

PROPHYLACTIC ANTIBIOTICS IN TRAUMATIC CEREBROSPINAL FLUID LEAK: A SYSTEMATIC REVIEW

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OBJECTIVES

This systematic review aimed to evaluate the efficacy, benefits, and potential harms of prophylactic antibiotic use in patients with traumatic cerebrospinal fluid (CSF) leaks for the prevention of meningitis.

METHODS

A systematic review was conducted through the selection and analysis of studies published between 2015 and 2025 in the PubMed, Google Scholar, and SciELO databases. The combined descriptors "Artificial Intelligence" and "Otorhinolaryngology" were used in both Portuguese and English. Studies published before 2015, as well as systematic, narrative, and integrative reviews, editorials, and expert opinion articles, were excluded.

RESULTS

Cerebrospinal fluid leaks are a rare condition associated with high morbidity and potentially fatal outcomes. They are classified as either traumatic or spontaneous. Traumatic CSF leaks are further categorized as iatrogenic (related to nasal or cranial surgery) or non-iatrogenic (resulting from blunt or penetrating trauma). CSF leaks occur in approximately 3% of closed head injuries, 9% of open head injuries, and 10–30% of skull base fractures.

Management may be either conservative or surgical, with both approaches aiming to prevent complications. Meningitis is the most common complication, with an incidence ranging from 10% to 37% following traumatic CSF leaks, increasing proportionally with the duration of the CSF leak. Prophylactic antibiotics are frequently administered during conservative management to reduce the risk of meningitis. However, this practice remains controversial, as current evidence suggests that prophylactic antibiotics may not effectively prevent meningitis and may contribute to the emergence of antimicrobial resistance.

DISCUSSION

Current evidence does not demonstrate a proven benefit of prophylactic antibiotic therapy in preventing meningitis among patients with traumatic CSF leaks. Commonly prescribed antibiotics, particularly cephalosporins, have poor penetration into non-inflamed meninges and are unlikely to eradicate potential pathogens, such as *Streptococcus pneumoniae*, from the upper respiratory tract.

Moreover, prophylactic antibiotic use may promote colonization with resistant bacterial strains, including penicillin-resistant organisms. These resistant strains may subsequently replace susceptible bacteria, potentially complicating the treatment of future episodes of meningitis. Although reducing unnecessary antibiotic use may not completely reverse the global trend of antimicrobial resistance, it can help mitigate its progression.

Additional considerations include drug-related adverse effects, the risk of allergic reactions, and the economic burden imposed on healthcare systems. Therefore, the decision to prescribe prophylactic antibiotics should be individualized, taking into account each patient's clinical condition while prioritizing accurate diagnosis and definitive management of the CSF leak itself rather than relying solely on antimicrobial therapy.

When traumatic meningitis develops, outcomes in adults are generally favorable if prompt and appropriate therapeutic antibiotic treatment is initiated. Early treatment reduces morbidity and mortality and allows definitive repair of the CSF leak under more stable, non-emergency conditions.

CONCLUSION

Although concern regarding meningitis in patients with traumatic CSF leaks is justified, current evidence supporting the use of prophylactic antibiotics is weak. Furthermore, prophylactic antibiotic therapy carries potential risks, including increased antimicrobial resistance, adverse drug reactions, and additional healthcare costs. A cautious, individualized approach focusing primarily on the diagnosis and management of the CSF leak is recommended. Further high-quality studies are needed, as the available evidence remains limited and is often based on studies with methodological shortcomings and relatively small sample sizes.