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Surgeons' Approach to Preoperative Antibiotic Prophylaxis

Cerrahların Preoperatif Antibiyotik Profilaksisine Yaklaşımı

✉ Müge Özgüler¹, ✉ Hüseyin Esin², ✉ İbrahim Murat Özgüler³, ✉ Şükran Köse⁴

¹Elazığ Fethi Sekin City Hospital, Clinic of Infectious Diseases and Clinical Microbiology, Elazığ, Turkey

²University of Health Sciences Turkey, İzmir Tepecik Education and Research Hospital, Clinic of General Surgery, İzmir, Turkey

³Firat University Hospital, Clinic of Cardiovascular Surgery, Elazığ, Turkey

⁴University of Health Sciences Turkey, İzmir Tepecik Education and Research Hospital, Clinic of Infectious Diseases and Clinical Microbiology, İzmir, Turkey

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Abstract

Objective: The surgical site infection (SSI) is one of the most common healthcare-associated infections in hospitalized patients. However, the most important factor in reducing SSIs is the appropriate selection of antimicrobial prophylaxis. Our aim was to evaluate the surgeons' attitudes toward preoperative antimicrobial prophylaxis.

Methods: A set of questions were organized on Google Docs' form by creating a survey to determine the surgeons' preoperative surgical prophylaxis approaches. Survey links were delivered to the surgeons online. Their answers were recorded on the Google Questionnaire and analyzed with Microsoft Excel and SPSS 15.

Results: A total of 111 surgeons participated in the study. Forty nine of the surgeons (44.1%) stated that they did not receive preoperative antibiotic prophylaxis training. Eighty-one surgeons (73.1%) stated that they used preoperative antibiotic prophylaxis to prevent surgical site-related morbidity. It was determined that 94 surgeons (84.7%) used cefazolin for antibiotic prophylaxis. In case of allergy to cefazolin, ciprofloxacin was the antibiotic preferred by 40 surgeons (36.7%). Fifty-two of the surgeons (46.8%) applied the antibiotics they used for prophylaxis only for 24 h. Seventy one of the surgeons (64%) said that they were informed on SSI surveillance by the Infection Control Committee in their hospitals and 40 of them (36%) stated otherwise.

Conclusion: The results of the study indicate that all physicians in surgical branches should be informed about the importance of preoperative antibiotic prophylaxis and the application recommendations of the guidelines.

Keywords: Antibiotic prophylaxis, surgeons, survey

Öz

Amaç: Cerrahi alan enfeksiyonları; hastanede yatan hastalarda en sık görülen sağlık bakımıyla ilişkili enfeksiyonlardan biridir. Ancak, cerrahi alan enfeksiyonlarının azaltılmasında en önemli faktör uygun antimikrobiyal profilaksinin yapılmasıdır. Bu çalışmada amacımız cerrahların preoperatif antimikrobiyal profilaksiye yaklaşımları değerlendirmektir.

Yöntem: Cerrahların preoperatif cerrahi profilaksisi yaklaşımlarını belirlemek üzere Google Anket üzerinden çeşitli sorular hazırlandı ve anket linkleri cerrahlara internet üzerinden ulaştırıldı. Cerrahların sorulara verdiği yanıtlar Google Anket üzerinde kaydedilip, Microsoft Excel ve SPSS 15 ile analiz edilmiştir.

Bulgular: Çalışmaya 111 cerrah katılmıştır. Kırk dokuz cerrah (%44,1) preoperatif antibiyotik profilaksisi eğitimi almadığını belirtti. Cerrahların 81'i (%73,1) cerrahi alan ilişkili morbiditeyi önlemek amacı ile preoperatif antibiyotik profilaksisi kullandıklarını belirtti. Cerrahların 94'ünün (%84,7) antibiyotik



Address for Correspondence/Yazışma Adresi: Hüseyin Esin MD, University of Health Sciences Turkey, İzmir Tepecik Education and Research Hospital, Clinic of General Surgery, İzmir, Turkey
Phone: +90 533 547 48 17 **E-mail:** dr.hesin@hotmail.com
ORCID ID: orcid.org/0000-0001-9004-1794

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Öz

profilaksi amacıyla sefazolin kullandığı saptandı. Sefazoline allerji durumunda siprofloksasin 40 cerrah (%36,7) tarafından tercih edilen antibiyotik idi. Elli iki cerrah (%46,8) profilaksi için kullandıkları antibiyotiği yalnızca 24 saat uyguladıklarını belirtti. Cerrahların 71'i hastanelerinde Enfeksiyon Kontrol Komitesi tarafından yapılan cerrahi alan enfeksiyonu sürveyansı konusunda bilgileri olduğunu ve 40'i (%36) ise bilgisi olmadığını belirtmiştir.

Sonuç: Çalışmamızda elde ettiğimiz verilere dayanarak, cerrahi branşlardaki hekimlere preoperatif antibiyotik profilaksinin ne kadar önemli olduğu ve kılavuzların uygulama önerileri anlatılmalıdır.

Anahtar Kelimeler: Antibiyotik profilaksisi, cerrahlar, anket

Introduction

Surgical site infections (SSIs) are one of the most common healthcare-associated infections in hospitalized patients. The average SSI rate is 1.9% according to the National Healthcare Safety Network data^(1,2).

In our country; in 2012, the SSI rate was 1% according to the data of the National Hospital Infections Surveillance Network Report⁽³⁾. The experience and performance of the surgeon, the hospital and operating room conditions, the sterilization techniques of surgical instruments, operative duration, preoperative skin preparation, body temperature and glycemic control of the patients and comorbid conditions are factors affecting the development of SSI^(4,5). However, the most important factor in reducing SSI is the appropriate selection of antimicrobial prophylaxis⁽⁶⁾.

Antimicrobial prophylaxis is recommended for clean-contaminated and contaminated wounds with a high risk of infection development. It is also advantageous in clean surgeries like prosthesis implantation, which can lead to serious infection-related concerns. However, antimicrobial prophylaxis is not indicated in clean surgical procedures. In dirty wounds, treatment must be done, not prophylaxis⁽⁷⁾.

Our aim was to evaluate the surgeons' attitudes toward preoperative antimicrobial prophylaxis.

Materials and Methods

Firat University Ethics Committee approval was received for this study (decision no: 17, date no: 28.11.2019). Taking into consideration the "Clinical Practice Guidelines For Antimicrobial Prophylaxis in Surgery"⁽⁷⁾ published by the Infectious Diseases Society of America in 2013, a set of questions were organized on Google Docs' form by creating a survey to determine the surgeons' preoperative surgical prophylaxis approaches. Survey links were delivered to the surgeons online. Surgeons voluntarily participated in the survey. The identification of the participants is kept hidden.

Their answers were recorded on the Google Questionnaire and analyzed with Microsoft Excel and SPSS 15.

Statistical Analysis

In our study, the results are presented as a descriptive statistical analysis.

Results

A total of 111 surgeons participated in the study. Eighty nine of 111 surgeons were male and 22 were female. The average age of female surgeons was 39±6 years and that of male surgeons was 44±9 years. The average year in the profession of women was 16±8 and the average of years of work for male surgeons was 19±10. Average working time in the surgical branch was 14±8. Working time in the surgical branch was 12±6 for female surgeons and 14±8 for male surgeons. The demographic information, professional and surgical experiences, and surgical branches of the surgeons participating in the study are presented in Table 1. 44.1% of surgeons stated that they did not receive preoperative antibiotic prophylaxis training, 55.9% of them stated that they received training. Priority reasons for the use of preoperative antibiotic prophylaxis are presented in Figure 1. They stated that the most common factors observed by surgeons in SSIs were Gram-positive factors with a rate of 72.1%, Gram-negative agents with a rate of 23.4% and anaerobic agents with a rate of 4.5%.

It was found that 84.7% of surgeons used cefazolin for antibiotic prophylaxis. 23.4% of surgeons preferred ampicillin sulbactam and 12.6% used ceftriaxone. The most preferred antibiotics are presented in Figure 2.

Sixty-three-point one percent of surgeons administered cefazolin at a dose of 1 g, 16.2% applied 2 g, 1.8% applied 3 g, and 18.9% of surgeons adjusted the dose according to the weight of patient. In patients over 120 kg, 79.3% of surgeons applied 2 g and 20.7% of them applied 3 gr. The antibiotics preferred in case of allergy to cefazolin are presented in

Table 1. The demographic information, professional and surgical experiences, and surgical branches of the surgeons participating in the study

	n (%)	
Gender (F-M)	22 (19)	89 (81)
Average Age (F-M)	39±6	44±9
The average year for the medical profession (F-M)	16±8	19±10
Average working time in the surgical branch (F-M)	12±6	14±8
Hospital status n (%)		
a. Second stage hospital (state hospitals, private branch hospitals, other official institution hospitals)	48 (43.2)	
b. Third stage hospital (training and research hospitals, university hospitals)	63 (56.8)	
Surgical branches n (%)	Plastic and reconstructive surgery	32 (28.8)
	General surgery	21 (18.9)
	Cardiovascular surgery	12 (10.8)
	Otorhinolaryngology	12 (10.8)
	Orthopedics and traumatology	7 (6.3)
	Urology	7 (6.3)
	Brain surgery	5 (4.5)
	Thoracic surgery	4 (3.6)
	Gynecology and obstetrics	4 (3.6)
	Ophthalmology	3 (2.7)
	Pediatric surgery	3 (2.7)
	Oncological surgery	1 (0.9)
Total	111 (100)	

n: Number, F: Female, M: Male

Figure 3. Ciprofloxacin was preferred by 40 surgeons (36.7%), ampicillin sulbactam by 24 (22%), erythromycin by 20 (18.3%), clindamycin by 19 (17.4%), vancomycin by 7 (6.4%), and ceftriaxone by 6 surgeons (5.5%).

Twenty-two (19.8%) surgeons ordered antibiotic prophylaxis 30 min before surgery, 17 (15.3%) used in the service before the patient took to the operating room, 14 (12.6%) used 1 h before surgery, 38 (34.2%) used during anesthesia induction, 6 (5.4%) stated that they applied 1 h before the incision, 9 (8.1%) used 30 min before the incision, and 5 (4.5%) during the incision (Figure 4).

Fifty-two (46.8%) of the surgeons applied the antibiotics they used for prophylaxis only for 24 h, 13 (11.7%) for 48 h, 8 (7.2%) until discharge, 16 (14.4%) until the drainage catheters were removed, 11 (9.9%) stated that they continued the application for a week and 11 (9.9%) for five days (Figure 5).

Paradoxically, 90.1% of surgeons thought that the prophylaxis period should not be extended, while 9.9% emphasized that it should. 37.8% stated that prolonging the prophylactic antibiotic would prevent infection of the drain catheters, 40.5% said it would prevent microbial contamination, 18%

stated that it would prevent purulent discharge in the surgical area, and 3.6% said it would prevent the patient from having fever.

When an additional intraoperative antibiotic dose was in question, 88 (79.3%) surgeons stated that an additional antibiotic dose should be given in prolonged procedures.

Surgeons stated that additional antibiotic doses should be administered in these cases; deterioration in sterility (34.2%), unsuitable operating environment (33.3%), obesity of the operated patient (26%), unsuitability of the sets used in surgery (24.3%), abdominal surgery (19.8%), excessive bleeding (%) (14.4), poor general condition of the patient (10.8%) and emergency cases (9.9%).

Sixty-two (55.9%) surgeons did the wound care themselves after surgery, 25 (22.5%) were the health officers, 21 (18.9%) were nurses, 32 (28.8%) were the assistant physicians, 6 were (28.8%) 5.4 the patients themselves and their relatives.

Sixty-four (57.6%) of the surgeons stated that they did not apply topical antibiotic prophylaxis, 21.6% applied topical antibiotics, and 20.7% used it on occasion.

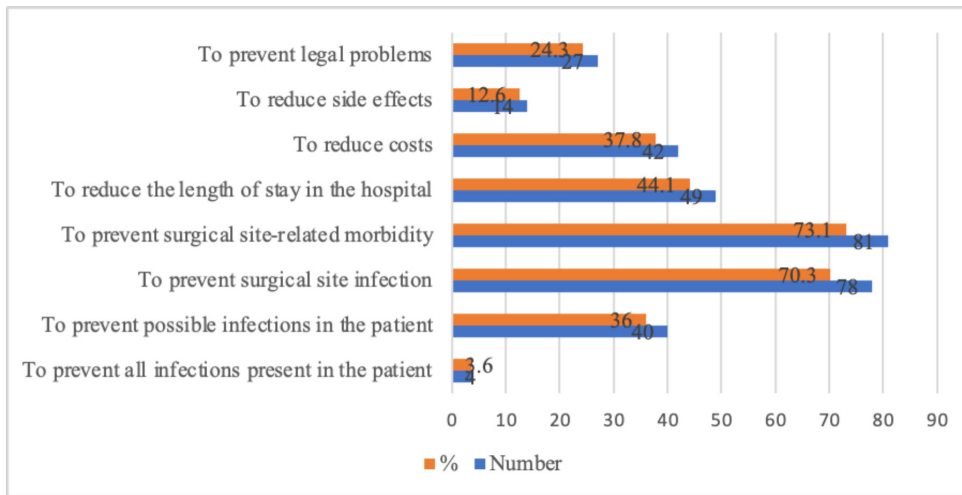


Figure 1. Priority reasons for surgeons to use preoperative antibiotic prophylaxis

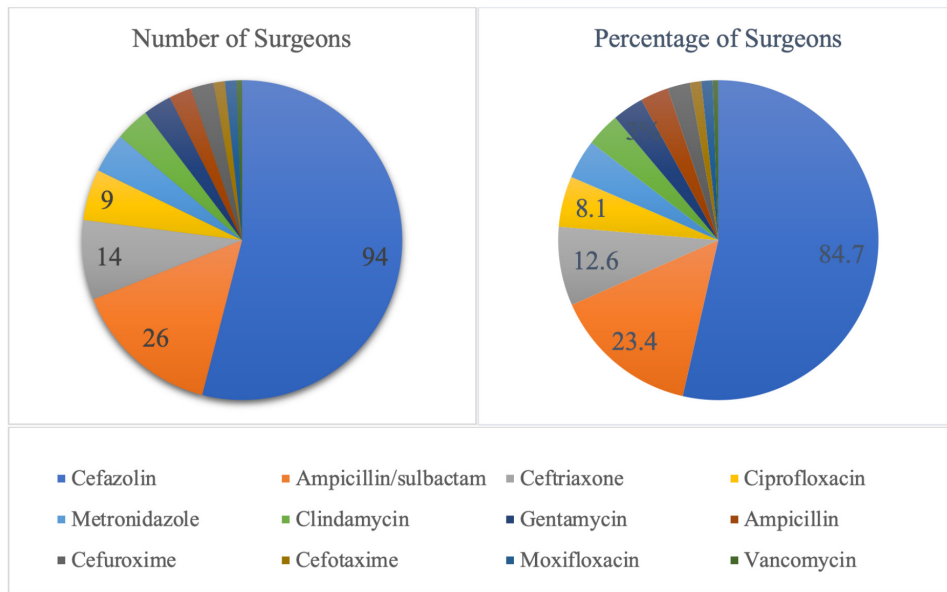


Figure 2. Antibiotics used in preoperative prophylaxis

The most common SSI agents witnessed by the surgeons participating in the study were Gram-positive in 80 (72.1%) case, Gram-negative in 26 (23.4%) and anaerobes in 5 (4.5%). To the question of "what is the frequency of SSI you have observed", 64.9% of surgeons answered that they observed a rate of 0-5%, 16.2% had not witnessed any SSI, and 14.4% observed a frequency of 5-10%. The remaining 4.5% defined as SSI>10%.

The percentage of surgeons who use antibiotic prophylaxis for clean-contaminated, contaminated, and dirty wounds were high while the percentage of surgeons were low who

use antibiotic prophylaxis for clean wounds (Table 2 gives details of types of wounds for which surgeons use antibiotic prophylaxis).

Sixty-three (56.8%) surgeons stated that they mostly applied the preoperative antibiotic prophylaxis correctly, 35.1% said that they applied the preoperative antibiotic prophylaxis completely correctly and 6.3% stated that they sometimes applied it correctly. 64% of surgeons said that they were informed on SSI Surveillance by the Infection Control Committee in their hospitals and 36% stated otherwise.

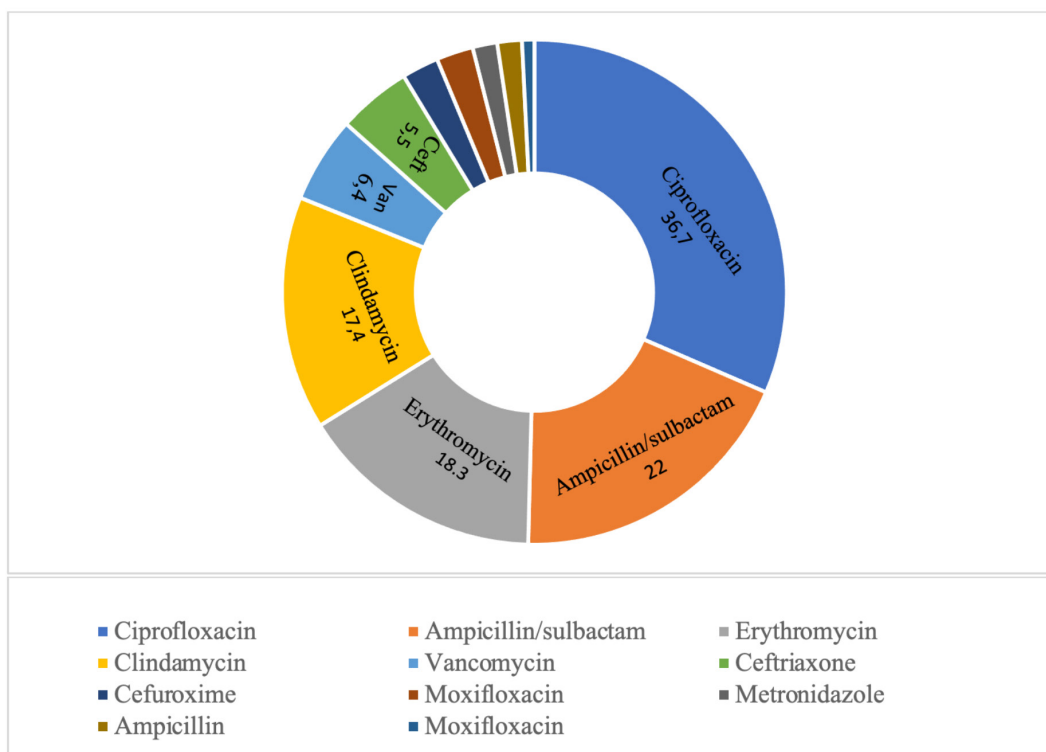


Figure 3. The antibiotics preferred in case of allergy to cefazoline

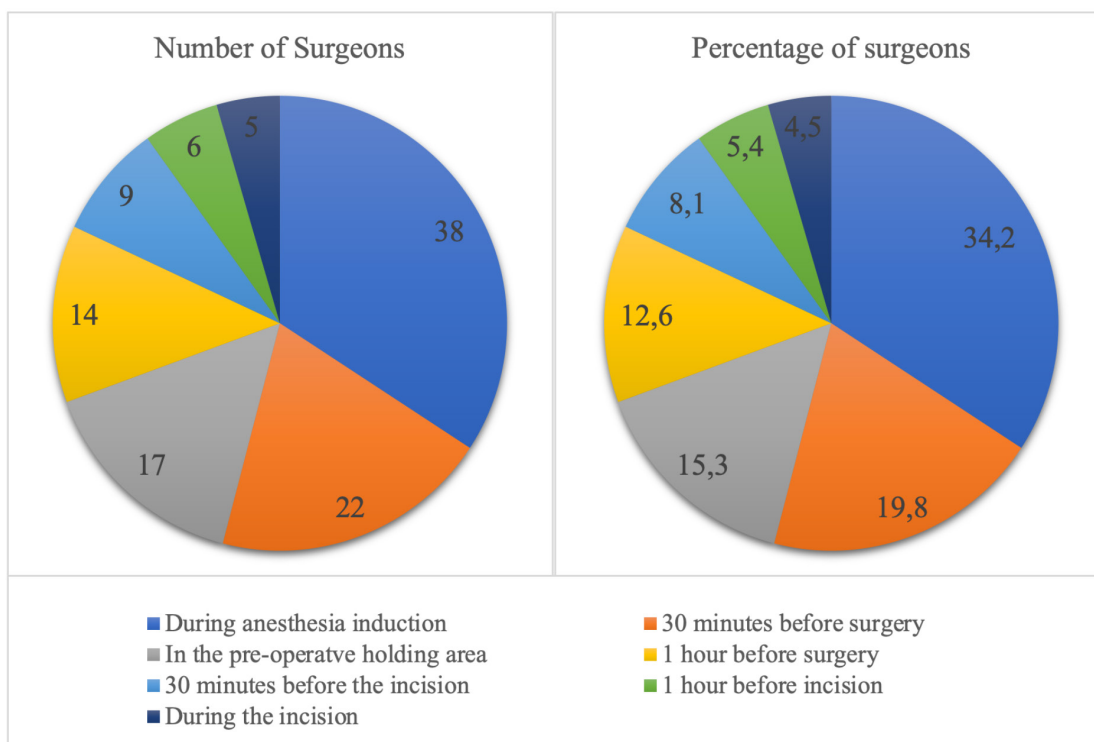


Figure 4. Timing of surgical antibiotic prophylaxis

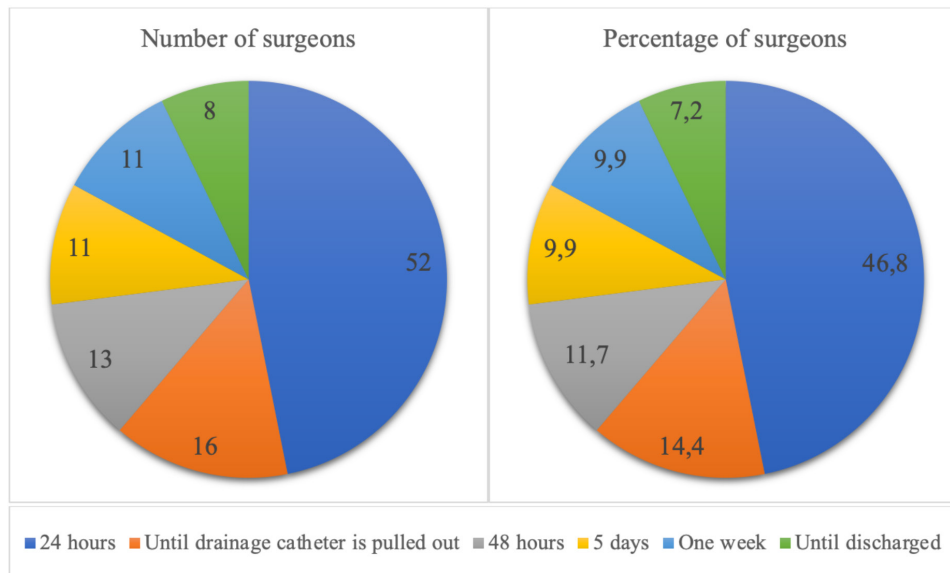


Figure 5. Duration of postoperative antibiotic prophylaxis

Table 2. Number and percentage of surgeons who perform prophylaxis in different types of wounds

	Types of wounds for which surgeons use antibiotic prophylaxis	Types of wounds for which surgeons do not use antibiotic prophylaxis
Surgical wounds	n (%)	n (%)
Clean (Surgical procedures that do not involve organs with flora such as gastrointestinal, genitourinary system)	36 (32.4)	94 (84.7)
Clean-contaminated: Surgical procedures in which the alimentary, genitourinary tracts are entered under controlled conditions	66 (59.5)	10 (9)
Contaminated: Surgical procedures in which the alimentary, genitourinary tracts are entered under uncontrolled conditions	51 (45.9)	16 (14.4)
Dirty wounds: Infected wounds in which purulent material is obtained	48 (43.2)	23 (20.7)

n: Number

Discussion

In our study, practices such as antibiotic prophylaxis in clean surgeries that do not require antibiotic prophylaxis, prophylactic antibiotic preferences and doses, the time to apply prophylaxis in the preoperative period, and the continuing use of antibiotics that should be discontinued within 24 h postoperatively are diverged from the guideline recommendations. In the study by Karaali et al.⁽⁸⁾ in our country, which evaluated the approach of general surgeons to surgical prophylaxis, it was shown that approximately 75% of surgeons did not comply with all stages of surgical

prophylaxis. In a multicenter study conducted in 2013, it was found that surgeons' compliance with current guidelines in perioperative antimicrobial prophylaxis practices was found to be low⁽⁹⁾.

However, Karaali et al.⁽¹⁰⁾ reported that the prescription rate of surgeons in the general surgery clinic was reduced from 80.6% to 9.4% by a new antibiotic stewardship program and that reported that the program they introduced could be used effectively and simply.

In a study, one or more parameters were found to be inappropriate in 78 (98%) surgeries. The use of broad-

spectrum antibiotics was determined in 69% of all surgeries. Additionally, the prophylaxis was found to be prolonged in 53% of procedures. The mean duration of prophylaxis application was determined as 2.6 days. In 88% of prophylaxis applications was observed as monotherapy and 13% was more than one⁽¹¹⁾.

In another study, a longer than a day prophylaxis was determined in 56% of the participants. It was determined that prophylaxis continued in 11% of patients until the patient was discharged⁽⁹⁾.

In our study 84.7% of the surgeons used cefazolin for antibiotic prophylaxis. It has been determined that the most commonly used antibiotics in surgical prophylaxis are first generation cephalosporins, ampicillin sulbactam and third generation cephalosporins^(11,12) was determined that the antibiotic chosen for surgical prophylaxis was not suitable in 41% of cases, and the prophylaxis duration was longer than recommended in 29.1% of the patients. In other studies, it was determined that surgical prophylaxis was extended by 82%, and 80% of interventions were used longer than two days^(12,13).

The guidelines recommend antimicrobial agents with the narrowest spectrum of infection. There is no sufficient evidence showing that the broader spectrum antimicrobial agents that are often requested to prevent postoperative SSI are more effective than older antimicrobial agents with narrower spectrums in lowering the rates of postoperative SSI.

Due to its duration of action, spectrum of activity, safety and low cost, the current and first choice antibiotic included in the guidelines for preoperative antibiotic prophylaxis is cefazolin⁽¹⁴⁻¹⁶⁾.

For most procedures, regardless of the presence of intravascular catheters or drains, the duration of antimicrobial prophylaxis should be less than 24 h^(17,18). The safety and effectiveness of topical antimicrobials have not been clearly established; therefore, routine use of this method cannot be recommended in cardiac or other procedures⁽¹⁹⁾.

Successful prophylaxis requires antimicrobial delivery to the surgical site before contamination occurs. Therefore, the antimicrobial agent should be administered by ensuring that serum and tissue concentrations exceed the minimum inhibitor concentration throughout the duration of the procedure^(17,18).

Generally, the first antimicrobial dose is recommended to be started 60 min before the surgical incision^(17,18). Because of the long infusion times required for vancomycin and fluoroquinolones, they should be started 120 min before the surgical incision. Considering the long half-lives of these drugs, serum levels of these substances, which are applied relatively earlier, should be carefully adjusted during most surgical procedures⁽⁷⁾.

Study Limitations

This original study has some limitations. Firstly, subgroup analyzes could not be performed due to low numbers in the groups. Secondly, the survey questions and their resulting answers are somewhat subjective.

Conclusion

In many surgical procedures that require great risks, labor and time, our surgeons make great efforts to heal their patients and save their lives. In these surgeries where such a great effort and risk is taken, sometimes a tiny microorganism can cause damaging results. In this study, we found a practice that is not totally in-line with guidelines on wound types that should be applied to prophylaxis, surgeons' pre-operative prophylaxis preferences, the time of prophylactic antibiotic application, the discontinuation of prophylaxis in the postoperative period, and the use of topical antibiotics in postoperative wound care. Based on the data we obtained in our study, surgeons especially trainee surgeons in surgical branches, should be informed about the importance of preoperative antibiotic prophylaxis and the application recommendations of the guidelines.

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Ethics

Ethics Committee Approval: The study were approved by the Firat University Ethics Committee (decision no: 17, date no: 28.11.2019).

Informed Consent: Online informed consent was obtained.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.Ö., H.E., İ.M.Ö., Ş.K., Concept: M.Ö., H.E., İ.M.Ö., Ş.K., Design: M.Ö., H.E., İ.M.Ö., Ş.K., Data Collection or Processing: M.Ö., H.E., İ.M.Ö., Ş.K., Analysis or Interpretation: M.Ö., H.E., İ.M.Ö., Ş.K., Literature Search: M.Ö., H.E., İ.M.Ö., Ş.K., Writing: M.Ö., H.E., İ.M.Ö., Ş.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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