

DRUG UTILIZATION REVIEW OF ANTIMICROBIALS PROPHYLAXIS IN GASTROINTESTINAL SURGERIES ASSOCIATED WITH POST-OPERATIVE SURGICAL SITE WOUND INFECTION

Rajat Rana*, Aneena Suresh, Suhas Reddy, Safna Mariyam, Dinesh Pore, Ambujakshi HR, Nawaz Mohammad

*Assistant Professor, Department of Pharmacy Practice, Acharya & B.M Reddy College of Pharmacy, India
Assistant Professor, Department of Pharmacy Practice, Acharya & B.M Reddy College of Pharmacy, India
Assistant Professor, Department of Pharmacy Practice, Acharya & B.M Reddy College of Pharmacy, India
Assistant Professor, Department of Pharmacy Practice, Acharya & B.M Reddy College of Pharmacy, India
Assistant Professor, Department of Pharmaceutical Chemistry, Acharya & B.M Reddy College of Pharmacy, India
Professor & Head, Department of Pharmacognosy, Acharya & B.M Reddy College of Pharmacy, India
Assistant Professor, Department of Pharmaceutics, Acharya & B.M Reddy College of Pharmacy, India

Abstract

Aim

The aim of the study to assess the prevalence of post-operative wound infection, prevalence of different microorganisms and its sensitivity pattern to commonly used antibiotics and its use.

Methodology

A total of 200 patients with gastrointestinal surgeries, such as appendicitis, ileal perforation, sigmoid volvulus, duodenal perforation and obstructed hernia were included in the study. Deep tissue culture was taken from the infected wound for microbiological examination done by streak method, colony characters, and antibiotic sensitivity tests were done by 'Kirby-Bauer' method.

Results

Out of the 200 patients, 22 patients had post-operative wound infections. Prevalence of wound infection was higher in Appendicitis than in other gastrointestinal surgeries. Pathogens that are prevalent in post-operative wound infection are Staphylococcus aureus (Appendicitis, Ileal Perforation, Duodenal Perforation), Klebsiella (Appendicitis and Duodenal Perforation, sigmoid volvulus) Escherichia coli (Appendicitis) and Pseudomonas (Appendicitis). Isolated pathogens were tested for its sensitivity against commonly used antibiotics at the hospital.

Conclusion

Antimicrobial Amikacin was sensitive to all isolated pathogens with very low resistance profile compare to other commonly used antimicrobials at hospital. The major identified pathogens were Staphylococcus aureus, followed by Klebsiella. In spite of sterilization techniques, modern surgical equipments, prophylactic use of antibiotics, and post-operative wound infection still remains a challenge and contributes to patient's morbidity and mortality.

Keywords:

Post-operative, Wound Infection, Gastrointestinal Surgery, Appendicitis, Amikacin.

Introduction

During the past few decades, the number of antimicrobial resistant pathogens has increased rapidly in many parts of the world. The World Health Organization (WHO) warns that the purchase of antimicrobials without a prescription leads to the misuse and overuse of antimicrobials, resulting in the emergency of antimicrobial resistant pathogens.¹ Of note, the rate of increase of antimicrobial resistant pathogens in Asia is the highest in the world. Most of the post-operative wound infections are caused by bacteria. Infections caused by bacteria can be prevented, managed and treated through anti-bacterial group of compounds known as antibiotics. Antibiotics can be defined as the variety of substances derived from bacterial sources (microorganisms) that control the growth of or kill other bacteria. However, Synthetic antibiotics, usually chemically related

to natural antibiotics, have since been produced that accomplish comparable tasks^{2,3,4}. Antibiotic use have been increasing steadily in recent years. Between 2005 and 2011, the units of antibiotics sold increased by about 40 per cent. Increased sales of cephalosporins were particularly striking, with sales (in units sold) increasing by 60 % over that five-year period, but some increase was seen in most antibiotic classes⁵. The widespread use of antimicrobial agents for prophylaxis has altered surgical practice markedly in the past 20 years and now represents one of the most frequent uses of antibiotics in hospitals, accounting for as many as half of all antibiotics prescribed. Surgical antimicrobial prophylaxis has been shown in many randomized clinical trials to reduce the incidence of postoperative wound infections.⁶ Wound infection is defined as one that occurs within 5-7 days of the operative procedure. It involves only the skin or subcutaneous tissue of the incision, and at least one of the following: purulent drainage from the superficial incision; organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision; following signs or symptoms of infection: pain or tenderness, localized swelling, redness or heat and superficial incision is deliberately opened by a surgeon, unless culture of incision is negative.⁷ Appropriate antibiotic therapy is essential in the management of the post-operative wound infection and selection of antimicrobial therapy should include the following considerations (a) Confirm the presence of infection, (b) Identification of pathogen, (c) Selection of therapy based on sensitivity test and (d) Monitor the therapeutic responses.^{8,9} The study was designed based on the prevalence of wound infection after gastrointestinal surgeries in the multispecialty tertiary care teaching hospital attached to the B.R Ambedkar Medical College. The aim of this study was to assess the prevalence of post-operative wound infection, prevalence of different microorganisms and its sensitivity pattern to commonly used antibiotics in the hospital and its uses.

Materials and Methods

This observational study was carried out prospectively in the department of surgery, B.R Ambedkar Medical College and Hospital. The study period was conducted in October 2014- March 2015. A total of 200 patients who have undergone gastrointestinal surgeries like Appendicitis, Ileal Perforation, Sigmoid Volvulus, Duodenal Perforation, and Obstructed Hernia were included in the study. After gastrointestinal surgeries, patients were maintained and treated in surgery ward where they were observed for post-operative wound infection on the 3rd, 5th, and 7th day after surgery. Deep tissue culture was taken from the infected wound for microbiological examination. Done by streak method, colony characters, antibiotic sensitivity tests were done by 'Kirby-Bauer' method on second day by kept it on duration of 24hrs at 37°C. Collection of culture report on day 3 for finding the isolated microorganism and sensitivity pattern of drugs. Antibiotic sensitivity tests were carried out on isolated and identified colonies of *E. coli*, *Pseudomonas*, *Staphylococcus aureus*, and *Klebsiella*.

Results and Discussion

Prevalence of post-operative wound infection:

The study included a total of 200 patients among them, prevalence of Appendicitis was higher with the incident rate of 107(53.5%) followed by Duodenal Perforation with the incident rate of 58 (29.0%). The prevalence of different types of gastrointestinal surgeries was listed in Table 1.

Out of the total 200 patients, 22 patients had post-operative wound infection. Prevalence of wound infection was far higher in Appendicitis with the incident rate of 13 (12.24 %) followed by Duodenal Perforation with the incident rate of 6 (10.34 %). Summary of post-operative wound infection of various emergency gastrointestinal surgeries was listed in Table 2.

Prevalence of different microorganisms:

Pathogens that are prevalent in post-operative wound infection are *Staphylococcus aureus* (Appendicitis, Ileal Perforation, Duodenal Perforation, and Obstructed Hernia), *Klebsiella* (Appendicitis and Duodenal Perforation, sigmoid volvulus) *Escherichia coli* (Appendicitis) and *Pseudomonas* (Appendicitis). Isolated pathogens were tested for its sensitivity against commonly used antibiotics at the hospital. The major pathogen isolated from the post-operative wound infection of Appendicitis was *Staphylococcus aureus* with the incident rate of 6 (46.15 %) followed by *Klebsiella* with the incident rate of 4 (30.76 %). The major pathogen isolated from the post-operative wound infection of duodenal perforation was *Staphylococcus aureus* with the incident rate of 4 (66.66 %) followed by *Klebsiella* with the incident rate of 3 (33.3 %). Whereas the major pathogen isolated from the post-operative wound infection of Obstructed Hernia, Sigmoid Volvulus and Ileal Perforation was *Staphylococcus Aureus* followed by *Klebsiella*. Summary of pathogens isolated from the pus collected from various gastrointestinal surgeries was listed in Table 3.

Sensitivity pattern to commonly used antibiotics:

Isolated pathogens were tested for its sensitivity against commonly used antibiotics in the hospital and sensitivity pattern is listed in table 4. amikacin and cefotaxime was sensitive to all isolated pathogens when compared with ceftriaxone and metronidazole. ceftriaxone and metronidazole does not show any sensitivity in pseudomonas.

Tables

Table 1: Prevalence of Gastrointestinal Surgeries

Surgery	Prevalence	Percentage (%)
Appendicitis	107	53.50%
Duodenal perforation	58	29.00%
Obstructed hernia	15	7.50%
Sigmoid volvulus	11	5.45%
Ileal perforation	9	4.50%

Table 2: Summary of Post-Operative Wound Infection

Surgery	Number Of Cured Cases	Percentage (%)	Number Of Infected Cases	Percentage (%)
Appendicitis	95	88.7%	13	12.24%
Duodenal perforation	52	89.6%	6	10.34%
Obstructed hernia	13	86.6%	1	6.66%
Sigmoid volvulus	10	90.9%	1	9.09%
Ileal perforation	8	88.8%	1	11.11%

Table 3: Summary of isolated pathogens

Surgery	Staph.Aureus	Klebsiella	E.Coli	Pseudomonas
appendicitis	6(46.15%)	4(30.76%)	2(15.38%)	1(100%)
Duodenal perforation	4(66.66%)	2(33.33%)	0(0.00%)	0(0.00%)
Obstruceted hernia	1(100%)	0(0.00%)	0(0.00%)	0(0.00%)
Sigmoid volvulus	0(0.00%)	1(100%)	0(0.00%)	0(0.00%)
Ileal perforation	1(100%)	0(0.00%)	0(0.00%)	0(0.00%)

Table 4: Sensitive pattern of isolated pathogens

Antimicrobials	Staph.aureus		Klebsiella		E.coli		Pseudomonas	
	S	R	S	R	S	R	S	R
Amikacin	11	1	3	1	3	1	2	0
Cefotaxim	7	4	2	4	2	1	1	1
Ceftriaxone	5	6	2	4	3	1	0	1
Metronidazole	8	3	4	1	3	0	0	3

Conclusion

This study shows the incidence of post-operative wound infections in gastrointestinal surgeries and major identified pathogens were staphylococcus aureus followed by klebsiella. Antimicrobial Amikacin was sensitive to all isolated pathogens with very low resistance profile compare to other commonly used antimicrobials at hospital. In spite of sterilization techniques, modern surgical equipments, and prophylactic use of antibiotics, post-operative wound infection still remains a challenge and contributes to patients morbidity and mortality.

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