SURGICAL WOUND INFECTION IN A TERTIARY CARE TEACHING RURAL HOSPITAL

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ABSTRACT

BACKGROUND

Surgical wound infections are one of the important and most common infections seen in surgery department. They require immediate management. They increase the economic and social burden of hospitals, clinicians and society. So, in this context, we evaluated the various aspects of surgical wound infection during surgical care in our institution, F. H. Medical College & Hospital, Agra, UP. This is a rural based college and hospital involved in teaching medical, nursing and para medical students. Rapid diagnosis and management are pivotal for the survival of patients and their effect reflects on hospital morbidity and mortality. Their accurate diagnosis and treatment are essential and are challenging to every surgeon.

MATERIALS & METHODS

This clinical and observational study was conducted in the department of general surgery F.H. Medical College and Hospital, Agra, U.P. A total of 1494 patients were admitted for surgical procedures from August 2018 to October 2018. All the operated cases during the said period (major, minor, elective, emergency, conventional procedures) were included in this study. Sample swabs were collected from the first dressing and up to 3 weeks post operatively for aerobic and anaerobic micro biomes culture. Microbiological sensitivity to antibiotics was performed randomly.

RESULTS

Infection rate was 11.44%. The Incidence of surgical wound infection was higher with increasing age. The wound infection in emergency surgery was 32% as compared to routine elective surgery. The higher incidence 13.88% to 15.62% was detected in longer hospital stay of more than 10 days in pre- and post-operative period. Dirty wounds had the highest incidence of wound infection 54%. Higher periods of keeping drains had higher incidence of wound infection 50%. *Escherichia coli* was isolated in 32% and *Pseudomonas aeruginosa* was isolated in 28%.

CONCLUSION

Surgical wound infection incidence is related to various factors like age, sex, duration in hospital stay, and causative factors. Increasing age had higher incidence of infection. Environmental factors, internal and external causes, had impact on infection. Duration of hospital stay, surgical procedure done, duration of surgery are all related to the incidence of infection. Multiple organisms are isolated in long duration of hospital stay which leads to more infection and short duration in all respects had less infection in surgical wound. Determination of risk also helps the surgeon towards possible outcome. Incidence of surgical wound infection is low in our study. Rational antiseptic, sterilization, antibiotic policy and more infection control measures were found to be necessary. We have taken care in hand washing, proper use of personal protective equipment and segregation instruments and articles as necessary.

KEY WORDS

Disease Control, Prevention Criteria, Hospital Stay, Surgical Procedure & Period, Surgical Drain, Surgical Wound Infection.

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BACKGROUND

This is a descriptive study of surgical wound infections. These are infections that occur within 30 days of surgery and within 1 yr. in case of prosthesis. Post-operative infection and sepsis are the common complications.

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The infection rate is 15% in clean extra abdominal surgery and 20% in intra-abdominal procedures^[1] surgical infection leads to nosocomial infection which accounts for 15%. Surgical infection is classified into superficial, incision, skin and subcutaneous tissue, deep incision fasciae, muscles, space, cavity and organ related infection^[2] The U.S. National research council group in 1964 classified it in to four groups on degree of microbial contamination of operative wound,^[3] The types of wound may be clean, clean contaminated, contaminated and dirty. With prophylactic administration of antimicrobial agent, the infection rate in contaminated group has reduced drastically. In U.S. the infection rate in hospital to be clean is 2.1%, clean contaminated 3.3%, contaminated 6.4%, dirty 7.1%, as reported by U.S. National nosocomial infection surveillance system. However Indian rate of infection is raging from 4.2%-30%^[4] This variability is with differences in

hospital environment. The surgical wound infection constitutes a threat and challenge to surgical patient. The hospital policy and performances are the main factors. The sources of infection are surgical wards, by infected urine, faeces, sputum and other body fluid, patient's attendant, materials, operating room, O.T. Articles, surgical team and technique.

The organisms are staphylococcus aureus. Escherichia coli and clostridia. The infection may be prevented and controlled in pre-operative intra-operative and post-operative period. The infection may develop in to sepsis. It requires a combination of therapeutic approaches. The management is better today than it was many years ago. It is a multi-factorial syndrome that has been ranked as 10th leading cause of death in U.S.^[5]. The data is from the 1995 U.S. census^[6]. The infection is characterized by inflammation and coagulation^[7]. The radiological approach, imaging guided management, have contributed to the decreasing morbidity and mortality rate of many surgical infections. Therefore in order to identify the origin of an infection, close co-operation among the radiologist, the clinician and the surgeon is fundamental^[8]. There are financial involvements in the care of simple and serious surgical wound infections. The direct costs are on drugs, materials, morbidity and mortality^[9]. Indirect costs are- loss of productivity, functional capacity, increased litigation and decreased patient's satisfaction. The presence of exogenous factors like surgeon, operating room and environment; the endogenous factors like- patient's microbes, prophylaxis by use of mechanical, chemical and antimicrobial modalities in combinations affect the outcome. Recent national surveys have documented sub optimal prophylactic antibiotic use in 40 to 50% of operative procedures imposed significantly with relative reduction in infection.^[10] The risk factor should be kept in mind for faster identification of patient at risk for severe infection and they need rapid pathogen identification as well as early initiation of accurate empirical antimicrobial therapy which is of pivotal importance for the survival of patient.^[11] This study was under taken to study the problems of surgical wound infection which remains unexplored due to lack of resources and environment factors in a hospital. Hence this study is in the interest of larger population towards patient care through health, medical and hospital services. This study was taken up in F.H. Medical College and Hospital, Agra (U. P.), India, situated in rural region and is surrounded by rail route and road route which results in polluted area.

Aims and Objectives

1. To determine the incidence of surgical wound infection, pattern of infection, factors influencing surgical infection.
2. Evaluation of pathogens and patterns of infection.

Sepsis is a condition that kills rapidly which requires a combination of therapeutic approaches, because no single therapy is available. The management of surgical wound infection in hospitals is significantly better today than it was 30 years ago. However, infection associated mortality rates still remain unacceptably high. We must work together to embrace new strategies in order to improve patient's outcome still further. The recent improvement in outcomes has been characterized by the successive introduction of multiple

interventions and therapies and ongoing process. We believe that the current wave of clinical trial data relating to a number of new interventions should be viewed in the context of his trend towards effective and improved management of the condition and desired out-come.

Limitations

Limitations must be disclosed in this observational cohort study. Due to the monocentric design of the study. These results cannot be generalized without restrictions since the blood culture request was used as the primary selection criterion for screening of potential study. Antimicrobial treatment prior to the taking of blood cultures was less frequently found in bacteraemic, fungaemic infection of patients since starting antimicrobial treatment before having taken patient's samples for microbiological diagnostics is well-known yet unsolved and apparently unavoidable in clinical practice. It was not assessed as a major limitation. In addition, the blood culture flasks used contains resin particles, which decreased the concentration of completely absorbed antimicrobial substances present in patients' blood.

Several important studies have been completed in recent years that have identified successful evidence based on therapeutic and disease management strategies for critically ill patients, including surgical wound infection. This research has expanded our understanding about infection, Rapid diagnosis of infection in patients, and more successful treatment of underlying infections are required. Most importantly, for the first time, therapies have been developed that have shown consistent, positive effects on morbidity and mortality.

Currently available strategies for the management of surgical wound infection includes timely identification, diagnosis, rapid identification of causative organisms; appropriate and timely antimicrobial therapy, targeted pharmacological therapies, appropriate nutrition, effective supportive therapies, prophylaxis against stress and patient management by highly qualified clinicians and nursing staff. These strategies have helped to reduce the incidence of surgical wound infections, support to failing organs and prevent complications. Combination therapy-based approach is the key to diminishing surgical wound infection.

MATERIALS AND METHODS

The present study was conducted in the department of general surgery F.H. Medical College and Hospital, Agra U.P. India from August 2018 to October 2018. Consent and patients' details were taken. History was taken. Clinical, local and systemic examination was done. Relevant investigations were done in relation to pre-, per- and post-operative period. Type of surgery, operating time, presence of drains and duration of hospital stay were recorded. Infection rates, incidences and categories were recorded. Samples were aseptically collected at the time of first dressing 7 to 10 days and 2 to 3 weeks from the wounds having serous or purulent discharge. All the samples were processed. Smear prepared and Gram staining was done. The other swab was used for culture in blood agar and MacConkey's agar. The organisms were identified. Antibiotic sensitivity of the isolates were performed. The sensitivity patterns were observed, analysed and recorded. Patients were followed for period of 3 weeks after surgery. Observations and results were recorded in various tables.

RESULTS

In this study, 1494 cases were included. Emergency surgery was done in 250 patients and elective surgery in 1244 patients during the study period. The cumulative infection rate is 11.44% in 171 patients out of 1494 patients. The infection in emergency cases are 80- 32% and elective cases 91- 7.3%.

20- 30 Yrs.	282	18.87%
31- 40 Yrs.	398	26.63%
41- 50 Yrs.	354	23.69%
51- 60 Yrs.	320	21.41%
61- 70 Yrs.	140	9.37%

Table 1. Age Distribution In 1494 Patients

Incidence in 31-40 Yrs. age group was 26.63% in 398 patients.

Male	1120.5	75%
Female	373.5	25%

Table 2. Sex Distribution In 1494 Patients

75% were male.

Length of Stay (Days)	No. of Pt.	Infection	Percentage
3	720	30	4.16%
3- 10	630	35	7.31%
10	144	20	13.88%

Table 3. Pre-Operative Hospital Stay In 1494 Patients

Pre-operative hospital stay 3 to 10 Days.

Length- Days	No	Infection	Percentage
1- 2	490	20	4.08%
3- 5	410	30	7.31%
6- 10	370	40	10.81%
More 10	224	35	15.62%

Table 4. Post-Operative Hospital Stay In 1494 Patients

Infection were in 6 to 10 days hospital stay 15.62%

Patient	No. of Cases	Percentage
Emergency	250	16.73%
Elective	1244	83.26%

Table 5. Operative- Procedures In 1494 Patients

Organ Operated	No. of Cases	Infection	Percentage
Appendectomy	100	5	5%
Intestinal Obstruction	40	20	50%
Intestinal Perforation	20	10	50%
Strangulated Hernia	30	5	16.66%
Abscess- Drainage	20	5	25%
Breast Abscess	10	5	50%
Scrotal Abscess	30	20	66.66%

Table 6. Infection In Emergency Surgical Procedure

Infections more in scrotal abscess 66.66%.
In 250 patients- infection - 80 cases 32%.

Organs	No. of Cases	No. of Infection	%
Open Cholecystectomy	468	10	2.13%
Open Interval Appendectomy	188	6	3.19%
Mesh Hernioplasty	228	4	1.75%
Open Cystolithotomy	20	5	25%

Excision of Cyst	40	4	10%
Excision of Lipoma Swelling	35	5	14.28%
Excision of Peri Anal Sinus	30	5	16.66%
Haemorrhoidectomy	70	10	14.28%
Fistulectomy	30	6	20%
Excision of Fibro Adenoma	20	5	25%
Hydrocoele	50	10	20%
Nephrolithotomy	5	1	20%
Prostatectomy	30	5	16.66%
Miscellaneous-Surgery	30	15	50%

Table 7. Infection in Elective Surgical Procedure

50% in 30 cases of Miscellaneous surgery
1244 in 1494 patients- Infection- 91- 7.31 %

Surgery Types	No. Cases	Infection	%
Emergency	250	80	32%
Elective	1244	91	7.31%

Table 8. Infection in 1494 Cases- 171- 11.44%

Cumulative infection is 11.44%

Hours	Cases	No- Infection	Percentage
1	402	30	7.4%
1- 2	508	80	15.74%
2 & More	584	120	20.54%

Table 9. Duration of Surgery In 1494 Patients- 230- 15.39%

More in 2 hours duration of surgery.

Days	No. of Patients	No Infection	Percentage
1- 3	94	10	10.63%
4- 7	130	25	19.23%
7 & More	40	20	50%

Table 10. Duration of Drainage In 1494- 264- 20.83%

Infection- more in 7 days drainage tube.

Bacteria Isolated	No Cases	Resistant	Sensitive
Staphylococcus aureus	20 16%	Ciprofloxacin Amikacin	Ceftriaxone & Sulbactam
Enterococcus faecalis	30 24%	Ciprofloxacin Amikacin	Ceftriaxone & Sulbactam
Escherichia coli	40 32%	Ciprofloxacin Amikacin	Ceftriaxone & Sulbactam
Pseudomonas aeruginosa	35 28%	Ciprofloxacin Amikacin	Ceftriaxone & Sulbactam

Table 11. Antibiotic Sensitivity Pattern Analysis In 125 Cases Randomly

All were sensitive to ceftriaxone & sulbactam.

DISCUSSION

Emergency surgery was performed in 250 cases and elective surgery was done in 1444 patients. The cumulative infection rate was 171 (11.44 %) in the present study with the age distribution between 20 yrs. to 70 yrs. 398 patients were of 31-40 years age group which was the largest (26.63%). Sex distribution was 75% male & 25% female in this study. Table - 2 shows the duration of pre and post-operative hospital stay and shows that infection was more in long hospital stay in emergency & elective procedures. Tables 3 & 4 depict that infection may be due to the increased chances of hospital acquired infection as there was a significantly increased incidence with longer duration of surgery. Table 10 shows that patients with post-operative drains develop more infection than among that drains were not placed; the reason may be that the drain itself acting as a causative factor of infection.

Randomly culture and sensitivity of swabs was performed, and the isolates were resistant ciprofloxacin amikacin. All the cases responded properly to ceftriaxone and sulbactam. The prevalence rate of infection in India was high 4 to 30%^[12] The Indian hospitals report much higher incidence than U.S. & European countries (0.5 – 15%) which may be due to lack of proper resources & hospital policy and infection control measures. The infection rate in the present study was lower than other hospital-based studies of this country. This is due to better setup & better control practices. The higher rate in emergency surgery was due to emergent preoperative preparation. Longer post-operative stay was five times more likely to develop infection Kamet et al^[13] duration of operation has increased risk of infection Maheshetal^[14] the most common isolated organism in infection was S. Aureus & Enterococcus and was sensitive to drugs, T - 11.

Several important studies have been completed in recent years that have identified successful evidence based on therapeutic and disease management strategies for critically ill patients, including those with infection. This research has expanded our understanding of the biochemistry of infection, improved definitions of infection, and enabled more rapid identification of infection of patients and more successful treatment of underlying infections. Most importantly, for the first time, therapies have been developed that have shown consistent, positive effects on morbidity and mortality.

Currently available strategies for the management of patients with infection include: timely patient identification and diagnosis; rapid identification of causative organisms; appropriate, timely antimicrobial therapy; improved ventilator techniques (Low Pressure Ventilation); appropriate goal directed haemodynamic support; targeted pharmacological therapies, glucocorticoid therapy; glycaemic control (Intensive Insulin Therapy); appropriate nutrition; effective supportive therapies prophylaxis against stress ulcers, administration of anticoagulants, dialysis; and patient management by highly qualified clinicians and nursing staff. These strategies have helped to reduce the incidence of surgical wound infections, support failing organs and prevent complications in morbidity and mortality are achievable, and that an incremental-combination-therapy-based approach is the key to diminishing infection-associated morbidity and mortality.

CONCLUSION

Surgical wound infection has always been a major problematic factor in surgery & trauma. In this study the various tables reflect the process & outcomes in spite of all measures of

control. Evidence based antibiotic medication policy is needed in medical practice. This requires better asepsis, antiseptic, sterilization action, antibiotics to lower the rate infection, morbidity, mortality, maintain the reputation of the institution & hospital as well as clinician and surgeon.

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