www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v7i1.34

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Original Article

Study of Various Bacteriological Agents & their Antibiotic Sensitivity Pattern in Surgical Site Infections (SSI)- A Prospective Study

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Abstract
Background & Aim: *Surgical site infections cause a significant problem to the surgeons & contribute significantly to the post. op. Morbidity. A lot of organisms starting from staph. aureus, epidermidis, E.coli, klebsiella, pseudomonas, proteus, enterococci are responsible depending on various types of surgical site infections (clean/clean contaminated/contaminated/dirty). Our aim was to study the bacteriological pattern and formulation of a protocol for use of antibiotic according to the sensitivity of organisms in various surgical site infections.*
Methods: *This prospective study was based on study of various bacteriological agents & their antibiotic sensitivity pattern in 214 patients who were admitted to our surgical unit at S.C.B medical college Cuttack during the period of June 2016 to June 2018 considering the inclusive & exclusive criteria .Among them 29 patients developed surgical site infection (SSI).Post op wound inspection was started on 3rd day, followed by every alternate day. Any secretion or pus if found was sent to dept.of microbiology for culture & sensitivity. Organisms isolated were recorded along with their sensitivity.*
Results: *In our study of 214 patients among which 29 developed surgical site infection, Staph. aureous, & epidermidis account for most of the wound infection in clean wound, E.coli, enterococci, klebsiella, pseudomonas were responsible in clean contaminated , contaminated & dirty wounds in various proportions*
Most of the organisms were sensitive to combination of piperacillin & Tazobactam and Amino glycosides with MRSA (methicillin resistant staph. aureous) were sensitive to linezolide, teicoplanin.
Conclusion: *Surgical site infection is a very common nosocomial infection contributing to post operative morbidity. So proper detection of causative agent & their treatment by following their sensitivity pattern decreases the post operative complication as well as reduces the incidence of antibiotic resistance.*
Keywords: *Surgical site infection, bacteriological agents, sensitivity pattern.*

Introduction

Although treatment of infection has been an integral part of surgeons practice since the dawn of time the body of knowledge that led to the present field of surgical infectious disease was derived from evolution of germ theory(Louis

pasteur) & antisepsis.[1] Application of the later to clinical practice particularly after introduction of anesthesia by Morton was pivotal in allowing surgeons to expand their repertoire to encompass the complex procedures that were previously associated with extremely high rate of mortality & morbidity due to post op infections. During later part of nineteenth century Louis pasture discovered Germ theory & developed techniques of sterilisation. Joseph Lister after observing that 50 %of his patients undergoing amputation died because of infection, he started using carbolic acid solution. Hippocratis used wine &vinegar to irrigate wounds. [2]The concept of magic bullet that could kill microbes but not the host became reality after discovery of sulfonamide. Penicillin was discovered by Alexander Fleming in 1941. [3]After that A new adjunct method came to treat & prevent infection. The present generation of surgeons have seen increasing no of serious infections related to complex operations, prolonged operative time, increasing number of geriatric patients, increase use of implant, organ transplantation requiring immunosuppressive agents. simultaneously the resistance of the organisms also increasing .so to deal with the changing nature of the organisms ,modern surgeons must be well aware of the organisms that may initiate surgical site infection & their remedies.[4] Surgical site infection are defined as infection less than 30 days after surgery or 1 year of implant involves skin, subcutaneous tissue (superficial incision type), fascia & muscle(deep incision),or deep organ space infection plus one of the followings that is 1.purullent material from the wound or through the drain. 2. diagnosis by a surgeon . 3. signs of inflammations that is pain, tenderness or culture of organism from the wound.[5]

Methods

This prospective study was conducted in the department of General surgery, S.C.B medical college, cuttack, odisha during the period of 2016 June to 2018 June taking 214 patients undergoing some form of surgery among whom SSI was found in 29 patients using following inclusion &exclusion criteria.

Inclusion Criteria: All elective & emergency cases undergoing operative procedures.

Exclusion Criteria: All infective wounds needing Incision & drainage & all patients presenting in very low moribund conditions.

Surgical procedures were performed with all available aseptic conditions. Wound inspection was routinely done on 3rd day and alternate day thereafter. If any discharge or pus was found it was sent to laboratory for culture & sensitivity.SSI was clinically diagnosed if there was any serous, non purulent or purulent discharge, signs of infection like edema, redness ,local rise of temperature is there. Data obtained from study were arranged according to organisms isolated and their sensitivity reports. Before that the wounds were classified as clean, clean contaminated, contaminated and dirty.

Results

In our study out of 214 patients that had undergone surgery, 50% (107) were clean surgeries, 25% (54) were clean contaminated, 15% (32) were contaminated, 10% were dirty. surgery didn't include necrotizing infections, abscess, infective lesions requiring I&D and patients admitted in very low conditions. Among 214 patients chosen for study 29 (13.5%) patients developed SSI which was comparable to other reports (2.5 to 40%)[8,9].among those 14 cases (48%) were dirty surgery,9 cases(31%) were contaminated, 5 cases(17.%) were clean contaminated, 1 case (3.4%) was clean case. The biological pattern in our study were staph .aureous, Epidermidis, 50%, pseudomonas 24%, E.coli 14%,enterococci 12% in clean wounds (class 1).I n clean contaminated (class 2) organisms isolated were E.coli(35%), Enterococci (32%), klebsiella (18%). staph. aurious(15%).In class 3 (contaminated wound) were E.coli (38%). Enterococci (34%), klebsiella (23%), bacteroides (5%), staph aureus (5%). In class 4(dirty wound)

organisms isolated were E.coli(33%), klebsiela (25%), enterococci(22%), staph aureus (11%), proteus mirabilis(9%).(fig1-4)(table-1)

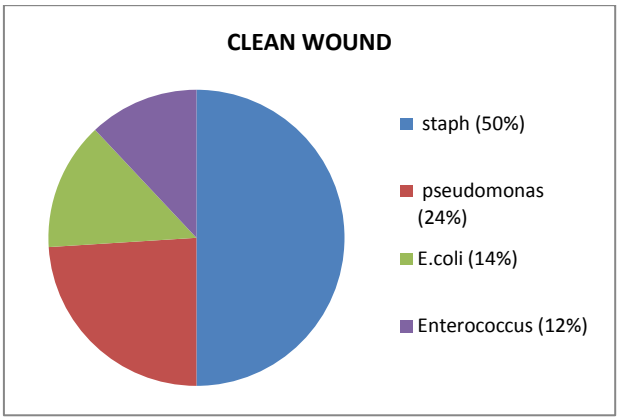

Fig-1

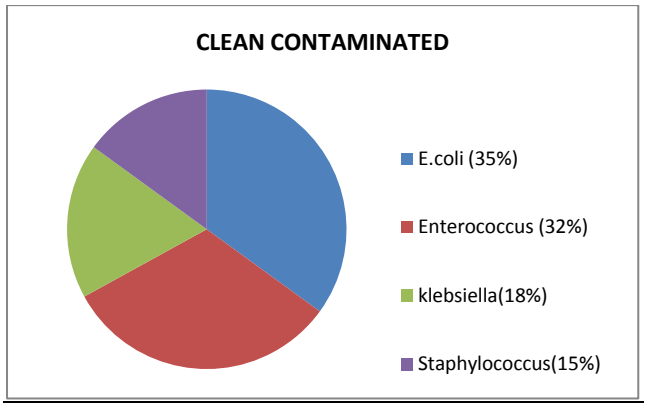

Fig-2

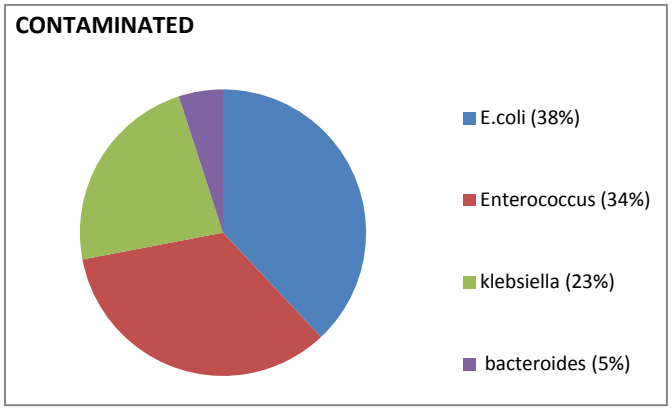

Fig-3

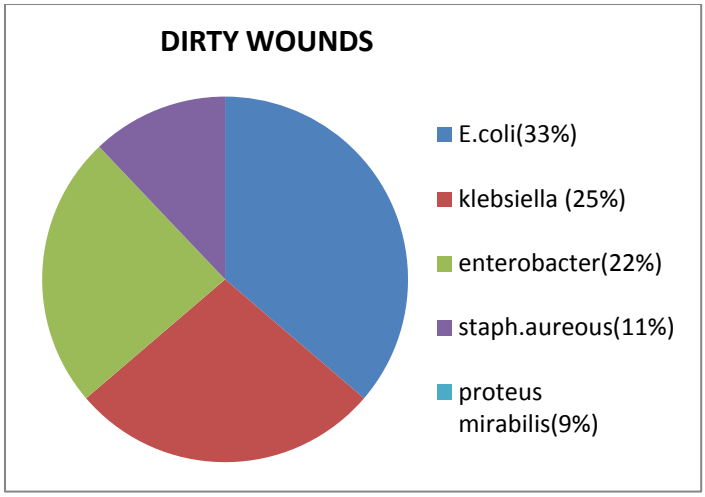

Fig-4

Table 1: Organisms & There Sensitivity Towards Various Antibiotics

ANTIBIOTIC CLASS	S. AUREUS	MRSA	S. EPIDERMIDIS	*ENETEROCOCCUS*	E.COLI	PSEUDOMONAS
Penicillin	_	_	_	+/_	_	_
Piperacillin + Tazobactam	+	_	+	+/_	+	+
Cephalosporin						
1st gen (cefazolin)	+	_	+/_	_	_	_
2nd gen (cefuroxime)	+	_	+/_	_	+	_
3rd gen (ceftriaxone)	+	_	+/_	_	+	_
(ceftazidime)	+	_	+/_	_	+	+
Carbapenem						
Meropenem	+	_	+	_	+	+
Imipenem + cilastatin	+	_	+	+/_	+	+
Aminoglycosides						
Gentamycin	+	_	+/_	+	+	+
Amikacin	+	_	+/_	_	+	+
Floroquinolone						
Ciprofloxacin	+	_	+	_	+	_
Glycopeptides						
Vancomycin	+	+	+	+	_	_
Linezolid						
Teicoplanin	+	+	+	+	_	_
	+	+	+	+	_	_

Discussion

Surgical site infection (SSI) occurs within 30 days of surgery or 1 year of implant. It can affect skin, subcutaneous tissue (superficial incision type), fascia or muscle (deep incision type),or organ space infection. One of the followings like, diagnosed by a surgeon, purullent discharge from the wound, discharge from the drain site, localised signs of inflammation like pain, tenderness, or culture of organism from the operative site wound must be present for SSI to be diagnosed [6].Surgical wounds can be clean(hernia, breast biopsy), clean contaminated (cholecystectomy, elective GI surgery) ,contaminated(penetrating abdominal trauma, intestinal obstuction & enterotomy) & dirty surgery(peptic ulcer perforation, diverticular perforation) .The overall infection rate is 2%-40%.In our study this infection rate is 13.5%.In our study the infection rate in clean, clean contaminated, contaminated & dirty wounds were 3.4%,17.2%,31%,48% respectively.According to National research council USA this rate was 1-3%,6-9%,20-25%,30-40%respectivey.The work of Cruse & Ford acts as a benchmark for these infection rate(9,10). Factors affecting the SSI were duration of surgery, types of wound, ASA clssification. prolonged hospital stay was also seen to influence & increase the SSI rate may be because of hospital environment, various diagnostic procedures,. Kowli et al [7] found that the infection rate was 17.4% when preoperative stay was within 7 days & it was above 70% when the stay was 21days.Anviker et al [8] showed the infection rate was increased to 5% when the stay was more than 7 days. In the bacteriological pattern among the clean wounds staph. aureous was found to be(50%),the most common. E.coli in 14% cases.[9]In clean contaminated wounds they were E. coli (35%)followed by Enterococci group (32%). In contaminated it was same like clean contaminated group. In dirty group E. coli was the most common pathogen followed by klebsiella. This pattern is also consistent with other studies.The common organisms among gram positive were staph. aurius, enterococus. Gram negative organisms were E.coli, pseudomonas aerogenosa, klebsiella (Rao & Harsh)[10]. In the study conducted by Nicholas 1998, Schaberg 1994 staphylococcus was the main organism followed by E.faecalis .Among the gram negatives E.coli, pseudomonas were the main pathogens.[11-15] Staphylococus was sensitive to combination of piperacillin & Tazobactam, Amino glycosides but resistant to penicillin alone .methicillin resistant staphylococcous (MRSA) were sensitive to vancomycin, linezolide & teicoplanin. E.coli was found to be sensitive to piperacillin & tazobactam, Aminoglycosides but were resistant to meropen-am. Pseudomonas was susceptible to ceftazidime, meropenem, piperacillin & tazobactam. In our study overall most of the organisms were sensitive to piperacillin & tazobactam, Amino glycosides. MRSA were sensitive to teichoplanin, vancomycin, linezolide though vancomycin resistant cases were also found.[16]

Conclusion

Surgical site infection is one of the most common nosocomial infections and one of the common causes of post operative morbidities. Though multiple factors contribute to this & to be taken care, the causative agent determination & its treatment is very important for the patient's better outcome, to avoid complications & to avoid antibiotic resistance. A microbiologist is very much essential in this respect. So effort must be given to understand the pathogens responsible for these infections and their treatment by proper selection of the antibiotics in various forms of SSI. in our study in our institution we have tried to throw some light in these areas.

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