FREQUENCY OF SURGICAL SITE INCISION INFECTIONS AND REMEDIAL MEASURES

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ABSTRACT

Objective: To find out the frequency of surgical site incision infections, study any variations, and propose ways to reduce this frequency.

Study Design: Cross sectional descriptive study.

Place and Duration of Study: Orthopedic department of Military Hospital, Rawalpindi, Six months, from September 2012 to February 2013.

Material and Methods: A non-probability convenient sampling was done. Data of patients who underwent orthopedic surgery was collected using standardized data collection form and was analyzed using SPSS 21 software. Each patient enrolled in the study was followed up for 30 days postoperatively and observed for development of infection.Orthopedic operations of 14 different varieties were included. Data was collected over six months and infections occurring during each month were measured and recorded as either superficial or deep. Following details were recorded; type of surgery, wound class, type and duration of operation, antimicrobial prophylaxis, preoperative hospital stay and total hospital stay. Surgical wound was first inspected at the time of the first dressing after completion of operation, thereafter at 7th, 15th and 30th day. Superficial or deep infection was diagnosed according to the criteria laid down by CDC.

Results: A total of 175 patients were studied, out of which 41.7% (73 patients) were males and 58.3% (102 patients) were females. The superficial surgical incision infections followed more or less uniform pattern with an average of 6.241% patients getting infected each month. Most of the superficial infections occurred after k wire procedures. Deep surgical incision infections occurred at an increased frequency during the months of November and December as compared to previous moths, with infection rate of 11.11% (5 out of 45 patients) and 12.9% (3 out of 31 patients) respectively. Reason for this was that general surgery procedures were being performed in the same operation theatres as orthopedic cases. The rate of infections fell around 4% after segregation of orthopedic OT.

Conclusions: Surgical site infections can occur at an increased rate in any good setup, if standard segregation of clean and contaminated cases is not adopted. Infections may be reduced by adopting standard operative/ sterilization procedures and educating the concerned staff as well as the patients about the precautions.

Keywords: Orthopedic surgery, Sterilization, Wound infections.

INTRODUCTION

A surgical site infection is one that occurs after surgery in the part of the body where the surgery took place. Surgical site infections may be divided into superficial infections involving the skin only or deep infections involving tissues under the skin, organs, or implanted material[1].

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Surgical site infections present as a significant risk associated with any surgical procedure taking place, representing significant burden on patient morbidity and mortality, as well as increased cost to health services[2]. Several risk factors influence the development of surgical site infections. The awareness of these risk factors will help to promote effective preventive strategies [2]. The amount of bacterial burden is the most important risk factor[3-5], though the use of prophylactic antibiotics coupled with modern surgical techniques hasled to reduction in this risk.

US National Research Council group devised a system of classification for operative wounds based on the degree of microbial contamination in 1964[3]. Four wound classes were described with an increasing risk of infection: clean, clean-contaminated, contaminated and dirty.

US National Nosocomial Infection Surveillance (NNIS) system hospitals have reported surgical infection rates to be 2.1% for clean cases, 3.3% for clean-contaminated cases, 6.4% for contaminated and 7.1% for dirty cases[6]. There is still significant difference in each group based on the type of surgery being performed[7].

According to CDC, infections occurring within 30 days of surgery (or within a year in the case of implants) should be classified as either superficial or deep surgical site infections (table-I).

MATERIAL AND METHODS

This was a cross sectional study conducted at orthopedic department of MH Rawalpindi, between September 2012 and February 2013.

Patients of all age groups presenting to OPD of orthopedic department and undergoing both simple and complicated operations were included in the study. Patients suffering from chronic osteomyelitis, tumors, diabetes mellitus, and ischemic heart diseases, malnourished and immune compromised patients, as well as contaminated and dirty wounds, already prone to develop infections were excluded from the

Table-1: Criteria for diagnosis of superficial and deep infections[8].

Superficial incisional surgical site infections	Deep incisional surgical site infections
• Occur within 30 days of procedure • Involve only the skin or subcutaneous tissue around the incision. • *Plus* **At least one of the following criteria:** • Purulent drainage from the incision • Organisms isolated from an aseptically obtained culture of fluid or tissue from the incision • At least one of the following signs or symptoms of infection - pain or tenderness, localised swelling, redness or heat - and the incision is deliberately opened by a surgeon, unless the culture is negative • Diagnosis of superficial incisional SSI by a surgeon or attending physician	• Occur within 30 days of procedure (or one year in the case of implants) • Are related to the procedure • Involve deep soft tissues, such as the fascia and muscles. • *Plus* **At least one of the following criteria:** • Purulent drainage from the incision but not from the organ/space of the surgical site • A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms - fever (>38°C), localised pain or tenderness - unless the culture is negative • An abscess or other evidence of infection involving the incision is found on direct examination or by histopathologic or radiological examination • Diagnosis of a deep incisional SSI by a surgeon or attending physician.

study.

After informed written consent for the study, all patients who met inclusion criteria were enrolled into the study through a non-probability convenient sampling. Data was collected using standardized data collection form.

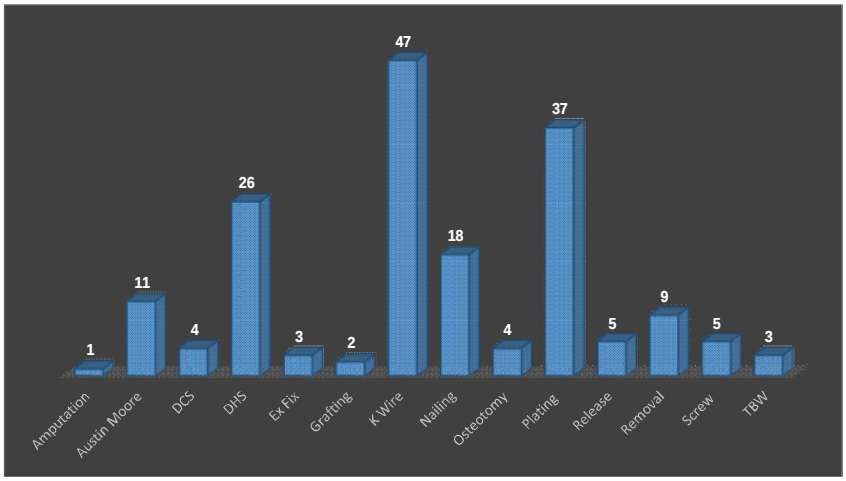
Each patient enrolled in the study was followed up from the time of admission until time of the discharge and 30 days postoperatively for development of infection. Standard antimicrobial prophylaxis with injection Cefuroxime 1.5 gramsI/V was given, half hour before beginning of operation. Following details were recorded; type of surgery, wound class, type and duration of operation, preoperative hospital stay and total hospital stay. Surgical wound was first inspected at the time of the first dressing and then at 7th, 15th and 30th day respectively. Superficial or deep surgical site infection was diagnosed if the diagnostic criteria was met (table-I).

The data collected was analyzed using SPSS 21 software. The frequencies of superficial and deep infections occurring during each month were found. The operation theatres were observed for underlying causes of development of infections.

RESULTS

A total of 175 patients were studied, out of which 73 (41.7%) were males and 102 (58.3%) were females, with male to female ratio of 1:1.4.

Operations of 14 different varieties were included and analyzed for surgical site infections. Maximum number of patients undergoing orthopedic procedures were of k-wire fixation (26.86%) due to the fact that many children present with supracondylar fractures, which are managed by the said procedure. K wire fixation was followed by



Frequency of different types of orthopedic procedures

Figure-1: The superficial surgical incision infections followed more or less uniform pattern with an average of 6.241% getting infected each month.

DHS (21.14%) and Austin Moore procedures (5.7%) (fig-1).

Mean operation time was 2.3 hours. Mean hospital stay of the patients was 3.4 days. A total of 157 clean and 18 clean contaminated wounds were studied. During the time span of six months, infections occurring during each month were measured and recorded as either superficial or deep separately (fig-2). The cases are still followed in the OPD for deep infections.

A total of 22 infected cases were found over six months, out of which 11 were superficial and 11 were deep.

Eleven cases with deep infection had to be readmitted for giving injectable antibiotics, according to culture sensitivity reports.

All superficial infections were K-wire procedure related, with infection rate of 23.40% with infection rate increasing from around 2% to 11.11% and 12.9% respectively (fig- 2). During this time general surgery and orthopedic operations were being performed on the same operation tables.

The operation theatres were separated at the beginning of January. Once the operation theatre for orthopedic operations was separated from general surgery operations, the rate fell back to 3.70% and 4% during January and February respectively.

DISCUSSION

In USA each year, approximately 500,000 surgical patients develop SSIs. The hospital costs associated with these infections are in excess of $7 billion[9]. Mean length of postoperative stay of these patients is significantly longer than for those without these infections. The situation is even bleak in Pakistan[10,11]. Surgical site infections are increase

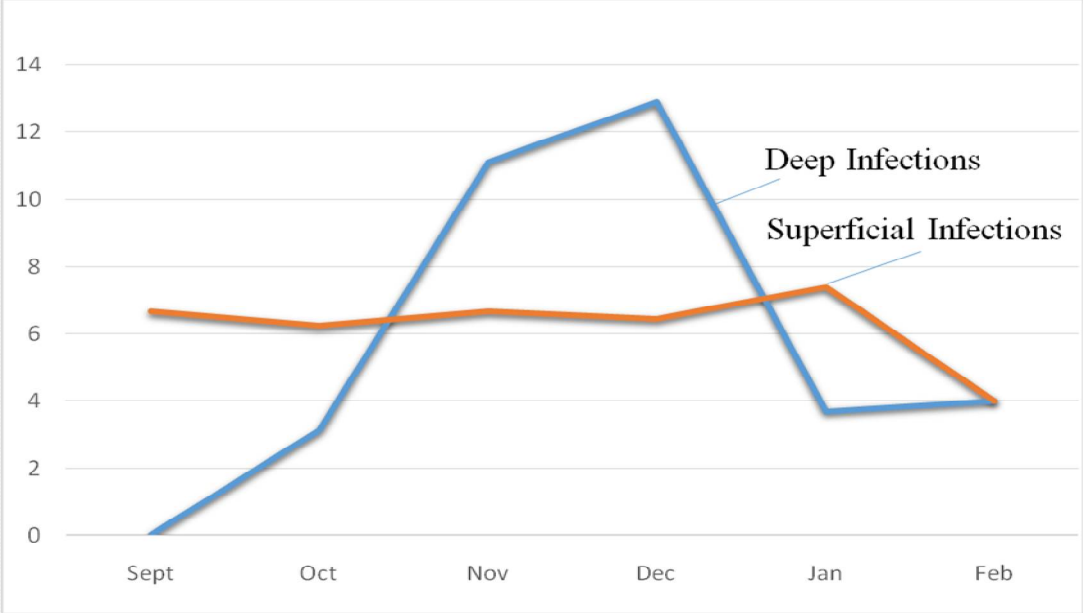


Figure-2: Monthly percentage of infected cases.

amongst k wire associated procedures, which was very much noteworthy.

Deep surgical incision infections showed a steep rise during November and December morbidity, hospital stay, and treatment costs, causing psychological trauma to patients and their care providers[12]. There is a need to identify the underlying causes for high infection rate in

our setup because it is always better to prevent infection rather than to treat it.

Apart from the patient's health status, proper preparation of the patient before the surgery and use of antibiotic prophylaxis is important for prevention of surgical site infections[13]. At Military Hospital, we have world class facilities to counter infections, including good sterilization techniques, laminar flow of air and carbolization methods. In spite of all this we are having infections at a rate more than the accepted percentage of around 5%.

Almost all superficial infectionsoccurring in our study were found to be k-wire related (23.404%). This may be due to the fact that in our setup, the wires are left outside the skin and not completely subcutaneous, increasing the chances of superficial surgical infections as percutaneous wires have a significantly greater infection rate than wires buried deep to the skin[14,15]. Moreover our people are not well educated and do not take care of the hygiene of the wound, which is very much required, already pointed out by Hsu and Schwartz[16]. However, this type of surgical infection occurs all over the world and resolves immediately once the k wires are removed.

Deep surgical site infections showed a marked rise in frequency during months of November and December. This raised concern, leading us to investigate and find out the underlying cause. Skin flora of patients and health care workers, air borne bacteria, utensils, clothes and all surfaces in contact with patient or doctor may serve as a source of infection[17,18]. After searching for the underlying cause, it was found out that general surgery procedures were being performed in the same operation theatre as the orthopedic cases.

Orthopedic procedures are generally considered to be clean, with relatively less chances of contamination, whereas general surgery procedures involved even rectal fistula operations. Both types of operations were being performed on the same operating table. These general surgery operations were serving as the source of spread of infection, which was being transferred to the clean orthopedic cases. According to Kramer and Assadian, infectious particles may remain and sediment during later procedures[19].

Effective duration of disinfectant, thorough wipe disinfection of all potentially contaminated surfaces, change of cleaning utensils along with clothes and shoes of all team members are required to be considered and thoroughly observed for prevention of spread of infection[19].

German Federal Commission of Hospital Hygiene and Infection Prevention, in 2000, proposed distinct units based on degree of microbial contamination. Benefits of separating clean and contaminated cases, if the costs allow and if a significant number of septic procedures are required to be performed, are well known [19,20].

Due to increased rates of deep surgical infections to 11.11% and 12.9% during November and December respectively, we recommended separating the operation theatres for general surgery and orthopedic cases to control the increased rates of infection. Once the operations theatres were separated, the infection rates fell down to around 3.704% and 4% during January and February respectively.

Conclusion

Surgical site infections can occur at an increased rate in any good setup, if standard segregation of clean cases from contaminated cases is not adopted.

Recommendations

Infections may be reduced by segregating the general surgery and orthopedic operations, adopting standard operative/ sterilization procedures and educating the staff as well as the patients.

CONFLICT OF INTEREST

The authors of this study reported no conflict of interest.

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