ICU
MANAGEMENT & PRACTICE

Guidelines: Antibiotic Prophylaxis in Trauma

Antibiotic prophylaxis (AP) in surgery prevents surgical site infections (SSIs). Despite clear recommendations from health authorities, AP is often misused globally, leading to reduced patient safety and increased antimicrobial resistance. Factors contributing to inappropriate AP use include errors in drug selection, dosage, duration, timing, and administration method.

In polytrauma patients with multiple associated injuries, there is an increased risk of infection, prompting widespread but often unjustified antibiotic use. Clinical research reflects this heterogeneous practice, highlighting the challenge of standardising definitions and approaches to AP administration.

Antibiotic prophylaxis in trauma cases should be tailored to individual patient characteristics, aiming to minimise infection risks without promoting multiresistant species or causing adverse effects. Antimicrobials should only be administered when necessary, based on specific criteria, rather than out of fear of infection. Evidence-based guidelines and antimicrobial stewardship programmes should be implemented globally. Recommendations from various medical societies emphasise the importance of targeted antibiotic prophylaxis in managing trauma across different body regions, aiming to guide clinical practice effectively.

These guidelines are evidence-based and provide recommendations for optimal AP management in trauma patients. However, they do not establish a rigid standard of practice but offer suggested care plans based on available evidence and expert consensus. Alternative approaches are not excluded as long as they meet the standard of care.

A comprehensive search was conducted across multiple databases to gather relevant citations pertaining to AP in trauma cases. A group of experts from relevant societies collaborated to provide evidence-based positions on the topic, leading to a consensus after several rounds of discussion and revisions. This review reflects the agreed-upon recommendations reached through this process.

In cases of blunt head and brain trauma managed nonoperatively, AP is generally not recommended. However, in penetrating head and brain trauma, prolonged AP (for 24 hours) is advised. Blunt head and brain traumas are common, although penetrating injuries are more prevalent in certain regions. Literature on antibiotic therapy for these injuries is limited, with generally low-quality evidence. Studies show no significant differences in infection rates between patients receiving AP and those who don't, regardless of basilar or skull fractures. However, there is heterogeneity in inclusion criteria, duration of therapy, and dosages across studies. Prolonged antibiotic prophylaxis is administered with various drugs, but investigation into antibiotic-resistant bacteria is lacking.

AP is recommended in cases of blunt maxillofacial trauma requiring open reduction of fractures and for penetrating maxillofacial trauma. Prolonged antibiotic prophylaxis (24 hours) may be considered for open reduction of contaminated wounds. Infection is a common complication in open mandibular fractures, often due to oral cavity colonisation. However, there's no consensus on AP administration for operative and nonoperative facial fractures. Studies show no significant differences in infection rates related to fracture location or antibiotic class. Antibiotic therapy in maxillofacial fractures reduces SSIs, especially in open fracture reductions. Short antibiotic regimens may be as effective as longer ones. Postoperative continuation of antibiotic therapy does not significantly reduce SSIs. Evidence suggests that AP is beneficial in maxillofacial trauma cases requiring open reduction, but prolonged regimens and timing of administration do not confer additional benefits.

For healthy patients with blunt thoracic trauma or those undergoing chest tube placement, AP is generally not recommended. However, it is indicated for penetrating thoracic trauma patients undergoing chest tube placement, all cases of delayed drainage of retained haemothorax, and both blunt and penetrating thoracic trauma cases undergoing surgical exploration (thoracotomy/thoracoscopy). Retained haemothorax and penetrating thoracic trauma are risk factors for pneumonia and empyema. The effectiveness of AP in reducing infectious complications varies depending on the trauma mechanism and procedure type. Studies show that it is effective in reducing overall empyema rates, especially in penetrating trauma patients, but its efficacy is less pronounced in blunt trauma cases. Additionally, the absence of periprocedural antibiotics is associated with a higher risk of pneumonia in patients with retained haemothorax after blunt trauma. However, in some settings, such as low-resource environments, the incidence of empyema does not significantly differ between patients receiving or not receiving AP.

In non-operatively managed blunt abdominal trauma, AP is generally not recommended. However, it is indicated in penetrating abdominal trauma, particularly in patients undergoing surgical exploration (laparotomy/laparoscopy). Prolonged antibiotic prophylaxis (24 hours) and/or antibiotic therapy should be considered in patients with hollow viscus injury. Historically, colonic penetrating trauma had high mortality rates before the antibiotic era. Standardising indications for AP in abdominal trauma has been challenging due to unclear distinctions between prophylaxis and therapy and limited literature. While no prophylaxis is recommended for blunt trauma unless a hollow viscus injury is suspected, broad-spectrum antibiotics with aerobic and anaerobic coverage are preferred in penetrating trauma cases. Haemorrhagic shock and acute kidney injury necessitate antibiotic dose adjustment.

Contaminated hollow viscus injuries warrant antibiotic therapy rather than prophylaxis. The duration of antibiotic therapy should be minimised while ensuring patient safety and benefits. Damage-control laparotomy outcomes are influenced by postoperative antibiotic administration and the presence of hollow viscus injuries. However, the relationship between prolonged antibiotic therapy (>24 hours) in penetrating trauma and preventing surgical site infections, reducing mortality, or intra-abdominal infections has not been conclusively demonstrated.

AP effectively reduces wound infections in open fractures and should be administered promptly. However, long-term antibiotic treatment (7-10 days) is not effective in reducing the infection rate. For gunshot-related fractures, AP longer than 24 hours is not indicated. Various antibiotics have been studied, including penicillin derivatives and aminoglycosides, but there's no clear definition of prophylaxis, and the ideal timing for initiation remains uncertain. Studies have shown lower infection rates in patients receiving AP than those without. However, there's limited evidence on the effects of prophylaxis on drug-induced bacterial resistance.

In burn patients, routine AP is generally not indicated. Instead, primary infection prevention involves extensive irrigation and removal of contaminated material from the burn site. There's no significant difference between systemic and topical AP in preventing infections in burn patients. However, in severe burn cases requiring endotracheal intubation and mechanical ventilation, AP is recommended, ideally administered before intubation and based on antibiotic pharmacokinetics. It may also be indicated to prevent split-thickness skin graft infection. Routine antibiotic prophylaxis following debridement of devitalised tissues is not recommended. In burn patients, infections cause mortality and skin graft loss, often involving multiresistant species. Systemic AP has been shown to reduce all-cause mortality and pneumonia rates, with a greater effect on gram-positive infections. However, no definitive benefit was observed in terms of sepsis, antibiotic resistance, wound healing, or mortality related to systemic or topical AP. The use of systemic AP in paediatric burn injuries does not provide beneficial effects compared to no antibiotic use. Wound microbiology is influenced by antibiotic therapy, with multidrug-resistant organisms found in a significant percentage of patients.

Routine AP is not strictly indicated for skin and soft tissue injuries and should be evaluated on a case-by-case basis. Similarly, routine antibiotic prophylaxis for mammalian bites should also be considered case-by-case. However, accurate prevention of viral infectious diseases, such as the rabies virus, and attention to tetanus immunisation are crucial. Source control, achieved through cleaning, irrigating, and disinfecting wounds, is essential for all skin and soft tissue injuries, including mammalian bites.

Overall, AP should be utilised only when necessary, as its excessive use does not benefit patients and may contribute to bacterial resistance. It's crucial to assess individual infection risks for each patient, prioritising source control to prevent infections effectively.

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