

A comparative study of Single dose versus multiple doses of antibiotic prophylaxis in open inguinal hernioplasty

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Abstract: Inguinal hernioplasty is one of the most commonly performed surgeries worldwide. Elective inguinal hernioplasty is considered to be a clean procedure which does not require antibiotics prophylaxis but prosthetic material like polypropylene mesh is routinely used during procedure. This makes the topic debatable because use of prosthetic material like mesh increases the risk of surgical site infection. The incidences of surgical site infection (SSI) after inguinal hernioplasty ranges from 0 to 14 % in international literature. It is also more controversial whether single doses antibiotics or conventional multiple doses antibiotics for 5 to 7 days is effective. Our study aims to compare the efficacy of single dose versus multiple dose antibiotic prophylaxis in open inguinal hernioplasty. This prospective study was conducted during the period of Dec 2015 to March 2017 in the Dept of Surgery at People's hospital & people's college of medical science and research center Bhopal. All 100 patients were included and undergoing for Lichtenstein hernioplasty were distributed in systematic manner in two group i.e. Group A (even serial numbers) and group B (odd serial numbers). Group A received single dose preoperative antibiotic prophylaxis and Group B received multiple doses of perioperative antibiotics. The incidence of surgical site infection (SSI) is quite similar in group A (2%) as compare to group B (0%), and there was no significant difference in surgical site infection (SSI) between both groups (P value = 0.315). Average cost of antibiotics was Rs 1100 among multiple dose patients and Rs 135 among single dose patients (P value = 0.0001) which was statistically significant difference in cost of antibiotics in both groups. Single doses antibiotic prophylaxis is as effective as multiple doses antibiotic and potentially cost effective.

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I. Introduction

Inguinal hernia surgery is the most commonly performed surgery. Lichtenstein tension free repair using polypropylene mesh is the gold standard procedure for inguinal hernioplasty. Surgical site infection is the most frequent complication in inguinal hernioplasty¹. Reported surgical Wound Infection rates in elective operations vary from 2% for inguinal hernia repair to 26% for colectomy, and even higher for emergency surgery. The risk factors for SSI have been identified as age (older than 70 years), co morbidity, operative time, and routine use of drainage and prostheses². SSI is related with an increase in length of stay and costs and a decrease in quality of life³.

The introduction of tension free hernioplasty has made the use of antibiotic prophylaxis more critical because of the infection risk when prosthetic materials are used. The presence of plastic biomaterial increases the incidence of complications relating to the mesh itself, in addition to other recognized complications of the hernia repair⁴.

Use of antibiotics in Lichtenstein's hernia repair is still debatable in various set up. Some surgeons use a single dose of pre-operative antibiotic, while the majority uses multiple doses of post-operative antibiotics claiming that the latter is superior to the former in prevention of SSI in Lichtenstein's repair. Another subject in these setup that must be addressed in antibiotic prophylaxis is cost-effectiveness. In these cases, the costs of antibiotic administration must be carefully evaluated against the potentials benefits⁵⁻⁷.

Inappropriate use of surgical antibiotic prophylaxis is common, for example, incorrect timing, duration, doses and use of antibiotics. The timing of first dose is very important, and improper timing is one of the most common problems in surgical prophylaxis. *There is no evidence that administration of postoperative doses of an antimicrobial agent provides additional benefit, and this practice should be discouraged, as it is costly and is associated with increased rates of microbial drug resistance.* It is important to emphasize that surgical antibiotic prophylaxis is an adjunct to, not a substitute for, good surgical technique. *Numerous clinical studies have clearly shown that appropriately timed "single shot" prophylaxis is as effective as multiple dose prophylaxis^{8,9}.* So we have conducted this comparative study to assess the single dose versus multiple doses of antibiotic prophylaxis in open inguinal hernioplasty, so that the efficacy and cost effectiveness of both the variants can be evaluated.

II. Material And Methods

The study was conducted during the period of Dec 2015 to March 2017 in the Dept of Surgery at People's hospital & People's college of medical science and research center, Bhopal. All indoor patients of inguinal hernia undergoing open mesh hernioplasty within the inclusion criteria were taken in the study.

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. Immunocompromised patients

Data collection Procedure

All the patients underwent routine investigation and pre-anesthetic checkup. Patients were distributed into two groups i.e. Group A and group B in a systematic manner (even serial numbers in group A and odd serial numbers in group B).

Group A- Received single dose preoperative antibiotic prophylaxis i.e. inj. Amoxycillin+Clavulanic acid 1.2gm I/V half an hour before commencement of surgery. (All even cases).

Group B- Received multiple doses of post operative antibiotic i.e. inj. I/V Amoxycillin+Clavulanic acid 1.2gm BD for 3 days followed by tab. Amoxycillin+Clavulanic acid 625 mg TDS for next 4 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.

Statistical analysis

Quantitative data is presented with the help of Mean and Standard deviation. Association among the study groups is assessed with the help of Chi-Square test. 'P' value less than 0.05 is taken as significant.

III. Result

A total of 100 patients undergoing the procedure were included and divided into two groups. Each has 50 patients.

Surgical site infection (SSI) was observed in all pts on previously determined post operative days and average cost of antibiotics were also calculated.

Surgical site infection (SSI)

As in the table 1, Out of 50 patients of Group A one developed SSI as compared to none in Group B. There is no statistically significant difference in incidence of SSI in both groups (p=0.315).

Table 1- Incidence of Surgical site infection between Group A and Group B patients.

Cases	Group A	Group B	P value
Total patients	50(100%)	50(100%)	$\chi^2= 1.010$ P value = 0.315
Incidence of surgical site infection	1(2%)	0(0%)	

As shown in the table 2, only single patient developed sign of inflammation on 3rd postoperative day among study group A. The affected patient was later given additional doses of antibiotic to treat infection and inflammation resolved on 5th post operative day.

Table 2 – Distribution of incidence of SSI in relation to various observations Days in Group A pts.

	Preoperative	3rd POD	5th POD	8 th POD	14th POD	30th POD
Total no. of pts observed	50	50	50	50	50	50
Incidence of SSI	0	1	0	0	0	0

As shown in table 3, none of patient among study group B developed SSI on all followed post-operative days.

Table 3 — Distribution of incidence of SSI in relation to various observations Days in Group B pts.

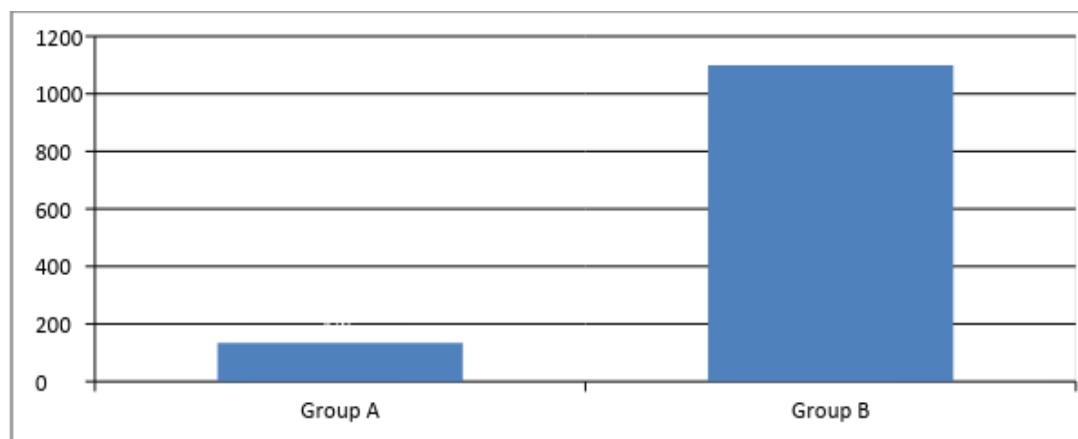
	Preoperative	3rd POD	5th POD	8 th POD	14th POD	30th POD
Total no. of pts observed	50	50	50	50	50	50
Incidence of SSI	0	0	0	0	0	0

Cost of antibiotics

Cost of antibiotic (amoxicillin + clavulanic acid) used in this study is calculated as average cost of antibiotic (cost of antibiotic/patients). Average cost of antibiotic in Group A was Rs 135 while cost of antibiotic per patients in Group B was 1100 Rs. P value is 0.0001 (P value <0.05).

Table 4- Average cost of antibiotics in both groups.

	Group A(mean)	Group B(mean)	P value
Average cost of antibiotics	Rs 135	Rs 1100	0.0001



IV. 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 group B 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 1964¹¹. 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 period¹². 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-contaminated surgical cases.

In 2001, Chambers in their study recommended that first generation cephalosporin antibiotic the cefazolin are drugs of choice for the use of prophylactic antibiotics for the general surgical prophylaxis than the second or third generation cephalosporin¹³.

Naz in a comparative study between a single-dose cephradine as the prophylactic antibiotics versus conventional dose of antibiotics in major gynecological procedures have stated prophylactic antibiotic use is adequate provided standard principles of operative surgery are adhered¹⁴.

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 availability¹⁵.

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.

Present study was conducted over 100 patients who underwent for elective open inguinal hernioplasty and equally divided in to group A (who received single dose antibiotic prophylaxis) and Group B (who received multiple dose antibiotics). Rate of surgical site infection (SSI) is quite similar in group A (2%) as compare to group B(0%),only single patient developed SSI in group A while none of the patient developed SSI in group B. There was no significant difference in surgical site infection (SSI) between both groups (P value =0.315)

A.R.Surahioetal (Total cases)	Antibiotic prophylaxis	Infections	Costs(mean)
90	Single dose	3(3.33%)	185
90	3 doses	7(7.77%)	255
In present study (Total cases)	Antibiotic prophylaxis	Infections	Costs(mean)
50	Single dose	1(2%)	135
50	Multiple doses	0(0%)	1100

In our study, results of average cost of antibiotics were revealed among inguinal hernia patients. Average cost of antibiotics was increasing as doses of antibiotics increases from single to multiple. It was highest among patients on multiple doses antibiotics & lowest among single dose antibiotic. It was Rs 1100 among multiple dose patients and Rs 135 among single dose patients. There was statistically significant difference in cost of antibiotics in both groups. (P value=0.0001).

These results were similar to the study conducted by Pavan BK etal in which The cost of antibiotic per patient in group A was Rs.32 while that in group B was between a minimum of Rs.192 in patients without SSI to a maximum of Rs.340 with SSI. The difference in cost of antibiotic in both groups was statistically significant as also seen in present study¹⁶.

Arjona F et al had conducted a study to find out the economic advantages following use of prophylactic antibiotic rather than traditional 7 days antibiotics, using 5260 patients in a medical Centre in Southern Taiwan and stated that use of prophylactic antibiotic alone for the surgical patients had resulted in gain of 1.5 million dollars for the public¹⁷.

V. 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 doses in one group and in other group same antibiotics were used.

The rates of infections are quite similar in single dose and multiple doses antibiotics. Thereby making single dose antibiotics prophylaxis as effective as multiple dose antibiotic prophylaxis.

This study also shows that single dose antibiotic prophylaxis is economical and puts fewer burdens on the patient.

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