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REVIEW

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ANTIBIOPROPHYLAXIS AND ANTIBIOTHERAPY IN ABDOMINAL SURGERY –  
SHORT REVIEW

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**ABSTRACT**

*Surgical site infection (SSI) represents a concerning for all surgeons because both the unfavorable impact on health care costs and risk factors that increase the durations of wound healing and SSI rate. A review of PubMed, Scopus and Google Scholar has been made. The keywords used were related to surgical site infection prevention. SSIs have a raised incidence in abdominal surgery because of the fact that many types of bacteria live in the gastrointestinal tract and during a surgical procedure some may escape and cause an infection. There is a high risk of postoperative infections in gastric surgery due to intestinal anastomoses which are predisposed to leakage. In hernia repair surgery there is a higher rate of SSIs than expected for a clean procedure, and one risk factor may be represented by the prosthetic device used. On the other hand, in laparoscopic cholecystectomy, there is a very low risk of SSI and antibioprophylaxis is not recommended. But the most contaminated procedure with the highest risk of infectious complications is colorectal surgery, which requires a combination of antibiotics because of the numerous types of microorganism. Abdominal surgery comprises different techniques and involves most elements of the gastrointestinal tract. Some procedures need antibiotic prophylaxis and in others antibiotic administration is even prohibited. The most effective antibiotics are first and second-generation cephalosporins.*

**KEYWORDS:** *infection, antibioprophylaxis, abdominal surgery, antibiotics*

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**INTRODUCTION**

Infections associated with healthcare and surgical field is a very important topic for surgeons all over the world. They are so relevant because have a negative impact on outcomes and healthcare costs. A patient with a SSI necessitate approximately 6 additional days of hospitalization, that leads to doubling hospital care costs [1]. In most surgical procedures, antibioprophylaxis is recommended because it covers both SSIs and intraoperative contamination. Furthermore, antibiotic

prophylaxis is essential because it plays an important role in the patient's gut microbiota and also in Multidrug Resistance (MDR) development. The incidence of SSIs varies from one surgical procedure to another, from one surgeon to another and from patient to patient [2]. There are also a lot of substantial risk factors, such as age, diabetes mellitus, smoking, impaired immune system or obesity that should be taken into account when evaluating a surgical patient. These factors increase both the duration of wound healing and risk of postoperative infection, especially obesity as it is a very

concerning issue nowadays. SSIs are various and can be categorized as superficial wound infections ( involving the skin and subcutaneous fat), deep wound infections ( involving fascia and muscle) and organ space infections and the microorganism that is often involved is *Staphylococcus aureus*, which in some cases may be resistant to methicilin [3], [4]. The aim of this review is to highlight the importance of antibiotic prophylaxis in abdominal surgery and enhance the ways it can be made.

## METHODS

We conducted a literature search of PubMed, Google Scholar and Scopus databases. Search terms included ( “ antibioprophylaxis” OR “ antimicrobial prophylaxis” OR “ antibiotics” OR “ antimicrobials “ OR “ risk factors” ) AND “ abdominal surgery” in all fields. The target was human studies written in English and published less than 10 years ago.

## RESULTS AND DISCUSSIONS

SSIs have a raised incidence in abdominal surgery due to the fact that in the gastrointestinal tract lie a multitude of bacterias and during surgery, some may escape and cause a light or severe infection. Also the presence of wound drain increase the risk of SSI. Most guidelines recommend a 24 h antibiotic cure after the surgery, even though using a single perioperative dose do not have inferior results. Despite all of these, surgeons often use a prolonged antibiotherapy, which may lead to antimicrobial resistance with no better results regarding SSIs prevention [5]

### *Gastric surgery*

Gastric surgery is generally classified as GAST-T ( total gastrectomy), GAST-D ( distal gastrectomy) and GAST-O ( other type of gastric surgery). The highest incidence of postoperative infection is encountered in GAST-T because it involves multiple anastomoses which are liable to leakage [6]. The risk of infection is associated with older people higher body mass index, tumor bleeding, low preoperative hemoglobin, factors that are often present in patients with gastric cancer that requires GAST-T. A low percent of patients can die from sepsis after a gastric

surgery. Most common microorganisms involved are both Gram-positive and Gram-negative bacterias such as *Escherichia coli*, *Enterococcus* or *Klebsiella pneumoniae* [7]. To lower the risk of postoperative infections, guidelines recommend administration of cefazolin, 2g/ 3g for patients weighing more than 120kg, administered 30-60 min before surgery, with a recommended redosing interval from initiation of preoperative dose of 4 hours, and, for the patients who are allergic to  $\beta$ -lactam, clindamycin ( 900 mg) or vancomycin (15mg/kg) + aminoglycoside or aztreonam ( 2g) or fluoroquinolone. Vancomycin and fluoroquinolone should be administered 120 min before incision [8].

### *Inguinal hernia repair surgery*

Inguinal hernia repair is a common surgery and it is considered a clean procedure. Despite that, there is a higher rate of postoperative wound infection than expected for a clean procedure [9]. Also, a prosthetic device is involved in this type of surgery which may be an additional source of infection and therefore an antibioprophylaxis should be taken into account [10]. There are different views whether using antibioprophylaxis or not because reported infection rate in this case could be influenced by many factors such as study location, SSI definition or surveillance method [11]. However, most studies show the effectiveness of antibioprophylaxis. Cefazolin, 2g / 3g for patients weighing more than 120kg, administered 30-60 min before surgery, with a recommended redosing interval from initiation of preoperative dose of 4 hours, and for the patients who are allergic to  $\beta$ -lactam clindamycin ( 900 mg) or vancomycin (15mg/kg) are indicated in this procedure [8].

### *Laparoscopic cholecystectomy*

Laparoscopic cholecystectomy is a minimal invasive surgery and the risk for infectious complications is very low. Most studies reveal the fact that antibiotic prophylaxis has no significant role in the prevention of surgical site infection in this type of surgery, and the use of antibiotics increases significantly the costs of this procedure [12]. In contrast with other type of surgeries, high BMI is not considered a risk factor in laparoscopic

cholecystectomy and this may be another argument against the use of antibiotic prophylaxis. In some cases, such as patients with risk factors of bactibilia, antibioprophylaxis is effective and these patients should receive a single dose of cefazolin 1g IV [13]. Most surgeons ignore the recommendations and give antibiotics to all patients who undergo laparoscopic cholecystectomy. The misuse of antibiotics may lead to bacterial resistance and therefore to other complications [14].

### Colorectal surgery

Among all gastrointestinal surgical procedures, the greatest rate of SSI belongs to colorectal surgery [15]. It has been reported that up to 40% of patients develop a post-operative SSI when prophylactic antibiotic is not administered. The most likely sources of bacterial contamination are the patients' skin flora and intestinal flora. Gram-positive, Gram-negative bacteria, facultative anaerobic bacilli (e.g. *Escherichia coli*) and obligate anaerobes (e.g. *Bacteroides fragilis*) are the most common microorganisms involved in colorectal postoperative SSIs [16]. In the past, mechanical bowel preparation (MBP) was the only method used to prevent infectious complications. Then, it was proved that there is no clinical or microbiologic evidence to support MBP alone as a method to reduce SSI rates [15]. Therefore, antibiotic use started to be taken into consideration.

Second-generation cephalosporins should be used against Gram-positive and Gram-negative organisms, but they are not effective against obligate anaerobes. Thus, a combination of second-generation cephalosporins and metronidazole is adequate to cover all microorganisms involved in infectious complications after colorectal surgery [16]. According to guidelines, best association of antibiotics is cefotixin, 2g, with a recommended redosing interval of 2 h, + metronidazole, 500mg, or clindamycin (900 mg) + aminoglycoside or aztreonam (2g) or fluoroquinolone for the patients who are allergic to  $\beta$ -lactam [8].

### CONCLUSION

Abdominal surgery comprises different techniques and involves most elements of the gastrointestinal tract. There is a large variety of procedures, from minimal invasive to invasive ones and therefore the amount of microorganisms that could cause a post-operative infection also varies. In minimal invasive procedures, such as scheduled laparoscopic cholecystectomy, antibioprophylaxis is not required, while in invasive procedures first and second-generation cephalosporin are indicated to be administered 30-60 min before surgery. In colorectal surgery, besides cephalosporins, metronidazole is indispensable to cover obligated anaerobes.

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