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Efficacy of single dose versus multiple dose antibiotic prophylaxis in anterior abdominal wall hernia repair at a tertiary hospital

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Abstract
Introduction: Our study is aimed to compare the impact of single vs. multiple dose of antibiotic in terms of post-operative infection related complications. In Anterior Abdominal Wall Hernia Repair at a Tertiary Hospital.
Materials and Methods: The present study was prospective and longitudinal. Protocol of the procedure was formed along with Performa, Patient Information Sheet and Informed Consent Form. This study was carried out from October 2017 to September 2018 in surgery department of SSMC, Tumkur, in association with. Total 100 patients who were admitted for elective surgery were included in our study. The patients were randomly divided in two equal groups: single dose (SD) group and multiple dose (MD) group, comprising of 50 patients in each group. SD group was given Amoxycillin-Clavulanic acid (2 gm) intravenously at the time of induction of anaesthesia. Whereas, MD group was given Amoxycillin-Clavulanic acid (2 gm) intravenously at the time of induction of anaesthesia followed by Amoxycillin-Clavulanic acid (1 gm) intravenously twice a day for two days post-operatively.
Results: In single dose antibiotic group, total post-operative infection rate was 8% and that in multiple dose groups was found to be 0%. Data was analyzed with Chi- square test and the difference in the rate of SSI in both the groups was found statistically insignificant.
Conclusion: The rate of post-operative SSI after single dose antibiotic intravenously at induction of anaesthesia is comparable with that of multiple dose antibiotics. So single dose antibiotic regimen can be safely practiced in this surgery.

Keywords: Single dose vs. multiple dose, antibiotic prophylaxis, anterior abdominal wall hernia repair

Introduction
The mesh repair of the anterior abdominal wall hernias has been established as the technique of choice among the majority of surgeons. The technique used most frequently today is the free tension technique. This technique allows wound repair, better collagen restoration and prevents recurrence. Furthermore, the use of a polypropylene (PP) mesh has many advantages such as biocompatibility and comfort. This free tension technique is commonly accepted for recurrent, complicated and primary hernias because of the low risk of infection of the introduced foreign body, such as a non-absorbable mesh. Surgical wounds may be classified as follows, based on perioperative bacterial contamination: clean, clean contaminated, contaminated and dirty. Wound infections are categorized as superficial or deep. Superficial incisional surgical site infection occurs within 30 days of surgery and involves only the skin and subcutaneous tissue. Deep incisional surgical site infection involves deep soft tissue and appears to be related to the operation. It occurs within 30 days if no implant was left in place and within one year if an implant was left in place. But there are reports of Mesh infection occurring after one year of surgery also. Hernia mesh repair of the anterior abdominal wall is regarded as a clean surgery and the incidence of postoperative mesh infection is considered to be around 1-2% It is uncertain whether antibiotic prophylaxis is necessary to prevent postoperative wound infection, especially when a foreign body like a polypropylene mesh is used. There are no specific guidelines for antibiotic prophylaxis; the surgeon is responsible for determining whether a patient needs antibiotics or not.

The estimation of the value of the antibiotics seems to be empiric rather than evidence based and that is why their value is a controversial issue. There are antibiotic supportive statements that reported a decrease of the wound infection rate from 9% to 0.7% after antibiotic prophylaxis that are in contrast to other statements in which the antibiotic contribution is underestimated. There is no evidence that the advantages of antibiotic prophylaxis outweigh its disadvantages. The "triple E" summarizes the equivocal nature of antibiotic prophylaxis: ecological impact on the patient's flora (resistance and mutations of the microorganisms), adverse effects such as anaphylaxis, hypersensitivity, and blood dyscrasias and finally, economic impact. We present our experience with the use of multiple doses of antibiotics in hernia mesh repair.

Materials and Methods

The study was conducted during the period of October 2017 to September 2018 in SSMC Tumkur. Total 100 patients who were admitted for elective surgery were included in our study. The patients were randomly divided in two equal groups: single dose (SD) group and multiple dose (MD) group, comprising of 50 patients in each group. SD group was given Amoxycillin-Clavulanic acid (2 gm) intravenously at the time of induction of anaesthesia. Whereas, MD group was given Amoxycillin-Clavulanic acid (2 gm) intravenously at the time of induction of anaesthesia followed by Amoxycillin- Clavulanic acid (1 gm) intravenously twice a day for two days post-operatively and a cidal action is exerted. Penetration to the site of infection also depends on the pharmacokinetic properties of the drug. A drug which penetrates better and attains higher concentration at the site of infection is likely to be more effective. The fluoroquinolones have excellent tissue penetration—attain high concentrations in soft tissues, lungs, prostate, joints, etc. Ciprofloxacin and rifampin have very good intracellular penetration. Cefuroxime, ceftriaxone, chloramphenicol, ciprofloxacin attain high CSF concentration. Commonly used antimicrobials drugs for surgical prophylaxis 1. Amoxicillin 2 g (50 mg/kg) 2. Cephalexin 2 g (50 mg/kg) 3. Cefadroxil 2 g (50 mg/kg) For patients allergic to penicillin1.Clindamycin 600 mg (20 mg/kg) 2. Azithromycin 500 mg (15 mg/kg3.Clarithromycin 500 mg (15 mg/kg Parenteral (single injection just before procedure) 1. Ampicillin 2 g (50 mg/kg) i.m./i.v.2. Cefazolin 1 g (25 mg/kg) i.v.3. Vancomycin 1 g (20mg/kg) i.v. (in MRSA prevalentareas and/or penicillin allergic patients).4. Clindamycin 600 mg (20 mg/kg) i.v. (for penicillinallergic patients).
635. Cefuroxime 1.5 g (30 mg/kg) i.v.+ Metronidazole 0.5 g (10 mg/kg) i.v.6. Gentamicin 160 mg (3 mg/kg) i.v.+ Metronidazole 0.5 g (10 mg/kg)

Inclusion Criteria

1. Adult patients of either sex between 18 and 65 years.
2. Patients scheduled for routine open hernioplasty.
3. Both direct and indirect inguinal hernia.

Exclusion Criteria

1. Age group less than 18 years and more than 65 years.
2. Patients posted for emergency surgeries.
3. Patients with complicated hernia.
4. Patients having any pre-existing infection at surgical site.
5. Patients with severe co-morbid diseases like diabetes, cardiovascular diseases and any other are excluded from the study.
6. Patients taking steroids.
7. Immuno compromised patients.

Data Collection Procedure

All the patients underwent routine investigation and pre-anaesthetic checkup. Patients were distributed into two groups i.e. SD and MD groups in a systematic manner (even serial numbers in group A and odd serial numbers in group B).
Group SD consists 50 cases received single dose preoperative antibiotic prophylaxis i.e. inj. Amoxycillin + Clavulanic acid 2gms I/V half an hour before commencement of surgery. (All even cases).
Group MD consists 50 cases received multiple doses of post-operative antibiotic i.e. inj. I/V Amoxycillin + Clavulanic acid 2 gms BD for 3 days followed by tab. Amoxycillin + Clavulanic acid 2 gms TDS for next 2 days in addition to single dose preoperative antibiotic prophylaxis (all odd cases).
All the procedures were carried out by consultant surgeons under all standard aseptic precautions. Monofilament Polypropylene mesh was used for hernioplasty. Surgical site inspection was done on 3rd, 5th, 8th, 14th, 30th post-operative day for surgical site infection. Stitch removal done on 8th postoperative day. Cost of the antibiotic included in this study was also calculated as an average cost of the antibiotics.

Results

A total of 100 patients undergoing the procedure were included and divided into two groups SD and MD. Each has 50 patients.
As in the table 1, Out of 50 patients of Group SD four patients developed SSI (surgical site infection) as compared to none in Group MD.

Table 1: Each has 50 patients

Cases	Sd group	MD group
Total patients	50	50
Incidence of ssi	4	0

As shown in the table 2, three patients developed sign of inflammation on 2nd postoperative day among SD group. The affected patients was later given additional doses of antibiotic to treat infection and inflammation resolved on 4th post-operative day.

Table 2: three patients developed sign of inflammation on 2nd postoperative day among SD group

	Pre-operative	2nd day	4th day	8th day	16th day	32nd day
Total no of patients	50	50	50	50	50	50
Incidence od SSI	0	4	0	0	0	0

Table 3: As shown in table 3, none of the patient among MD group developed SSI on all followed post-operative days.

	Pre-operative	2nd day	4th day	8th day	16th day	32nd day
Total no of patients	50	50	50	50	50	50
Incidence od SSI	0	0	0	0	0	0

Discussion

Our study which was done to assess the effectiveness of a single dose of prophylactic antibiotic versus multiple doses antibiotics for 7 days has shown no significant difference in the wound infection rate in both the studied groups. However, there is a significant increase in the cost and side effects of antibiotics in the study MD group using 7 days antibiotics. The use of prophylactic antibiotic in all surgical cases are advocated ever since, the concept of use of antibiotic preoperatively to curtain and prevent wound infection was postulated by Bernard and

Cole in 1964.11 The overall experience from around the world has evidently recommended using the specific antibiotics in the pre- operative period rather than traditional use of 5-7 days of antibiotics in the post-operative period. With so much advancement in the strict asepsis of the environment and hygiene of the operation theatres which is being practiced widely, it was questioned in many surgical settings on the need of antibiotic at all for clean and clean-contaminate surgical cases. In 2001, Chambers *et al*. in their study recommended that first generation cephalosporin antibiotic the cefazolins are drugs of choice for the use of prophylactic antibiotics for the general surgical prophylaxis than the second or third generation cephalosporin. Naz *et al*. in a comparative study between a single-dose cefradine as the prophylactic antibiotics versus conventional dose of antibiotics in major gynaecological procedures have stated prophylactic antibiotic use is adequate provided standard principles of operative surgery are adhered. Wideman and Matthijssen in his study conducted on the use of cefazolin versus cefotaxime as the prophylactic antibiotic in 118 hysterectomy patients in 1982 stated cefotaxime and cefazolin are equally beneficial on all aspect, and use depend on the cost and availability. Several studies have been conducted on the choice of antibiotic and timing of use of antibiotics. Most of the studies have recommended the first dose to be given 30-60 min prior to surgery, and long-acting antibiotic must be selected.

Complications

The most dreaded complications are anaphylaxis or drug reaction and death. Its routinely associated with the b-lactam drugs. Including the cephalosporins, carbapenem, pencillin and monobactam Vancomycin also caused man syndrome Cephalosporins can rarely lead to hypoprothrombinemia and disorder of bleeding. Stretomycin can cause nephrotoxicity and hepatotoxicity.

Conclusion

Use of antibiotic prophylaxis is still a subject of many controversies. This study of antibiotic prophylaxis for hernioplasty included two classes of antibiotic prophylaxis. The most effective antibiotics were used in single dose in
one group and multiple doses group are same. The rate of infections is quite similar in single dose and multiple doses antibiotics; thereby making single dose antibiotics prophylaxis as effective as multiple doses of antibiotics.

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