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A Review On Surgical Site Infections

Shamshath Begum. M[1*], Gunjan[2], Kashmira J Gohil[3], Sriram. A[4]

1.Department of Pharmaceutics, Anand College of Pharmacy, Sharda Group of Institutions, Agra-282007(UP)

2. Department of Pharmacology,School of Pharmacy,Sharda University,Greater Noida-201310 (UP)

3.Department of Pharmacology, Anand College of Pharmacy, Sharda Group of Institutions.Agra-282007 (UP)

4.Department of Pharmacy Practice, SRM College of Pharmacy, Kattankulathur-603203 (Tamil Nadu)

ABSTRACT

Emerging antibiotic resistance is a major global public health challenge. At the same time, untreated infections are one of the main causes of surgical mortality in low- and middle-income countries. Surgical site infections are most common type of infections among worldwide. Almost 30-50% of antimicrobials are used as prophylaxis in hospital care setting. However, between 40-90% of this prophylaxis is inappropriate because the antimicrobials were given at wrong time or given for long time. Choosing antimicrobials for prophylaxis is based on some factors, antimicrobial regimen, dose, route, time of administration. The right time for administration of prophylaxis dose is within 30-60 minutes before surgical incision. This is the most appropriate time for most of the preoperative surgical cases. Surgical prophylaxis is an effective treatment approach for minimizing post-surgical infections. Moreover, Antimicrobial prophylaxis should be restricted to specific, proper indications to avoid unnecessary medical expenses, side effects, and antimicrobial resistance.

Keywords: Antimicrobial Resistance, Choice of Antimicrobials, Surgical Antimicrobial Prophylaxis, Surgical Site Infections, Timing of Antimicrobial Prophylaxis.

*Corresponding Author Email: shamshad_fazul@yahoo.co.in

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INTRODUCTION

Antimicrobial resistance is one of the major global threats among worldwide. Globally resistant of microorganisms with usage of antimicrobials and the major hospital acquired infections and, among those, surgical site infections are the mostly reported and surveyed type of health associated infections.

Surgical Site Infections

Emerging antibiotic resistance is a major global public health challenge. At the same time, untreated infections are one of the main causes of surgical mortality in low and middle income countries. SSIs were considered to be major health care associated infections among worldwide and moreover 30- 45% of all Hospital acquired infections were represented by surgical site infections. Hospital acquired infections are the commonest cause for increasing mortality and morbidity rates and also affects economic burden among worldwide. Surgical site infections are defined as the infection occurs at the surgical site after surgery. Mortality rates were found high in patients with surgical site infections compared with uninfected cases. The role of Antimicrobials in surgery was mainly indicated for the prevention of post-surgical infections. Almost 32 % to 59 % of antimicrobials used in surgery wards are prescribed for surgical prophylaxis and 41% of the antimicrobials were used to treat post-surgical infections**.** In India, surgical site infections were commonly occurred after surgery which gives significant burden with regards to the patient's mortality, morbidity rates, lengthy hospital stay and increased health care costs. Increased infection coupled with the usage of antimicrobials can also lead to the progressing antimicrobial resistance in India [1]. Surgical antimicrobial prophylaxis is one of the most commonly used practices in surgery to prevent the incidence of SSI. Prophylaxis may become the standard care for contaminated and clean contaminated infections and for surgery[2]. The surgical site infection causes huge impact on quality of life of patients and considerably to increase economic burden.

Risk Factor for Surgical Site Infections

The risk of developing surgical site infections among elderly was considered to be more when compared with others. There are various risk factors among elderly patients depends upon characteristics of various microorganisms, Wound contamination, resistance pattern of pathogens, Patient characteristics associated with increased risk of SSI which includes diabetes mellitus, obesity, advanced age, associated infection at another site, lengthy hospital stay and surgical factors includes procedure type and entry of foreign bodies which may leads to develop surgical site infections. The levels of Glucose increased predominantly after post-surgical period

particularly in patients with diabetes that leads to an increased risk of surgical site infections. Diseases such as Hepatocellular carcinoma, lung cancer and chronic kidney disease conditions that leads to increase surgical site infections and it delays wound healing process. Our body immune system may be affected by radiations, unhealthy diet and by certain anticancer medications, immunosuppressant, and corticosteroids as it causes the post-operative surgical site infections.

SSI (Surgical site infections)

Causes of SSI	**Transmission of infection**	**Factors affecting SSI**	**Prevention of Infection**
Malnutrition	Immunosuppressant, surgery, burns, geriatrics, cancer.	Anxiety, age, obesity, Duration of surgery,	creating awareness
Disease factors (Diabetes, Cancer, CKD, Arthritis)	Broken skin, mucus membrane, GI tract	Degree of contamination during surgery	Treating And Preventing infections by appropriate use of antibiotics
Habitual factors (Smoking, Obesity etc.)			Good aseptic measures and
Previous history of infection &Prolonged hospital stay			Proper healthy diet

Role of Antimicrobials In Surgical Site Infections

There are various ways to prevent surgical site infections; the most significant way is administering the antimicrobial prophylaxis at proper time. The antimicrobial prophylaxis plays an important role in preventing and reducing incidence of postoperative surgical site infections. The use of prophylactic antimicrobials is one of the important factors in surgery and has been regularly used to eradicate endogenous microorganism and to prevent infection complication. Appropriate prophylactic antimicrobials administration before surgery can reduce the incidence of surgical site infection [3-4].The proper use of antimicrobial prophylaxis can reduce the risk of post-surgical infections but the use of additional antimicrobials may increase the risk of antimicrobial resistance [5]. Almost 30-50% of antimicrobials used as prophylaxis in hospital care setting. However between 40-90% of this prophylaxis is inappropriate because the antimicrobials were given at wrong time or given for long time [6].

Choice of Antimicrobial Prophylaxis

Choosing antimicrobials for prophylaxis is based on some factors, antimicrobial regimen, dose, route, time of administration. Before going to choose an antibiotic always ask the patient about the prior history of antimicrobial allergy. It is important to select an antimicrobials with narrowest

antibacterial spectrum required to reduce the pathogens[7-8].The timing of dosing is important for most of the beta lactam antimicrobials because they are having short half-life. Intramuscular antimicrobials are less common used than i.v antimicrobials. They are given at the time of premedication so that peak tissue levels are attained at the most critical time, and at the time of surgical incision[9].Cephalosporin's are preferred as first line choice of prophylaxis on the basis of cost, efficacy and tolerability. Second and third generation cephalosporin's targeting most of the microorganisms while avoiding broad-spectrum antimicrobial prophylaxis that may lead to the development of antimicrobial resistance.

Timing of Surgical Prophylaxis

Despite the advances in surgical techniques and pathogenesis understanding of surgical wound infections, SSIs continue to be a major challenge for surgical society. Hence, antimicrobial prophylaxis should be started prior to contamination, which is considered essential to control bacteria growth and significantly lower the incidence of SSIs. The right time for administration of prophylaxis dose is within 30-60 minutes before surgical incision. This is the most appropriate time for most of the preoperative surgical cases. The duration of antimicrobial prophylaxis in surgery should not exceed 24 hours. Drugs such as ciprofloxacin and Vancomycin needs more time (above 60 -120 mins) for administration of prophylaxis. Studies estimated that 55-68 % of surgical site infections are inevitable, mostly related to the use of recommended evidence-based practices such as the timing, selection, and duration of preoperative prophylactic antibiotics. Normally prophylaxis may give before 30 minutes prior to surgery. In a recent survey showed that the preoperative administration of antimicrobials within 2 hours before surgical incision reduced the rate of Surgical site infections compared with 3.8% for early administration (2–24 hours before surgical incision) and 3.3% for any postoperative administration (any time after incision).

LIST OF ANTIMICROBIALS USED IN SURGICAL PROPHYLAXIS

Drug	Adult dose	Child dose	Route	Timing
Ampicillin + sulbactum	3gm	50mg/kg	iv/im	30 mins
Amoxicillin	2gm	50mg/kg	oral	1hr
Ampicillin	2gm	50mg/kg	iv/im	30 mins
Cephalexin	600mg	20mg/kg	oral	1hr
Cefazolin	2gm	30mg/kg	iv	30 mins
Cefuroxime	1.5gm	50mg/kg	iv	30 mins
Cefotaxime	1gm	50mg/kg	iv	30 mins
Ceftriaxone	2gm	50-75mg/kg	iv	30 mins
Ciprofloxacin	500mg	10mg/kg	iv/oral	30 mins
Clindamycin	900mg	10mg/kg	oral	1hr
Ertapenam	1gm	15mg/kg	iv	
Fluconazole	400mg	6mg/kg	iv	

Gentamycin	5mg/kg	2.5mg/kg	iv/im	30 mins
Metronidazole	500mg	15mg/kg	iv/im	30 mins
Moxifloxacin	400mg	10mg/kg	iv	1hr
Vancomycin	15mg/kg	15mg/kg	iv	1hr
Levofloxacin	500mg	10mg/kg	oral	

CONCLUSION

The role of Antimicrobial prophylaxis in surgery has led to the prevention of wide variety of surgical site infections. Antimicrobial Surgical prophylaxis is an effective treatment approach for minimizing post-surgical infections. . Inappropriate and excessive antimicrobial usage leads to increase in healthcare cost and may cause antimicrobial resistance. Moreover Antimicrobial prophylaxis should be restricted to specific, proper indications to avoid unnecessary medical expenses, side effects, and antimicrobial resistance**.**

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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