indications for gynecologic surgery or laparotomy who fulfilled the inclusion and exclusion criteria. The inclusion criteria were all patients at Dr. Sardjito General Hospital and affiliated hospitals who met the indications for gynecologic surgery whether emergency or elective, with the size of tumor mass of not more than the size of a uterus at 12 weeks of gestation and mobile. The exclusion criteria were having diabetes mellitus, blood clotting disorder, immune system disorder, a case of malignancy, fixed tumor mass, severe endometriosis, and the size of tumor mass of more than the size of a uterus at 12 weeks of gestation.

Patient recruitment and subsequent experimental procedures were performed with the approval from the the Medical and Health Research Committee, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta and after obtaining written informed consent from patients.

Study protocol

General check up was performed in all patients before surgery, which included a detailed history, general physical, systemic examination and serum albumin level. Enrolled patients were then randomly allocated into Pfannenstiel or linea mediana incision groups. The incision technique to be allocated during surgery was determined by the operator. In the operating room before surgery, the base line data including heart rate, blood pressure were recorded. Under general anesthesia, the Pfannenstiel or linea mediana incision was conducted. The post incision data including the conditions of wound on the third day, length of operation, loss of blood, serum albumin level, and antibiotics used were recorded.

Statistical analysis

Data was analyzed using SPSS system (Statistical Package for the Social Sciences).

Data of subjects characteristics were presented as mean \pm standar deviation (SD) or frequency (percent). Chi square test was used to evaluate the influence of incision technique on the wound condition on the third day after surgery. Logistic regression analysis was used to evaluate the influence of the variables that related to the wound condition on the third day after surgery.

RESULTS

Seventy five subjects have been recruited in the period of January to July 2010. However, there were only 60 subjects who fulfilled the inclusion criteria and 15 subjects were excluded due to the exclusion criteria. The characteristics of subjects are presented in TABLE 1.

TABLE 1. Characteristics of subjects. Data were presented as mean \pm SD or frequency (percent).

| Variables | n | Mean \pm SD |
|------------------------------|----|---------------------|
| Age (year) | 60 | 38.80 \pm 9.16 |
| Duration of surgery (minute) | 60 | 102.17 \pm 33.18 |
| Loss of blood (mL) | 60 | 444.17 \pm 173.47 |
| Serum albumin (g/dL) | 60 | 3.75 \pm 0.48 |
| Incision type | 60 | |
| • Linea mediana (n/%) | | 30 (50%) |
| • Pfannenstiel (n/%) | | 30 (50%) |
| Antibiotics used | 60 | |
| • Ceftriaxone (n/%) | | 30 (50%) |
| • Cefotaxime (n/%) | | 30 (50%) |

The number of subjects for each group, Pfannenstiel and linea mediana incision groups, was 30 respondents. Sixty-one percent of

subjects were more than 38 years old with the youngest subject was 18 years old and the oldest was 52 years old. The mean duration of surgery was 102.17 \pm 33.18 minutes with a maximum duration 150 minutes for a case of multiple myomas where total abdominal hysterectomy was performed. The mean of the amount of bleeding was 444.17 \pm 173.47 mL with the maximum was 1000 mL in the case of multiple myomas where myomectomy was performed with Pfannenstiel incision, while the minimum was 200 mL in a case of cyst requiring salpingo-oophorocystectomy. The mean of the serum albumin level of subjects was 3.75 \pm 0.48 g/dL with the highest level was 5.28 g/dL and the lowest level was 3.00 g/dL. Thirty five or 58% subjects had serum albumin level lower than the average level. Antibiotics used in this study were ceftriaxone and cefotaxime because both were often used in Dr. Sardjito General Hospital and other affiliated hospitals because of their effectiveness.

Characteristics of subjects based on incision technique used in this study are presented in TABLE 2. The characteristics of subjects who underwent Pfannenstiel incision compared to those undergoing linea mediana incision were not significantly different in the terms of age, serum albumin level, duration of surgery, loss of blood and antibiotics used ($p > 0.05$).

TABLE 2. Characteristics of subjects based on incision technique used. Data were presented as mean \pm SD or frequency (percent)

| Variables | Linea mediana (n=30) | Pfannenstiel (n=30) | p |
|------------------------------|----------------------|---------------------|------|
| Age (year) | 38.83 \pm 9.82 | 38.77 \pm 8.62 | 0.98 |
| Serum albumin level (g/dL) | 3.74 \pm 0.43 | 3.753 \pm 0.53 | 0.94 |
| Duration of surgery (minute) | 108.17 \pm 36.87 | 96.17 \pm 28.40 | 0.16 |
| Loss of blood (mL) | 435 \pm 177.70 | 453.33 \pm 171.67 | 0.67 |
| Antibiotics used | | | |
| • Ceftriaxone | 15 (50%) | 15 (50%) | 1.00 |
| • Cefotaxime | 15 (50%) | 15 (50%) | |

The influence of incision technique on the wound condition on the third day after surgery was analyzed using Chi square (TABLE 3). The dry wound condition on the third day after surgery was observed on 28 (93.33%) subjects who underwent Pfannenstiel incision and 25 (83.33%) subjects who underwent linea mediana incision, while the wet wound condition was observed on only 2 (6.67%) subjects who underwent Pfannenstiel incision and on 5 (16.67%) subjects who underwent linea mediana incision. No significant difference of

the wound condition on the third day after surgery between subjects who underwent Pfannenstiel and linea mediana incisions was observed in this study ($p=0.212$). The risk of the wound being not dried yet on the third day after surgery on subjects who underwent linea mediana incision technique was 2.5 times higher compared to subjects who underwent Pfannenstiel incision technique. However, it was not statistically different ($p= 0.212$; $RR= 2.5$; $95\% CI= 0.525-11.894$).

TABLE 3. The effect of incision technique on the wound condition on the third day after surgery

| Techniques | n | Wound condition on the 3 rd day after surgery | | RR (CI 95%) | p |
|---------------|----|--|-------------|---------------|-------|
| | | Wet | Dry | | |
| Linea mediana | 30 | 5 (16.67%) | 25 (83.33%) | 2.5 | 0.212 |
| Pfannenstiel | 30 | 2 (6.67%) | 28 (93.33%) | (0.525-11.89) | |

The influence of the variables related to the wound condition on the third day after surgery was analyzed using logistic regression analysis (TABLE 4). Antibiotics used in this study was the most influencing variable related to the wound condition on the third day after

surgery with RR value of 3.55, followed by incision technique ($RR=3.20$), age ($RR=2.99$) and serum albumin level ($RR=2.04$). However, all variables were not significantly different in association with the wound condition ($p>0.05$).

TABLE 4. Logistic regression analysis of variables related to the wound conditions on the third day after surgery

| Variables | p | RR | 95% CI |
|---------------------|------|------|--------------|
| Incision technique | 0.22 | 3.20 | 0.49 – 20.84 |
| Age | 0.29 | 2.99 | 0.39 – 23.22 |
| Duration of surgery | 0.95 | 1.06 | 0.16 – 7.03 |
| Loss of blood | 0.28 | 0.34 | 0.05 – 2.36 |
| Serum albumin level | 0.48 | 2.04 | 0.28 – 14.74 |
| Antibiotics used | 0.19 | 3.55 | 0.54 – 23.34 |

DISCUSSION

This study found that the influence of Pfannenstiel incision technique compared to linea mediana incision technique to the wound condition on the third day post gynecologic surgery was not significantly different.

However, the risk of the wound being not dried yet on the third day after surgery on subjects who underwent linea mediana incision technique was 2.5 times higher compared to subjects who underwent Pfannenstiel incision technique ($p= 0.212$; $RR= 2.5$; $95\% CI= 0.525-11.894$).

Several studies reported that Pfannenstiel incision is better than linea mediana incision in terms of incisional hernia incidence.^{4,11-13} The incisional hernia occur between 2-20% of patients after linea mediana incision. Therefore, incisional hernia is a major postoperative problem in linea mediana incision. Meanwhile, the literature on Pfannenstiel incision suggests an incisional hernia rate of 0 to 0.5%.^{11,13} Moreover, it was reported that wound healing process after surgery is faster and long-stay patients in the hospital is shorter for patients with Pfannenstiel incision.^{9,14}

Some factors contribute to the advantages of Pfannenstiel incision technique compared to linea mediana incision technique with respect to occurrence of incisional hernia. First, in Pfannenstiel incision, the skin, subcutaneous tissue and fascial defect are remote from the muscle defect, which is covered by healthy nonincised tissue, whereas in the linea mediana incision, all layers are incised in one plane making contamination more easy.^{4,11} Second, the linea alba as the connective tissue that envelops the muscle layer obliquus is incised during the linea mediana incision technique, whereas it is not incised with Pfannenstiel incision technique. Strong contraction of this connective tissue and muscle during coughing, vomiting, or defecation, will cause pressure and pose a risk of wound disruption which undergoes an increased unification. Moreover, the linea alba has the poorest blood supply of any area in the abdominal wall and this may contribute to deficient wound healing.¹¹ The process of wound healing requires adequate oxygen consumption, normoglycemia and absence of toxic or septic factors which reduces collagen synthesis and oxidative killing mechanisms of neutrophils.¹⁵ Third, Pfannenstiel incision follows all principles regarding atraumatic surgery without tension. The skin incision is performed along Langer's lines in

order to reduce tension due to the low traction at the edge of the wound.^{4,11} The division of external oblique aponeurosis is parallel to its fibers along the lines of tension. The force required to approximate the edges of a vertical incision is approximately 30 times greater than the force required to approximate a transverse incision. Fourth, damage to nerve supply and venous and lymphatic drainage may be different and thereby also influence wound healing.¹¹

Some of the weaknesses of this study should be considered and taken into account. For instance, the use of a prospective cohort design in this study was not a randomized controlled trial design due to the difficulty in obtaining subjects in relation to limited availability of research duration. Moreover, tensile strength to confirm wound healing was not determined in this study and the incisions were conducted by some operators who might have different skills. In addition, patients follow-up after being discharged from the hospitals were also not conducted.

CONCLUSION

It can be concluded that the influence of Pfannenstiel incision technique compared to linea mediana incision technique to the wound condition on the third day post gynecologic surgery is not significantly different. However, Pfannenstiel incision clinically has better outcome than linea mediana incision to the wound healing on the third day post gynecologic surgery. Further studies using randomized controlled trials design with more external variables need to be performed to confirm the superiority of Pfannenstiel incision technique compared to linea mediana incision technique.

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