Original Article

Postoperative Wound Infection in Elective Orthopaedics Implant Surgical Cases at Public Sector Hospital

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ABSTRACT

Objective: To determine the rate of postoperative wound infection, in clean cases with the use of ilmplant and analyse the factors responsible for surgical site infection.

Study Design: Prospective / descriptive study

Place and Duration of Study: This study was conducted at the Department of Orthopedic Surgery, Peoples University of Medical & Health Sciences (PUMHS) Nawabshah from July 2015 to June 2017.

Materials and Methods: Five hundred twenty cases were operated during two years, 26 developed infection. Patients of close fractures of long bones, immune competent, non diabetic, infection free, with age more than 10 years of either sex in which implants were used, included in this study. The cases on steroid therapy and chemotherapy were excluded from this study.

Results: Out of 520 cases operated during two years, 26 developed inflection, infection rate was 5%. The most common organism isolated was staphylococcus aureus in 18(69.2%) cases. Infected cases above 60 years of age were 18(69.2%) in 3(11.5%) patients, cause was unstable and insecure fixation, 5(19.2%) cases were infected due to the prolong operative time (more than two hours), 5(19.2%) cases had pre-operative stay in the ward (longer than two weeks).

Conclusion: In our setup the postoperative wound infection in clean Orthopaedic implant cases is much higher than International standards. Therefore, it should be controlled by early diagnosis, management and by eliminating the common factors responsible for postoperative wound infection.

Key Words: Orthopaedics Implants, Close fractures, Postoperative wound infection

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INTRODUCTION

Whena clean surgical wound becomes red, tender, swollen and drain purulent material; patient has febrile course after 3rd or 5th postoperative day, with an elevated WBC count and presence of organisms (positive cultures) in the pus, is known as postoperative wound infection. It may occurs within days, or it may not obvious until months or even years[1]. The postoperative wound infection causes significant morbidity with compromised ultimate results. There are number of factors contributing to the development of postoperative wound infections[2,3]. Pathogens may be introduced indirectlyby hematogenous route or directly into the wound via theatre atmosphere, theatre personnel, surgical instruments, surgeon, or by patient himself [4-10].

The postoperative wound infection rate has significantly decreased with introduction of antibiotics, proper sterilization methods, atraumatic surgical techniques, and improved sutures materials [11]. But inpublic sector hospitals, the incidence of postoperative wound infection is still to be high[12,13].

The purpose of this study was to analyse the factors responsible for postoperative wound infection and to reduce the rate of infection to minimum level by controlling the factors, responsible for infection either directly or indirectly.

MATERIALS AND METHODS

We conducted this prospective descriptive study at the Department of Orthopedic Surgery of Peoples University of Medical & Health Science (PUMHS) Nawabshah from July 2015 to June 2017. Patients of close fractures of long bones, immunocompetent, non diabetic, infection free with age more than 10 years of either sex in which implants were used, included in this

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study. The cases on steroid therapy, chemotherapy, diabetes mellitus, skin disease, open fractures or patients with any gross infected foci were excluded from this study.

During two years period, 520 patients of close fractures were operated in which implants were used. A proforma was filled for all patients included in the study. All the patients were operated under general anesthesia. Prophylactic antibiotic (3rd generation cephalosporin was administered 15 to 20 minutes before incision) and continued till 72 hours postoperatively. The dose was 0.5gm to 1.5gms depending upon body weight and type of surgery. The standard autoclave protocol was used for sterilization of implants. On the 3rdpostoperative day the first dressing was changed and then at the time of discharge 5th to 7th postoperative day and patients called on 14th postoperative day for removal of stiches. All patients were advised to follow up in outpatients department every month for 1 to 2 years to check the signs and symptoms of late infection. The wound was examined for redness, swelling, or any discharge.

Patients, who developed postoperative fever persisting for 48 hours after surgery, were kept on close observation till their infections settled. Wound discharge cultures were taken or in case with significant collection, aspiration of fluid from collection done, alternate stitches were removed early and if needed, incision and drainage of collection was attempted. Thourough debridement was done in cases with collection and continuous irrigation suction drainage was setup postoperatively for three days.

Total number of cases operated in two years divided by the number of cases developed infection was the criteria to evaluate the rate of infection. All the information about the patients bio data, operation performed, and infection were recorded by a predesigned proforma.

Statistical Analysis:

The qualitative variables in this study were presented by their percentage frequencies and compared with chi-square test or proportion, 95% confidence interval were also completed of various proportions.

RESULTS

Five hundred twenty patients of close fractures underwent implant surgery during two years period, out of these, 494 (95%) patients were infection free, while 26 (5%) patients developed infection with 95% confidence interval of 2.8 – 8.1, Table No.1. Two hundred and ten patients operated were between 10 – 60 years of age, 8 (30.76%) cases developed infection, while 330 patients were above 60 years and in this group, 18 (69.24%) cases developed infection. There were no any significant difference in proportions of infection according to age group P – 0.24, Chi-square = 1.35. Staphylococcus aureus was the most common organism isolated from 18 (69.2%) cases with 95% confidence interval (41.3 – 88.9). The other pathogens included Pseudomonas, Klebsiella, Proteus, and E. coli isolated in 3 (11.5%) cases out of 26 infected cases with their 95% confidence interval (1.4 – 35.7%).

The methicillin resistant staphylococcus aurous (MRSA) was isolated in 1 (3.84%) case, 95% confidence interval (0.0 – 24.10). Out of 26 (19.2%) cases surgical exposure time was more than two hours, which may be one of the contributing factors. Five (19.2%) cases infected had more than 2 weeks stay in ward with their 95% confidence interval (4.4 – 45.2). Three (11.5%) cases had unstable fixation, with their 95% confidence interval (0.9 – 34.0), Table No. 2.

Five (19.23%) patients had superficial infection and were treated by antibiotics medication according to their c/s reports with their 95% confidence interval (4.4 – 45.3).

Table No. 1: Rate of Infection

Total No. of Cases	Total No. of Infected Cases	Percentage	95% confidence interval
520	26	5.0%	2.8 – 8.1

Table No. 2: Factors involved in postoperative infection

Management	Total No. of Infected Cases	Percentage	95% confidence interval
Staphylococcus aureus	18	69.2%	41.3 – 88.9
Overage above 60 years	18	69.2%	41.3 – 88.9
Prolonged surgery	5	19.2%	4.4 – 45.2
Prolong pre-operative stay	5	19.2%	4.4 – 45.2
Improper fixation	3	11.5%	0.9 – 34.0

Table No.3: Management of Infected cases

Factors	Total No. of Infected Cases	Percentage	95% confidence interval
Antibiotic therapy	5	19.2%	4.4 – 45.3
Continuously irrigation suction derange	11	42.30%	16.7 – 68.7
Through debridement of wound, removal of implant, followed by skeletal traction or external fixation	10	38.4%	15.9 – 65.2

Eleven (42.30%) patients with deep infection were treated by antibiotics therapy and continuous irrigation suction drainage till control on infection with 95% confidence (18.7 — 68.7). Ten (38.4%) infected patients were treated by removal of implants and thorough debridement followed by skeletal traction or external fixator was required for fixation with their 95% confidence interval (15.9 – 65.2), Table. No. 3.

DISCUSSION

The infection rate of 5% in clean Orthopaedic procedures was much higher than accepted standard of less than 1 -2% postoperative wound infection, although it is comparatively low as compared to another study conducted at Bahawal Victoria Hospital[14] in Bahawalpur showing 7.8% infection rate. Marston et al, in 1996, reported the infection rate of 0.25% deep, and 5% superficial in 413 total hip replacement in ideal setup[15].

Some studies conducted in Pakistan have shown an overall infection rate of 10% and 7.8% respectively[16]. The rate of postoperative wound infection has been reported to be high without prophylactic antibiotics as compared to be used with prophylactic antibiotics. It varies between 0.4% - 2.8% with prophylactic antibiotics, however one local study reported 6% infections rate[4]. Recent international studies have shown further decrease in surgical site infection rate varies between 0.23%-1.34%.[17]

One study published in 2001, conducted at Jinnah Postgraduate Medical Center, Karachi, reported (3.97%) infection rate with prophylactic antibiotics[18]. On broad cross-section studies reported incidence of infection varied from 0.2% to 10% after clean Orthopaedic operations[19]. In this study the infection rate was same as in some countries but much higher than developed countries. Advanced age and long operative time were associated with wound infection; according to Burnet et al, advanced age was important determinant of wound infection. There is some doubt in predictive value of the interval between injury and operation[20].

Another study conducted on age groups, in which patients those under 40 years of age developed 13.95% infection rate and in patients over 40 years of age developed 57.14% infection rate. This revealed increased incidence of surgical site infection with increasing age21. Staphylococcus aureus (usually coagulase positive) was the most common pathogen cultured from Orthopaedic surgical site infections, followed by Proteus vulgaris, E. coli, and Pseudomonas aeruginosa. Burke reported that more than 50% of Staphylococcus cultures were emerged from the patients. It has been suggested that the source of resistant Staphhylococcus aureus are wards, operation theater and perssonel around him. According to Lindwell study, the strains of Staphylococcus were present in the operation theatre environment during the procedure. Gram -ve bacteria like Pseudomonas aeruginosa is discovered in patients with longer hospital stay. Gram -ve pathogens causing surgical site infections outnumber Gram +ve pathogens. The surgical site infections caused by resistant microorganisms usually occurs in patients receiving prophylactic antibiotics [22].

Another predisposing factor for surgical site infection was prolong surgery. In this study, there were 5 (19.25%) infected patients out of 26 infected patients had operative procedure more than 2 hours, counted as prolonged surgical time. Longer the operative time the more probability of wound is to be infected. The procedure therefore should be performed as efficiently and safely as possible. The length of the operative procedure has been appeared to be proportional to the risk of postoperative wound infection. According to Foot Hills hospital study conducted at both 5 and 10 years, Foord and Cruse revealed surgical site infection rate doubled with every hour of the procedure. There were 1.3% wound infection rate in patients in which procedure lasting one hour or less, whereas infection rate of 4% in those patients where procedure lasting three hours or more[23]. Long preoperative stay in the hospital is another cause of surgical site infection, because of nosocomial infection and spread of pathogens from air, skin of patients, bed sheets, and beds. Five (19.2%) cases which were infected because of long preoperative stay on close fractures were reported in our study. It is commonly held that a long preoperative stay at ward is associated with wound infection, theoretically via colonisation of multiple resistant pathogens. Cruse and Foord reported to support this; there were 1.2% wound infection rate in patients hospitalised for 0 to 1 day, whereas 3.4% wound infection rate recorded in patients hospitalised for more than two weeks. Mead et al, also found a higher risk of surgical site infection in patients with long preoperative hospitalization[23].

The Orthopaedic implant is also an important predisposing factor to cause postoperative wound infection. Bacteria as well as human tissue cells both compete for the occupancy of the implant surface. Human tissue cells have an affinity to compete by integration and adaptation. Bacteria have an affinity to compete by adhesion and colonization. This competition is known as race of the surface[24]. The Orthopaedic implant is incorporated as in 'inert' biomaterial, if the human tissue cells win, otherwise resulting infection occurs, if bacteria win, therefore that infection persists until the metal is removed.

There are various factors such as quality of theatre, air contamination in theatre, sterilization, disposables, dresses, theatre personnel, and patient himself, responsible for postoperative wound infections[25].The skin flora or any infected foci of patient is the most

important source of wound infection. The transient bacteremia due to mucosal break at preoperative shaving, presence of microorganisms at incision site, and spread of microorganisms along the postoperative drain tube come up with the surgical site infections. The operation theatre personnel is also responsible to develop surgical site infection by either contact through torn theatre dresses, punctuated gloves or by air contamination by excessive talking and movements. Anaesthetists and circulating nurse are blamed to contribute in increasing theatre air contamination as they do not wear gowns, surgical suits, do lot of talking and move frequently 26,[27].

In this study all 26 cases of wound infection were managed by different methods. Five (19.1%) of patients managed by bed rest, daily dressing and proper antibiotics therapy according to pus culture and sensitivity reports. Eleven (42.3%) of patients were managed by proper parenteral antibiotics with continuous irrigation and suction drainage. Ten (38.4%) of patients were managed by extensive debridement followed by removal of metals. These patients were applied with external fixators or kept on skeletal traction till infection subsided. The type of infection, causative microorganism, culture and sensitivity reports, antibiotics characteristics, and host factors are involved in choosing the appropriate antibiotics[28].

Operation is not always necessary, but is required when an abscess is found, or when radiographic changes of chronic osteomyelitis are seen. If those are not present, a trial of antibiotics therapy according to culture and sensitivity results is appropriate. If patients doesn't respond to antibiotics within 36 to 48 hours, then an abscess is formed, therefore it should be drained accordingly. If they failed, excision of infected and necrotic material should be followed by intermittent antibiotic irrigation and suction drainage may control the infection, if possible the implant should be removed in order to achieve adequate debridement, the fracture should be held securely within external fixator or kept on skeletal traction. Prevention is the best solution and attachment to the basic principles of management of infection will lead to achievesuccess[29].

CONCLUSION

In our setup the postoperative wound infection rate in clean Orthopaedic implant cases is much higher than international standards. Therefore it should be controlled by early diagnosis, management, and by eliminating the common factors responsible for the development of postoperative wound infection given in this study.

Author's Contribution:

Concept & Design of Study:	Zahoor Illahi Soomro
Drafting:	Karam Ali Shah
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Revisiting Critically:	Zahoor Illahi Soomro
Final Approval of version:	Zahoor Illahi Soomro

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