CASE REPORT

The need to immobilise the cervical spine during cardiopulmonary resuscitation and electric shock administration in out-of-hospital cardiac arrest

Milene Desroziers,[1] Sophie Mole,[1] Daniel Jost,[1,2] Jean-Pierre Tourtier[1]

[1]Prehospital Emergency Department, Paris Fire Brigade, Paris, France
[2]Sudden Death Expertise Center, Paris, France

Correspondence to
Dr Daniel Jost,
daniel.jost@pompiersparis.fr

Accepted 30 May 2016

SUMMARY

In cases of out-of hospital cardiac arrest (OHCA), falling to the ground can cause brain and neck trauma to the patient. We present a case of a man in his mid-60s who suffered from an OHCA resulting in a violent collapse. The patient received immediate cardiopulmonary resuscitation, but his spine was immobilised only after a large frontal haematoma was found. The resuscitation efforts resulted in return of spontaneous circulation and discharge from hospital. After this, doctors performed angioplasty, followed by a cardiopulmonary bypass. Later, CT scan examination reported a displaced and unstable fracture of the 6th vertebra without bone marrow involvement. The patient underwent a second operation. 40 days later, he was able to return home without sequela. This case shows the importance of analysing the circumstances of a fall, considering the possibility of two concomitant diagnoses and prioritising investigations and treatment.

BACKGROUND

Taking care of an out-of-hospital cardiac arrest (OHCA) patient after he or she has fallen from standing height requires adequate immobilisation of the cervical spine to avoid iatrogenic trauma due to neck handling. The National Institute for Health and Care Excellence defines a dangerous mechanism of injury as that involving a fall from a height >1 m or five stairs.[1] Only abrasions and bruising of the face may be apparent, however, the transmitted hyperextension force gives rise to injuries of the vertebral column and spinal cord. Missed diagnoses can have devastating consequences.[2]

CASE PRESENTATION

We report a case of a man in his mid-60s, a victim of OHCA, with a secondary cervical spine injury. Chest compressions were begun 5 min after collapse. The emergency medical service (EMS) automatic external defibrillator (AED) delivered two successive shocks. The patient recovered spontaneous circulation a few minutes after the emergency physician arrived, around 10 min after his first collapse. The bystander did not report any traumatic circumstance, except the fall from standing height. The first EMS team (fire fighters) did not immediately apply neck protection. After the arrival of the emergency medical team, a voluminous left periorbital haematoma was found, leading the team to immobilise the cervical spine before intubation.

INVESTIGATIONS

Initial electrocardiogram reported coronary artery lesions, which required immediate coronarography. This showed a left anterior descending artery partial obstruction. Ultrasound reported an ejection fraction of the left ventricle around 10%. Meanwhile, CT focusing on the cervical spine showed an unstable fracture of the 6th vertebra with 120° angulation. The medullary canal reduction was lower than 50%, and with no intracranial haematoma.

DIFFERENTIAL DIAGNOSIS

The main difficulty was in evaluating if the spinal injury was the cause of the cardiac arrest or if the spinal injury was the consequence of the patient's fall from standing height. Individuals who fall onto their face can also suffer 'central cord syndrome', which is characterised by bladder dysfunction, variable sensory loss and greater motor impairment in the arms than in the legs.

TREATMENT

The patient needed a cardiopulmonary bypass on the first day and cervical osteosynthesis on the 10th day after his initial accident (figure 1).

OUTCOME AND FOLLOW-UP

The patient regained consciousness on the second day in the intensive care unit (ICU). After 40 days, he managed to walk from the ICU, on his own two feet, to a physical rehabilitation department. One month after his return home, the patient passed away due to a new heart attack.

DISCUSSION

The final diagnosis for this patient's cardiac arrest was a paroxystic cardiac rhythm disorder due to coronary heart disease. Taking into account the kinetics of a trauma remains fundamental to appreciate its severity and to adapt the treatment. A fall from standing height even with low impact has a high risk of intracranial bruising, especially when it follows a convulsion.[2] Acute death due to hyperextension injury of the cervical spine, caused by slipping and falling onto the face, has occurred due to elevated blood alcohol levels, which reduce the victim's ability to protect himself during a fall.[3] A series of medicolegal autopsies reported association of cervical with spinal injury in 9.2% of patients with cranial trauma due to a fall from standing height.[4] In fact, syncope does not leave

To cite: Desroziers M, Mole S, Jost D, *et al*. *BMJ Case Rep* Published online: [*please include* Day Month Year] doi:10.1136/bcr-2016-214659

Figure 1 The CT focusing on the cervical rachis showed a 6th vertebral unstable body fracture with a 120° angulation. The medullary canal reduction was lower than 50%, and with no intracranial haematoma. Osteosynthesis found place on the 10th day after the cardiac arrest.

the patient time to protect himself from a cervical injury,[3] so even low kinetics can engender dramatic spinal lesions. In this case, the association with osteoarthritis worsened the lesion. The major risk was indeed the AED shocks, which could shake the patient's head and move a prior unstable fracture. The precocity of cervical immobilisation remains a lifesaving key; a neck brace has to be placed when cardiopulmonary resuscitation begins. Even if a patient is already in cardiac arrest, precautions against possible spinal trauma can avoid iatrogenic manipulations and totally change patient outcome. Ultimately, if the arrest is not treated, then spine immobilisation becomes a moot point.

Learning points

- This case alerts physicians to the possibility of significant cervical injury following falls from standing height in case of out-of hospital cardiac arrest.
- Unexpected physical signs must lead to suspicion of an associated diagnosis and to initiate appropriate investigations.
- Two concomitant diagnoses lead to reconsidering the correct order of investigation and treatment.

Acknowledgements The authors thank Martial Jost for his contribution to improving the quality of the paper.

Contributors MD treated the patient at the scene. SM and DJ wrote the paper. J-PT supervised the paper.

Competing interests None declared.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

1 Lecky F, Agarwal M, Green B, *et al*. *Head injury: triage, assessment, investigation and early management of head injury in children, young people and adults*. London: National Clinical Guideline Centre (UK), 2014.
2 Clayton JL, Harris MB, Weintraub SJ, *et al*. Risk factors for cervical spine injury. *Injury* 2012;43:431–5.
3 Davidson JS, Birdsell DC. Cervical spine injury in patients with facial skeletal trauma. *J Trauma* 1989;29:1276–8.
4 Turnham HL, Eve R. Cervical spine injury resulting from low impact fall following cardiac arrest. *Resuscitation* 2012;83:e229.