

# Variation of Prophylactic Antibiotic in Laparoscopic Cholecystectomy: Songklanagarind Hospital Perspective

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**Objective:** Evaluate the effectiveness of variation of prophylactic antibiotic in laparoscopic cholecystectomy.

**Material and Method:** A retrospective data review was undertaken of patients who received a laparoscopic cholecystectomy between January 1, 2005 and December 31, 2008 in Songklanagarind Hospital. The prevalence of surgical site infection (SSI), the variation of antibiotic prescription, and associated factors with SSI were reviewed and analyzed.

**Results:** Four hundred thirty nine patients received a successful laparoscopic cholecystectomy. The prophylactic antibiotic was utilized in 328 patients (74.7%). Cefazolin was the most common antibiotic used. Only 3 patients (0.9%) received the antibiotic according to the recommendation of center for disease control and prevention (CDC). The SSI was accounted in 41 patients (9.3%); 29 had the prophylactic antibiotic, while 12 did not. There was no statistically significant difference in the prevalence of SSI between the two groups ( $p = 0.54$ ). Factor significantly associated with SSI was the operative time more than three hours ( $p = 0.03$ ).

**Conclusion:** Various patterns of prophylactic antibiotic were encountered. The practice variation seemed to be ineffective in the prevention of SSI. The selectively risk factors should be considered in the antibiotic prophylaxis.

**Keywords:** Laparoscopic cholecystectomy, Prophylactic antibiotic, Surgical site infection

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Surgical site infection (SSI) is the most common of nosocomial infections after surgery and increases costs and hospital stays. Prophylactic antibiotics are recommended for reduction of incidence of SSI in contaminated procedure with high infection rates such as prosthetic implantation where consequences of infection are serious. The antibiotic should cover the flora organisms. It should be administered 30 to 60 minutes before the start of surgical incision and discontinued within 24 hours after end of surgery. A single preoperative dose of antibiotic is as effective as a 5-day course of postoperative therapy<sup>(1)</sup>.

Laparoscopic cholecystectomy is a common procedure in general surgery. Elective laparoscopic cholecystectomy have SSI rate between 0.4% and 3.8%. However, prophylactic antibiotics use is still controversial<sup>(2-5)</sup> and a meta-analysis found that

prophylactic antibiotics do not prevent infections in low-risk laparoscopic cholecystectomy patients<sup>(6-8)</sup>. A recent study in Songklanagarind Hospital showed that the rate of surgical site infection after laparoscopic cholecystectomy was 9.7% even though 96.86% of the study population had been given a prophylactic antibiotic. It was found that many factors may contribute to the incidence of postoperative infection, most notably if a drain is used, obesity, inaccurate prophylactic antibiotic injection, diabetes mellitus, an American Society of Anesthesiologists score (ASA) more than 2, or a long operative time<sup>(9)</sup>.

The aim of the present study was to specifically examine the usefulness of prophylactic antibiotic in decreasing postoperative laparoscopic cholecystectomy infection and associated factors.

## Material and Method

The authors' institution's Human Use Investigation Committee approved this study and allowed to review the database of patients who underwent a successful elective cholecystectomy at the General Surgical Unit of Songklanagarind Hospital

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between January 1, 2005 and December 31, 2008. Postoperative SSI was defined according to the center for disease control and prevention (CDC)<sup>(10)</sup> classification, which is infections occurring within 30 days after the operation and were divided into three groups, superficial, deep and organ/space infections.

Patient demographic data and operative information were recorded. Type of prophylactic antibiotic, and time when injection antibiotic, were reviewed. Factors that could be associated with postoperative infection were noted, ASA more than 2, operative times more than the 75<sup>th</sup> percentile of the average duration of this procedure (more than 3 hours), obesity (Body Mass Index-BMI of 30 or more), use of drain, a local bupivacaine injection was given at the surgical wound immediately after surgery, and diabetes mellitus.

Statistical analysis was done with the Statistical Package for the Social Sciences (SPSS). Results were expressed as the mean, standard deviation (SD), frequency and percentage. Univariate comparisons were carried out using Chi-square test or Fishers' exact test for discrete variables and student's t-test for continuous variables. A two-tailed p-value less than 0.05 was considered statistically significant.

## Results

During the 4-year study, 439 patients underwent a successful laparoscopic cholecystectomy. The mean age was  $53.44 \pm 13.83$  years. Three hundred nineteen subjects were female (72.7%). A prophylactic antibiotic was utilized in 328 patients (74.7%). Only

3 patients (0.9%) were injected antibiotic 30 to 60 minutes before starting the incision, and discontinued antibiotic within 24 hours after the operation. The variation of prophylaxis antibiotic included prescribed antibiotic more than 24 hours after surgery, or deviated timing of injection antibiotic. However, most of the patients received their antibiotic in the operating room as an injection by the anesthesiologist less than 30 minutes prior to the first incision.

The most common antibiotic used was cefazolin. SSI occurred in 41 patients (9.3%), distributed by group of superficial and deep infection as 40 (97.6%) and 1 (2.4%). None was reported of organ/space collection. The most common site of wound infection was the umbilical incision, 12 patients (30.8%).

The majority of the patients, 29 in 41 cases (70.7%) had received an antibiotic, while 12 in 41 cases (29.3%) had not. There was no significant difference between both groups ( $p = 0.53$ ), as well as type of antibiotic, timing of injection antibiotic and duration of antibiotic used, as shown in Table 1.

One out of three patients who received antibiotic 30 to 60 minutes before starting the incision and discontinued antibiotic within 24 hours after operative procedure developed SSI. This was not statistically significant different ( $p = 0.33$ ).

The factors of ASA more than 2, BMI of 30 or more, surgical drainage, surgical wound injection with bupivacaine and diabetes mellitus, did not have statistical significance to SSI. Only prolonged operative time more than 3 hours was significantly

**Table 1.** Characteristics of prophylactic antibiotic used

Variable (n = 328)	Prophylactic antibiotic No. (%)	Surgical site infection No. (%)	p-value
Antibiotic			
Cefazolin	238 (72.6)	22 (6.7)	0.68
Cefotaxime	71 (21.6)	4 (1.2)	0.28
Ceftriaxone	11 (3.4)	1 (0.3)	0.97
Other	8 (2.4)	2 (0.6)	0.10
Timing of injection			
More than 60 minutes to incision	11 (3.3)	11 (3.3)	0.98
30 to 60 minutes to incision	7 (2.1)	7 (2.1)	0.90
Less than 30 minutes to incision	298 (90.9)	298 (90.9)	0.66
After incision	12 (3.7)	12 (3.7)	0.27
Postoperative duration of antibiotic			
24 hours or less	247 (75.3)	19 (5.8)	0.20
More than 24 hours	81 (24.7)	10 (3.0)	0.20

**Table 2.** Factor associated to surgical site infection

Variable (n = 439)	No. (%)	Surgical site infection No. (%)	p-value
ASA more than 2	21 (4.8)	2 (0.46)	0.98
Obesity (BMI of 30 or more)	50 (11.4)	6 (12.0)	0.49
Underlying diabetes mellitus	63 (14.4)	7 (12.5)	0.60
Operative time more than 3 hours	22 (5.0)	5 (22.7)	0.03*
Surgical drainage	128 (29.2)	14 (10.9)	0.46
Surgical wound injection with bupivacaine	131 (29.8)	15 (11.5)	0.32

\* Statistical significance, p-value < 0.05

associated with SSI (p = 0.03, 95% CI = 1.08 to 8.91) with Odds ratio of 3.11, as shown in Table 2.

### Discussion

The known limitation of the retrospective study is lack of a good control group and the associated factors are not adequately controlled. Even though the sample population may be large, a lot of confounding data and bias in the data collection itself are usually present. Most risk factors of disease in the retrospective studies are analyzed by the Chi-square method, but this methodology is not adequate to confirm risk factors because the control group was not properly randomized.

Prophylactic antibiotics are currently normally used in most institutions in elective laparoscopic cholecystectomy. However, a number of recent studies<sup>(11-14)</sup>, including a meta-analysis, have suggested there is no benefit from prophylactic antibiotic use in low risk laparoscopic cholecystectomy<sup>(6-8)</sup>. The present study showed no statistical significance among variety of antibiotic prophylaxis. It means the antibiotic prophylaxis does not seem to affect the prevalence of postoperative infection in subjects. The routinely prophylactic antibiotic may not have the benefit in low-risk elective laparoscopic cholecystectomy patients. Therefore, the variety of antibiotic usage should be replaced by a systematic pattern of antibiotic administration.

Remarkably, the prevalence of SSI infection in the present study was quite high, with significant association to the operative time of more than three hours. An additional element should be considered as several studies reported that underlying diabetes mellitus could cause an increased susceptibility to biliary sepsis<sup>(15,16)</sup>. However, the present study did not show the significance. Beside, the real risk factors for

infectious process may occur among the patient biliary colic and increase of intraluminal pressure and biliary stasis<sup>(17-19)</sup>.

In conclusion, various patterns of prophylactic antibiotic were encountered. The practice variation seemed to be ineffective in the prevention of SSI. The risk factors should be considered in the antibiotic prophylaxis.

### Potential conflicts of interest

None.

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## ความแปรผันของยาปฏิชีวนะป้องกันในการผ่าตัดถุงน้ำดีผ่านกล้อง: มุมจากโรงพยาบาลสงขลานครินทร์

ศักดิ์ชาย เรืองสิน, ธันต์ชนก วนสุวรรณกุล

**วัตถุประสงค์:** เพื่อประเมินประสิทธิผลของความแปรผันของยาปฏิชีวนะป้องกันในการผ่าตัดถุงน้ำดีผ่านกล้อง **วัสดุและวิธีการ:** ทบทวนข้อมูลย้อนหลังของผู้ป่วยผ่าตัดถุงน้ำดีผ่านกล้องตั้งแต่ 1 มกราคม พ.ศ. 2548 ถึง 31 ธันวาคม พ.ศ. 2551 ณ โรงพยาบาลสงขลานครินทร์ วิเคราะห์อุบัติการณ์ของการติดเชื้อ ตำแหน่งผ่าตัด ความแปรผันของการใช้ยาปฏิชีวนะ และปัจจัยที่เกี่ยวข้องกับการติดเชื้อตำแหน่งผ่าตัด

**ผลการศึกษา:** ผู้ป่วยผ่าตัดถุงน้ำดีผ่านกล้องทั้งหมด 439 ราย ได้รับยาปฏิชีวนะป้องกันจำนวน 328 ราย (ร้อยละ 74.7) ยา cefazolin เป็นยาปฏิชีวนะที่ใช้มากที่สุด ผู้ป่วยเพียง 3 รายเท่านั้น ได้รับยาปฏิชีวนะตามคำแนะนำของศูนย์ควบคุมโรคประเทศสหรัฐอเมริกา ผู้ป่วย 41 ราย (ร้อยละ 9.3) การติดเชื้อตำแหน่งผ่าตัด ในจำนวนนี้ 29 ใน 41 ราย ได้รับยาปฏิชีวนะ และ 12 ใน 41 ราย ไม่ได้รับยาปฏิชีวนะ ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติของอุบัติการณ์ติดเชื้อตำแหน่งผ่าตัดระหว่างสองกลุ่ม ( $p = 0.54$ ) ปัจจัยสัมพันธ์กับการติดเชื้อตำแหน่งผ่าตัดอย่างมีนัยสำคัญคือการผ่าตัดนาน 3 ชั่วโมง หรือมากกว่า ( $p = 0.03$ )

**สรุป:** ความแปรผันของยาปฏิชีวนะป้องกันที่เผชิญอยู่และความแปรผันในเวชปฏิบัติไม่เกิดประสิทธิผล ในการป้องกันการติดเชื้อตำแหน่งผ่าตัด ปัจจัยเสี่ยงทางเลือกควรพิจารณาในการให้ยาปฏิชีวนะป้องกัน