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Finding The Culprit of Ssi in Post-Operative Orthopaedic Cases in Tertiary Health Care Center in Central India: An Observational Cross Sectional Study.

Dr. Santosh Kumar Mishra	resident department of orthopaedics , Gandhi Medical College,Bhopal
Dr. Abhishek Pathak	associate professor department of orthopaedics , Gandhi Medical College, Bhopal
Dr.Sunit Tandon	Professor department of orthopaedics , Gandhi Medical College, Bhopal
Dr.Anshuli Trivedi	assistant professor department of Preventive and social medicine , Gandhi Medical College, Bhopal

ABSTRACT

Introduction-In times of interventional orthopedics there is increase in risk of acquiring surgical site infections (SSI) that can jeopardize surgical outcome. Hence this study was done to find incidence of SSI & to isolate most common organism and their antibiotic sensitivity and resistance pattern.

Methodology-An observational cross sectional study is done at Department of orthopaedics at Gandhi Medical College Bhopal. A pretested proforma was used for data collection. Patients developing SSI within 30 days after operation were included in study & wound discharge was sent for examination & isolation of suspected organism.

Result- In total 6.89% patients developed SSI within 30 days of surgery. Most common organism isolated to cause SSI is Klebsiella 39.53% followed by E. coli 18.60%.

Conculsion-As most common organisms isolated are commensal of gut, hence maintenance of good perineal hygine, strict use of universal precautions & sterilization practices is likely to lower incidence of SSI.

KEYWORDS Surgical site infection, orthopaedics, Observational cross sectional.

Manuscript

Introduction- In the recent times of increased interventional orthopaedics which involves use of implants to manage fractures, also with increase in life expectancy more joint replacement surgeries are performed. This scenario has given rise to post-operative wound infection that presents as a challenge in clean orthopaedic surgeries. Surgical site infection after implant surgery is a disaster for both patient and surgeon, which may lead to antibiotic use/abuse, prolong rehabilitation, morbidity and mortality and increase case cost by 300% [(1)]. Infection is 2nd most common post-surgical complication often resulting in the need to remove implants [(2)].

It was observed that Gram-positive organisms predominate in orthopaedic SSIs, with coagulase-negative staphylococcus historically being the most common microorganism, followed by staphylococcus aureus. Other organisms that have been isolated from surgical wounds include pseudomonas, proteus spp, coliforms, enterococci, group C streptococci, klebsiella and other gram-negative bacteria[(3)]. Early infections (less than 2 weeks) are mainly caused by highly virulent microorganisms such as staphylococcus aureus or gram negative bacilli, whereas delayed (2-10 week) and late (more than 10 weeks) infections are caused by low virulence microorganism (e.g. coagulase-negative staphylococci) [(4)].

In orthopaedic surgeries patient undergoing open reduction & internal fixation are particularly vulnerable to post-operative wound infection because open reduction internal fixation interferes with the blood supply to the bone and implants are foreign bodies, which provide surfaces for bacterial adherence. Implant-associated infections are typically caused by microorganisms growing in biofilms [(5)]. Foreign bodies remain devoid of microcirculation which is crucial for host defense and the delivery of antibiotics. Existence within a biofilm represents a basic survival mechanism by which microbes resist against external and internal environmental factors, such as antimicrobial agents and host immune system [(6)]. Main risk factors for occurrence of infection in orthopaedic surgery are advanced age, diabetes, smoking, malnutrition, obesity, immune impairment, rheumatoid arthritis, infection in other part of body and anemia [(7)].

In spite of many advances in surgical techniques, good nutritional support, use of high potency antibiotic use, well sterilized operation theater ,use of quality sterilized implants and surgical equipment's, that were expected to control SSI. In current study it is found that there is significant increase in incidence of SSI. In times to come with advances & increased use of interventional orthopaedics it is expected that the incidence of implants & infections in joint prosthesis will further increase. Present study was undertaken to evaluate incidence of post-operative wound infection, spectrum of organisms isolated and their sensitivity and resistance pattern in elective orthopaedic implant surgeries in tertiary health care center.

Methodology- This observational cross sectional prospective study was conducted at Department of Orthopaedics at Gandhi Medical College Bhopal (M.P.) from 1st November 2013 to 31st October 2014. All the patients who had elective orthopaedic implant surgeries including all arthroplasties were included. The patients with probable other source of infection like open fractures or wounds elsewhere in body also cases needing external or internal fixation along with non implant surgeries were excluded from study. Due authorization to conduct the study was taken from ethics committee of institution. All the participants of the study were informed about the objectives & protocols of study. A thorough pre-operative history taking, clinical examination and relevant investigations were performed. A standard pre-operative preparation and institute

antibiotic protocol was followed in this study. All the surgeries were performed in well-equipped sterilized operation theatre using autoclaved surgical instruments, implants, drapes, and gowns. Preoperative part preparation was done before surgery. Standard surgical scrub was done for 5 minute before performing the operation. The incision site was painted with 10% povidone iodine and 70% ethyl alcohol. The principles of surgery were followed in all cases such as minimum tissue handling and maintenance of adequate hemostasis. Due caution was taken to curtail duration of surgery and blood loss. Suction drains & electric cautery were used whenever necessary. Skin closure was done with suture material or skin staples. For each patient 3rd generation cephalosporin and amikacin was given 30 minute prior to surgical incision. If procedure lasted for more than two hours, antibiotic dose was repeated. Intravenous antibiotic was given for 5 consecutive postoperative days. Each wound was assessed on 2nd, 5th and 8th postoperative days under full aseptic precaution; all negative suction drains were removed on 2nd postoperative day at the time of 1st dressing. All sutures/staples removal was done at 14th post-operative day, ensuring that wound has healed.

Hence on 2nd/5th/8th post operative day the wound that were found to be infected were managed by releasing the tense suture, collecting the discharge which was then evacuated and wound was thoroughly irrigated by normal saline (NS). The discharge was collected in disposable syringe or in sterile container and immediately sent for bacteriological culture and antibiotic sensitivity to Department of Microbiology at Gandhi Medical College Bhopal, and empirical antibiotic therapy against commonly isolated organism was started immediately followed by antibiotic treatment according to culture and sensitivity. Follow up of patients was done on 2nd week and 4th week after surgery for evaluation of post-operative wound condition.

Result-In total 624 consenting patients were included in this study, 43 patient (6.89%) developed surgical site infection. In this study Klebsiella was most commonly isolated organism in 17 infected patients (39.53%) followed by E. coli in 8 cases (18.60%). Staphyloccocs aureus was most common gram positive organism seen in 7 (16.28%) cases. In this study klebsiella had maximum antibiotic sensitivity with piperacillin+tazobactam in 52.94% isolates & maximum resistance was seen to moxifloxacin in 82.35% isolates, MDR Klebsiella were isolated in 35.29% cases. E.coli had maximum antibiotic sensitivity with piperacillin+ tazobactam in 50% isolates & maximum resistance was seen with moxifloxacin in 87.5% isolates followed by tobramycin in 75% cases. E.coli was MDR in 25% cases. Staphylococcus aureus had maximum antibiotic sensitivity with linezolid, teicoplanin and vancomycin in 71.43% isolates & maximum resistance was seen to sparfloxacin in 85.71% isolates followed by cefaclor and moxifloxacin. Staphylococcus aureus was MDR in 28.57% cases. In this study pseudomonas had maximum antibiotic sensitivity with meropenam in 66.67% isolates & maximum resistance was seen to moxifloxacin, levofloxacin and tobramycin in 83.33% isolates. Pseudomonas was MDR in 33.33% cases.

Discussion- In this study gram negative organisms were most commonly isolated among infected cases. Historically gram positive organisms were most commonly isolated in infected orthopaedic cases but pattern of infection is now changing and in most of studies gram negative organisms become most common culprit to cause surgical site infection and they are developing resistance to commonly used antibiotics.

Klebsiella and E.Coli is a commensal of gut and many orthopaedic patients are bedridden for prolonged periods; dressing, linen, clothes and even hands during perineal hygiene plays a major role in increasing chances of transmission of infection. In hospital settings, these bacteria become dominant flora of both mucosal and skin surfaces, particularly in association with antimicrobial use, severe illness, and extended length of stay. This colonization also may lead to subsequent post-operative wound infection

Similar to this study Thu L.T.A et al [8] isolated gram negative organism in 79.1% cases and Patkar R et al [9] isolated gram negative organism in 70.27% cases. Agrawal Alok C. et al [10] found gram negative (E.coli & pseudomonas) infections are major infecting organism in central India. But unlike to this study Agrawal Alok C. et al [10] found that klebsiella had maximum antibiotic sensitivity with cefoperazone and ceftriaxone and maximum antibiotic resistance with cloxacillin and ciprofloxacin & E.coli had maximum antibiotic sensitivity sensitivity with ceftriaxone and cefoperazone and maximum resistance with ampicillin and amoxicillin.

Conclusion- In this prospective study it was found that overall 6.89% patients developed SSI within 30 days of surgery. Most common culprit isolated to cause SSI is Gram Negative organisms. Most common organism isolated was klebsiella followed by E. coli. Klebsiella isolated in the study had maximum antibiotic sensitivity with piperacillin+tazobactam & maximum resistance to moxifloxacin. Similarly E.coli isolated had maximum antibiotic sensitivity to piperacillin+ tazobactam & maximum resistant to moxifloxacin. Multi drug resistant strains were seen in 30.23% cases. In the present series 3rd generation cephalosporins and aminoglycosides was used for prophylaxis but in view of this study if piperacillin+tazobactam are used SSI might be reduced. As both of these organism are commensal of alimentary tract hence perineal hygiene, universal precautions & sterilization practice should be adopted to prevent SSI.

Figure-1
Distribution on the basis of organism causing SSI

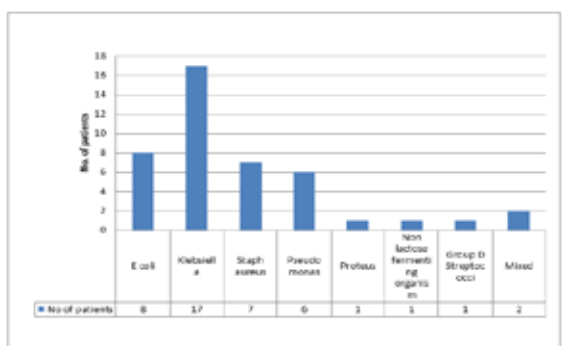

Table-1
Antibiotic sensitivity & resistance pattern for klebsiella isolated-

Sensitivity		%	Resistance		%
Piperacillin+ Tazobactam	9	52.94	Piperacillin+ Tazobactam	8	47.06
Levofloxacin	4	23.53	Levofloxacin	13	76.47
Cefoperazone+ Sulbactam	6	35.29	Cefoperazone+ Sulbactam	11	64.71
Imipenam	8	47.06	Imipenam	9	52.94
Meropenam	7	41.18	Meropenam	10	58.82
Moxifloxacin	3	17.65	Moxifloxacin	14	82.35
			MDR	6	35.29

Table-2
Antibiotic sensitivity and resistance pattern for E. coli isolated-

Antibiotics	Sensitivity	%
Piperacillin+Tazobactam	4	50
Levofloxacin	3	37.5
Tobramycin	2	25
moxifloxacin	1	12.5
Cefoprazone+sulbactam	3	37.5
Meropenam	3	37.5
Imipenam	3	37.5
		Resistance
Piperacillin+Tazobactam	4	50

Levofloxacin	5	62.5
Tobramycin	6	75
Moxfloxacin	7	87.5
Cefoperazone+Sulbactam	5	62.5
Meropenam	5	62.5
Imipenam	5	62.5
MDR	2	25

Table-3
Antibiotic sensitivity & resistance in staphylococcus aureus-

Antiboitics	Sensitivity	%	Resistance	%
Linezolid	5	71.43	2	28.57
Vancomycin	5	71.43	2	28.57
Cefaclor	2	28.57	5	71.43
Moxifloxacin	2	28.57	5	71.43
Tiecoplanin	5	71.43	2	28.57
Sparfloxacin	1	14.29	6	85.71
Clindamycin	3	42.86	4	57.14
MDR			2	28.57

Table-4
Antibiotic sensitivity & resistance pattern of pseudomonas-

Antibiotics	Sensitivity	%	Antibiotics	Resistance	%
Meropenam	4	66.67	Meropenam	2	33.33
Piperacillin+ Tazobactam	3	50.00	Piperacillin+ Tazobactam	3	50.00
Imipenam	3	50.00	Imipenam	3	50.00
Levofloxacin	1	16.67	Levofloxacin	5	83.33
Cefoperazone+ Sulbactam	3	50.00	Cefoperazone+ Sulbactam	3	50.00
Tobramycin	1	16.67	Tobramycin	5	83.33
moxifloxacin	1	16.67	Moxifloxacin	5	83.33
			MDR	2	33.33

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