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A study comparing preoperative intra incisional antibiotic infiltration and prophylactic intravenous antibiotic administration for reducing surgical site infection

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Abstract
Many methods have been evolved to combat wound infection during last century. Shortly after the introduction of the first antimicrobial agent Penicillin alone was shown to reduce the infection rate in abdominal surgery to 10% from a control rate of 25%.Initially, the antibiotics were only used post-operatively for treatment of already established SSI. Later, the concept of antibiotic prophylaxis was introduced. Many studies established the fact that preoperative prophylaxis with antibiotics reduces wound infection. All patients were given spinal anaesthesia all patients were painted with 10%povidone and recleaningwith spirit Surgical field was drappedproperly and aseptic precautions followed group a: prophylaxis by preoperative intraincisional infiltration of the antibiotic. One gram of cefotaxime diluted in 10 ml of distilled water will be infiltrated along the skin and the subcutaneous tissue in the proposed line of incision, 20 minutes before surgical incision. In Group 1, wound discharge was present in 1% on day 5. In group 2, wound discharge was present in 2% on day 5. There was no significant difference in wound discharge between two groups. At other intervals there was no discharge in both the groups.
Keywords: Preoperative intra incisional antibiotic infiltration, prophylactic intravenous antibiotic administration, surgical site infection

Introduction

Since the evolution of medicine, great strides have been taken in the field of advanced and minimal access surgeries. The focus is gradually shifting to day-care surgeries and surgeries with more cosmetically acceptable scars. However, despite the recent advances, one of the most commonly observed postoperative complication is surgical site infection (SSI)[1].

According to the National Nosocomial Infection Study (NNIS) report of the Centre for Disease Control (CDC), the prevalence rate of SSI, though preventable, is high[1].Surgical site infections are one of the most common nosocomial infections and constitute almost 38% of all infections in surgical patients[2].

Postoperative wound infection is a reason for pain,a nxiety,loss of function, scar contractions, and possible mortality secondary to sepsis. It also leads to increased hospital stay which further adds to the worry of both patient and the treating surgeon[3].

With the fear of a patient developing wound infection, surgeons, even today, burden the patient with higher antibiotics, even in clean uncontaminated surgeries which is certainly not justifiable especially in the wake of new drug resistant microorganisms. Prolonged use of antibiotics also adds to the cost incurred by the patient and various side effects such as nausea, vomiting, metallic taste, loose stools, etc.[4]

Hence, the timing, route and duration of antibiotic prophylaxis in surgery assume significant

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importance in that they should ensure that as high a concentration as possible reaches the wound before contamination as the most important factor in the pathogenesis of wound sepsis is the presence of bacteria in the incision at the time of closure. Local intraincisional administration of antibiotics is sensible, practical, and in this era of cost containment and increasing drug resistance, it is responsible.

The present study was undertaken to compare and evaluate the efficacy of single dose of preoperative intraincisional administration of cefotaxime with intravenous administration in preventing postoperative surgical site infections after hernia repair.

Methodology

Study design

A comparitative study preoperative intra incisional antibiotic infiltration and prophylactic intravenous antibiotic administration for reducing surgical site infection.

Inclusion criteria

1. Clean uncontaminated cases that included inguinal hernia.
2. Patients aged 20-60 years suffering from uncomplicated inguinal hernia.

Exclusion criteria

1. Immunocompromised.
2. Prolonged steroid therapy.
3. Suffering from diabetes mellitus.
4. Under the age of 20years.
5. Patient not giving consent.
6. All clean cases other than inguinal hernia.
7. Obstructed inguinal hernia.

Study sample size

In one group B (intravenous) it is 25%,another group A (intraincisional)it is 8.5% of surgical site infectionso to test the hypothesis(null hypothesis) of no difference in reference between TWO groups with 5% alpha error and 20% beta error. We require 95cases in each group, roundedto 100 casesin each group.

Study group

Group 1: Prophylaxis by preoperative intraincisional infiltration of the antibiotic. One gram of Cefotaxime diluted in 10 ml of distilled water will be infiltrated along the skin and the subcutaneous tissue in the proposed line of incision, 10 minutes before surgical incision. **Group 2:** A single dose of 1 gram of Cefotaxime will be administered intravenously 20 minutes before the surgical incision.

Pre operatively

Informed consent taken

Concerned consultant was intimated regarding the inclusion of the case in the studyshaving the abdomen from nipple to thigh one day prior to the procedureno antibiotic was given by any route other than that followed in the study.

Intraoperatively

All patients were given spinal anaesthesia all patients were painted with 10%povidone and recleaning with spirit surgical field was drapped properly and aseptic precautions followed group a: prophylaxis by preoperative intraincisional infiltration of the antibiotic. One gram of cefotaxime diluted in 10 ml of distilled water will be infiltrated along the skin and the subcutaneous tissue in the proposed line of incision, 20 minutes before surgical incision.

The dose was approximately 1ml per cm(100mg of antibiotic per cm)group b: a single dose

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of 1 gram of cefotaxime will be administered intravenously 20 minutes before the surgical incision.Cases in both the groups underwent mesh hernioplasty and deserda's procedures.

Post operatively

No antibiotic was given. Analgesics and intravenous fluid as per advice given. Surgical wound was inspected on D3 D4D5findings werenoted in the chart.Any other complaint like fever swelling discharge was enquiredas per CDC guidelines it was labelled infected.Appropriate antibiotic added if any surgical site infection found. Culture and sensitivity sent if discharge present.

Results

Table 1: Procedure done in two groups

		Group					
		Group 1		Group 2		Total	
		Count	%	Count	%	Count	%
Procedure	Lichtenstein hernioplasty	96	95.96%	92	92.00%	188	94.00%
	Desarda hernioplasty	4	4.04%	8	8.00%	12	6.00%
	Total	100	100.00%	100	100.00%	199	100.00%

$\chi 2 = 1.376$, df = 1, p = 0.214.

In Both group 1 and group 2, majority underwentLichtenstein hernioplasty (95.96% and 92% respectively). There was no significant difference in Procedure between two groups.

Table 2: Route of Administration of Antibiotic between Two Groups

		Group					
		Group 1		Group 2		Total	
		Count	%	Count	%	Count	%
Antibiotic i.v.	Intraincisional	98	98.00%	0	0.00%	98	49.00%
	Pre-Op Intravenous	0	0.00%	98	98.00%	98	49.00%
	Post-Op Intravenous	0	0.00%	0	0.00%	0	0.00%
	Pre-Op and Post-Op Intravenous	0	0.00%	2	2.00%	2	1.00%
	Intra-incisional and post-operative Intra-venous	2	2.00%	0	0.00%	2	1.00%

The Fisher exact test statistic value is 1.the result is not significant at $p<0.05$. The above table shows the antibiotic usage and the route of antibiotic administration.

Table 3: Surgical site Infection between two groups

		Group					
		Group 1		Group 2		Total	
		Count	%	Count	%	Count	%
Surgical site Infection	No	98	98.00%	98	98.00%	196	98.00%
	Superficial	2	2.00%	2	0.00%	4	2.00%
	Deep	0	0.00%	0	0.00%	0	0.00%
	Peritoneal	0	0.00%	0	0.00%	0	0.00%
	Unknown	0	0.00%	0	0.00%	0	0.00%

$\chi 2 = 0.00$, df = 1, p = 1.000.

$\chi 2$(with Yates correction) = 0.255, df = 1, p = 0. 614.

The above table shows that there is no significant difference in the occurrence of surgical site infection between the patients administered with intraincisional antibiotics and the patients administered with intravenous antibiotics.

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Table 4: Fever as a sign iof SSI seen between two groups

		Group						Chi Square
		Group 1		Group 2		Total		
		Count	%	Count	%	Count	%	
Fever Day 3	Yes	0	0.00%	2	2.00%	2	1.00%	χ 2 = 2.020, df = 1, p = 0.155
	No	100	100.00%	98	98.00%	198	99.00%	
Fever Day 5	Yes	0	0.00%	0	0.00%	0	0.00%	-
	No	100	100.00%	100	100.00%	200	100.00%	
Fever Day 7	Yes	0	0.00%	0	0.00%	0	0.00%	-
	No	100	100.00%	100	100.00%	200	100.00%	
Fever Day 14	Yes	0	0.00%	0	0.00%	0	0.00%	-
	No	100	100.00%	100	100.00%	200	100.00%	
Fever Day 30	Yes	0	0.00%	0	0.00%	0	0.00%	-
	No	100	100.00%	100	100.00%	200	100.00%	

On Day 3, in group 2, 2% had fever and none in group 1 had fever. There was no significant difference in fever between two groups.

Table 5: Wound Discharge seen between two groups

		Group					
		Group 1		Group 2		Total	
		Count	%	Count	%	Count	%
Wound Discharge Day 3	Yes	0	0.00%	0	0.00%	0	0.00%
	No	100	100.00%	100	100.00%	200	100.00%
Wound Discharge Day5	Yes	1	1.00%	2	2.00%	3	1.50%
	No	99	99.00%	98	98.00%	197	98.50%
Wound Discharge Day 7	Yes	0	0.00%	0	0.00%	0	0.00%
	No	100	100.00%	100	100.00%	200	100.00%
Wound Discharge Day14	Yes	0	0.00%	0	0.00%	0	0.00%
	No	100	100.00%	100	100.00%	200	100.00%
Wound Discharge Day 30	Yes	0	0.00%	0	0.00%	0	0.00%
	No	100	100.00%	100	100.00%	200	100.00%

Wound Discharge Day5: χ 2 = 0. 338, df = 1, p = 0.561.
Wound Discharge Day5: χ 2 = 0. 338, df = 1, p = 0.561.

In Group 1, wound discharge was present in 1% on day 5. In group 2, wound discharge was present in 2% on day 5. There was no significant difference in wound discharge between two groups. At other intervals there was no discharge in both the groups.

Table 6: Erythema seen between two groups

		Group						Chi Square
		Group 1		Group 2		Total		
		Count	%	Count	%	Count	%	
Erythema Day 3	Yes	2	2.00%	2	2.00%	4	2.00%	χ 2 = 0.00, df = 1, p = 1.000
	No	98	98.00%	98	98.00%	196	98.00%	
Erythema Day 5	Yes	0	0.00%	0	0.00%	0	0.00%	
	No	100	100.00%	100	100.00%	200	100.00%	
Erythema Day 7	Yes	0	0.00%	1	1.00%	1	0.50%	χ2 = 1.005, df = 1, p = 0.316
	No	100	100.00%	99	99.00%	199	99.50%	
Erythema Day 14	Yes	0	0.00%	0	0.00%	0	0.00%	
	No	100	100.00%	100	100.00%	200	100.00%	

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Erythema Day 30	Yes	0	0.00%	0	0.00%	0	0.00%	
	No	100	100.00%	100	100.00%	200	100.00%	

On Day 3, erythema was present in 2% of subjects in both group 1 and group 2. There was no difference in incidence of erythema between two groups.
On Day 7, 1% had erythema in Group 2 and none in Group 1. There was no difference in incidence of erythema between two groups.
There was no incidence of Erythema between two groups on other days.

Table 7: Wound Discharge seen between two groups

		Group					
		Group 1		Group 2		Total	
		Count	%	Count	%	Count	%
Wound Discharge Day 3	Yes	0	0.00%	0	0.00%	0	0.00%
	No	100	100.00%	100	100.00%	200	100.00%
Wound Discharge Day5	Yes	1	1.00%	2	2.00%	3	1.50%
	No	99	99.00%	98	98.00%	197	98.50%
Wound Discharge Day 7	Yes	0	0.00%	0	0.00%	0	0.00%
	No	100	100.00%	100	100.00%	200	100.00%
Wound Discharge Day14	Yes	0	0.00%	0	0.00%	0	0.00%
	No	100	100.00%	100	100.00%	200	100.00%
Wound Discharge Day 30	Yes	0	0.00%	0	0.00%	0	0.00%
	No	100	100.00%	100	100.00%	200	100.00%

Wound Discharge Day5: χ 2 = 0. 338, df = 1, p = 0.561.

In Group 1, wound discharge was present in 1% on day 5. In group 2, wound discharge was present in 2% on day 5. There was no significant difference in wound discharge between two groups. At other intervals there was no discharge in both the groups.

Discussion

In the present study there is no significant difference in the occurrence of surgical site infection between the patients administered with intra-incisional antibiotics and the patients administered with intravenous antibiotics i.e. both in group 1 and in group 2,2% of the cases had superficial surgical site infection which is very similar to the study carried out by Greenall *et al*., where the effect of intravenous and intra-incisional Cephaloridine was compared, both modes were found to be equally efficacious. Four hundred and five consecutive patients undergoing emergency or elective abdominal operations under the care of one surgeon were randomly allocated to receive prophylaxis against SSI by means of a single dose of 1gm cephaloridine given either intravenously or into the incision at the beginning of the operation. The rates of SSI were not significantly different between the two groups i.e. 3.5% and 2.1%, respectively[5].
On Day 3, in group 2, 2% had fever and none in group 1 had fever. There was no significant difference in fever between two groupsnone of subjects in both the groups had swelling on different days of follow up.
On Day 3, erythema was present in 2% of subjects in both group 1 and group 2. There was no difference in incidence of erythema between two groups.
On Day 7, 1% had erythema in Group 2 and none in Group 1. There was no difference in incidence of erythema between two groups.
In Group 1, wound discharge was present in 1% on day 5. In group 2, wound discharge was present in 2% on day 5. There was no significant difference in wound discharge between two groups. At other intervals there was no discharge in both the groups.
Discharge was sent to culture and sensitivity. The group1 which developed surgical site infection were discharged with antibiotics and analgesics. Group 2 2% developed SSI were

discharged with the antibiotic and analgesics. Probably the duration of surgery may be a causative factor in causing SSI.

In a study conductedby Sudhir S *et al*., the surgical site infection following surgery in both the groups was very high.In study group 8 out of 25 were infected and in control group,12 out of 25 patients; wound were infected. The wound infection rate was 32% in study groupand 48% in control group and showingthat rate of wound infectionreduced in study group but was not statistically significant[6].

In a study conducted by Aditya N Patil *et al*., patient (3.3%) from Group A and 4 (13.3%) patients from Group B were documented as having developed superficial surgical site infection inferring that the incidence of surgical site infection was less in the group where the intra-incisional antibiotics were infiltrated. They studied clean contaminated cases of appendectomy. Another variation in there study was they used cefotaxime instead of ceftriaxone. They found that 3.3% patients from intra-incision Group and 13.3% patientsfrom intravenous group were documented as having superficial surgical site infection[7].In conclusion of their study they noted although not statistically significant, there was clinically a lesser incidence of SSI in individuals who received intra incisional antibiotic our study shows that most of the SSI noted on 7th postoperative day (50%). SSI earliestnoted on 5th postoperative day. It warrants a careful inspection of surgical site on 5th and subsequent postoperative days. If any sign of SSI appears one or two sutures should be removed and collected pus should be drained and sent for culture and antibiotic sensitivity.

In a similar study conducted by Anoopsingh*et al*.;in clean contaminated cases in category A, 5 out of 22 patients (22.72%), while in category B, 1 out of 20 patients (5%) developed SSI. Though the difference is not statistically Significant but still it infers the incidence of surgical site infection was less in the group where the intra-incisional antibiotics were infiltrated[8].

Conclusion

The results of the present study showed that intraincisional antibiotic is as effective as intravenous antibiotic in reducing surgical site infection in hernia.

However results were not statistically significant. Both had equal results in clean case (hernia).

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