ORIGINAL ARTICLE

Efficacy of Short course perioperative antibiotic prophylaxis: surgical site infection in elective orthopedic surgery

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ABSTRACT

Background: Drug resistance is generated by the excessive and uncontrolled use of antibiotics. Therefore, this study was conducted to compare the effectiveness perioperative antibiotic prophylaxis of short course against long term administration of surgical site infection preventive antibiotics.

Material and method: This prospective study was conducted in the department of orthopedic of King Khalid Hospital, Majmaah from February 2019 to November 2020. Informed written consent were taken from the patients who underwent through elective orthopedic surgery and ethics committee approval was taken from the institute. Clinically diagnosed surgical wound were completely examined. Pus samples were collected and transported in transport medium to the microbiology department immediately for further processing of specimens (culture, identification and antimicrobial sensitivity) by standard microbiological methods. SPSS version 20.0 with 95% confidence interval was used for analysis of result.

Result: Total 200 patients were included in this study among them 100 was in Group I from 10-70 years age and 100 were in Group II from 7-70 years age. Demographical characteristics and other predisposing factors like smoking and diabetes were found non-significantly statistically. Among 200 patients 142 (71.0%), 51 (25.5%) and 7 (3.5%) underwent spinal anesthesia, general anesthesia and epidural anesthesia respectively. only 8 (4%) patients developed surgical site infection and culture showed growth of staphylococcus aureus and Escherichia coli spp.

Conclusion: Short course of perioperative antimicrobial prophylaxis for prevention of infections in elective orthopedic surgeries can shorten hospitalization, post-operative morbidity and unnecessary usage of long term antibiotics which also decreases the chance of antibiotic resistance in elective orthopedic surgery. There is paucity of data in different region of the country, needs more study on short term prophylaxis if it is to be substantiated.

Key words: orthopedic, surgery, prophylaxis, surgical site infection, antibiotic, fracture, short course

INTRODUCTION

Antimicrobial prophylaxis has been accepted as a universal protocol for reducing postoperative complications pertaining to infections in surgical practice.[1,2] One of the most devastating complications linked to any surgical operation is infection, prolonged morbidity, disability and increased mortality.[3]

Nearly 20% of hospitalized patients in developed countries have developed hospital acquired infections and considered the third most prevalent complication in hospital. [2] Most are surgical site infection (SSI), which reported 5.6% of patients admitted to surgical care.[4] SSI is an infection occurs during or around the operative incision 30 days to one year after surgery and affecting both the incision and the deep tissues in sites of the body where the surgery took place and their consequences are highly relevant.[5] The more likely patients who acquired SSI were to attend ambulatory and emergency department, regular use of radiological service, high readmission rate and home health care assistance.[6]

SSI prevention in orthopedic surgery has some specialties which are unknown for general surgery: poor inocula for implant associated foreign body infections, skin commensals pathogenicity, a potential haematogenic cause for certain infections and the need for prolonged post discharge follow-up for implant associated surgery for a minimal duration of one year. [7-10]

In numerous surgical maneuvers controversy are regarding type of antibiotics and its duration of administration. Antimicrobial resistance and super infection with resistant pathogens are the consequences of long course of antibiotic prophylaxis.[11-12] Drug resistance is generated by the excessive and uncontrolled use of antibiotics. Therefore, this study was conducted to compare the effectiveness perioperative antibiotic prophylaxis of short course against long term administration of SSI preventive antibiotics.

MATERIAL AND METHOD

This prospective study was conducted in the department of orthopedic of King Khalid Hospital, Majmaah from February 2019 to November 2020. Informed written consent were taken from the patients who underwent through elective orthopedic surgery and ethics committee approval was taken from the institute.

Equal numbers of patients were distributed into two groups. Group I patients were given 3 doses of 1 g intravenous (IV) ceftriaxone in combination with amikacin (15 mg/kg) perioperatively at an interval of 12 hours (first dose of which was given 30 minutes before the start of the surgery). Group II patients were given the usual course of 5 days of intravenous antibiotics (ceftriaxone 1 g two times daily in combination with amikacin [15 mg/kg twice daily], which was succeeded by oral cefuroxime, 500mg twice daily till stitches were removed. In both, the groups an additional perioperative dose of antibiotic was given when the surgical procedure surpassed 2 hours or more or if more than 1000 ml of blood transfusion was required by the

patient. Patients on immunosuppressive therapy, open fractures and hypersensitive to cephalosporin were excluded from this study.

Symptoms like inflammation and pus discharge at the site of operation was the characteristic feature of surgical wound.[13] Clinically diagnosed surgical wound were completely examined. Pus samples were collected and transported in transport medium to the microbiology department immediately for further processing of specimens (culture, identification and antimicrobial sensitivity) by standard microbiological methods.[14] SPSS version 20.0 with 95% confidence interval was used for analysis of result, presented and interpreted in the tables and charts.

RESULT

Total 200 patients were included in this study among them 100 was in Group I from 10-70 years age and 100 were in Group II from 7-70 years age. Demographical characteristics and other predisposing factors like alcoholism, smoking, diabetes were found non-significantly statistically.

Table/ fig. 1: Demographical details of patients.

S.N.	Demographic Data	Group I (n=100)	Group II (n=100)	P-value
1	Age in years	37 (10-70)	36 (7-70)	0.3
2	Sex			
	Male	71	68	0.7
	Female	29	32	
3	Surgical site infection	5	4	0.6

Among 200 patients 142 (71.0%), 51 (25.5%) and 7 (3.5%) were underwent spinal anesthesia, general anesthesia and epidural anesthesia respectively. Different type of cases in Group I and Group II explained in table/fig 2.

Table 2: Details of type of cases in Group I and Group II

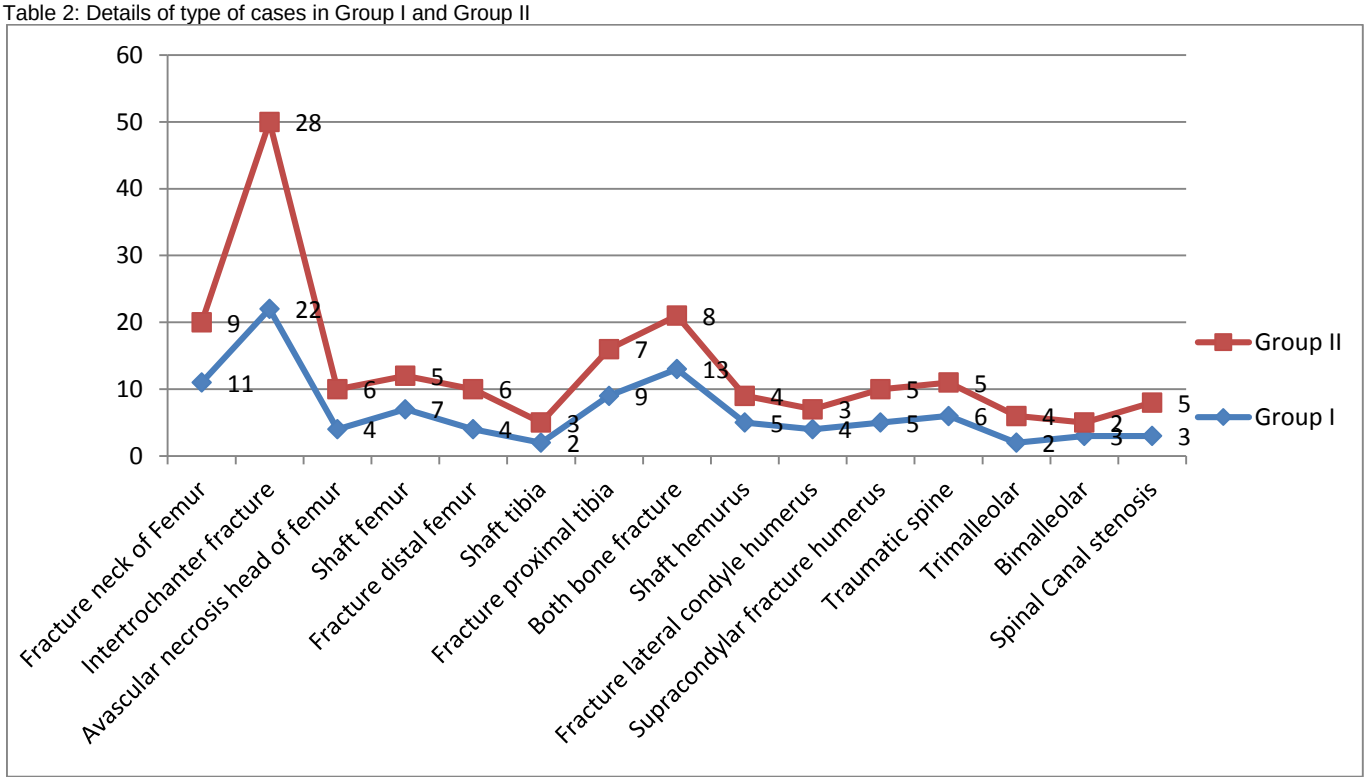


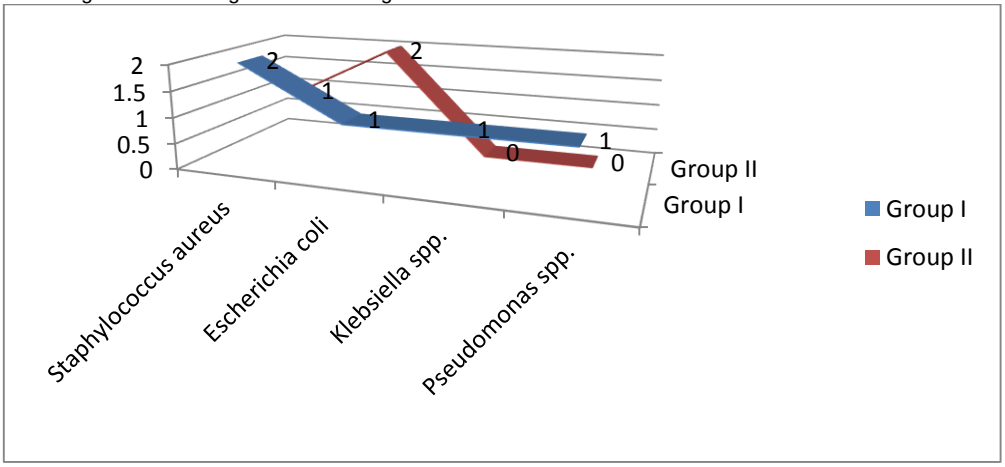
Table / Fig. 3: Type of surgery and infection rate

Type	Group I		Group II	
	N (%)	Infected patients	N (%)	Infected patients
Dynamic hip screw	22 (22%)	2	28 (28%)	0
Total hip anthroplasty	4 (4%)	0	9 (9%)	0
Plating	31 (31%)	3	25 (25%)	3
Hemiarthroplasty	11 (11%)	0	9 (9%)	0
K Wring	9 (9%)	0	8 (8%)	0
Nailing	9 (9%)	0	8 (8%)	0
Spinal canal stenosis	3 (3%)	0	5 (5%)	0

Table/Fig. 4: classification of surgical site of infection.

Classification of infection	Group I	Group II	p- value
	N=100 (%)	N=100 (%)	
Superficial	4 (4%)	1 (1%)	0.18
Deep	1 (1%)	2 (2%)	0.27
Total	5 (5%)	3 (5%)	0.73

Table/Fig. 5: Isolated organism from surgical site infection.



Among 200 patients only 8 (4%) patients were developed surgical site infection. Among them staphylococcus aureus and Escherichia coli were more prevalent than klebsiella spp. And pseudomonas spp. Staphylococcus aureus, all were sensitive to vancomycin, clindamycin, cefoxitin, azithromycin, and were resistant to amikacin, amoxiclav, and co-trimoxazole. Escherichia coli were receptive to amoxiclav, cefixime, and cefoperazone + sulbactam but were unaffected to amikacin and co-trimoxazole. Pseudomonas was responsiveto aztreonam and imipenem but was impervious to amikacin, cefepime, and ceftazidime. Klebsiella was susceptible to cefixime, imipenem, amoxiclav but resistant to amikacin, ceftriaxone, and co-trimoxazole.

DISCUSSION

Prolonged hospital stay for patients which leads to increases cost of medical system along with this severe physical disabilities that reduce the quality of life have been consequences of Post-operative wound infections.[15] The greatest concern for both surgeons and patients is to reduce the SSI. Ranges of rate of SSI from 2.5% to 41.9% reported in various studies done worldwide and from hospital to hospital.[16] Prophylactic antibiotics are playing crucial role for the prevention of SSIs.[17-19] However, the preference of antibiotic and its duration of administration remains a matter of personal preference. With multi drug resistant pathogens in general, it is a matter of time to limit antibiotics use, especially their long term presence in perioperative prophylaxis of large spectrum against antibiotics.[17-19]

We found surgical site infection rate 4.0 which was similar to the other studies marimithu et al.[2], mathur et al.[11], kim et al.[20], Nimmi et al.[21] shown in table/fig 6.

Table/ Fig. 6: Comparison with other studies.

Authors	Sample size	Duration of antibiotic	Infection rate (%)
Our study	Group I-100 patients	24 h	5
	Group II-100patients	10-15 days	3
Marimuthu et al.[2]	Group A - 156 patients	72 h	4
	Group B - 170 patients	24 h	2
Mathur et al.[11]	Group 1-100 patients	24 h	2
	Group 2-97 patients	Till suture removal	2.1
Kim et al.[20]	Group A - 281 patients	72 h	0.4
	Group B - 221 patients	48 h	1.4
Nimmi et al.[21]	Group A - 223 patients	24 h	No infection
	Group B - 104 patients	72 h	No infection

Among 200 patients only 8 (4%) patients were developed surgical site infection. Among them staphylococcus aureus and Escherichia coli were more prevalent than klebsiella spp. And pseudomonas spp. similar observation was reported by other authors Owen et al.[22] and Mundhada and Tenpe[23] had also found Staphylococcus aureus as the major organism responsible for causing SSI. However, there was no statistical difference in the rates of SSI between two groups.

Statistically non significance difference were observed in this study first day antibiotic prophylaxis group which had surgical site infection comparable to the 10-15 days. In

similar study Mathur et al.[11] reported short course of perioperative antimicrobial prophylaxis was cost-effective as well as efficacious in preventing infections. In another study by Kim et al.,[20] the effectiveness of 48 hours antimicrobial treatment was compared with that of 72 hours dosage and it was recommended that antimicrobial prophylaxis for 48 hours was as effective as that for 72 hours. A fair approach in the management of antibiotics in prophylaxis patients should therefore be preferred to achieve a high level of plasma and tissue of antibiotics during and immediately after surgery when bacterial infection was maximum. This should be achieved on the appropriate route, timing and duration for prophylactic antibiotics.[24-25]

Perioperative prophylaxis poses extensive burden on hospital expenses in these countries. Toxicity, expense and inception of drug tolerance in the long course minimized by perioperative antimicrobial prophylaxis of short course.

Limitations: This study have less sample size but comprehensive data collection data collection to generalize the population to the source and it gives message that short course antimicrobial prophylaxis was as good as long term dosage and as effective.

CONCLUSION

Short course of perioperative antimicrobial prophylaxis for prevention of infections in elective orthopedic surgeries along with this it reduce the shorten hospitalization, post-operative morbidity, unnecessary usage of long term antibiotics which also decreases the chance of antibiotic resistance in elective orthopedic surgery. There is paucity of data in different region of the country, needs more study in the region of paucity short term prophylaxis in our country is to be substantiated.

Conflict of Interest: Nil

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