

Case Report

Tree Limb Impalement: Lower Extremity Muscle Herniation from Penetrating Trauma

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Introduction

Impalement injuries, while often visually stunning, are traumatic injuries that consist of both penetrating and blunt elements. In addition, these injuries require special consideration for retained foreign body. When the impaled object is left in place, the course and trajectory of the penetrating object can be ascertained with physical exam alone. Blunt injury is more occult, and is secondary to the force required to penetrate the tissue[1]. The available literature tends to focus on bony or vascular injuries that result from extremity impalement or the management of thoracoabdominal impalement. Little research is offered that pertains to management of soft tissue injury from retained extremity foreign body, especially in injuries that do not involve bone or neurovascular structures. Specifically, management of muscular injury is difficult to find. In this report, we present the case of an 11-year-old male who presented with a tree limb impaled through his right lower extremity. The neuro-vasculature was intact; however, injury to the muscle fascia caused a focal herniation of fibularis brevis.

Case Report

An 11-year-old African American boy presented to the emergency room after injuring himself playing football. The patient reported he ran out of bounds and subsequently tripped and fell onto a tree limb that impaled his right lower extremity. He denied any other traumatic injuries including loss of consciousness. He was transported from the scene with the foreign body in place (Image 1). His past medical and surgical history was significant only for baseline iron deficiency anemia with his baseline hemoglobin/hematocrit of 10.8/33.9 and no evidence of leukocytosis. X-ray findings revealed significant soft tissue injury without fracture (Image 2).



Figure 1: Intraoperative photograph depicting tree limb impalement



Image 2: X-ray of right lower extremity showing foreign body without bony injury

On physical examination, an approximately 19cm tree limb of 1-2cm in diameter was protruding from the right lower extremity lateral to the tibia. There was no active bleeding, pulses were easily palpable, and sensation and motor function were intact. Zosyn was administered.

The patient was taken directly to the operating room for exploration. A one centimeter incision was made at the base of the tree limb and using gentle traction the foreign body was removed. The wound was inspected and irrigated with antibiotic solution. No neurovascular injury was identified and the wound was hemostatic. The fibularis brevis muscle was noted to be herniating through its investing fascia. The fascial defect was reapproximated using simple interrupted 2-0 Vicryl. The wound edges were debrided and the skin was widely reapproximated with two interrupted vertical mattress sutures of 3-0 Nylon. The patient had an uneventful postoperative period and was discharged home on post-operative day one.

Discussion

Management of impalement injuries varies upon location, impalement object, and injured structures. Several key principles are common to multiple modes of injury. The foreign body should not be removed as this could lead to loss of the tamponade effect resulting in significant blood loss [1-3]. If required, careful shortening of the object may be undertaken to allow for transportation; and, if necessary the patient may be transported with objects en masse depending on the situation [1,2]. Traditional trauma principles of airway management and resuscitation apply. Imaging is performed on a case-by-case basis and should serve as an adjunct to definitive management without delaying intervention in the unstable patient [2,3].

In the operating room, location of the foreign body will dictate positioning [2]. Access to vital structures and the ability to control any bleeding are the essential operative components; thus, for extremity wounds a "fistulotomy-type" incision connecting entrance and exit wounds allows for evaluation of all structures along the tract prior to release of the tamponade effect [1,2]. The inclusion of a foreign body inherently predisposes the wound to contamination and antibiotics are recommended with irrigation, drainage, and debridement undertaken in addition to management of any injured structures [1-3].

In this specific case the injury to the muscle fascia caused a focal herniation of muscle tissue. Muscle herniation can occur as

a result of congenital fascial weakness or through acquired means typically as a result of trauma [4]. Traumatic injuries include closed injuries as well as penetrating injuries [4]. Muscle herniation can be asymptomatic but can also lead to a palpable bulge, pain, strangulated muscle tissue, weakness, neuropathy, and decreased physical activity [4]. The management of muscle herniation is controversial and includes fasciotomy, primary fascial repair, and flap, mesh, or patch repair [4]. Presentation also dictates management strategies as an asymptomatic congenital defect would require a different workup than a fascial defect from a closed fracture. With no consensus available, definitive care is left up to the practitioner and should take into account presentation, activity level, associated injuries, location and size of defect, and the likelihood of subsequent sequelae such as increased compartment pressures from revascularization or repetitive trauma in an athlete.

In conclusion, impalement injuries are a heterogeneous group of trauma patients that can include a wide variety of injury patterns. The key principles of management include maintenance of the tamponade effect by keeping the retained foreign body in place during transportation to the hospital and the operating room. In addition, adequate visualization and preparation for catastrophic injuries such as major vessel or organ injuries must be considered to ensure rapid stabilization after removal of the foreign body. Isolated extremity injuries require careful attention to neurovascular and bony injuries. Furthermore, in cases such as ours which involve muscle and soft tissue injury only, repair of fascial wounds can be performed primarily or with adjuncts; however, if the patient is at risk for compartment syndrome one should consider fasciotomy. Lastly, all impalement wounds revolve around a foreign body and infection prophylaxis is indicated along with either loose reapproximation in primary closure, secondary, or delayed closure.

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