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The Effect of Short V.S Long-Term Antibiotic Prophylaxis In Gynecologic Surgery

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ABSTRACT

This study aimed to investigate the difference between the prophylaxis made with only one or two dose first-generation cephalosporin and at least 3 days first-generation cephalosporin use in the emergence of surgical site infections in patients with vertical abdominal incision.
This study was completed retrospectively by examining the file, computer and laboratory results of 91 postoperative patients with median incision who showed a high risk for infection in Haseki Training and Research Hospital Department of Obstetrics and Gynecology between August 2014-May 2015.
In our study, surgical site infection in the short-term perioperative prophylaxis group is 57,1 percent of patients, while in long-term perioperative prophylaxis group this rate is 15,4 percent. In short-term perioperative prophylaxis group, surgical site infections rate were detected significantly higher p (<0,001) than long-term perioperative prophylaxis group.
In our study, perioperative prophylaxis with only one or two doses of Cefazolin Na in gynecological or gyneco-oncological operations with median incision, contrary to what was suggested by the guide, were found to be significantly inadequate p (<0,001) versus to the at least three days prophylaxis with Cefazolin Na in the prevention of surgical site infections. However, it was found that perioperative prophylaxis of at least 3 days was sufficient.

Key Words: Surgical site infection, perioperative prophylaxis, vertical incision, cefazolin Na

Introduction

In various different publications, surgical site infections (SSI) in hospitalized surgical patients have been reported to occur in the first or second frequency of nosocomial infections (1, 2). Antibiotics have always been used to prevent surgical site infections. The first study that the antibiotic given just before surgery was effective in preventing infection was published by Burke in 1961 (3).

However, due to undesirable consequences in prolonged prophylaxis, perioperative antibiotic prophylaxis (POP) guidelines have been published by many centers. Prophylaxis also has undesirable consequences such as changing the flora of the patient as a result of the use of antibiotics, the manifestation of resistant bacteria in the patient's flora, infection with resistant bacteria, the development of superinfection, the emergence of undesirable effects due to antibiotics, unnecessary doses and increased cost of antibiotic use for a long time, and a false sense of security to the surgeon (4).

Similar to most surgical clinics, it is common to begin prophylaxis with Cefazolin Na 1-2 hours before the operation and continue parenterally for 3-7 days after the operation to be completed on the 10th day with an oral antibiotic in clean wound surgeries of the abdominal cavity in operations like splenectomy, pyloromyotomy, and antireflux intervention (5).

According to a study conducted at Uludağ University, after the POP guideline was published with the purpose to reduce prolonged prophylaxis, the rate of single-dose antibiotic prophylaxis was detected as 29,3% with no difference in comparison to prior use of prophylaxis. It was found that the implementation continued at a rate of by 38,4% even after the publication of the POP for more than 24 hours guideline (6).

Contrary to many studies and POP guidelines published around the globe, since surgeons still

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prefer the use of long-term prophylactic antibiotherapy based on their personal experience, our study aims to statistically compare the rates of SSI following the POP guidelines with 1st generation cephalosporin and the use of 1st generation cephalosporin for at least 3 days in patients with vertical abdominal incision as it carries a high risk of SSI.

Materials and Methods

In this study, patient files, documentation and the laboratory results on the system of 91 patients who underwent an operation with a median incision between August 2014 and May 2015 at Haseki Training and Research Hospital Gynecology and Obstetric Clinic were examined. Six patients were operated with a vertical incision, 3 patients did not follow up with their examination, 5 patients were transferred to the post-operative intensive care unit due to their additional diseases, and 4 patients who had entered the dirty or contaminated wound class were excluded from the study. The study included 73 patients in the clean or clean-contaminated wound class operated with a median incision.

In line with the recommendations of Haseki Training and Research Hospital Infection Committee, some of the surgeons abandoned prolonged antibioprophylaxis and performed the recommendations of the committee. Some surgeons continued long-term antibioprophylaxis. For this reason, 2 groups of patients who underwent short and long-term surgical antibiotic prophylaxis were formed spontaneously.

Prior to surgery, following a nil per os period of 8 hours, 1 g of IV Cefazolin Sodium was given 30 minutes prior to incision, the operation began after the sterile scrubbing with 10% Polyvidone-Iodine solution, vaginal cleansing and sterile covering. After the necessary surgical intervention, the abdominal fascia was closed with PDS (polydioxanone suture) and the skin was stapled in accordance with its anatomy.

In the group with short-term surgical antibioprophylaxis, in cases such as prolonged operation time or blood product transfusion, a second dose of IV Cefazolin Sodium was administered but no more than 2 doses of prophylaxis were used. In the long-term prophylaxis group, 3x1 IV 1 gr Cefazolin Sodium was administered for at least 3 days.

Patient wound dressings were renewed daily until discharge during the postoperative period and were followed up for surgical site infection. Patients were asked to follow up for outpatient examination immediately if they presented with any complaints. Otherwise outpatient follow up examinations were expected 1 week and 1 month after discharge.

Age, comorbidity and smoking were analyzed as demographic data. There were no patients receiving immunosuppressive therapy.

The 1992 criteria of Center of Disease Control and Prevention (CDC) were used to define the surgical site infection (7).

SPSS Statistics software 15.0 for Windows program was used for statistical analysis. Descriptive statistics; the mean, standard deviation, minimum, maximum and median were given for numerical variables. In two independent groups, the numerical variable was compared with Student's T-test when the normal distribution condition was met, and Mann Whitney U Test was applied when the normal distribution conditions were not met. The rates in the groups were established by Chi Square Analysis. Statistical significance level was accepted as $p<0,05$.

Results

Of the 73 patients included in the study, 52 patients were administer long-term perioperative antibiotic prophylaxis (POP) with 3x1 Cefazolin Na for at least 3 days, and 21 patients were given short-term POP with a one or two doses of Cefazolin Na.

The mean age was 51,2 ± 16,6 years (range=18-76y) in the short-term POP group, and 50,4 ± 13,4 years (range=21-76y) in the long-term POP group (Table 1).

When comorbid chronic diseases are evaluated, there were 4 patients (19,0%) with diabetes, 9 patients (42,9%) with hypertension and hypothyroidism in 2 patients (9,5%) in the short-term POP group. In the long-term POP group, 4 patients had diabetes (7,7%), 5 patients had hypertension (9,6%), and 2 patients (3,8%) had hypothyroidism. The rate of patients with hypertension was statistically higher in the short-term POP group compared to the long-term POP group ($p = 0,002$) (Table 1).

The number of smokers in short and long-term POP groups were 7 (33,3%) and 12 (23,1%), respectively, and there was no statistically significant difference between the two groups ($p = 0,36$). There was no significant difference between the American Society of Anesthesiologists (ASA)

Table 1. Age Distribution and Accompanying Chronic Diseases In Cases From The Study

		Treatment		
		Short term POP (n=21)	Long term POP (n=52)	
		Mean.±SD Min-Max / Median	Mean.±SD Min-Max / Median	p
Age		51,2±16,6 18-76 / 51	50,4±13,4 21-76 / 50,5	0,823
Accompanying Chronic Diseases: n (%)	DM	4 (19,0)	4 (7,7)	0,216
	HT	9 (42,9)	5 (9,6)	0,002
	Hypothyroidism	2 (9,5)	2 (3,8)	0,574
Smoker: n (%)		7 (33,3)	12 (23,1)	0,366
ASA Scoring: n (%)	1	10 (47,6)	35 (67,3)	0,117
	2	11 (52,4)	17 (32,7)	0,117

Table 2. Comparison of Surgical Wound Classes and Drain Inserted Cases

		Short-term POP	Long-term POP	p
Drain inserted cases n (%)		15 (71,4)	27 (51,9)	0,127
Surgical Wound Classes n (%)	Clean	3 (14,3)	10 (19,2)	0,745
	Clean-Contaminated	18 (85,7)	42 (80,8)	

Table 3. Comparison of Drain Withdrawal Times

	Short-term POP	Long-term POP	
	Mean.±SD Min-Max / Median	Mean.±SD Min-Max / Median	p
Drain withdrawal times (day)	3,5±1,2 2-6 / 3	2,6±1,0 1-4 / 3	0,045

physical status score rates between the groups (p = 0,117) (Table 1).

The number and percentages of the operation indications in the short-term POP applied group are Endometrial Carcinoma 7 (33,3), Serous Cystadenoma 1 (4,8), Malignant Dysgerminoma 1 (4,8), Malign Mixt Müllerian Tumor 2 (9,5), Myoma Uteri 1 (4,8), Torsion of Ovarian Carcinoma 1 (4,8); Borderline Ovarian Tumor 8 (15,4), Cervix Carcinoma 2 (3,8), Endometrial Carcinoma 11 (21,2), Fibroma 2 (3,8), Corpus Hemorrhagicum 2 (3,8). The number and percentages of the operation indications in the long-term POP applied group, Corpus Luteum 1 (1,9), Dermoid Cyst 3 (5,8), Mucinous Cystadenoma 6 (11,5), Serous Cystadenoma 2 (3,8), Malignant Mixt Mullerian Tumor 1 (1,9), Myoma Uteri 5 (9,6) and Ovarian Carcinoma 9 (17,3).

The number of patients with inserted intra-abdominal drains was 15 (71,4%) in the short-term POP group, and 27 (51,9%) in the long-term POP

Table 4. Comparison of Incision Type, Blood Product Transfusion and Operation Times

	Short-term POP	Long term POP		p
Median Abdominal Incision n (%)	Below navel	4 (19,0)	16 (30,8)	0,309
	Above navel	17 (81,0)	36 (69,2)	
Transfusion n (%)	None	13 (61,9)	34 (65,4)	0,840
	ES	3 (14,3)	9 (17,3)	
	ES+TDP	5 (23,8)	9 (17,3)	
		Mean.±SD Min-Max / Median	Mean ±SD Min-Max / Median	p
Duration of Operation (min)		149,5±27,7 90-200 / 150	144,4±38,9 100-300 / 140	0,291

Table 5. Comparison of Surgical Site Infection Rate, Diagnosis Day and SSI Classification

		Short term POP	Long term POP	
		Mean.±SD Min-Max / Median	Mean.±SD Min-Max / Median	p
Surgical Site Infection n (%)		12 (57,1)	8 (15,4)	<0,001
Day of diagnoses		9,0±1,7 6-12 / 8,5	9,5±2,9 5-14 / 9,5	0,630
	Superficial	7 (33,3)	3 (5,8)	0,005
Classification of SSI n (%)	Deep	5 (23,8)	4 (7,7)	0,109
	Organ/Cavity	0 (0,0)	1 (1,9)	1,000

Table 6. Comparison of Values In Secondary Suturation, Wound Dressing and Debridement

	Short term POP	Long term POP	
	Mean.±SD Min-Max / Median	Mean.±SD Min-Max / Median	p
Secondary Suturation n (%)	8 (38,1)	3 (5,8)	0,001
Renewal of wound dressing	8,6±5,9 2-24 / 7	6,7±5,1 2-25 / 5,5	0,084
Debridement n (%)	10 (47,6)	7 (13,5)	0,004

group, with no statistically significant difference between the two groups (p = 0,127) (Table 2). However, the postoperative day the drain was removed was 3,5 ± 1,2 days (range=2-6d) in the short-term POP group, 2,6 ± 1,0 days (range=1-4d) in the long-term POP group and a statistically significant difference between the two groups (p = 0,045) was detected (Table 3).

There was no statistically significant difference between the two groups in terms of the duration of the operation, perioperative erythrocyte

Table 7. Comparison of Hospitalization Following Discharge and Days of Hospitalization

	Short term POP	Long term POP	
	Mean.±SD Min-Max / Median	Mean.±SD Min-Max / Median	p
Day of Discharge	9,2±6,0 3-27 / 8	7,6±5,2 2-27 / 6,5	0,183
Hospitalization following discharge n (%)	7 (33,3)	3 (5,8)	0,005
Days of hospitalization following discharge	6,6±7,8 3-24 / 3	7,0±5,6 2-13 / 6	0,903

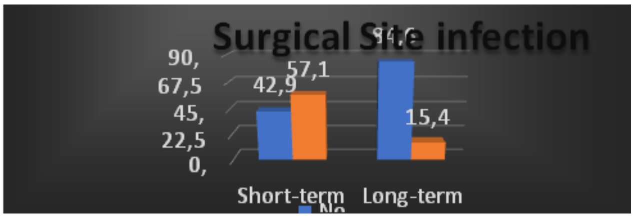

Fig. 1. Comparison of Surgical Site Infection Rate

suspension transfusion and surgical wound classification (clean, clean-contaminated), respectively listed as p = 0,297, p = 0,297 and p = 0,745 (Table 2 and 4).

The number of patients who developed surgical site infection (SSI) was 12 (57,1%) in the short-term POP group and 8 (15,4%) in the long-term POP group. Surgical site infection rate was significantly higher in the short-term POP group compared to the long-term POP group (p = <0,001) (Table 5 and Figure 1).

The day of diagnosis for SSI was made on the postoperative day 9,0 ± 1,7 in the group with short-term POP, and day 9,5 ± 2,9 in the group with long-term POP. There was no statistically significant difference between the two groups (p = 0,6) (Table 5).

According to the SSI classification of 12 patients who developed surgical area infection in the group with short-term POP, the number and percentage distribution were 7 (33,3%) patients with an incisional (superficial) wound infection, and 5 (23,8%) with deep surgical wound infection (Table 5).

According to the SSI classification (7), out of the 8 patients who developed a surgical area infection in the long-term POP group, the number and percentage distribution of patients were 3 (5,8%) with incisional (superficial) wound infection, and 4 (7,7%) with deep surgical wound infection, and the number of patients with an organ/cavity infection was 1 (1,9%) (Table 5).

No statistically significant difference was found between the rates of deep surgical wound infection and organ/cavity infection between the two groups (p = 0,109 and p = 1,000 respectively). However, the rate of incisional (superficial) wound infection was significantly higher in the short-term POP group compared to the long-term POP group (p = 0,005) (Table 5).

The number of patients who developed SSI requiring debridement was 10 (47,6%) in the short-term POP group and 7 (13,5%) in the long-term POP group. The rate of surgical site infection that would require debridement was significantly higher in the group with short-term POP compared to the group with long-term POP (p=0,004) (Table 6).

The number of patients who developed SSI requiring secondary suturing was 8 (38,1%) in the short-term POP group and 3 (5,8%) in the long-term POP group. The rate of SSI that would require secondary suturing in the group with short-term POP was significantly higher than the group with long-term POP (p=0,001) (Table 6).

There was no statistically significant difference between the two groups in terms of the day of discharge following the operation and the day of hospitalization following discharge
(p = 0,183 and p = 0,943 respectively) (Table 7).

The number and percentage of patients who developed SSI that would require hospitalization after discharge were 7 (33,3%) in the short-term POP group and 3 (5,8%) in the long-term POP group. In the short-term POP group, the SSI rates that would require hospitalization after discharge were statistically significantly higher than the long-term POP patients (p = 0,005) (Table 7).

Discussion

Postoperative wound infections have a remarkable effect on health resources and expenditures. While device-related infections are more common in developed countries, surgical wound infections are more frequently reported in developing countries (8). Antibiotics have always been used to prevent surgical wound infections. The first study in which an antibiotic administered just before surgery that showed to be effective in preventing infection was published by Burke in 1961 (9).

Antibiotics should be administered as a single dose or for a short period of time. Wittmann et al. stated that the effects of a single dose prophylaxis and five-day antibiotic administration did not yield difference in results in their 1996 study and thereafter received support in studies in literature (10-15). In our study, contrary to the literature, surgical site infection rates were found to be significantly higher in patients who underwent short-term prophylaxis with a single or two doses, compared to patients who received prophylaxis for at least three days (p = <0,001).

Wound infection rates in a larger scope are approximately 1,5-3,9% (0,8-9,6%) for clean wounds, 3-4% (3-24,5%) for clean-contaminated wounds, 8,5% (8,5-15,2%) for contaminated wounds and 28-40% (21,3-41%) for dirty wounds (1, 8, 16, 17, 18, 19, 20). However, these studies were conducted without considering the risk factors of the patient. In our study, regardless of the duration of antibiotic administration, when the SSI rates in the clean or clean-contaminated wound class were evaluated, the SSI rate was found to be higher than listed in literature with a rate of 27,39%. It is possible to understand the reason for this by examining the factors of the patient, methods and techniques of the surgery.

Nguyen D et al., in their study in 2001, found that surgical site infections increased 1,69 times in malignant neoplasms (2). The majority of patients (67,1%) in our study groups were operated for malignant reasons. In addition, the risk of infection in the surgical field increases 1,51 times for each hour of surgery. It has been reported that the rate of infection is 3-4% in operations less than 30 minutes, with an increase to a rate of 14% in more than 2 hours and to 18% in operations exceeding 6 hours (1, 2, 16, 18, 21, 22, 23). In our study, the duration of surgery was approximately 2,5 hours in both groups.

In order to prevent SSI, the incision should be made to reduce any damage to tissues and should prevent the accumulation of agents that inhibit host defense mechanisms and accelerate bacterial growth such as necrotic tissues, foreign bodies, blood and serum (22). In our study, patients with a median incision were evaluated, and this incision itself due to its size is considered a risk factor for the development of SSI.

In operations performed with clean wound class in the low-risk group, which included more than 1800 patients, the rate of infection was equal (1,8%) in the group with and without use of antibiotic prophylaxis, while the high-risk group containing more than 500 patients were administered antibiotic prophylaxis and showed a wound infection rate of 4,6%, whereas a rate of 11,1% was seen in the group that did not receive prophylaxis. (24). When these two studies are evaluated within themselves, the rate of SSI in patients of the low-risk group undergoing prophylaxis in the clean wound class is 1,8%, while despite the prophylaxis, the rate of SSI in the high-risk group is 4,8%.

In determining and preventing risk of SSI, the many contributing risk factors of the patient, the hospital, the operating room, the operation and the hospital staff (doctor, nurse, cleaning staff, etc.) should be evaluated. As stated in many studies, POP should be reviewed and planned individually for each patient. Contrary to those stated in many publications, surgeons in their professional life practice prophylaxis for a longer period of time than recommended in POP guidelines. This practice is in line with their personal experience in evaluating the factors of the hospital, community and the individual patient. In our study, without a risk assessment as suggested by the literature, it was found that SSI is significantly higher in patients who underwent short-term POP with a high rate of 57,1% when compared to the group with long-term POP.

Unfortunately, the use of antibiotics only with the experience of surgeons without a certain standardization is an indisputable fact that the use of antibiotics can cause the basis to other infections, cause side effects and, more importantly, a bacterial resistance problem that will affect the whole society. To overcome this impasse, up to date studies are required for a detailed risk assessment with the patient population in our country.

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