

RESEARCH ARTICLE

PHARMACOLOGY

EFFICACY OF CEFOPERAZONE AND SULBACTAM AS A SURGICAL ANTIBIOTIC IN HIP SURGERY



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ABSTRACT

Surgical site infections (SSI's) following hip surgery can lead to prolonged hospitalization, increased morbidity and mortality and increased financial burden to patients. A total of 192 patients were enrolled in the study on the basis of inclusion and exclusion criteria. Surgical site was monitored based on the guidelines issued by the Scottish Centre for Infection and Environmental Health. The wound was checked on the 3rd, 6th, 12th and 30th days postoperatively. Out of 192 enrolled patients, only 12 (6.25%) patients were found to be affected with surgical site infection. Higher infection rate was found in patients with ASA score > 2 (27.27 %), patients with risk index 2 (30.77 %), diabetic patients (19.05%) and smoker patients (17.95 %). Also higher infection rate was found for surgery having longer duration. Cefoperazone and sulbactam was found to be effective prophylactic antibiotic in hip surgery.

KEYWORDS

Surgical site infection, hip surgery, prophylactic antibiotic, cefoperazone, sulbactam

INTRODUCTION

Surgical site infection (SSI) is a major complication of surgical procedures. SSI may occur at the site of incision or in the organ or tissue operated during the surgery. Generally SSI is caused by the bacteria present on the patient's skin or in the environment of the operation theater. A surgical site infection (SSI) is the second, most common cause of nosocomial infection after urinary tract infections and cause approximately 17% of all hospital-acquired infections¹. SSI's can affect the quality of patient's life, prolong total hospitalization stay and also increase the rehospitalization rates. They are also associated with considerable morbidity and increased financial burden. Orthopedic SSI's results in approximately double rehospitalization rates and increase healthcare cost by 300%².

One group of patient's frequently targeted study of SSI is those undergoing prosthetic joint surgery³. The overall incidence of SSI after prosthetic joint replacement surgery is low, with infection rates reported between 0.6% and 4.5% depending on the surveillance method employed by the healthcare facility⁴.

Identification of surgical site infected patients involved clinical as well as laboratory finding. It is crucial that for such a study, consistent and standardized definition should be used; otherwise inaccurate and uninterpretable SSI rates will be computed and reported. The Centre for Disease Control and Prevention (CDC) established National Nosocomial Infection Surveillance (NNIS) system which has

developed a standardized surveillance criterion for defining SSI.

Known risk factors for SSI are related to the environment, surgeon, and patient. Some of these factors are amenable to intervention (e.g. conditions in the operating room). Other factors, such as advanced age and diabetes mellitus, are intrinsic patient risks and cannot be modified⁵. Antimicrobial prophylaxis contributes to the reduction in incidence of SSI and is standard practice for surgical procedure. Specific recommendations are available regarding the choice of the antibiotic, duration of prophylaxis, and timing of the first dose⁶.

Preventive preoperative measures that can reduce the risk of SSI's include administration of antimicrobial prophylaxis, proper utilization of skin antiseptic agents for patient and the surgical team, proper patient preoperative hair removal and the policy of canceling elective procedures when remote skin, urinary or pulmonary infections occur⁷. Also well organized system of surgical site infection surveillance and reporting of it may help in reduction of surgical site infection.

Now a day surgical site infection is a major problem for patients undergoing hip surgery. Much attention is needed to prevent occurrence of SSI's. In the present study we selected the patients undergoing hip surgery at private hospital. This study was carried out to check the efficacy of cefoperazone in combination of sulbactam as a prophylactic antibiotic for preventing SSI's. Various risk factors which are responsible for SSI's were also taken into consideration. All risk factors were correlated with occurrence of SSI's.

MATERIALS AND METHODS

This is prospective study involving surgical patients from orthopedic department.

The protocol was submitted to Institutional Human Ethical Committee (IHEC) of R. C. Patel Institute of Pharmaceutical Education &

Research, Shirpur and approval was got for the same.

Selection of patients

Patients of both gender having age more than 18 years and undergoing surgery for hip fracture i.e. neck femur fracture, inter-trochanteric fracture and sub trochanteric fracture were enrolled in the study.

Patients infected before surgical procedure, patients on therapeutic antibiotic before surgery, patients requiring further surgery within 72 hours, patients allergic to penicillin and cephalosporin and patients infected with AIDS or tuberculosis were excluded from the study.

Data collection

After the confirmatory decision taken by, both the patient as well as surgeon, patient was admitted to the hospital one day, before the surgery for the physical and laboratory investigation. At the time of admission patient's general information such as name, age, sex, contact no. etc were recorded in the form of report. After admission patient's social history regarding diet, smoking and drinking habits and history regarding injury were taken. On the second day, laboratory data was recorded containing information, mainly on HIV and Hepatitis B tests and related to hematological parameters.

Further examination was done related the nature of fracture and treatment (surgical procedure). Generally 3 types of fracture were considered under the heading of hip fractures: Neck femur (N.F.) fracture, Inter-trochanteric (I.T.) fracture and Sub-trochanteric (S.T) fracture. All patients with neck femur fracture undergone hemi replacement therapy with AMP (Austin Moore Prosthesis) implants. Patients with I.T. fracture undergone plating or nailing. For nailing PFN (Proximal Femoral Nail) was used and for plating, plate was fixed with the help of DHS (Dynamic hip screw) and S.T.

fracture was treated in the same manner as that of I.T. fracture, instead of PFN, long PFN was used and instead of DHS, long DHS was used.

Before the induction of anesthesia, ASA (American society of Anesthologist) scoring pattern was recorded with the help of anesthetic doctor. It is indicative of physical status of the patients. If ASA score found to be > 2 then it would be considered as a first risk factor for SSIs. First dose of antibiotics was given to the patient 0-60 min before incision.

After measuring ASA score, surgeon was asked for expected duration of surgery and it was compared with actual duration of surgery. If duration of surgery found to be greater than 75th percentile of the expected duration of surgery, then it would be considered as a second risk factor.

After recording ASA score and duration of surgery, risk index was measured. Risk index was calculated [based on National Nosocomial Infection Surveillance (NNIS) guidelines with the help of two risk factors i.e. co-morbidity (as indicated by an ASA score >2) and duration of operation (>75th percentile)] as follows:

Risk index 0 = when neither risk factor is present

Risk index 1 = when either one of the risk factors is present

Risk index 2 = when both risk factors are present

After finishing operative procedure patient was discharged within 3-5 days depending on the patient's condition. Surgical site was monitored based on the guidelines issued by the Scottish Centre for Infection and Environmental Health (Table 1). The wound was examined on the 3rd, 6th, 12th and 30th days postoperatively

Table 1
SCIEH guidelines for surgical site infections surveillance

1. Infection occurs within 30 days after the operative procedure
2. And involves only skin and subcutaneous tissue of the incision
3. And the patient has at least one of the following:
 - Purulent discharge from the superficial incision
 - Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
 - At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness or heat and superficial incision is deliberately opened by surgeon unless incision is culture negative
 - Diagnosis of SSSI by clinician

The following are not reported as SSSI:

- Stitch abscess (minimal inflammation and discharge confined to the points of suture penetration)
 - Infected burn wound
 - Incisional SSI that extends in to the fascial and muscle layers (deep incisional SSI)
-

RESULTS

A total of 192 patients were enrolled in the study on the basis of inclusion and exclusion criteria. In the present prospective study a total of 12 patients (6.25%) were found with surgical

site infection with only superficial surgical site infection. The detailed of all the patients is given below in the following table as sex, age, smoking status, diabetes status, ASA scoring, duration of surgery, risk index, and duration of hospital stay.

Table 2
Patient data analysis

Parameter	Total patients	% of patients
Sex:		
Male	102	53.68
Female	90	47.37
Age:		
< 40years	41	21.58
40-60 years	68	35.79
> 60 years	83	43.68
Smoking status:		
Smoker	39	20.53
Non smoker	153	80.53
Diabetes status:		
Diabetic patients	42	22.11
Non-diabetic patients	150	78.95
ASA scoring:		
ASA score 1	104	54.75
ASA score 2	66	34.74
ASA score 3	22	11.58
Duration of surgery:		
Greater than 75 th percentile of expected duration of surgery	71	37.37
Not greater than 75 th percentile of expected duration of surgery	121	63.68
Risk index:		
0	98	51.58
1	68	35.79
2	26	13.68
Duration of hospital stay (Days):		
5	30	15.79
6	40	21.05
7	38	20
8	31	16.32
9	29	15.26
10	24	12.63

In present study major risk factors e.g. ASA score, risk index, and duration of surgery were also noted. Out of 104 patients with ASA scoring pattern 1, two patients (1.92 %) were found with SSI. Out of 66 patients with ASA

scoring pattern 2, four patients (6.06 %) were found with SSI. Out of 22 patients with ASA scoring pattern 3 or more than 3, six patients (27.27 %) were found with SSI. As shown in figure 1.

Figure 1
ASA scoring pattern of infected patients

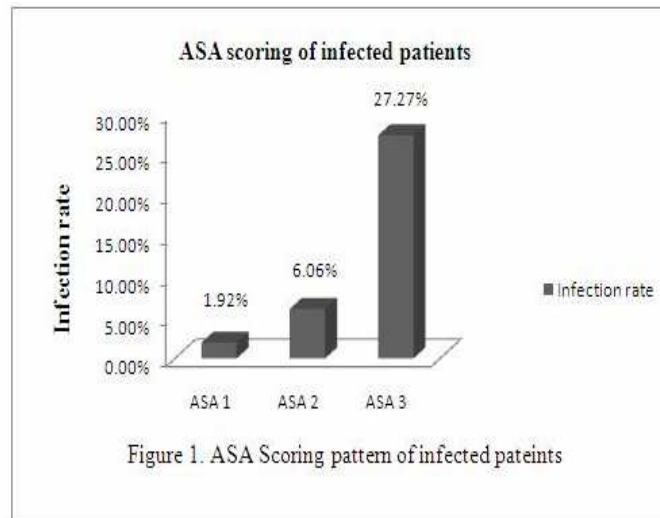


Figure 1. ASA Scoring pattern of infected patients

A total of 71 patients had found with duration of surgery > 75th percentile of expected duration of surgery out of them 7 (9.86 %) patients were found with SSI. risk index was calculated from the duration of surgery. Out of 98 patients with risk index 0, 1 (1.02 %) patients were found with

SSI. Out of 68 patients with risk index 1, 3 (4.41 %) patients were found with SSI. Out of 98 patients with risk index 2, 8 (30.77 %) patients were found with SSI. As shown in figure2.

Figure 2
Risk index of infected patients

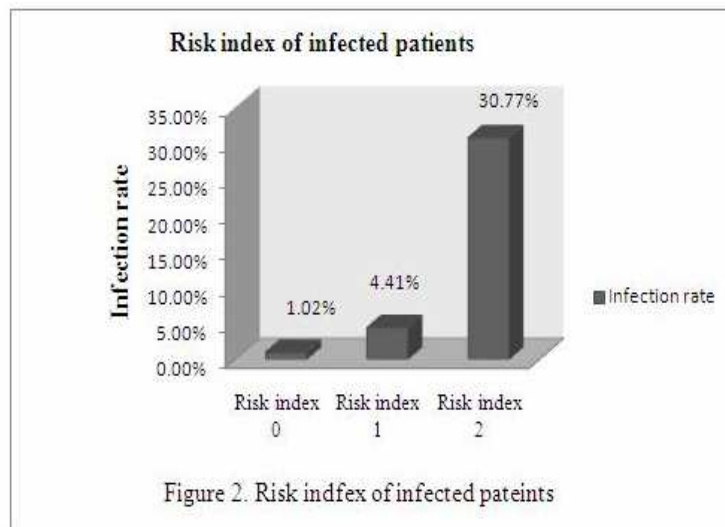


Figure 2. Risk index of infected patients

Out of 192 surgery 79 were undergone surgery for neck femur fracture, 82 for inter-trochanteric fracture and 30 for sub trochanteric fractures, out of them 5 (6.33 %) patients, 4 (4.88 %) patients

and 3 (10 %) patients were found with surgical site infection respectively.

Duration of total hospitalization was measured. Higher infection rate was found with longer day

DISCUSSION

Present study was designed to assess the efficacy of cefoperazone and sulbactam combination in hip surgery, as a surgical antibiotic and also to evaluate the risk factors for SSIs. In the present study incidence rate of surgical site infection was found 6.25 % (infected patients/100 patients). Fever, redness, pain and pus formation around stitches area were the major signs and symptoms of all infected patients.

Age is found to be one of classical risk factor for surgical site infections. Increased age is associated with increased incidence of SSI up. Several risk factors for SSI are similar among elderly patients and younger patients, but financial factors and factors related to health services may differ from each other⁸. In present study SSIs rate was increased with increase in age. 8.43 % patients were found to be infected in the category of age group above 60 years as compared to 5.88 % and 2.44 % in other age group. The clinical presentation of infection and the pathogens that cause infection are similar among elderly patients and younger patients. However, the mortality rate, the duration of hospitalization, and the costs associated with hospital cares are greater for elderly patients with SSI as compared to younger patients with SSI⁹. In previous study it was found that older patients with *Staphylococcus aureus* SSIs had a 3-fold increase in mortality, longer post-operative hospital stays, and higher hospital charges than did younger patients with *S. aureus* SSIs¹⁰.

Nicotine use delays primary wound healing and may increases the risk of SSI¹¹. In present study higher SSI rate was found in smoker patients (17.95 infections/100 patients) as compared to non-smoker patients (3.27 infections/100 patients). In another study smoking was also found to be the only factor significantly associated with surgical site infection¹².

hospitalization

Diabetes may be one of risk factors for surgical site infection. The contribution of diabetes to SSI risk is controversial because the independent contribution of diabetes to SSI risk has not typically been assessed after controlling all potential confounding factors¹¹. Increased glucose levels (>200 mg/dL) in the immediate postoperative period (<48 hours) were associated with increased SSI risk. Preoperative weight loss and tight control of blood glucose levels may reduce the risk of SSI⁴. In the present study 19.05 % diabetic patients was found with surgical site infected where as 2.67 % non- diabetic patients found infected.

Duration of surgery is positively associated with risk of wound infection; increase in duration of surgery can lead to higher rate of surgical site infection¹³. The duration of an operation is a measure of the length of exposure to potential contamination, but may also reflect the complexity of the procedure and surgical technique¹⁴. In present study patients having duration of surgery greater than 75th percentile of expected duration of surgery, were associated with higher infection rate (9.86 %) as compared to those who had completed surgery in stipulated period (4.13 %).

Surgical site infection also depends on the ASA scoring pattern of the surgical patients. An ASA score >2 is associated with increased risk of wound infection and this risk is additional to that of classification of operation and duration of surgery¹⁴. In present study infection rate was increased as increase in ASA score of the patients. 1.92 % patients with ASA score 1, 6.06% patients with ASA score 2 and 27.27 % patients with ASA score 3 found to have surgical site infection.

The NNIS risk index was a found to be good predictor of SSI¹⁵. In present study patients with risk index 2 were associated with higher surgical site infection rate 30.77 % as compared to 4.41% and 1.02 % infection rate

for patients having risk index 1 and 0 respectively. The general effectiveness of the NNIS method was established by Culver and co-workers, who demonstrated that the SSI risk increased from 1.5% to 13% when the NNIS risk index increased from a score of 0 to 3¹⁴. Prolonged hospital stay is frequently suggested as a patient characteristic associated with increased SSI risk. However, length of preoperative stay is likely a surrogate for severity of illness and co-morbid conditions requiring inpatient work-up and/or therapy before the operation¹¹. It was found that there was increase in SSI rate with the increase in hospital stay. Highest infection rate (12.5%) was found with 10 days hospitalization.

CONCLUSION

From the results, we can conclude that; cefoperazone and sulbactam combination show good efficacy as a prophylactic antibiotic in hip surgery. This combination is effective in

prevention of superficial SSIs and early deep incisional SSIs. ASA score > 2, higher duration of surgery, risk index and increased age were found as a risk factor for SSIs. To find out others responsible risk factors for surgical site infections and to know the serious adverse effect of surgical site infection on joint function as well as quality of life (activity of daily life) further study is required for longer duration. Much attention is required for prevention of SSIs to overcome economical burden and minimize the serious adverse effects.

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