Volume 3, Issue 3, March 2025 ISSN (E): 2938-3765

OSTEOMYELITIS: A COMPREHENSIVE REVIEW OF PATHOGENESIS, DIAGNOSIS, AND MANAGEMENT

G‘afurov Mirjalol 1,
Xayrullayev Muhammad 1
Lecturers of the Department of Preclinical Subjects,
University of the Zarmed, Bukhara, 200100, Uzbekistan

Abstract
Osteomyelitis is a severe bone tissue infection commonly caused by bacterial pathogens, with Staphylococcus aureus being the predominant organism. This study explores the epidemiology, pathogenesis, clinical presentation, diagnostic modalities, and treatment strategies for osteomyelitis. A literature review was conducted to analyze current trends in diagnosis and management. The findings emphasize the importance of early detection through imaging and microbiological assessments and the role of antimicrobial therapy and surgical intervention. Future research should focus on novel treatment modalities and preventive strategies.

Keywords: Osteomyelitis, bone infection, Staphylococcus aureus, treatment.

INTRODUCTION

Osteomyelitis is a potentially debilitating bone infection arising from hematogenous spread, direct inoculation, or contiguous extension from adjacent infected tissues [1]. The incidence of osteomyelitis varies with age, underlying health conditions, and geographical factors. Despite advancements in medical imaging and antimicrobial therapy, osteomyelitis remains a significant healthcare burden due to its chronicity and complications [2]. This paper aims to analyze osteomyelitis in-depth, emphasizing its pathophysiology, clinical presentation, diagnostic approaches, and management strategies [3].

Methods

A systematic review of recent literature was performed using PubMed, Scopus, and Google Scholar databases. Studies published in the last decade were prioritized to ensure up-to-date insights into osteomyelitis. The inclusion criteria encompassed clinical trials, meta-analyses, and observational osteomyelitis diagnosis and treatment studies. Data were extracted and analyzed to identify emerging trends and best practices.

Results

Osteomyelitis affects pediatric and adult populations, with hematogenous spread being more common in children and direct inoculation or contiguous infection in adults. Common risk factors include diabetes mellitus, immunosuppression, trauma, and post-surgical complications [4].

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Staphylococcus aureus is the most frequently isolated pathogen, followed by Gram-negative bacteria and anaerobes. Biofilm formation is critical in chronic osteomyelitis, leading to antibiotic resistance and recurrent infections [5].

Acute osteomyelitis presents with localized pain, fever, and swelling, whereas chronic cases may manifest with persistent bone pain, fistula formation, and systemic symptoms. Imaging techniques such as X-ray, MRI, and CT scans aid in diagnosis, while bone biopsy and culture confirm microbial etiology[6].

Treatment Modalities

Antibiotic therapy is initiated based on suspected pathogens and later adjusted according to culture results [7]. Surgical debridement is necessary for abscess formation, sequestrum removal, or chronic osteomyelitis cases [8]. Adjunct therapies, including hyperbaric oxygen therapy and local antibiotic delivery systems, have shown promise in refractory cases [9,10].

Discussion

The management of osteomyelitis requires a multidisciplinary approach, integrating medical, surgical, and rehabilitative strategies. The emergence of antibiotic resistance necessitates the development of novel antimicrobials and alternative treatment modalities. Advances in molecular diagnostics and biomaterials for bone regeneration offer potential avenues for improved patient outcomes. However, challenges remain in early diagnosis and prevention of recurrence.

Conclusion

Osteomyelitis remains a complex clinical entity requiring timely diagnosis and a tailored treatment approach. While current therapies are effective, ongoing research should focus on improving diagnostic accuracy, enhancing treatment efficacy, and reducing complications. Preventive measures, including vaccination and infection control practices, are crucial in minimizing the disease burden.

References.

1. Lew, D. P., & Waldvogel, F. A. (2004). Osteomyelitis. *The Lancet*, *364*(9431), 369–379. https://doi.org/10.1016/s0140-6736(04)16727-5
2. Maffulli, N., Papalia, R., Zampogna, B., Torre, G., Albo, E., & Denaro, V. (2016). The management of osteomyelitis in the adult. *The Surgeon*, *14*(6), 345–360. https://doi.org/10.1016/j.surge.2015.12.005
3. Ziran, B. H. (2007). Osteomyelitis. *Journal of Trauma and Acute Care Surgery*, *62*(6), S59–S60. https://doi.org/10.1097/ta.0b013e318065abbd
4. Pinder, R., & Barlow, G. (2015). Osteomyelitis of the hand. *Journal of Hand Surgery (European Volume)*, *41*(4), 431–440. https://doi.org/10.1177/1753193415612373
5. Funk, S. S., & Copley, L. A. (2017). Acute hematogenous osteomyelitis in children. *Orthopedic Clinics of North America*, *48*(2), 199–208. https://doi.org/10.1016/j.ocl.2016.12.007

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

6. Gajagowni, S., & Padhye, A. (2024). Neonatal osteomyelitis. *NeoReviews*, *25*(5), e265–e273. https://doi.org/10.1542/neo.25-5-e265
7. Huang, Z., Wang, C., Shi, T., Wu, B., Chen, Y., Li, W., Fang, X., & Zhang, W. (2021). Salmonella Osteomyelitis in Adults: A Systematic review. *Orthopaedic Surgery*, *13*(4), 1135–1140. https://doi.org/10.1111/os.12912
8. Hwang, J., & Kelham, S. A. (2022). Osteomyelitis. *JAAPA*, *35*(9), 57–58. https://doi.org/10.1097/01.jaa.0000854520.27186.dd
9. Goodrich, L. R. (2006). Osteomyelitis in horses. *Veterinary Clinics of North America Equine Practice*, *22*(2), 389–417. https://doi.org/10.1016/j.cveq.2006.04.001
10. Calhoun, J. H., & Manring, M. (2005). Adult osteomyelitis. *Infectious Disease Clinics of North America*, *19*(4), 765–786. https://doi.org/10.1016/j.idc.2005.07.009.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5