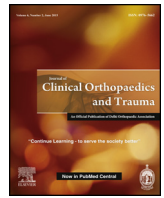




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Case report

The importance of pelvic ring stabilization as a life-saving measure in pre-hospital – A case report commented by autopsy

Carlos Durão^{a,b,*}, Magda Alves^b, André Barros^b, Frederico Pedrosa^a

^a National Institute of Legal Medicine and Forensic Sciences, Portugal

^b Hospital Vila Franca de Xira, Portugal

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ABSTRACT

Hip fractures with unstable pelvic ring have great morbidity and mortality rates. These fractures result from high energy trauma such as falls from heights, road accidents and collapsing structures or other similar mechanisms of action. We report the case of a 63 years old man, construction worker, who stood inside a ditch during a wall construction when he was surprised by this collapse, which resulted in direct trauma to the right thigh and pelvis. The autopsy revealed diaphysis fracture of the right femur with an open book pelvic fracture with severe hemorrhagic infiltration and hematoma of the pelvic muscles without arterial injury. Bone bleeding and the vascular damage associated with disruption of the sacroiliac ligaments promote a very significant bleeding. Simple maneuvers such as sheet circumferential compression to promote pelvic ring closure are effective on stabilizing and closure of the sacroiliac joint. Hip manipulation of the fracture was performed during the necropsy to demonstrate and prove how a simple sheet contention can promote stabilization of the pelvic ring by closing the sacroiliac joints in open book fractures.

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1. Introduction

Almost 3% of all skeletal fractures are pelvic ring disruptions,¹ and these are frequently associated with high morbidity and mortality (reports from 20% to 80% death rates).² These fractures result from high energy trauma such as falls from heights, road accidents and collapsing structures or other similar high kinetic action mechanisms.³ Pelvic fractures resulting from these scenarios are often associated with abdominal, pelvic or chest injuries. Vascular lesions and consequent blood loss are the fiercest complications. Hemodynamic instability and hypovolemic shock due to difficulty in containing these hemorrhages into the pelvic cavity can rapidly lead to death. Hemorrhagic shock is the most common cause of death in the first 24 h.⁴ This is the main reason why these lesions should be early diagnosed and stabilized in the pre-hospital setting. A wide variety of pelvic binders together with pelvic sheets is available and offer an adjunct to the initial management of trauma patients with pelvic fractures. These devices are referred to as pelvic circumferential compression devices (PCCDs). The main goal is to achieve fracture stability and

regain intrapelvic pressure, which can reduce hemodynamic compromise.

2. Case report

We report a case of a 63-year-old construction worker, who was working inside a ditch in a standing position. There was 20 cm depth concrete wall on his right side which suddenly collapsed (Fig. 1) with direct impact over its right side torso and lower limb. The victim got trapped in the debris but was promptly removed by its non-medically trained co-workers. According to their reports, immediately after the accident the patient was conscious and well-oriented, breathing spontaneously and with no external signs of massive hemorrhage. The emergency team was called and arrived on site in fifteen minutes. At its arrival, the patient was still well oriented, with a normal breathing rate and apparent circulatory integrity (BP of 110/72 mmHg and 93 bpm; and well perfused extremities). He was complaining of pain on his right pelvis and thigh – areas with large bruises and hematomas but no external considerable hemorrhage; the right lower limb perfusion and neurologic status were intact. Over the course of one hour his blood pressure gradually decreased and cardiac rhythm raised, developing hemodynamic instability. There was no response to fluid reposition with Ringer lactate, and eventually ended in cardiac arrest; resuscitation maneuvers performed by the

* Corresponding author at: Hospital Vila Franca Xira, Estrada Nacional n° 1, Povos, 2600-009 Vila Franca de Xira, Lisboa, Portugal.

E-mail address: drcarlosdurao@hotmail.com (C. Durão).



Fig. 1. Death scene demonstrating wall collapse.

emergency team on the way to the hospital were unsuccessful. The death occurred just over an hour after the accident and was confirmed upon hospital arrival.

The autopsy revealed an open-book pelvic ring fracture (Young-Burgess lateral-compression type III, Tile type B1) with severe hemorrhagic infiltration and extensive hematoma of the pelvic muscles. There was no recognizable arterial injury – superior gluteal, pudenda, and common, external and internal iliac arteries were intact. The only identifiable hemorrhage sources were the venous and bone bleeding – which resulted in about 800 ml blood loss. No visceral lesions were observed. Noticeably, the patient presented a considerable perineal ecchymosis, as a translation of hemorrhage, typically associated with pelvic ring fractures – Destot sign (Fig. 2). The patient also suffered an oblique diaphyseal fracture of the right femur (AO 32-B1). Unequivocally, the determined cause of death was hemorrhagic shock.

3. Discussion

Pelvic ring fractures can be classified based on type of mechanical instability, according to Tile's classification⁵ (A: stable,

B: rotationally unstable, C: vertically and rotationally unstable); or based on the energy vector, according to Young and Bruggess classification⁶ – lateral compression types (LC), anterior-posterior types (AP), vertical shears (VS) and combined mechanism (CM).

Both classifications are ordered according to the injury severity, in tight relation to the fracture stability. While the pelvic ring lacks inherent bony stability, it is held together by a network of interosseous ligaments. The pubic symphysis is the weakest link of the structure, representing only about 15% of its stability. The posterior elements – sacroiliac, sacrospinous, and sacrotuberous ligaments – are the strongest, contributing to the vertical and anterior-posterior stability of the pelvis. These findings correlate with blood transfusion and total fluid resuscitation requirements.⁷ During the necropsy, pelvic manipulation was performed, and the mechanism of lesion was clearly traceable, as described by the Young and Bruggess classification. In these lateral compression type III lesions, the first anterior-lateral impact causes the rupture of the anterior hemi-pelvis, and continued force application is transmitted to the posterior sacroiliac complex – the pelvic ring becomes disrupted in two points, and opens, hence the name “open-book fracture”.

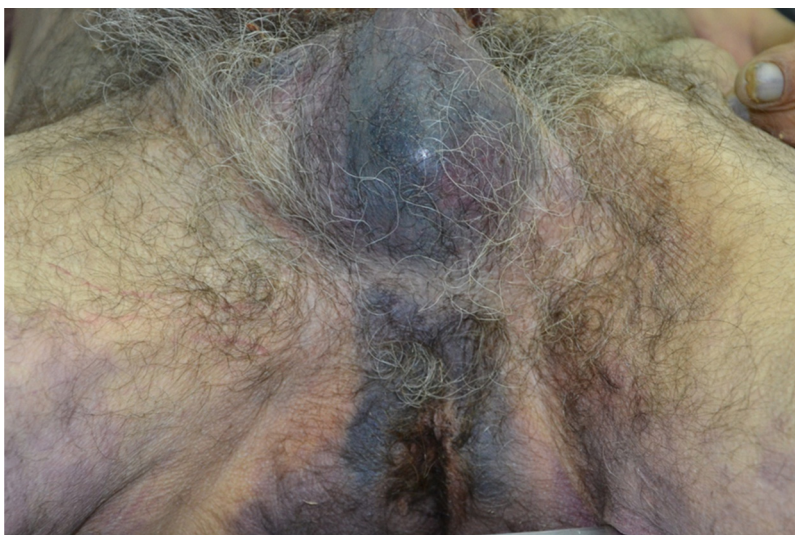


Fig. 2. Perineal ecchymosis (*Destot signal*) as a translation of hemorrhage and associated pelvic fractures.

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