RESEARCH ARTICLE

Wound Complications after Laparotomy for Endometrial Cancer

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Abstract

This study was conducted to determine the incidence of wound complications after laparotomy for endometrial cancer and significant predictors of risks. Medical records of patients with endometrial cancer undergoing laparotomy for surgical staging at Srinagarind Hospital, Khon Kaen University between January 2007 and December 2013 were reviewed. Intravenous antibiotic prophylaxis was routinely given 30 minutes before surgery. The primary endpoint was wound complications (including seroma, hematoma, separation, or infection) requiring additional medical and/or surgical management within 4 weeks of laparotomy. During the study period, 357 patients with complete medical records were reviewed. The mean age was 56.9 years. Wound complications were observed in 28 patients (7.84%, 95% CI, 5.27% to 11.14%). Body mass index (BMI) ≥ 30 kg/m2, diabetes mellitus (DM), and prior abdominal surgery were observed as significant independent factors predicting an increased risk of wound complications with adjusted odds ratios (95% CIs) of 2.96 (1.23-7.16), 2.43 (1.06-5.54), and 3.05 (1.03-8.98), respectively. In conclusion, the incidence of wound complications after laparotomy for endometrial cancer was 7.8%. Significant independent predictors of risk included BMI, DM and prior abdominal surgery.

Keywords: Wound complication - laparotomy - surgical staging - endometrial cancer - risk factors

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Introduction

Worldwide, endometrial cancer is the second most common gynecologic cancer (after cervical cancer) and the sixth most common cancer overall among women (Torre et al., 2015). In Thailand, endometrial cancer is the third most common gynecologic cancer after cervical and ovarian cancers (Moore et al., 2010). Yet, the incidence of endometrial cancer has increased markedly in Thailand in recent years, and it is anticipated to keep rising.

Surgical staging is the standard therapy of endometrial cancer (Meyer et al., 2015). Adjuvant therapy after surgical staging depends on detailed pathology examination of surgical specimens removed (Meyer et al., 2015; Tangjitgamol et al., 2015). Surgical staging can be done via laparotomy or laparoscopy. Laparoscopic surgical staging has been noted to be feasible, safe, and has a low rate of perioperative morbidities (Galaal et al., 2012; Wang et al., 2013). In Thailand, most cases however were done by laparotomy (Cheewakriangkrai et al., 2007; Panggid et al., 2010; Tangjitgamol et al., 2010).

It is common to encounter multiple preexisting medical and metabolic problems including advanced age, obesity, and diabetes mellitus in patients with endometrial cancer (Tangjitgamol et al., 2014). These comorbidities may predispose women with endometrial cancer at an increased risk of wound complications after operation. Wound complications affect recovery of illness, cause anxiety and discomfort, and increase healthcare cost (Perencevich et al., 2003; Reilly et al., 2008). Thus, the preventions of surgical wound complications are important topics of inquiry. However, before interventions can be designed and implemented, it is mandatory to identify specific risk factors associated with wound complication. Here, we reported the incidence of wound complications after laparotomy for endometrial cancer and significant predictors of risks.

Materials and Methods

Medical records of patients with endometrial cancer undergoing laparotomy for surgical staging at Srinagarind Hospital, Khon Kaen University between January 2007 and December 2013 were reviewed. Expedited approval for this study was obtained from the Ethics Committee on Human Research, Khon Kaen University. Because it was a retrospective study and the data were analyzed anonymously, the need for informed consent was waived

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by the Ethics Committee. Exclusion criteria included primary laparoscopic or vulvar procedures and incomplete documentation of perioperative care. All operations were performed by experienced gynecological oncology surgeons. The abdomen and vagina were immediately prepared with Betadine before operation. Intravenous antibiotic prophylaxis was routinely given 30 minutes before operation. In our institute, antibiotic prophylaxis of first choice was one gram of cefazolin. Redosing of antibiotics prophylaxis was generally considered when experiencing massive blood loss and prolonged length of operation.

Data on patients' demographics, surgical characteristics, and perioperative courses were abstracted from outpatient and admission hospital medical records. Patient demographics evaluated included age at operation, underlying medical and metabolic disorders, body mass index (BMI). Intraoperative characteristics included type of prophylactic antibiotic given, type of abdominal incision, length of operation (incision-to-skin closure time), estimated blood loss (EBL). Amount of EBL was retrieved from the records of anesthesiologists.

The primary endpoint for the present study was wound complications (including seroma, hematoma, separation, or infection) requiring additional medical and/or surgical management within 4 weeks of laparotomy.

Descriptive statistics were used as appropriate. On the basis of univariate analysis, variables potentially associated with wound complications including age, BMI, diabetes mellitus (DM), prior abdominal surgery (excluding tubal resection for contraception), types of abdominal incision (midline versus low-transverse incision), operative time, and amount of EBL were included (if $P<0.10$) in a logistic regression analysis to determine which, if any, were jointly important in predicting wound complications after laparotomy for endometrial cancer. An odds ratio with a 95% confidence interval (CI) that did not include unity was considered statistically significant. $P<0.05$ was considered statistically significant. Statistical analysis was carried out via SPSS (IBM, Armonk, NY, USA).

Results

During the study period, 357 patients with complete medical records were reviewed. The mean age was 56.9 years. Eighty-eight (25.6%) patients were premenopausal. Seventy (19.6) patients were nulliparous. Seventy-nine (22.1%) patients reported to have underlying DM. Fifty-five (15.4) patients had BMI > 30 kg/m^2. Three hundred and forty-nine (97.7%) patients underwent low-midline incision. Mean operative time was 141.2 minutes. Prolong operative time (>240 minutes) was observed

Table 1. Baseline Characteristics of the Patients

Characteristics		Total (n=357)	Wound complications Presence (n=28)	Absence (n=329)
Mean age ± SD (years)		56.85 ± 8.99	57.93 ± 11.35	56.76 ± 8.77
Mean BMI ± SD (kg/m2)		25.62 ± 5.02	28.34 ± 5.50	25.38 ± 4.92
Mean operative time ± SD (min)		141.16 ± 39.37	150.18 ± 36.27	140.40 ± 39.58
Median EBL, IQR (ml)		200, 100-300	200, 100-250	200, 100-300
Postmenopausal status		269 (74.40)	20 (71.43)	249 (75.68)
Nulliparous		70 (19.60)	6 (21.43)	64 (19.45)
Prior abdominal surgery		32 (9.00)	5 (17.88)	27 (8.21)
Underlying DM		79 (22.10)	11 (39.29)	68 (20.67)
BMI ≥ 30 kg/m2		55 (15.41)	9 (32.14)	46 (13.98)
EBL >1000 ml		8 (2.24)	2 (7.14)	6 (1.83)
Operative time > 240 minutes[1]		4 (1.12)	0 (0)	4 (1.21)
Abdominal incision	Midline	349 (97.7)	26 (92.86)	323 (98.18)
	Low-transverse	8 (2.24)	2 (7.14)	6 (1.82)
Lymphadenectomy		307 (85.99)	22 (78.57)	285 (86.63)
FIGO stage	IA	158 (44.30)	12 (42.86)	146 (44.38)
	IB	52 (14.60)	5 (17.86)	47 (14.26)
	II	63 (17.60)	5 (17.86)	58 (17.63)
	IIIA	21 (5.90)	1 (3.57)	20 (6.08)
	IIIC	38 (10.70)	2 (7.14)	36 (10.94)
	IV	25 (7.00)	3 (10.71)	22 (6.69)

Abbreviation: SD, standard deviation; BMI, body mass index; EBL, estimated blood loss; IQR, interquartile range; DM diabetes mellitus; FIGO, international Federation of Gynecology & Obstetrics;[1] Incision-to-skin closure time; Data are present as number (percentage) unless state otherwise

Table 2. Significant Factors Predicting wound Complication after Laparotomy for Endometrial Cancer

Variable	Category	Wound complications	Adjusted OR (95% CI)	P-value
BMI	> 30 kg/m^2	16.36%	2.96 (1.23-7.16)	0.016
	≤ 30 kg/m^2	6.30%	Reference level	
History of DM	Presence	13.92%	2.43 (1.06-5.54)	0.035
	Absence	6.12%	Reference level	
Prior abdominal surgery	Presence	15.63%	3.05 (1.03-8.98)	0.043
	Absence	7.08%	Reference level	

OR, odds ratio; CI, confidence interval; BMI, body mass index; DM, diabetes mellitus

in four patients. Median blood loss was 200 ml with an interquartile range of 100-300 ml. Excessive blood loss (>1000 ml) were noted in 8 (2.2%) patients. The majority of patients were in FIGO stage I.

Wound complications after laparotomy for endometrial cancer were observed in 28 patients (7.84%, 95%CI, 5.27% to 11.14%). Table 1 displays baseline characteristics of the patients stratified by the presence or absence of wound complications. Patients experiencing wound complication tended to have underlying DM, previous history of major abdominal surgery, high BMI when compared to patients who did not have wound complications. The distributions of menopausal status, nulliparity, and stages of disease were roughly similar between the two comparison groups.

Univariate analyses, which included age, BMI ≥30 kg/m^2, underlying DM, previous major abdominal surgery, types of abdominal incision, lymphadenectomy, prolong operative time, and excessive blood loss was carried out. High BMI, presence of underlying DM, previous history of major abdominal surgery, and excessive blood loss were noted to have a P-value of less than 0.10 and these 4 variables were then subjected to multivariate analysis using logistic regression. Only BMI, underlying DM, and prior abdominal surgery were remained to be significant independent factors predicting an increased risk of wound complications. Wound complications were significantly more likely to be found among patients with BMI ≥ 30 kg/m^2, underlying DM, and those who had previous history of major abdominal surgery (Table 2).

Discussion

In the present study, the authors systematically evaluated the demographic and operative characteristics of patients undergoing laparotomy for endometrial cancer aimed to determine the incidence of wound complications and its associated risks. The incidence of wound complications in the present study was 7.84%. On basis of multivariate analysis, three significant independent factors associated with increased risk of wound complications were noted including elevated BMI, DM, and prior abdominal surgery.

The incidence of wound complications after laparotomy for endometrial cancer varies from 3.86% to 31.1% (Kodama et al., 2006; Bolac et al., 2013). In the present study, the incidence of wound complications was 7.84% with 95%CI of 5.27% to 11.14%. This wide variation is secondary to the differences in patients' baseline and operative characteristics. This indicates the necessity of determining specific data for each setting if comprehensive preventions of surgical wound complications are to be achieved.

There are many factors that affect wound healing, and obesity is a major issue. Patients who suffer from obesity are more likely to take longer time for complete wound healing. The possible explanations on how obesity impede wound healing include an increased wound tension, a more trauma or even necrosis of abdominal wall secondary to more forceful retraction during operation. Skin folds in obese patients may harbor micro-organisms resulting in wound infection and separation (Wilson and Clark, 2004; Guo and Dipietro, 2010). In addition, the frequent wound complications in the obese patients may be caused by a relative hypoperfusion and ischemia occurring in subcutaneous adipose tissue thus decreasing delivery of optimal tissue level of prophylactic antibiotics (Pevzner et al., 2011).

In previous study conducted to evaluate factors associated with wound complication after gynecologic cancer surgery, BMI was noted to be the strongest predictor and became increasingly more likely beginning at BMI of 25 kg/m^2. Wound complications among gynecolgic cancer patients were 5.6-time more likely in gynecologic cancer patients who had BMI ≥ 30 kg/m^2 when compared to normal weight patients (Nugent et al., 2011). In a study of Bolac et al (2013), BMI ≥ 30 kg/m^2 was a significant independent factor predicting wound complications after laparotomy for endometrial cancer. As compared with patients who had BMI lower than 30 mg/m^2, patients with BMI ≥ 30 kg/m^2 carried a 1.2-fold higher risk of wound complications. Similarly, elevated BMI has been identified as an independent risk factor in our study. Endometrial cancer patients with BMI ≥ 30 kg/m^2 had approximately 3-fold higher risk of wound complications after laparotomy as compared with patients who had lower BMI (95%CI, 1.23-7.16).

Impairment of wound healing among diabetic patients has long been acknowledged (Guo and Dipietro, 2010). Various underlying mechanisms causing wound healing impairments among diabetic patients have been proposed including a relative tissue hypoperfusion, dysfunction in fibroblasts and epidermal cells, impairments of angiogenesis and neovascularization, high levels of metalloproteases, tissue damage secondary to the formation of advanced glycation end-products, and decreased host immunity (Guo and Dipietro, 2010). Unsurprisingly, incidence of wound complication after laparotomy for endometrial cancer among diabetic patients in the present study was significantly higher than that in non-diabetic patients (13.9% and 6.1%, respectively; adjusted OR, 2.4; 95%CI, 1.06-5.54).

In the present study, prior abdominal surgery was independent factor associated with higher risk of wound complications. Women with abdominal surgical scars from prior abdominal surgeries were approximately 3-fold more likely to experience wound complications than those who had never had (95%CI, 1.03-8.98). In a previous study conducted to evaluate wound complications after gynecologic cancer operation, prior abdominal surgery posed an increased risk of wound complications with adjusted OR of 3.28 (95%CI, 1.89-5.70) (Nugent, et al., 2011). In general, incision will be made through the same incision as the previous operation if clinically feasible, poor wound healing conditions in tissue where there is already a scar are therefore anticipated. Another reasons for increased wound complications in patients with previous abdominal surgeries can be attributed to presence of adhesions that can lead to technical difficulties in operating; long operative time thus increasing the chances of contamination; more wound trauma because of prolong and forceful retraction during surgery. This fact may be particularly relevant to patients undergoing

extensive surgical procedure such as our study population.

In conclusion, incidence of wound complications after laparotomy for endometrial cancer was 7.84% (95%CI, 5.27% to 11.14%). Significant independent predictors of risk included BMI, DM and prior abdominal surgery.

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