Unexpected outcome (positive or negative) including adverse drug reactions

How to survive an 11-storey fall

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Summary

Survival from a high fall is rarely possible. We report an unusual case of a patient who fell over 100 ft on to boggy ground and survived. A successful outcome was achieved by the use of aggressive blood product resuscitation and the early application of a pelvic fixator.

BACKGROUND

Injury from a high fall is frequently fatal and, thus, an unexpected survivor deserves an analysis to learn what contributed to a successful outcome. We have specifically focused on the emerging evidence around haemostatic resuscitation.

CASE PRESENTATION

A 22-year-old man was witnessed to fall from the 11th floor of a multi-storey tower block (approximately 100 ft) landing on boggy ground. Primary survey identified an intact airway, hypoxaemia (spontaneous respiratory rate 34, SpO₂ of 80% on 15 litre O₂) with bilaterally reduced air entry and

Figure 1 Pelvic x-ray showing fractures through the right sacral ala and through the superior ramus of the left pubic bone with marked separation at the symphysis pubis.

cardiovascular instability (pulse 121 bpm, blood pressure 81/56 mm Hg). Temperature was 34.1 °C. Pupils were both equal and reactive to light, his Glasgow Coma Scale (GCS) was 13 (E3, M6, V4) while moving all four limbs. His abdomen was tender with a 13 cm perineal tear.

Radiologically, his C-spine was unremarkable; his chest film identified a right 7th rib fracture, a right haemopneumothorax and a pneumopericardium. Pelvic radiograph (figure 1) demonstrated a fracture through the right sacral ala and left pubic bone, with a further fracture through the pubic body associated with separation at the symphysis pubis, consistent with a vertical shear configuration type fracture.

His hypoxaemia improved with intubation and right-sided chest drain, which confirmed a haemopneumothorax. His cardiovascular instability deteriorated with the loss of a central pulse. Spontaneous circulation was restored following 1 min of cardiopulmonary resuscitation, adrenaline and a massive transfusion (15 packed red cells, 8 fresh frozen plasma (FFP), 1 pool platelets and 2 cryoprecipitate). An external fixator was applied in the emergency department. Following these interventions, he regained haemodynamic stability and underwent CT scanning of the head, neck, chest, abdomen and pelvis.

INVESTIGATIONS

In addition to the injuries already noted, CT demonstrated a substantial retroperitoneal haematoma with free intraperitoneal fluid with intact solid organs. There was a proximal urethral injury associated with the pubic ramus fracture and blood tracking into the left thigh suspicious of a bladder injury. In addition, there were fractures of the right transverse processes of L3, L4 and L5.

TREATMENT

Following resuscitation there were no further periods of haemodynamic instability; thus, he was transferred to intensive care. Eight hours later a laparoscopy was performed to assess the free intraperitoneal fluid, which was identified as haematuria. Following conversion to laparotomy a massive retroperitoneal haematoma, bladder and urethral injury was found requiring primary repair and the fashioning of a suprapubic catheter. As there was no evidence of ongoing haemodynamic compromise due to pelvic haemorrhage, no further treatment of the pelvic fracture was deemed necessary.

OUTCOME AND FOLLOW-UP

His postoperative course was complicated by acute respiratory distress syndrome, a persisting bronchopleural fistulae and rhabdomyolysis. He required 24 days of intensive care, prolonged ventilation, haemofiltration and further blood products—no further operative intervention was required. The pelvic fixator was removed after 8 weeks and he was discharged on day 73 neurologically intact.

DISCUSSION

The three main factors in determining outcome following a fall from a height are the distance fallen, the surface struck and the presence of neurological injury.¹ In the literature, survival following falls of greater than 40 ft are rare as the energy transfer involved is massive.¹ A fall greater than five

storeys is usually considered fatal, although which body region collides with the ground first contributes to prognosis.¹

We report an unusual case of a patient who fell over 100 ft, on to boggy ground, limbs first sustaining limb and pelvic trauma while, crucially, remaining neurologically intact.¹ His New Injury Severity Score was 50 (chest 5, pelvis 3 and abdomen 4), Revised Trauma Score 6.817 and percentage predicted survival using Trauma and Injury Severity Score methodology 70.8%. His outcome is related to several factors: his physiological reserve and the prompt resuscitation.

Hindering the resuscitation of trauma patients is the derangement of physiology seen in major injury often referred to as 'the lethal triad'—acidosis, hypothermia and coagulopathy.² In this case, the patient presented with hydrogen ions 110, temperature 34.1 °C, and prothrombin time 1.11 (1.55 post massive transfusion). Successful management involves prompt restoration of circulating volume and controlling further haemorrhage; in this case, by the early application of his external pelvic fixator in the emergency department.

Focusing on blood product resuscitation, current opinion is undergoing a paradigm shift in what constitutes appropriate management. Administration of packed red cells is often prompt, but the slow use of non-red cell components to maintain a 'normal' clotting cascade has been lacking. Previous guidelines used a prothrombin ratio >1.5 to trigger the use of FFP.³ This has been found inadequate as laboratory testing can take 20 min and FFP defrosting 25 min.³ Thus, a trauma patient's clotting profile may differ from when a sample is taken to when FFP is finally administered.

There is now emerging evidence from several large retrospective series, using military resuscitation guidelines, that using increased FFP from the outset reduces mortality with additional benefit in using the ratio of 1:1 packed red cells:FFP.⁴ Civilian practice, as yet, cannot fully embrace such resuscitation practice as the system for issuing blood has yet to allow for the dynamic pace of trauma resuscitation; hence, our ratio is only 1.1.8. As the evidence base expands, this may change.

However, haemostatic resuscitation is not without risk and level I evidence is still lacking in identifying its exact benefit and use. Fundamentally, what is required is a better real time assessment of a patient's clotting profile enabling a more patient-specific approach.

Learning points

- Survival from a high fall is rarely possible but in this case is helped by the patient landing on his lower limbs and boggy ground without sustaining a serious head injury (presenting GCS of 13: E3, M6, V4).
- A successful outcome was achieved by the use of aggressive blood product resuscitation and the early application of a pelvic fixator.
- The precise role of blood product resuscitation in blunt trauma is unclear and requires clarification.

Competing interests None.

Patient consent Obtained.

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