

Primary Management and Antibiotic Prophylaxis in Open Injuries of the Lower Limb: Current guidelines

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Abstract

Primary management of open injuries is of utmost importance as it has direct implication on the functional outcome. Strict adherence to the ATLS protocol followed by appropriate splintage of the limb must be done. While antibiotics need to be given within 3 hours since injury, wound lavage and wound cultures have no role. Documentation and adequate counselling regarding the complications also needs to be done while managing every case of open injury.

Keywords: Open injury, antibiotic prophylaxis, wound lavage, limb splintage

Principal Recommendations:

- Open Injury must be considered as an Orthopaedic emergency
- Initial assessment and treatment of the patient occurs simultaneously and in accordance with Advanced Trauma Life Support (ATLS) principles
- Assessment of any open injury is systematic and repeated in order to identify established or evolving limb-threatening conditions, and to document limb status prior to manipulation or surgery
- Haemorrhage control is through direct pressure or, as a last resort, through application of a tourniquet
- Photograph the wound for documentation
- Limb splintage is by the most appropriate means of immobilization available in the emergency department
- Antibiotic and antitetanus prophylaxis are given within 3 hours from injury
- Wound lavage and Primary wound cultures have no role and are not advocated
- Adequate counselling regarding the management and outcomes is to be given to the patient and the attenders by the Consultant

Introduction:

Every open injury is an Orthopaedic emergency and the success in treatment depends on the evaluation and management that starts at the emergency department. An open injury always presents dramatically and has the capacity to distract the untrained person from assessing the more serious injuries which may be life threatening [1,2]. The management of open injuries has advanced from the "Era of Life Preservation" in the 1950's to the "Era of Functional restoration" following advances

in the field of orthopaedic surgery and plastic surgery. Availability of antibiotics and understanding the need for aggressive debridement and early soft tissue cover helped to control infection bringing in the "Era of Infection Control" [3]. The key in achieving good functional outcomes are related to good primary management of such injuries. In this article, we shall focus on the important steps which need to be routinely managed while managing open injuries.

Initial assessment:

Nearly 30% of patients with open injuries have more than one injury and hence the temptation to focus only on the bleeding wound must be avoided while assessing patients with open fractures [1,2,4]. Thorough evaluation as per ATLS (Advanced Trauma Life Support) protocol is of utmost importance. Assessment of airway, breathing and circulation is vital and should be followed as a standard protocol. There may be a number of injuries that are missed and there is a role for fast whole-

body CT scanning which helps to identify injuries to the head, neck, spine, chest, and pelvis. An estimate of the blood loss must be undertaken quickly and, if necessary, resuscitation measures immediately instituted. Inadequate resuscitation is an important cause of avoidable deaths and later comorbidities such as infection, delayed wound

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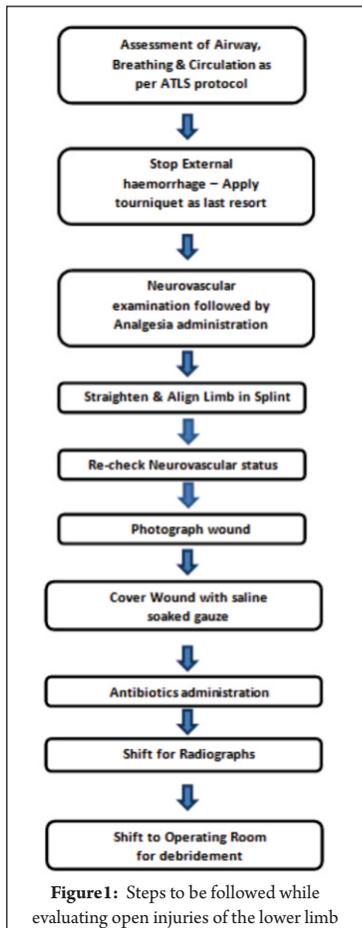
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healing, and pulmonary complications. Acidosis, hypothermia, and coagulopathy, the deadly triad in injured patients, are often present in patients with open injuries and these must be identified and corrected quickly [3]. It is now understood that simply monitoring the vital signs may be insufficient to determine the adequacy of resuscitation and treatment regimes that simply target vital signs may be harmful in the setting of polytrauma. Surgeons should consider damage control orthopaedics as a part of the resuscitation process [3,4].

Role of Documentation and Wound photographs:

Once the patient is stabilized it is important that the circumstances of the accident and the patient's history are meticulously documented [3]. Witnesses and accompanying family members may provide useful information regarding the nature of the injury. Information about the condition of the patient and the resuscitative measures undertaken at the scene of the accident, and the condition of the patient during transport to the hospital must be obtained from the emergency

medical attendants. In the emergency room examination of the wound should include the size and location of the wound, the orientation of the wound, to define if it is longitudinal, transverse or irregular, the depth of the wound and whether bone, tendons, and muscle are exposed. Photographic documentation of the wound should ideally be undertaken. This is important as a good visual documentation surpasses any written description and will be of immense value during follow-up examinations and for research purposes. A digital camera should be available in the emergency room where open injuries are received [2-4].

Clinical Examination:

Systematic, careful and repeated assessments are important. Neurovascular evaluation of the limb is essential and must be recorded clearly in the notes and repeated after each intervention. A high degree of suspicion must be maintained for established or evolving limb threatening situations: severe injuries to arteries or nerves are easy to miss in the acute situation and compartment syndrome can be difficult to diagnose. Capillary refill of the skin alone is not always a reliable sign [3-5]. The dorsalis pedis pulse and the posterior tibial pulse must always be palpated. Impaired perfusion raises the possibility of major arterial injury and requires immediate referral as muscle death starts to occur within 3-4 h of warm ischaemia. Compartment pressures should be measured if clinical suspicion is aroused by disproportionate pain to the involved injury or if the patient is obtunded. Dorsiflexion to assess the common peroneal nerve and plantarflexion to assess the posterior tibial nerve should be done in each case and the possibility of more proximal injury (to the sciatic nerve, nerve roots or spinal cord) should always be kept in mind. Prolonged ischaemia following arterial injury could also result in muscle paralysis. Appreciation of light touch should be tested on the sole of the foot to assess the posterior tibial nerve and in the first dorsal web space to assess the deep peroneal nerve. Initial management of open injuries can be done in sequential steps as shown in Table 1 so as to not miss out any important finding.

Role of wound washout and primary cultures in the emergency department:

A 'mini debridement' or 'washout' of the open injury in the emergency room does not aid in treatment. Digital exploration of the wound is not necessary and should be avoided. Lavage through the open wound serves to drive particulate debris further in. Wound management in the emergency setting should be restricted to removal of gross contaminants, photography and sealing [4,5]. A dressing moistened with normal saline and sealed over with adhesive film is recommended. Antiseptics in the dressing should not be used. Limbs are usually splinted on arrival in the emergency room. An appropriate sized splint spanning the ankle and the knee is initially used. Slippage may occur during transit and so checks for fit are essential. If above-the-knee plaster of Paris back slabs are used, appropriate apertures or windows need to be created to allow repeated checks of the vascular status. Studies have shown poor correlation between the presence of positive cultures and subsequent rate of clinical infection. There is disparity between the organisms grown on the initial wound swabs and the organisms grown subsequently after the development of wound infection. The commonly isolated organisms from established infection are *Staphylococcus aureus*, *Pseudomonas*, and *Escherichia coli* [3,6]. These organisms are frequently due to hospital contamination and are never isolated from the environment where the accidents occur. The practice of obtaining routine cultures from the wound either pre- or post debridement is no longer advocated.

Antibiotic Prophylaxis:

Antibiotic prophylaxis and antitetanus measures are provided in the emergency room [3,6]. The recommended antibiotics are co-amoxiclav (1.2 g) or cefuroxime (1.5 g) 8 hourly, or clindamycin 600 mg if the patient has a history of anaphylaxis to penicillin, continued until wound debridement.

BAPRAS (British Association of Plastic, Reconstructive and Aesthetic surgeons) [3,6,7] recommend the following suggestions in open injuries.

- 1) Administer antibiotics as early as possible (probably within 3 hours)
- 2) Agent of choice co-amoxiclav (1.2 g 8 hourly), or a cephalosporin (e.g., cefuroxime 1.5 g 8 hourly), continued until

first debridement (excision).

3) At the time of first debridement, co-amoxiclav (1.2 g) or a cephalosporin (such as cefuroxime 1.5 g) and gentamicin (1.5 mg/kg) should be administered and co-amoxiclav/cephalosporin continued until soft tissue closure or for a maximum of 72 hours, whichever is sooner.

4) Gentamicin 1.5 mg/kg and either vancomycin 1 g or teicoplanin 800 mg should be administered on induction of anesthesia at the time of skeletal stabilization and definitive soft tissue closure. These should not be continued postoperatively. Ideally start the vancomycin infusion at least 90 minutes before surgery.

It is very important for the treating

surgeon to understand that antibiotic administration is not a substitute for good debridement [3].

Role of Imaging in Open Injuries:

Simple radiographs of the lower limb complete the assessment. As with all bone injuries, the two views obtained should be orthogonal to each other and include ankle and knee joints. More than two images are sometimes necessary to obtain a sufficient radiological assessment. Inadequate views of the injured part may lead to missed diagnosis of injuries. In cases of polytrauma, views of the pelvis, the chest and the cervical spine are essential [7].

Adequate Counselling regarding the

outcomes:

Though not supported by any statistical data, counselling of the patient and relatives at the time of admission regarding the severity of the injury, the cost of treatment, the tentative duration and stages of treatment by a consultant who is experienced in the unit at the time of admission has helped patients realize the gravity of the situation and cope with the treatment. Such a practice is routinely followed in our department.

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