SURGICAL SITE INFECTION IN LUMBAR SURGERIES, PRE AND POSTOPERATIVE ANTIBIOTICS AND LENGTH OF STAY: A CASE STUDY

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Background: Postoperative wound infection also called as surgical site infection (SSI), is a trouble some complication of lumbar spine surgeries and they can be associated with serious morbidities, mortalities and increase resource utilization. With the improvement in diagnostic modalities, proper surgical techniques, antibiotic therapy and postoperative care, infectious complications can result in various compromises afterwards. The objective was to study the relation of surgical site infection in clean lumbar surgeries with the doses of antibiotics. This Retrospective study was conducted at Shifa International Hospital, from January 2006 to March 2008. **Methods:** Hundred post operated cases of lumber disc prolapse, lumbar stenosis or both studied retrospectively by tracing their operated data from hospital record section for the development of surgical site infection (SSI). The patients were divided into three groups depending upon whether they received single, three or more than three doses of antibiotics respectively. Complete data analyses and cross tabulation done with SPSS version 16. **Result:** Of 100 cases, only 6% had superficial surgical site infection; only 1 case with co morbidity of hypertension was detected. Twenty-one cases had single dose of antibiotic (Group-I), 59 cases had 3 doses (Group-II) and 20 cases received multiple doses (Group-III). There was no infection in Group-I. Only one patient in Group-II and 5 patients in Group-III developed superficial SSI. While 4 in Group-II, 3 in Group-III, and none of Group-I had >6 days length of stay (LOS). **Conclusion** The dose of antibiotic directly correlates with the surgical site infection in clean lumbar surgeries. When compared with multiple doses of antibiotics a single preoperative shot of antibiotic is equally effective for patients with SSI.

Keywords: Lumber surgery, surgical site infection, wound infection

INTRODUCTION

Postoperative wound infection also called as surgical site infection (SSI), is a trouble some complication of lumbar spine surgeries and they can be associated with serious morbidities, mortalities and increase resource utilization. With the improvement in diagnostic modalities, proper surgical techniques, antibiotic therapy and postoperative care, infectious complications can result in various compromises afterwards.[1] Rate of SSI was compared between the two antimicrobial prophylaxis groups (AMP), one with single dose and the other group with multiple doses. Patients with additional instrumentation was not statistically different between the two groups, the rate of SSI was 0.8% in multiple doses and 0.4% in one dose group. Patients in single dose group has decrease rate of SSI. Based on CDC guideline, a single dose AMP was proven to be efficacious for prevention of SSI in lumbar spine surgeries.[2]

As surgical site infection (SSI) is not uncommon even in clean surgeries, so new ways should be adopted and every effort should be made to curtail them.[3] The rate of infection is proportional to the magnitude of any intervention involved[4]; and its incidence is multifactorial in origin[5]. The accurate identification of various risk factors associated with SSI is essential to develop strategies to curtail such potentially devastating outcomes.[6]

The incidence of SSI after fenestration, decompressive laminectomy, and anterior or posterior lumbar spinal fusion procedures is 3% or even lower but the incidence increases to as high as 12% with the use of instrumentation.[6,7]

This study was done to correlate the role of antibiotics with the development of SSI and corresponding length of stay (LOS).

PATIENTS AND METHOD

From January 2006 to March 2008, all 100 operated cases at Shifa International Hospital under the impression of lumbar disc prolapse, spinal stenosis or both were studied. Informed consent was obtained from all patients. Complete history and physical examination was done. Diagnosis was confirmed on MRI scan and on peroperative findings. Postoperative complications like dural tear, CSF leak, fever, infection, and spondylodiscitis were also recorded in data. Doses of antibiotics given and length of stay (LOS) was analyzed with the postoperative complication of surgical site infection. Follow up data was traced from one month postoperative period to more than six months. Surgical site infection (SSI) was closely monitored by both the surgeons.

Presence or absence of co morbidities like hypertension, diabetes mellitus and ischemic heart disease were noted. Patients having fractures, trauma, and Pott's disease were excluded from the study.

Choice of antibiotic was either first or third generation cephalosporin, was based on two different surgeon's preference and was same in all three groups.

By reviewing postoperative patient's charts, patients were divided into three groups based on doses of antibiotics to see the frequency of SSI. Selection of patients to be placed in three groups for antibiotics was based on two different surgeons own preferences merely. The age, gender, initial presentation, co morbidity, preoperative health, nutritional status, disease status, pre operative, operative and postoperative managements and all hygienic conditions were similar in all three groups. In group-I single dose of antibiotic was given before skin incision. In group-II single dose of antibiotic was given before skin incision and other two doses were given post operatively. Third group was given >3 doses till they improved post operatively.

Data was thoroughly collected and processed in a spreadsheet and SPSS version 16 statistical software and graphpad.com (online statistical software). Statistical analysis consisted of a series of descriptive and frequency-based analysis. Comparison of frequency between graphs was done using Fischer Exact test. The level of statistical significance was $p<0.05$.

RESULTS

Out of 100 with male to female ratio of 2 to 3, 66 patients underwent fenestration procedure, 28 underwent laminectomy and 6 underwent both procedures at the same time. Cases age range was from 18 years to 70 years of age.

Only 6 cases were noted of having superficial surgical site infection (SSI), While 04 patients were noted of having fever.

We reported the result of antibiotic doses with the surgical site infection and postoperative length of stay in the hospital. Twenty-one patients in group-I were given single dose of antibiotic, 59 patients in group-II were given 3 dose of antibiotics and 20 patients in group-III were given more than 3 doses of antibiotics. Wound infection can be superficial or deep but we noticed only superficial site infection in all 6 cases (5 patients in group-II and 1 patient in group-III (Table-2).

Patients in all three groups, who developed superficial surgical site infection, broad spectrum antibiotic like ceftriaxone was given in multiple doses on surgeon's preference. The only isolating organism was staphylococcus aureus and no case with MRSA was noticed.

Patients who received multiple doses as they developed superficial surgical site infection, only 1 patient had hypertension; no other co morbidity like diabetes mellitus or ischemic heart disease was noticed.

Increase length of stay was noticed in patients having SSI. Out of 6 patients with SSI only 1 patient had 2 days LOS, While only 1 patient had >6 days LOS, and 4 patients were found of having 3–6 days LOS in the hospital.

Table-1: Demographic features and clinical outcome of the patients

	Number	%
Total patients Operated	**100**	
Gender		
Male	40	40.0
Female	60	60 .0
Co morbidities		
Hypertension	12	12.0
Diabetes mellitus	8	8.0
Others	5	5.0
Operating surgeon and number of surgeries		
Surgeon one	60	600
Surgical two	40	40.0
Type of surgery		
Fenestration	66	66.0
Laminectomy	28	28.0
Both	6	6.0
Type of surgery (revision)		
Fenestration	nil	0
Laminectomy	nil	0
Both	nil	0
Complications		
Surgical site infection with fever	4	4.0
Surgical site infection without fever	2	2.0
Haematoma formation	nil	0
Total	6	6.0
Isolating organism		
Staphylococcus aureus	6	6.0
MRSA	nil	0

Table-2: Antibiotic Doses and frequency of SSI

Doses of antibiotics	Superficial infection	No infection	Total patients	*p*-value*
Single	0 (0%)	5	21	1.00
Three dose	1 (1.7%)	58	59	
Single	0 (0%)	5	21	0.54
>3 doses	5 (25%)	15	20	
Three doses	1 (1.7%)	58	59	0.003
>3 doses	5 (25%)	15	20	

*Fischer Exact test

Table-3: Antibiotic doses and length of stay

Antibiotic Group	> 6 days of stay
Group-I	0
Group-II	4
Group-III	3

DISCUSSION

Surgical site infection is commonly classified into superficial and deep infection. Superficial infections are limited to skin and subcutaneous layer without involvement of fascia. While deep infections are limited to lumbo-sacral fascia for posterior lumbar wounds. Acute infections are within 3 weeks while chronic infections are those persisting >4 weeks.[7]

In spite of other complications of spinal surgeries, SSI was an important identifier. Its correlation with the co morbidities and LOS was also studied. In our study observer being both surgeons themselves, during two year period of operated cases at Shifa international hospital Islamabad. Like our study, different studies noticed cases with more than one surgeon at different institutions. Out of 2391 operated cases, only 46 cases developed SSI infection, yielding an over all infection rate of 1.9%.[5] In our study out of 100 patients, only 6 patients developed SSI, having infection rate of 7%. Increase infection rate in our study is primarily due to small study sample.

When thoracolumbar procedures wound infections are compared with the cervical wounds, cervical surgeries have very low infection rate of 0% to 1% only.[2,8,9] Posterior cervical procedures have higher rate of infection comparable to posterior lumbar surgeries, 1% to 9% only for instrumented surgeries.

Regarding wound infection, general invasiveness & complexity of procedure is directly related to the infectivity, more time taken in the operation room (OR) is also a significant measure. It is suggested that instrumentation can cause local soft tissue irritation leading to the local seroma formation with subsequent infection, as implants provide avascular surface for bacteria to grow.

Keller and Papas[7] reported a dramatic decrease in the infection rate from 2.7% to 0% with proper use of preoperative antibiotics. Important to discuss is the infection rate after lumbar discectomies, which has dropped from 9.3% to 1% with the use of preoperative antibiotics.[10] Various studies are compared with the placebo trial as well, so infection rate was quite lower about 4.3% as compared to the 12.7% with the placebo before undergoing lumbar surgeries.[11] Study by the Guiboux *et al*[12], showed surgical site infection in a rabbit model was effectively prevented with single use of preoperative dose of Cefazolin or Vancomycin given within an hour before surgery.

Antimicrobial prophylaxis (AMP) reduces the rate of SSI in lumbar spine surgeries, but a great deal of variation exists regarding the duration and timing of AMP.[6] Some spinal surgeons recommend administering first generation cephalosporin or clindamycin/ vancomycin in patients within an hour before surgery because antibiotic blood levels have been shown to decrease with the Operative time[13,14], and some of the spinal surgeons recommend re-dosing of antibiotic after 4 hours of operative time as we did in group II. However clinical studies comparing the single preoperative dose with the multiple postoperative doses is fail to show any statistical difference.[11,15] According to the Centre for Disease Control and Prevention (CDC) guidelines, the AMP period is changed to the day of surgery only.[7]

While comparing the two groups with single and multiple doses of antibiotics in various operated cases like lumbar disc prolapse, lumbar Stenosis, degenerative diseases of spine, spinal trauma, foraminal Stenosis, and spinal tumours. There were 1133 patients in multiple doses group and 464 cases in single dose group. Keeping the other variable e.g., like instrumentation constant, the over all SSI rate was 0.7%.[7] In our study we had increase rate of SSI in multiple doses group as compared to single dose group of patients.

For a SSI to occur bacteria has to be present in substantial quantity (>100,000 organisms).[16] Three possible sources are direct inoculation[17,18], soiling of incision in fresh postoperative phase[19] or through hematogenous spread[20]. Most of SSI is due to direct inoculation at the time of surgery as likely happened in our cases. Isolating organism in all of our patients with SSI was staphylococcus aureus like wise of other studies. Although we included Diabetes in our co morbidities, none of our patients with diabetes mellitus developed SSI. Only one association of hypertension was observed.

Finally discussing length of stay (LOS) with the SSI, we concluded that patients with increase in SSI had increased LOS along with increase doses of antibiotics required to control SSI.

CONCLUSION

As shown in other studies there are no advantage of giving multiple doses of antibiotics for elective clean surgery. A single preoperative shot of antibiotic is equally effective with the added advantage of decrease cost of surgery. We also propose that shorter length of stay in the hospital is also an important preventive factor.

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