Usage of Prophylactic Antibiotics in Uncomplicated Gynecologic Abdominal Surgery in Siriraj Hospital

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Objective: *To determine the rate of prophylactic antibiotics usage in uncomplicated gynecologic abdominal surgery in Siriraj Hospital, before and after guideline implementation.*
Material and Method: *Two hundred and fifty-eight women who underwent elective gynecologic surgery for a benign condition were enrolled. The patients were divided into two groups, before and after guideline implementation (control and study group). Medical records of these women were reviewed to determine the rate of prophylactic antibiotics usage, rate of postoperative infection, and antibiotics cost.*
Results: *The most common prophylactic antibiotics used were Cefazolin (41.9%), Cefoxitin (36.4%), and Augmentin (9.7%). Rate of single dose of cefazolin usage were not significantly different between the two groups (10.1% and 12.4% respectively, p = 0.482). However, the rate of postoperative oral antibiotic usage was significantly decreased (31.8% and 14.7% respectively, p = 0.001). The reduction of oral antibiotic usage was significant among staff only. The rate of postoperative infection between control and study groups, as well as between single and other antibiotic prophylaxis were similar. Had a single dose of cefazolin been administered to all patients, the antibiotics cost would have been reduced by 102,012 Baht or 91.8%.*
Conclusion: *Rate of a single dose of cefazolin usage as antibiotic prophylaxis in gynecologic surgery was similar to before guideline implementation. However, postoperative oral antibiotics usage decreased significantly, especially among the staff.*

Keywords: *Prophylactic antibiotics, Gynecologic surgery*

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Abdominal hysterectomy, the most common gynecologic operation performed at Siriraj Hospital, is classified as a clean-contaminated operation that carries a high risk of infection. Postoperative infection is one of the most common and serious complications occurring after surgery. It is associated with prolonged hospital stays and results in increased medical care costs. In abdominal gynecologic surgery, the main source of infection is from endogenous organisms, a heavy mixture of aerobic and anaerobic bacteria, introduced into the operative site from the vagina and endocervix.

Postoperative infection may imply febrile reactions, wound infection, vaginal cuff infections, and urinary tract infections. A number of risk factors for postoperative infection have been identified such as age of the patients, underlying disease, type of surgery, duration of procedure, amount of perioperative bleeding, and preoperative bacterial vaginosis[1,2]. Prophylactic antibiotic interventions have been widely adopted in gynecologic surgery for decades. Antibiotic prophylaxis has been proven effective for prevention of infection, particularly for vaginal hysterectomy and total abdominal hysterectomy. Mittendorf R et al, found that infection rates of abdominal hysterectomy with and without antibiotic prophylaxis have been reported to be approximately 9.0-9.8% and 21-23.4% respectively[3].

However, inappropriate and prolonged use of antibiotics to prevent postoperative wound infection, has been a serious problem in Thailand. This could

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result in increased morbidity and mortality of patients, and give rise to the health care costs due to increasing antibiotic resistance rates. Successful antimicrobial prophylaxis depends on the characteristics of the infecting organisms and their interaction with the selected antibiotic regimen. Systemic antibiotics are believed to augment natural defense mechanisms but rely on a narrow window of time to combat infection at the period of inoculation. For many procedures, antibiotic prophylaxis is given during the induction of anesthesia. During long surgical time, additional doses of antibiotics are given at intervals of 1-2 times the half-life of the antibiotics to maintain adequate level throughout the procedure. Moreover, additional doses may be used in high-risk patients and when blood loss is substantial. There was a meta-analysis showing that antibiotic prophylaxis with cephalosporins was useful in preventing fever and infection after abdominal hysterectomy[4].

Cephalosporins are agents of choice for antibiotic prophylaxis because of their broad and appropriate spectrums of activity. Among these, Cefazolin is the most widely used antibiotics because it has a combination of a long half-life (90-150 minutes), high efficacy, and reasonable cost. The American College of Obstetricians and Gynecologists (ACOG) also suggests that a single dose of 1-2 g Cefazolin or a single dose of 500 mg Metronidazole given intravenously is the prophylactic regimen recommended for abdominal hysterectomy[5].

The Department of Obstetrics and Gynecology, Faculty of Medicine, Siriraj Hospital has adopted such recommendations in 2004 for all uncomplicated elective gynecologic surgery. The purpose of the present study was to evaluate the usage of antibiotic prophylaxis and the rate of postoperative infections in patients undergoing uncomplicated elective gynecologic surgery before and after guideline implementation.

Material and Method

The present study was conducted at Siriraj Hospital with the approval of the Institutional Ethic Committee. Two hundred and fifty eight women who underwent gynecologic surgery for a benign condition during the year 2003 and 2004 were enrolled. The patients were divided into two groups, before and after guideline implementation (control and study group).

Exclusion criteria included patients with underlying medical conditions, immunocompromised host, obesity (BMI > 30 kg/m^2), any coexisting infection or fever before surgery, gynecologic malignancy as the final diagnosis, long operative time (more than 3 hours), intraoperative complications such as intra-abdominal organ injury, excessive blood loss (more than 1500 ml), and previous immunosuppressant or radiation therapy.

Medical records of these women were reviewed to determine the usage of prophylactic antibiotics, the rate of postoperative infection, and the medical cost. Baseline characteristics from the medical data and various characteristics were compared between the control and the study group.

Postoperative infections were classified as wound infection, vaginal cuff cellulites, pelvic cellulites, and febrile morbidity. Febrile morbidity was defined as body temperature more than 37.8°C on two or more consecutive days more than 24 hours after surgery, associated with surgical site infection and non-surgical site infection, e.g. UTI[6]. In the present study, the postoperative infection was evaluated only in the early postoperative period that was about one week after surgery.

Statistical analysis was performed using SPSS version 11.5 for Windows. Univariate analysis was used to compare various characteristics between the two groups, either by two-tailed Chi-square test, Fisher's exact test or Student's *t*-test as appropriate. Statistical significance was considered if p-value was less than 0.05.

Results

During 2003-2004, two hundred and fifty-eight patient's profiles were available for analysis. Table 1 shows characteristics of the patients in each group. Both groups were comparable with regard to baseline characteristics, including age, diagnosis, types of operation, duration of surgery, intraoperative blood loss, and physician who made the operation, staff, and resident. The mean age of control and study group were comparable (43.3 ± 7.1 and 41.4 ± 6.4 years respectively, $p = 0.31$). The majority of diagnosis of both groups was myoma uteri (63.6% and 68.2% respectively) and adenomyosis (24.8% and 15.5% respectively). No significant differences were observed ($p = 0.14$).

Operative characteristics were not significantly different between the two groups. The majority of operations was hysterectomy (89.2% and 84.5% respectively, $p = 0.36$). The duration of surgery was 127.4 ± 30.6 and 132.4 ± 41.4 minutes respectively ($p = 0.27$). Intra-operative blood loss was 311.1 ± 228.2 and 352.5 ± 296.7 ml respectively ($p = 0.21$). The surgeons were more commonly to be staff than residents in both

groups (79.1% vs. 71.3% and 20.9% vs. 28.7% respectively, p = 0.15).

Table 2 shows that the most common prophylactic antibiotics used were Cefazolin, Cefoxitin, and Augmentin. There were significant differences between the two groups. Rate of Cefazolin usage increased significantly from 32.6% to 51.2% (p < 0.01). However, rate of single dose cefazolin usage increased only slightly and was not significantly different (p = 0.48). Postoperative oral antibiotic usage was also significantly decreased (31.8% and 14.7% respectively, p = 0.001).

Table 3 shows the rate of prophylactic antibiotics usage by staff and residents. Among staff, prophylactic antibiotics usage did not change significantly (p = 0.67). Rate of single dose Cefazolin for preoperative prophylaxis was slightly increased (12.8% and 13%). However, the rate of postoperative oral antibiotic usage was reduced significantly (33.3% and 13.0%, p = 0.001). Among residents, the rate of single dose cefazolin usage was increased (0% and 10.8%) and the rate of oral antibiotic usage was reduced (25.9% and 18.9%), but without statistical significance (p = 0.08, and 0.72 respectively).

Table 4 shows that postoperative infection was similar between the two groups (4.7% in control and 1.6% in the study group, p = 0.14). Rate of postoperative infection in single dose cefazolin was 3.4% and was 3.1% for other antibiotics (p = 0.79). The most common causes of postoperative infection were UTI and wound infection.

With regard to medical cost of antibiotics, the authors found that the total cost of antibiotics used

Table 1. Baseline characteristics of the patients

Characteristics	Control group (n = 129)	Study group (n = 129)	p-value
Age (years)	43.3 ± 7.1	41.4 ± 6.4	0.31
Diagnosis			0.14
Myoma uteri	82 (63.6%)	88 (68.2%)	
Adenomyosis	32 (24.8%)	20 (15.5%)	
Others	15 (11.6%)	21 (16.3%)	
Operation			0.36
Hysterectomy	115 (89.2%)	109 (84.5%)	
Others	14 (10.8%)	20 (15.5%)	
Duration of surgery (min)	127.4 ± 30.6	132.4 ± 41.4	0.27
Intraoperative blood loss (ml)	311.1 ± 228.2	352.5 ± 296.7	0.21
Physician			0.15
Staff	102 (79.1%)	92 (71.3%)	
Resident	27 (20.9%)	37 (28.7%)	

Table 2. Antibiotics Usage

Antibiotics Usage	Control group (n = 129)	Study group (n = 129)	p-value
Types of antibiotics			<0.01
Cefazolin	42 (32.6%)	66 (51.2%)	
Cefoxitin	47 (36.4%)	47 (36.4%)	
Augmentin	17 (13.2%)	8 (6.2%)	
Others	23 (17.8%)	8 (6.2%)	
Antibiotics prophylaxis			0.48
Single dose of Cefazolin	13 (10.1%)	16 (12.4%)	
Others*	116 (89.9%)	113 (87.6%)	
Postoperative oral antibiotics	41 (31.8%)	19 (14.7%)	0.001

* included multiple doses of cefazolin or other antibiotics

Table 3. Antibiotics prophylaxis used by physician

Antibiotics Usage	Control group (n = 129)	Study group (n = 129)	p-value
Staff	n = 102	n = 92	
Antibiotics prophylaxis			0.67
Single dose of Cefazolin	13 (12.8%)	12 (13.0%)	
Others	89 (87.2%)	80 (87%)	
Postoperative oral antibiotics	34 (33.3%)	12 (13.0%)	0.001
Resident	n = 27	n = 37	
Antibiotics prophylaxis			0.08
Single dose of Cefazolin	0	4 (10.8%)	
Others	27 (100%)	33 (89.2%)	
Postoperative oral antibiotics	7 (25.9%)	7 (18.9%)	0.72

Table 4. Comparison of postoperative infection

	N	Postoperative infection	p-value
Group			0.14
Control group	129	6 (4.7%)	
Study group	129	2 (1.6%)	
Antibiotics use			0.79
Single dose of Cefazolin	29	1 (3.4%)	
Others	229	7 (3.1%)	

was 111,042 Baht. However, if the authors only used single dose cefazolin in all patients in the present study, the total cost would be only 9,030 Baht. This means that the antibiotics cost would have been reduced by 102,012 Baht or 91.8%.

Discussion

Despite careful aseptic surgical techniques, postoperative infection remains a problem. The use of prophylactic antibiotics can reduce the rate of surgical infection, providing the right drug is chosen for the right occasion and given at the optimal time. The term prophylaxis is only appropriate when there has been no preoperative contamination or established infection. Many studies showed that properly administered prophylactic antibiotics could prevent postoperative infection[7,8]. Many factors could also influence the success of prophylaxis including choice of appropriate antibiotics, timing of administration, and proper duration of therapy. With regard to antibiotic prophylaxis for gynecologic procedures, the ACOG recommends that in abdominal or vaginal hysterectomy, Cefotetan is preferred, but reasonable alternatives are Cefazolin and Cefoxitin. Metronidazole is an alternative drug for patients undergoing hysterectomy who were penicillin allergy.

The results from this study revealed that only a few surgeons follow guidelines for antibiotic prophylaxis. The widely use of multidose antibiotics remained almost the same in the study group as in the control group, both among the staff and residents. On the other hand, the rate of postoperative oral antibiotics usage decreased significantly, especially among staff. Perhaps, this was due to a belief that a single dose prophylactic antibiotic for gynecologic surgery was not effective enough to prevent postoperative infection. The results also showed that postoperative infections were also not significantly different between the two groups, and between single dose and multidose regimen. However, only early postoperative infections were evaluated in the present study. In addition, the present study also showed that a total of 102,012 Baht or 91.8% of medical cost could have been saved if single dose cefazolin guideline was applied.

Cefazolin is generally accepted as an appropriate antibiotic for postoperative infection prophy-

laxis. It is chosen because it is effective against a wide range of wound pathogens, inexpensive, has a sufficiently long half-life, and is highly concentrated in wounds[3,9,10]. One randomized study showed that the use of a single dose of cefazolin is as effective as four doses of cefazolin in the prevention of serious infectious morbidity associated with gynecologic surgeries[11]. Some studies have pointed out that prolonged use of antibiotics did not reduce the rate of surgical site infections, but it contributed to the increase in resistant species outbreaks, for example, methicillin - resistant Staphylococcus aureus (MRSA)[12].

In conclusion, the rate of a single dose prophylactic antibiotic usage in uncomplicated gynecologic surgery was similar to before guideline implementation. However, postoperative oral antibiotics usage decreased significantly, especially among the staff. Single dose cefazolin usage seemed to be as effective as other prophylactic antibiotic in the prevention of early postoperative infection associated with gynecologic surgery. The authors hope that the results could persuade other gynecologists to follow this prophylactic antibiotic guideline to prevent infections and reduce the unnecessary costs.

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การใช้ยาปฏิชีวนะเพื่อป้องกันการติดเชื้อหลังการผ่าตัดเปิดหน้าท้องในผู้ป่วยนรีเวชที่ไม่มีภาวะแทรกซ้อนในโรงพยาบาลศิริราช

ดิฐกานต์ บริบูรณ์หิรัญสาร, ปิยวัฒน์ เลาวหุตานนท์, กัญญา แก้วมณี, มณฑา แห่งทรัพย์เจริญ, รพีพรรณ อุปการ, สุปรีดา เมฆอนันตโกศล

วัตถุประสงค์*: เพื่อศึกษาอัตราการใช้ยาปฏิชีวนะเพื่อป้องกันการติดเชื้อหลังการผ่าตัดเปิดหน้าท้องในผู้ป่วยนรีเวชที่ไม่มีภาวะแทรกซ้อน ในโรงพยาบาลศิริราช ระหว่างช่วงเวลาก่อนและหลังการเสนอแนะแนวทางการใช้ยาดังกล่าวในภาควิชาสูติศาสตร์-นรีเวชวิทยา โรงพยาบาลศิริราช*

วัสดุและวิธีการ*: ทำการศึกษาในผู้ป่วยนรีเวชจำนวน 258 คนที่มารับการรักษาโดยการผ่าตัดเปิดหน้าท้องโดยการนัดหมายล่วงหน้า ที่ภาควิชาสูติศาสตร์-นรีเวชวิทยา โรงพยาบาลศิริราช โดยแบ่งการเก็บข้อมูลเป็น 2 ช่วงเวลา ได้แก่ ก่อนและหลังการเสนอแนะแนวทางการใช้ยาปฏิชีวนะเพื่อป้องกันการติดเชื้อหลังการผ่าตัดเปิดหน้าท้องใน ผู้ป่วยนรีเวช (กลุ่มควบคุมและกลุ่มศึกษา) ทำการทบทวนเวชระเบียนของผู้ป่วย ทำการรวบรวมข้อมูลต่าง ๆ เกี่ยวกับการใช้ยาปฏิชีวนะ และบันทึกข้อมูลในแบบบันทึกข้อมูลที่จัดทำขึ้น จากนั้นจึงนำข้อมูลที่ได้ไปวิเคราะห์ เพื่อศึกษาอัตราการใช้ยาปฏิชีวนะเพื่อป้องกันการติดเชื้อหลังการผ่าตัด อัตราการเกิดภาวะแทรกซ้อนหลังผ่าตัด และค่าใช้จ่ายสำหรับการใช้ยาปฏิชีวนะ*

ผลการศึกษา*: ยาปฏิชีวนะที่ใช้เพื่อป้องกันการติดเชื้อหลังการผ่าตัดเปิดหน้าท้องในผู้ป่วยนรีเวชที่ไม่มีภาวะแทรกซ้อนบ่อยที่สุด 3 ลำดับคือ เซฟาโซลิน (41.9%), เซฟ๊อกซิติน (36.4%) และ อ๊อกเมนติน (9.7%) อัตราการใช้ยาปฏิชีวนะเพียง 1 ครั้ง ก่อนผ่าตัด ไม่มีความแตกต่างกันระหว่างกลุ่มควบคุมและกลุ่มศึกษาคือ 10.1% และ12.4% ตามลำดับ (p = 0.48) อัตราการใช้ยาปฏิชีวนะชนิดรับประทานหลังผ่าตัด มีปริมาณการใช้ลดลงอย่างมีนัยสำคัญจาก 31.8% เหลือ 14.7% (p = 0.001) โดยเฉพาะในกลุ่มผู้ป่วยที่ได้รับการผ่าตัดโดยอาจารย์แพทย์ อัตราการเกิดภาวะแทรกซ้อนหลังผ่าตัดในกลุ่มที่ใช้ยาปฏิชีวนะเพียง 1 ครั้งและหลายครั้ง ไม่แตกต่างกัน การใช้ ยาปฏิชีวนะเซฟาโซลิน 1 ครั้ง ในผู้ป่วยทุกคนที่มารับการผ่าตัด สามารถลดค่าใช้จ่ายที่เกี่ยวกับการรักษาพยาบาลลงได้ประมาณ 102,012 บาท คิดเป็น 91.8%*

สรุป*: อัตราการใช้ยาปฏิชีวนะเพียง 1 ครั้ง ก่อนผ่าตัด เพื่อป้องกันการติดเชื้อหลังการผ่าตัดเปิดหน้าท้อง ในผู้ป่วยนรีเวชระหว่างช่วงเวลาก่อนและหลังการเสนอแนะแนวทางการใช้ยาไม่แตกต่างกัน แต่พบว่าการใช้ยาปฏิชีวนะชนิดรับประทานหลังผ่าตัดลดลงอย่างมีนัยสำคัญโดยเฉพาะในกลุ่มผู้ป่วยที่ได้รับการผ่าตัดโดยอาจารย์แพทย์*