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Practice of Antibiotic Prophylaxis in Abdominal Hysterectomy at King Chulalongkorn Memorial Hospital

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ABSTRACT

Objectives: To evaluate the rate of adherence to the guidelines for antibiotic prophylaxis using in elective abdominal hysterectomy.

Materials and Methods: Retrospective descriptive study was conducted by reviewing medical records of women underwent elective abdominal hysterectomy at King Chulalongkorn Memorial Hospital (KCMH) from January to December 2019. Cases who having bacterial infection, surgical procedures on gastrointestinal or urinary tract, operative time longer than 3 hours, blood loss more than 1,500 milliliters, immunosuppression, or receiving immunosuppressive agents were excluded. Logistic regression analysis was used to determine factors associated with appropriate use of antibiotics prophylaxis.

Results: A total of 588 women underwent elective abdominal hysterectomy in the study period. Among 391 eligible patients with a mean age of 48.7 years, 326 cases (83.4%) had benign diseases on final diagnosis. Most of the operations used transverse skin incision and a median operative time and blood loss were 90 minutes and 200 milliliters, respectively. Use of antibiotics prophylaxis that adherent to the guidelines was demonstrated in 63 cases (16.1% of all cases, 19.3% of cases without staging procedures). Among cases without staging procedures, operation by residents was the only factor that significantly increased appropriate use of antibiotics prophylaxis with adjusted odds ratio of 6.84 (95% confidence interval 3.40-13.74).

Conclusion: Uses of antibiotic prophylaxis for abdominal hysterectomy at KCMH were mostly not adherent to the guidelines. An antibiotic stewardship program needs to be implemented to improve the practice.

Keywords: antibiotic prophylaxis, hysterectomy, practice.

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การใช้ยาปฏิชีวนะป้องกันการติดเชื้อสำหรับการตัดมดลูกทางหน้าท้องในทางปฏิบัติในโรงพยาบาลจุฬาลงกรณ์

กันตา พระไวย์, สุรสิทธิ์ ชัยทองวงศ์วัฒนา

บทคัดย่อ

วัตถุประสงค์: *เพื่อประเมินอัตราการปฏิบัติตามแนวทางการใช้ยาปฏิชีวนะป้องกันการติดเชื้อสำหรับการตัดมดลูกทางหน้าท้องที่ไม่เร่งด่วน*

วัสดุและวิธีการ: *การศึกษาเชิงพรรณนาย้อนหลังโดยการทบทวนเวชระเบียนของสตรีที่ได้รับการตัดมดลูกทางหน้าท้องที่ไม่เร่งด่วนในโรงพยาบาลจุฬาลงกรณ์ ตั้งแต่เดือนมกราคมถึงธันวาคม ค.ศ. 2019 ผู้ป่วยที่ถูกคัดออกจากการศึกษา ได้แก่ มีการติดเชื้อแบคทีเรีย, ได้รับการผ่าตัดในระบบทางเดินอาหารหรือทางเดินปัสสาวะ, ระยะเวลาการผ่าตัดนานกว่า 3 ชั่วโมง, ปริมาณการเสียเลือดมากกว่า 1,500 มิลลิลิตร, ภูมิคุ้มกันบกพร่อง หรือ ได้รับยากดภูมิคุ้มกัน การประเมินปัจจัยที่สัมพันธ์กับการใช้ยาปฏิชีวนะเพื่อป้องกันการติดเชื้อที่เหมาะสมใช้การวิเคราะห์การถดถอยโลจิสติค*

ผลการศึกษา: *จำนวนสตรีที่ได้รับการตัดมดลูกทางหน้าท้องที่ไม่เร่งด่วนในช่วงระยะเวลาการศึกษาทั้งหมด 588 ราย มีผู้ป่วยที่เข้าเกณฑ์การศึกษาทั้งสิ้น 391 ราย ซึ่งมีอายุเฉลี่ย 48.7 ปี และ 326 ราย (ร้อยละ 83.4) ได้รับการวินิจฉัยขั้นสุดท้ายเป็นโรคที่ไม่ใช่มะเร็ง แผลผ่าตัดส่วนใหญ่เป็นแผลในแนวขวาง มีค่ามัธยฐานของระยะเวลาการผ่าตัด และปริมาณการเสียเลือดเท่ากับ 90 นาที และ 200 มิลลิลิตรตามลำดับ พบการใช้ยาปฏิชีวนะป้องกันการติดเชื้อที่ดำเนินตามตามแนวทางปฏิบัติ 63 ราย (ร้อยละ 16.1 ของผู้ป่วยทั้งหมด, ร้อยละ 19.3 ของผู้ป่วยที่ไม่ได้รับการผ่าตัดเพื่อกำหนดระยะโรคมะเร็ง) ในรายที่ไม่ได้รับการผ่าตัดเพื่อกำหนดระยะโรคมะเร็ง พบว่า การผ่าตัดโดยแพทย์ประจำบ้านเป็นปัจจัยเดียวที่เพิ่มการใช้ยาปฏิชีวนะที่เหมาะสมอย่างมีนัยสำคัญ โดยมีค่า odds ratio เท่ากับ 6.84 (ช่วงความเชื่อมั่นร้อยละ 95 เท่ากับ 3.40-13.74)*

สรุป: *การใช้ยาปฏิชีวนะป้องกันการติดเชื้อสำหรับการตัดมดลูกทางหน้าท้องในโรงพยาบาลจุฬาลงกรณ์ ส่วนใหญ่ไม่เป็นไปตามแนวทางปฏิบัติ จำเป็นต้องดำเนินการตามระบบการส่งเสริมการใช้ยาปฏิชีวนะอย่างสมเหตุผลเพื่อนำไปสู่การปรับปรุงการปฏิบัติอย่างเหมาะสมต่อไป*

คำสำคัญ: *ยาปฏิชีวนะป้องกันการติดเชื้อ, การตัดมดลูก, การปฏิบัติ*

Introduction

Surgical-site infection is one of the common complications of gynecologic surgery. Risk of the infection is increased when patients have any predisposing factors that included poor-controlled diabetes, smoking, obesity, malnutrition, thick subcutaneous tissue, concomitant urinary tract or skin infections, bacterial vaginosis, or immunodeficiency[1]. Besides other preventive measures, antibiotic prophylaxis given before an abdominal hysterectomy has demonstrated an effectiveness in reducing the incidence of postoperative infection[2] and is widely recommended globally[1,3,4].

The guidelines on antibiotic prophylaxis for abdominal hysterectomy have recommended giving a single dose of cefazolin intravenously within 1 hour before surgery[1]. In patients allergic to cephalosporins, clindamycin, erythromycin, or metronidazole should be used instead[1,3]. No additional doses are recommended except when the procedure is longer than 3 hours, or the estimated blood loss is more than 1,500 milliliters (mL)[3]. Continuation of antibiotic prophylaxis after completion of the operation is discouraged because it may increase cost and risk of adverse events, but no additional benefit is demonstrated[5]. In addition, the overuse of antibiotics can contribute to development of drug-resistant bacteria[6].

There has been practice variation among countries in the use of surgical antibiotic prophylaxis; however, adherence to guideline recommendations should be emphasized[7]. The present study was conducted to assess a proportion of cases underwent elective abdominal hysterectomy at King Chulalongkorn Memorial Hospital (KCMH) that was adherent to the practice guidelines for antibiotic prophylaxis.

Materials and Methods

This retrospective descriptive study was approved by The Institutional Review Board of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand. Medical records of patients who underwent elective abdominal hysterectomy at KCMH from January to December 2019 were reviewed. The study population were women between 18 and 60 years of age who admitted for elective abdominal hysterectomy. Cases having bacterial infection required antibiotic treatment, undergoing surgical procedure on gastrointestinal or urinary tract in the same operation, operative time longer than 3 hours, blood loss more than 1,500 mL, being immunocompromised, or receiving immunosuppressive agents or chemotherapy were excluded.

Data were retrieved from the medical records that coded with ICD-9-CM number 68.39 (other and unspecified subtotal abdominal hysterectomy) or 68.49 (other and unspecified total abdominal hysterectomy) and recorded in the case report form. Baseline characteristics including age, weight, height, body mass index, menopausal status, and underlying medical diseases were collected. Information on operation and antibiotic use that were retrieved including surgical indications, surgeon's status, incision types, procedure details, duration of operation, estimated amount of intraoperative blood loss, number and type of prophylactic antibiotics, timing to administer antibiotic prophylaxis and duration of antibiotic use. Adherence to the guidelines for antibiotic prophylaxis was determined by three aspects. First, whether to use recommended antibiotics. Cefazolin is the first line recommended antibiotic while either clindamycin or metronidazole is used in cases with allergy to cephalosporin. Second, whether used only a single dose of intravenous antibiotic. Lastly, whether the drug was administered within 60 minutes prior to incision.

The sample size was calculated by using the formula for a binary outcome in single population[8]. According to Sae-Tia et al study[9], the proportion of cases with appropriate use of antibiotic prophylaxis was 0.752. A total of 316 cases were needed when an alpha error was 0.05, an acceptable error was 0.05, and 10% cases with missing data. Statistical analysis was performed with SPSS software package version 22.0 (IBM Corp., Armonk, NY, USA). Data were presented as mean and standard deviation (SD) or median and interquartile range (IQR) for quantitative measurement. Numbers and percentages were used to describe

qualitative data. The association between various factors and appropriate antibiotic administration was assessed by calculating odds ratio (OR) and 95% confidence interval (CI). Logistic regression analysis was used to determine adjusted OR and 95% CI for each factor.

Results

There were 588 women who underwent an elective abdominal hysterectomy at KCMH in 2019. After excluding patients who required postoperative antibiotic treatment, the total number of eligible cases was 391 with a mean age of 48.7 years and a mean body mass index of 24.6 kg/m^2 (Table 1). Most of the pathological diagnosis were benign conditions (326 cases, 83.4%) including uterine fibroids, benign ovarian tumors, endometriosis and precancerous lesions. Surgical staging procedures were performed in 65 cases for whom carcinoma were diagnosed in 56 cases while the other 9 cases had benign ovarian tumors. About half of the operations were performed by attending staff and most of the skin incisions were transverse. The median duration of operation was 90 minutes and median intraoperative blood loss was 200 mL.

Table 1. Demographic, clinical and operative data (n = 391).

Characteristics	Values
Age (years)	48.7 ± 9.2
Body mass index (kg/m^2)	24.6 ± 4.4
Menopause	103 (26.3%)
Having medical disease	145 (37.1%)
Final diagnosis	
Myoma/adenomyosis	258 (66.0%)
Benign ovarian tumor	47 (12.0%)
Other benign tumor/endometriosis	10 (2.6%)
CIN/EIN	11 (2.8%)
Endometrial cancer	52 (13.3%)
Ovarian cancer	10 (2.6%)
Other cancer	3 (0.8%)
Surgical staging procedures	65 (16.6%)
Midline incision	120 (30.7%)
Surgeon's status	
Resident	148 (37.9%)
Fellow	42 (10.7%)
Attending staff	201 (51.4%)
Operative time (minute)	90 (75-120)
Estimated blood loss (mL)	200 (100-350)

Data presented as mean ± standard deviation, n (%), median (interquartile range)
CIN: cervical of intraepithelial neoplasia, EIN: endometrial intraepithelial neoplasia

Cefazolin was used for antibiotic prophylaxis in 209 cases (53.5%) (Table 2) while clindamycin was prescribed to all of 4 women who allergy to cephalosporin. Only 86 cases (22.0%) received a single dose of antibiotics while 240 cases (61.4%) got parenteral antibiotics more than 24 hours. Oral antibiotics were noted in 67 cases (17.1%). Regarding timing of antibiotic administration, 338 cases (86.4%) were given within 60 minutes prior to skin incision. Overall, adherence to the guidelines for antibiotic prophylaxis was found in 63 cases (16.1%) which all were benign diseases without staging procedures. The rate of adherence to the guidelines in elective abdominal hysterectomy without staging procedures in this study population were 19.3% (63 in 326 cases).

Table 2. Antibiotic use (n = 391).

Characteristics	Values
Antibiotic use for prophylaxis	
Cefazolin	209 (53.5%)
Ceftriaxone	154 (39.4%)
Clindamycin	26 (6.6%)
Others	2 (0.5%)
Duration of parenteral antibiotic	
Single dose	86 (22.0%)
One day	65 (16.6%)
More than one day	240 (61.4%)
Use of oral antibiotic	67 (17.1%)
Antibiotic administered within 60 minutes prior to skin incision	338 (86.4%)
Adherence to the guidelines	63 (16.1%)

Data presented as n (%)

Among cases without surgical staging, resident as a surgeon was the only factor that significantly increased the adherence to the practice guidelines with an OR (95%CI) of 6.61 (3.47-12.62) and an adjusted OR (95%CI) of 6.84 (3.40-13.74) (Table 3).

Table 3. Factors associated with adherence to the guidelines of antibiotic prophylaxis in cases without staging procedures (n = 326).

Factors	Adherence to the guidelines	OR (95%CI)	Adjusted OR (95%CI)
Menopause			
Yes (n = 55)	7 (12.7%)	0.56 (0.24-1.30)	0.55 (0.21-1.42)
No (n = 271)	56 (20.7%)		
Having medical disease			
Yes (n = 106)	22 (20.8%)	1.14 (0.64-2.04)	0.92 (0.47-1.77)
No (n = 220)	41 (18.6%)		
BMI ≥ 30 kg/m2			
Yes (n = 34)	4 (11.8%)	0.53 (0.18-1.55)	0.38 (0.12-1.19)
No (n = 292)	59 (20.2%)		
Midline incision			
Yes (n = 79)	20 (25.3%)	1.61 (0.88-2.94)	1.02 (0.52-1.99)
No (n = 247)	43 (17.4%)		
Surgeon status			
Resident (n = 140)	49 (35.0%)	6.61 (3.47-12.62)	6.84 (3.40-13.74)
Others (n = 186)	14 (7.5%)		
Operative time ≥ 90 minutes			
Yes (n = 167)	36 (21.6%)	1.34 (0.77-2.34)	1.26 (0.65-2.42)
No (n = 159)	27 (17.0%)		
Estimated blood loss ≥ 200 mL			
Yes (n = 196)	40 (20.4%)	1.19 (0.68-2.11)	0.81 (0.42-1.57)
No (n = 130)	23 (17.7%)		

OR: odds ratio, CI: confidence interval

Discussion

Antibiotic prophylaxis for abdominal hysterectomy is aimed to reduce post-operative surgical-site infection[2]. However, inappropriate use of antibiotic

prophylaxis in terms of timing and type of antibiotics may not serve this intention. Furthermore, overusing antibiotics may increase the risk of harmful adverse effects and promote antibiotic resistant bacteria[6]. According to the KCMH guidelines for antibiotic prophylaxis using in elective abdominal hysterectomy that follows the American College of Obstetricians and Gynecologists recommendation[1], adherent use of antibiotic prophylaxis was found only 16.1% of all cases. Only 54.5% of cases received cefazolin or appropriate alternatives. Grievously, use of a single-dose regimen was found in about one-fifth of cases.

One of reasons for not adhering to the guidelines related to antibiotic choices. Cefazolin, a beta-lactam antibiotic that is mostly recommended for antibiotic prophylaxis in abdominal hysterectomy[1,3], was used only 53.5% of all cases in the present study. Due to broader-spectrum activity, ceftriaxone was the second most prescribed although a randomized controlled trial showed no difference between ceftriaxone and cefazolin in preventing infectious morbidity for hysterectomy[10]. Some physicians believe that broad spectrum antibiotics would have a better result. In fact, when compared to recommended beta-lactam antibiotics, rates of post-hysterectomy surgical site infection were significantly higher among patients who received alternative or non-standard regimens[11].

Previous studies demonstrated that there was no significant difference in the rate of surgical site infections between patients receiving a single dose or multiple doses of prophylactic cefazolin for hysterectomy[5,12]. Nevertheless, prolonged administration of antibiotic prophylaxis was reported to be very common (41- 86%)[13]. To achieve adequate tissue concentrations of the antibiotic at the time of the incision and throughout the procedure, antibiotic prophylaxis is widely recommended to administer within 60 minutes prior to incision[1, 3]. However, poor adherence to recommended timing intervals were noted as the most common problem[14].

Low adherence to the guidelines for antibiotic prophylaxis in the present study were similar to reports from other low- and middle-income countries[15]. Abubaker et al's study assessed compliance with antibiotic prophylaxis for obstetrics and gynecology surgeries in three tertiary hospitals located in Northern Nigeria[16]. Optimal timing of antibiotic prophylaxis was found in 16.5% of cases and all the procedures used prolonged duration of administration with range of 5 to 12 days.

Because all of cases with staging procedures were non-adherent to the guidelines, they were excluded from multivariable analysis to determine factors associated with the adherence. The only significant factor increasing adherence was surgeon status as residents. This finding was comparable with Uppendahl et al's study that resident cases had more adherence to the guidelines compared with others. More aware of the current guidelines and in training quality audit might be an explanation for this circumstance.

The present study provided information regards to practice on antibiotic prophylaxis for abdominal hysterectomy in the tertiary hospital. The study results should increase awareness for both gynecologists and hospital administrators to urgently develop strategies to improve proper use of antibiotic prophylaxis. Although the present study collected data from electronic medical records using in KCMH, there were still some limitations due to its retrospective nature. Some input may not be accurate as prospective data collection, such as timing and blood loss. No detailed information was recorded to explain why some cases were prescribed prolonged use of antibiotics. A prospective study is needed to evaluate the outcomes of the antibiotic stewardship program that should be implemented.

Conclusion

Uses of antibiotic prophylaxis for abdominal hysterectomy at KCMH were mostly not adherent to the guidelines. An antibiotic stewardship program needs to be implemented to improve the practice for reduction of overused antibiotic as well as prevention of antimicrobial resistance.

Potential conflicts of interest

The authors declare no conflicts of interest.

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