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WOUND INFECTION;
FREQUENCY IN CLEAN SURGICAL OPERATIONS

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ABSTRACT... **Objective:** The aim of the study was to evaluate the frequency of infection in clean surgical cases (General & Orthopaedic). **Study Design:** A descriptive study. **Place & Duration of Study:** This descriptive study was conducted at department of surgery & orthopaedic DHQ Teaching Hospital Sargodha from July 2007 to Dec, 2008. **Patients & Methods:** In this study 1500 clean surgical cases were included. Wounds were examined on third post operative day and then regularly after removal of stitches. Surgical wounds were examined finally on fifteenth post operative days. Description of wound condition and detailed data of patients were collected on preformed performas. Patients with wound infection developed pain at operation site and fever on third post operative day. Wounds were examined for swelling, redness, discharge; stitch abscess. Routine investigations were done as per protocol ie complete blood examination, complete urine examination, blood sugar, C-reactive proteins etc. Wounds swab was taken for microscopy and culture sensitivity. **Results:** This study was carried out on fifteen hundred clean surgical cases (General & Orthopaedic). There were 1064 males and 436 females. Male to Female ratio was 2.4: 1. Infection was detected in 110 patients (7.3%) while no infection was found in 1390. Infection was maximum in patients more than 60 yrs of age (10.9%). Wound infection was minimum in young patients (3.5%).commonest micro organism isolated from the infected wound was staphylococcus areus. Other organism isolated was streptococcus pyogenes, proteus and pseudomonas. No MRSA was detected. **Conclusion:** In our case study clean cases were found generally free of infection especially young patients. Whereas increased incidence of infection was noted in old patients. Wound infection is associated with significant morbidity in the form of delayed wound heeling, prolonged hospital stay and increased economical pressure on the patient.

Key words: Clean cases. Infection. Diabetes mellitus.

INTRODUCTION

Post Operative wound infection is a major concern for the surgeon as well as for the patient. Surgical infection may prove to be disastours. In 1896, Brewer reported Post – Surgical infection rate of 39%. Mekussik et al, reduced the post operative infection rate from 15 to 1.1% in the 2nd world war era. In the beginning of 19th century, basic aseptic measures and anti-biotics helped to minimize the rate of infection. Most commonly infective organism is staphylococcus aureus in clean cases[8]. Wound infection is classified as superficial, deep (early and delayed) and late. Superficial and early deep infection was part of our study.

Many methods are available for the control of contamination and growth reduction of Micro Organisms[1]. Different methods are Dry heat (Hot air Oven), Boiling, Pressurized Steam (autoclave), chemical and radiation (Gamma Rays). Hot air oven provides a good sterilization but its penetration is low. Autoclave creates pressurized steam which has a high penetration power[5,16]. Gluteraldehide is the most effective chemical agent for fine and delicate instruments used in Arthroscopy etc[13].

It is easier to prevent infection than to treat it[16]. Preoperative evaluation of the patient is a pre-requisite to

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rule out underlying risk factors. Many factors are involved in spread of infection in theater. Prophylactic antibiotics given at induction of anaesthesia can decrease the rate of infection[4,12]. Topical antibiotic used alone cannot prevent infection.

Diagnosis of post surgical infection is straight forward in typical cases. But in complicated cases it needs astute clinical judgment[19]. Diagnosis of post operative wound infection is based on constitutional symptoms, clinical examination and lab investigations such as TLC, DLC, ESR and CRP[17]. Imaging studies such as Ultrasonography and MRI scans help to localize deep seated infections. Usually the patients develop high grade fever on 3rd post operative day along with continuous pain over operation site. On clinical examination wound is reddish, warm, swollen. Sometimes wound discharge and stitch abscesses are visible. High frequency Ultrasonography is helpful for deep seated areas such as hip and shoulder joint[15]. Three phase technicium[99] scan, indum[11] and gallium[67] scans are also useful as supportive diagnostic tools in difficult cases[8]. Technicium[99] scans used alone is not diagnostic for infection as its response is present in clean patients for one to one and half year post operatively[14]. Biopsy is last resort for undiagnosed cases but is carried out rarely in operative cases[9].

MATERIAL AND METHODS

We carried out a study between July, 2007 to December, 2008. It included 1500 clean orthopaedic / General Surgery operations performed in the Government General Hospital without any modification in existing conditions. There were 850 orthopedic and 650 Gen-surgery cases.

INCLUSION CRITERIA

Patients of both sexes between 10 to 60 years were included in the study. All patients with closed fractures and clean Gen-surgical cases (where no viscus opened) were also included.

EXCLUSION CRITERIA

Patients under the age of 10 and above 60 were excluded from this study. Other exclusion criteria were patients with Diabetes mellitus, Uremia, Jaundice, Rheumatoid arthritis, Immune compromised patients for example AIDS, patients with malignancy, patients with chronic illness/bed ridden patients, catheterized patients with infected urine, patient on steroid, patients on cytotoxic drugs and radiotherapy, patients with visceral perforation, patients with open fractures and clean contaminated cases (where viscus was opened for example stomach/bileduct).

All the patients admitted in the unit during this period were included without any discrimination. All the patients were operated on elective basis in the theaters reserved for morning list. Clean cases were defined as those having intact skin without break over the operation site. All the patients having skin break or scratches over the involved site were excluded. These patients were examined pre-operatively. If some remote area infection was suspected, the operations were delayed for few days. Prophylactics antibiotics first generation Cephalosporin for example Velosef one gram was given at induction and then one gram three times a day for next 72 hours. The distribution of cases regarding sex is given in Table I. Distribution of cases according to age is given in table II.

Wounds were examined on third post operative day and then regularly after removal of stitches till 15th day. Detailed data of patients and description of wound condition was collected on preformed performas. Patients with wound infections develop fever and pain at operation site on 3rd to 4th post operative day. Superficial wound infection was clinically detected on examination of wound which showed redness, swelling, warmth and tenderness. Stitch abscess and wound discharge was noted in some cases. All patients had raised TLC and CRP. Deep infection was detected by high resolution Ultrasound scan. None of the patients required MRI, Radioactive scan or Tissue Biopsy.

Management of infected cases was planned according to degree of infection. Superficial infection was treated by removal of stitches, daily wound dressing and IV antibiotic. Deep infection was treated by thorough wound debridment under general anesthesia and IV antibiotic for

seven days and delayed wound closure. All the patients were cured.

RESULTS

We carried out the study of frequency of post operative wound infection in clean surgical operation on 1500 cases. There were 1064 Males and 436 Females. Male to Female ratio was 2.4 to 1. Most patients were between 10 to 60 years of age. All the patients were followed for 2 weeks. Evaluation of the patients and the wound was the regularly done till 15th day. A Performa was attached to the record of each patient. All the patients were assessed regarding pain at the operation site Fever, wound discharge etc. The status of wound was recorded as present and absence of infection.

The infection is usually apparent by that time. Late infections are uncommon. The patients having discharge at operation site or soakage of dressing were considered as infected. All the other patients whose wounds were healing normally were considered clean. There were no infections in 1390 (92.7%) cases. The infection was detected in 110 (7.3%) of the patient. Commonest micro organism isolated on culture and sensitivity was Staphylococus aureus. Other microrganisms isolated were streptococcus Pyogenes, Proteus, Klaebsiella, E.Coli, Psuedomonas and Bacteroides (anaerobes). MRSA was not detected in any patient. Organisms Cultured are shown in the Table III.

Table-I. The distribution of cases according to sex

Sex	Cases
Male	1064
Female	436

Table-II. The distribution of cases according to age

Age	Cases
10-20yrs	700
21-40yrs	470
41-60yrs	266
50-60yrs	64

Table-III. Organisms Cultured (n=110)

Infective agent	No. of patients	%age
Staphylococus aureus	80	72.7%
Psudomonas	07	6.3%
Proteus vulgaris	08	7.2%
Others	15	13.6%

The rate of infection was more in old age group as compared to young patients as shown in table IV. Infection was also seen more common in males then females as shown in table V. Infection rate is more in Males since they are prone to high energy trauma. In this study over all post operative infection rates in clean surgical cases was 7.3%, 5.3 superficial and 2% deep.

Table-IV. Influence of age on rate of infection

Age in yrs	Total cases	Infected cases	Rate of (%) infection
0-20	700	51	3.5
21-40	470	32	6.5
41-60	266	20	7.5
>61	64	09	10.9

Table-V. Influence of sex on rate of infection			
Sex	**Total cases**	**Infected cases**	**Rate of (%) infection**
Male	1064	85	8
Female	436	25	5.7

Table-VI. The comparison of infection rate in clean cases		
Study	**Rate of (%) infection**	**year**
Court Brown[13]	1.8%	1992
Duncan and Masri[14]	1%	1994
Desmet[15]	2.5%	1995
Engesactyer[11]	0.3%	1995
Marston[12]	0.25%	1996
Zafar Iqbal	Deep 0.8%, Superficial 5%	1996
Present Study	Deep 2%, Superficial 5.3%	2007

DISCUSSION

Review of international literature shows different frequency of wound infection in clean cases. A study conducted by court-Brown[3] and his colleagues in 1992 shows wound infection in clean cases of less then 1.8% as shown in table VI. Another study conducted by Marsten[11] in 1996 shows wound infection of .25% after total hip replacement shown in table VI . Another study conducted by Zafar Iqbal and Colleagues[17] shows superficial wound infection 5% and deep infection 2.8%. They reviewed 1000 clean orthopaedic surgical cases in 1996. Our study was conducted on 1500 clean orthopedic and surgical cases in year 2007 – 2008. The results were comparable with other national and international studies as shown in table VI. The infection rate is still on higher side. Our study shows overall infection rate 7.3%. 5.3% was superficial infection and 2% was deep infection which is much higher when compared with international literature. This infection rate is still optimum in the existing conditions. The rate of infection is higher in older patients as compared with younger age group.

Experience of Surgeon also influences the rate of infection. Soft tissue handling is more delicate with experience while duration of surgery shortens. Both these factors help to decrease the rate of infection. The rate of infection was 6.6 % in patients operated by consultants while rate of infection was 9.45 % in the group operated by novice house surgeons. Females have lower rate of infection (5.7%) as compared with Males infection (8%). The Males are afflicted by high energy trauma more frequently then Females.

Post operative wound infections can be minimized by taking appropriate pre-operative, operative and post operative measures[18]. Pre-operatively length of the hospital stay should be kept minimum. Pre-operative shaving should be avoided. Patients should be properly evaluated to rule out any infective focus. Diabetes mellitus should be under controle. Nutritional status should be evaluated[20]. Haemoglobin level should be at least 10 gram/dl. Prophylactic antibiotics should be given to the patient at induction[12,18]. Operation Theater should be specially designed with laminar air flow system installed in the theater[7] and provision of utraclean filtered air. High standard of sterilization should be maintained through CSSD (central sterilization supply department). Antiseptic skin preparation should be standardized[5]. Attention should be paid to the theatre technique and discipline[18]. There should be minimum traffic in the theatre. Staff members with infective focus should be excluded from the theatre. Staff should always wash their hand between the operations[8]. There should be gentle tissue handling. Operation time should be kept to minimum[17]. Meticulous haemostasis and suction drainage of the wounds is mandatory for decreasing the rate of infection. There should be separate operation theatre for clean and infected cases. Post operatively there should be standardized aseptic dressing technique[2]. Hands should be washed between the dressings. There should be separate dressing rooms and dressing should be done by non touch technique. Urinary catheterization should be done by aseptic technique with closed system of drainage. Silastic catheter should be used instead of rubber catheter. Contaminated articles

should be properly disposed off. There should be regular cleaning and disinfection of the ward. Each unit should have antibiotic policy because indiscriminate use is one of the cause of cross infection and development of resistant of flora. Perioperative hypothermia should be avoided and supplemental oxygenation in recovery room should be ensured

CONCLUSION

This study determined the rate of infection in a Government General Hospital in the existing conditions. The rate of infection is higher than the Worldwide acceptable level. There are many areas which need improvement. Thorough pre-operative evaluation, proper control of blood sugar, prophylactic antibiotics, good sterilization, meticulous surgical techniques, and proper post operative dressing by non touch technique can dramatically lower the rate of infection. These improvements will help to decrease the economical pressure on patients and will lower the load of patients on the hospitals, and will reduce the hospital stay and hence wound infection related patient morbidity.

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