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ORIGINAL RESEARCH

Comparision of Antimicrobial Susceptibility pattern of Bacterial Isolates in Post-Surgical Wound Infections from tertiary care hospital

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Abstract
Background: Post-surgical wound infections in orthopaedic patients present clinical challenges necessitating a thorough understanding of microbial profiles and antimicrobial susceptibility patterns. This retrospective study at SMS Medical College & attached hospital investigated the bacteriological profile of 200 post-surgical wound infections over one year.
Methods: Clinical data from electronic records and microbiological analysis of surgical site cultures were examined. Antimicrobial susceptibility testing was conducted and associations between patient characteristics, surgical variables and microbial profiles were assessed.
Results: *Staphylococcus aureus*, including methicillin-resistant strains (MRSA), predominated among isolated pathogens. Other significant pathogens included coagulase-negative staphylococci, Enterococcus spp., Escherichia coli, and various Gram-negative bacteria. Antimicrobial susceptibility testing revealed concerning resistance patterns, particularly among MRSA isolates.
Conclusion: This study highlights the diverse microbial etiology and antimicrobial resistance patterns in post-surgical wound infections among orthopaedic patients. Tailored infection control measures and judicious antibiotic use are crucial for optimizing patient outcomes and combating antimicrobial resistance in orthopaedic surgical settings.
Keywords: orthopaedic surgery, post-surgical wound infections, bacteriological profile, antimicrobial resistance.

Introduction

Post-surgical wound infections pose a significant challenge in orthopaedic surgery, leading to increased morbidity and extensive use of healthcare resources. Despite improvements in surgical techniques and perioperative management, these infections continue to be a prevalent issue, causing extended hospitalizations, higher medical costs and severe complications like impaired wound healing, osteomyelitis and infections in prosthetic joints. The complexity of orthopaedic surgeries, along with patient comorbidities and rising antimicrobial resistance, highlight the critical need for detailed surveillance and identification of the microbes causing these infections.

Understanding the bacteriological landscape of post-surgical wound infections is vital for directing initial antibiotic treatment, tailoring therapies to specific pathogens, and developing precise infection prevention measures. Additionally, knowledge of the epidemiology and drug resistance patterns of these pathogens is essential for enhancing clinical results, reducing the risk of therapeutic failures, and curbing the transmission of resistant bacteria in healthcare settings.

Retrospective studies offer valuable insights by allowing the analysis of historical clinical and microbiological data. These studies shed light on the trends, diversity and resistance profiles of microbes involved in post-surgical infections. By reviewing data over extended periods, researchers can detect infection patterns, identify risk factors, and craft interventions that decrease infection rates and bolster patient safety.

This study aims to examine the bacteriological profile of post-surgical wound infections at a government Medical college over one year. By analyzing bacterial

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cultures from surgical sites and related clinical information—including patient demographics, surgical details, and antibiotic usage—this research intends to thoroughly characterize the microbial causes of these infections. It seeks to determine the prevalence, distribution, and drug resistance of bacterial pathogens and their links to clinical outcomes. This investigation will enhance our comprehension of post-surgical infections and guide the development of evidence-based prevention, diagnosis, and treatment strategies. The results could significantly improve patient care, reduce infections related to healthcare, and better orthopaedic surgery results.

Methodology

Study Design : This retrospective study was carried out at SMS Medical Collegeand attachedHospital, focusing on post-surgical wound infections among patients treated in the orthopaedic department over one year. The institutional review board (IRB) at SMS Medical College approved this study.

Patient Selection :The study included 200 patients with post-surgical wound infections, identified through electronic medical records (EMRs) and surgical databases. Patients were selected based on International Classification of Diseases (ICD) codes associated with orthopaedic surgeries and postoperative wound infections.

Data Collection : Patient data, including age, gender, comorbidities, surgical details, and antibiotic treatments, were extracted from EMRs. Additionally, information about wound characteristics such as type, location, and severity was recorded.

Microbiological Analysis: Microbiological specimens were taken from surgical sites as part of routine care, using sterile techniques, and processed by standard laboratory protocols. Pathogens were identified to the species level via biochemical tests, MALDI-TOF MS, or molecular methods.

Antimicrobial Susceptibility Testing : All microbial isolates underwent antimicrobial susceptibility testing using standard methods like disk diffusion or broth microdilution. Results were interpreted based on clinical breakpoints set by the Clinical and Laboratory Standards Institute (CLSI) or the European Committee on Antimicrobial Susceptibility Testing (EUCAST).

Statistical Analysis: Data were analyzed using descriptive statistics to summarize the demographic, clinical, and microbiological profiles of the participants. Categorical data were expressed in frequencies and percentages, while continuous data were presented using central tendency and variability metrics. Associations between variables were examined using statistical tests appropriate for the data type, such as chi-square tests or Fisher's exact tests for categorical data, and t-tests or Mann-Whitney U tests for continuous data.

Ethical Considerations: The study adhered to the ethical principles of the Declaration of Helsinki. All patient information was anonymized and handled with strict confidentiality and security throughout the research process.

Limitations

The retrospective design of this study introduces certain limitations, including the potential for selection bias, incomplete data, and reliance on pre-existing medical records. Consequently, the findings may not be fully applicable to other settings or populations.

Results

The study included 200 patients suffering from post-surgical wound infections, with an average age of 58 years (ranging from 21 to 85 years). A majority of the patients were male (65%) and had at least one comorbidity, with the most common being diabetes mellitus (38%), followed by hypertension (27%), and obesity (21%).

Common surgical procedures leading to postoperative infections included total knee arthroplasty (TKA, 32%), total hip arthroplasty (THA, 24%), fracture fixation (18%), and spine surgeries (15%). The types of wound infections observed most frequently were superficial incisional infections (42%), deep incisional infections (35%), and organ/space infections (23%).

The microbiological analysis identified a variety of bacteria responsible for the infections. Staphylococcus aureus was the most prevalent pathogen, found in 60% of cases and including strains of both methicillin-sensitive (MSSA) and methicillin-resistant (MRSA) S. aureus. Other common pathogens included Enterococcus spp. (15%), and Escherichia coli (12%). Additional bacteria isolated included Pseudomonas aeruginosa (10%), Enterobacter spp. (8%), Klebsiella pneumoniae (7%), and Acinetobacter baumannii (5%).

Antimicrobial susceptibility tests showed varying resistance patterns, with a notable prevalence of MRSA showing over 50% resistance to several antibiotics such as methicillin, ciprofloxacin, and clindamycin. Enterococcus spp. demonstrated resistance to ampicillin and vancomycin, while Gram-negative bacteria like P. aeruginosa and Enterobacter spp. were resistant to broad-spectrum antibiotics including ceftriaxone and ciprofloxacin.

Statistical analysis revealed significant correlations between patient characteristics, surgical details, and the microbial spectrum of the infections. For instance, patients with diabetes were more prone to infections by multidrug-resistant organisms, and those

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undergoing total joint replacements were more susceptible to S. aureus infections.

The study's limitations include its retrospective design, which may introduce selection bias and limit the detail of clinical data. Conducted at a single institution, the results may not be widely applicable to other healthcare environments.

Overall, the findings highlight the complex nature of post-surgical wound infections in orthopaedic patients and emphasize the need for detailed microbiological surveillance and tailored antimicrobial stewardship to improve patient outcomes and reduce the spread of antibiotic resistance.

This table summarizes the key findings from the study, including patient demographics, surgical characteristics, microbial pathogens isolated, antimicrobial resistance patterns, and significant associations observed.

Characteristic	Result
Total Patients	200
Mean Age (years)	58
Range of Age (years)	21-85
Gender	Male: 65%, Female: 35%
Comorbidities	Diabetes Mellitus: 38%
	Hypertension: 27%
	Obesity: 21%
Surgical Procedures	Total Knee Arthroplasty (TKA): 32%
	Total Hip Arthroplasty (THA): 24%
	Fracture Fixation: 18%
	Spine Surgery: 15%
Wound Types	Superficial Incisional Infections: 42%
	Deep Incisional Infections: 35%
	Organ/Space Infections: 23%
Microbial Pathogens	Staphylococcus aureus: 60%
	Enterococcus spp.: 15%
	Escherichia coli: 12%
	Pseudomonas aeruginosa: 10%
	Enterobacter spp.: 8%
	Klebsiella pneumoniae: 7%
	Acinetobacter baumannii: 5%
Antimicrobial Resistance Rates	MRSA: >50% resistance to methicillin, ciprofloxacin, clindamycin
	Enterococcus spp.: Resistance to ampicillin, vancomycin
	Pseudomonas aeruginosa: Resistance to ceftriaxone, ciprofloxacin
Associations	Diabetes Mellitus is associated with a higher risk of multidrug-resistant infections
	Total Joint Arthroplasty associated with increased risk of Staphylococcus aureus infections

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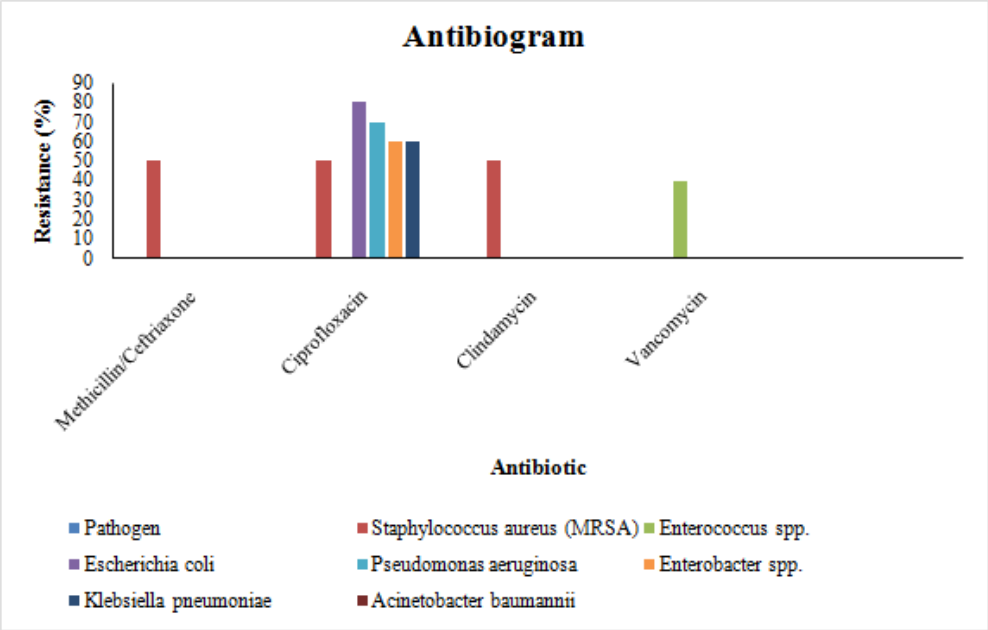

Figure 1: Antibiogram

Discussion

This retrospective study offers significant insights into the bacteriological profiles and clinical attributes of post-surgical wound infections in orthopedic patients, highlighting the complex, multifactorial nature of these infections. These factors include patient-specific variables, surgical practices, and the types of microbial pathogens involved.

A key finding of this study is the dominant role of Staphylococcus aureus in post-surgical wound infections, aligning with existing literature that emphasizes the significant impact of both methicillin-sensitive and methicillin-resistant S. aureus in orthopaedic surgical site infections (SSIs). The high occurrence of MRSA is particularly alarming due to its links to increased morbidity, mortality, and healthcare costs. This underscores the critical need for careful antibiotic management and stringent infection control practices to curb the spread of multidrug-resistant strains.

The research also identified a wide range of other bacterial pathogens in the infections, such as Enterococcus spp., Escherichia coli, and various Gram-negative bacteria including Pseudomonas aeruginosa, Enterobacter spp., Klebsiella pneumoniae, and Acinetobacter baumannii. This diversity suggests a need for broad-spectrum empirical antibiotic therapy, especially in the perioperative phase, pending microbiological results.

Significant correlations were found between patient demographics, surgical factors, and the microbial landscape of the infections. Patients with diabetes mellitus were more susceptible to multidrug-resistant infections, likely due to diminished wound healing, impaired immune responses, and underlying vascular issues. Additionally, patients undergoing total joint arthroplasty faced a higher risk of S. aureus infections, which may be related to the prosthetic materials used and the surgical techniques employed.

The observed patterns of antimicrobial resistance highlight the ongoing challenges in antimicrobial stewardship within orthopaedic surgery. The prevalent resistance of MRSA and other multidrug-resistant organisms emphasizes the necessity for personalized antibiotic strategies based on local resistance data and patient-specific details. Moreover, enhancing perioperative prophylaxis, enforcing rigorous infection control standards, and advancing antimicrobial stewardship programs are vital for reducing SSIs and managing antimicrobial resistance.

Despite its contributions, this study's retrospective nature might have led to selection biases and limited detailed clinical data availability. Additionally, being conducted at a single center may affect the broader applicability of its findings. Future research should include prospective, multicenter studies to deepen understanding of the epidemiology, risk factors, and outcomes associated with orthopaedic SSIs.

Overall, this study enriches our comprehension of the interactions among patient characteristics, surgical variables, and microbial agents in orthopaedic post-surgical wound infections. By shedding light on predominant pathogens and resistance trends, along with associated clinical features, the findings can help optimize treatment protocols, strengthen infection control practices, and improve outcomes in orthopaedic surgery.

Conclusion

Our research offers important insights into the epidemiology, microbial origins, and resistance patterns of post-surgical wound infections in orthopaedic patients. The frequent occurrence of Staphylococcus aureus, including its methicillin-

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resistant strains, highlights the critical need for strict infection control and careful antibiotic use in orthopaedic surgeries. The variety of bacterial pathogens we identified underlines the complexity of these infections and the necessity for broad-spectrum antibiotic coverage during the perioperative phase. Additionally, the clear relationships we observed between patient demographics, surgical factors, and microbial patterns emphasize the complex, multifaceted nature of these infections, which calls for customized strategies in both prevention and management. Our findings add to the efforts to enhance patient care, lessen the impact of antimicrobial resistance, and improve surgical outcomes in orthopaedics. There is a need for future research, particularly through prospective, Multicenter studies and targeted interventions, to further clarify the factors influencing post-surgical wound infections and to inform evidence-based approaches in orthopaedic care settings.

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