EMERGENCY CASEBOOK

Fractures of the atlas: can we rely on the NICE guidelines for imaging the cervical spine after head injury?

B Barry, G George, H Oag, B Shafighian

Emerg Med J 2006;23:e52 (<http://www.emjonline.com/cgi/content/full/23/9/e52>). doi: 10.1136/emj.2006.038257

We describe a patient who was not thought to fulfil the NICE criteria for imaging the cervical spine after head injury but who had two fractures of the atlas, thus rendering the vertebral ring unstable. The reasons for missing this injury in the emergency department are discussed.

A 26 year old female patient was brought to the emergency department (ED) by ambulance. She was the driver of a car in a road traffic accident. She had lost control of her car on a dual carriageway, possibly on ice. The vehicle had left the road and had skimmed along a ditch; it had not rolled or collided with any other vehicle. The airbags had deployed. The patient was unable to remember the accident, implying that she had suffered a mild head injury. When the ambulance crew arrived on the scene, she was walking along the side of the road. On arrival in hospital, her Glasgow coma score (GCS) was 15/15. She was not intoxicated and there were no significant injuries apart from the history of amnesia for the impact. She had delayed onset of neck pain but no cervical midline tenderness. She initially had a full range of neck movement. She was admitted to hospital, mainly for social reasons: she was "out of area" and her partner had been admitted with a hand injury. While on the ward, her neck pain increased and she began to experience significant difficulty in moving her neck. There was cervical tenderness, but not in the midline. The trauma

consultant requested *x* rays and a fracture of the atlas was diagnosed (fig 1A). A subsequent CT scan showed two fractures of the vertebral ring (fig 1B). A re-formatted image shows the anterior fracture (fig 1C). The patient subsequently had an MRI scan to exclude damage to the transverse ligament. She was immobilised in a Philadelphia collar.

DISCUSSION

The NICE algorithm for cervical spine imaging after head injury (Clinical Guideline 4, Head Injury, June 2003)¹ states that if the GCS is 15/15 at the time of the assessment, if there is no focal neurological deficit, and no paraesthesiae in the extremities, patients should be assessed for neck pain and tenderness. If a patient does have neck pain, as in the case reported here, he/she should have cervical spine imaging if aged more than 65 years or if there was a dangerous mechanism. Dangerous mechanism in adults is specifically defined as: a fall from a height of more than 1 m or five stairs; an axial load to the head, for example, when diving; a high speed motor vehicle collision greater than 65 mph; a rollover motor accident; ejection from a motor vehicle; an accident involving motorised recreational vehicles; or a bicycle collision. In our case, the vehicle speed was unknown, as is often the case. At the time, the ED senior house officer did not suspect a dangerous mechanism (as defined above) and she proceeded to check for the presence of low risk criteria. According to the NICE algorithm, the presence of any one of the following enables safe assessment of the range of motion: simple rear-end shunt; sitting position in the ED;

Figure 1 (A) Lateral radiograph of the upper cervical spine showing a fracture through the lamina of the atlas. A second fracture through the arch of the atlas is less obvious. (B) Axial CT showing fractures through the right lamina and arch of the atlas. (C) Re-formatted image showing the fracture through the arch of the atlas.

ambulatory at any time since the injury; delayed onset of neck pain; or absence of midline cervical spine tenderness. Our patient had walked at the scene, and there was no midline cervical spine tenderness. Furthermore, she was able to move her neck adequately, thus obviating the requirement for imaging, according to the algorithm.

The NICE publication (Clinical Guideline 4) does not cite references but states "This guidance represents the view of the Institute, which was arrived at after careful consideration of the evidence available". However, it is identical with the Canadian C-spine rule for radiography in alert and stable trauma patients.² The Canadian rule is mathematically based and "dangerous mechanism" was found to be the most powerful factor predicting significant cervical spine injury. The second most powerful predictor was "age more than 65 years". If dangerous mechanism is excluded (whether appropriately or inappropriately), reliance is then placed on the presence of any one of the low risk criteria, some of which were weak predictors of outcome. For instance, according to the original data in table 2 of the Canadian paper,² 44.4% of patients with a significant cervical spine injury had walked after the injury, whereas 68% patients with no cervical spine injury had done so, odds ratio 1.0 (0.7 to 1.5)² (table 4). It is therefore self evident that ambulation is not a reliable clinical discriminator. With respect to delayed onset of neck pain, the mean time to onset of pain in the injured group was 16 min and in the uninjured group it was 38 min. Midline tenderness was a more useful indicator (but is not infallible³) and was present in 86.1% of patients with significant injury and in 57.3% of patients without significant injury. The danger is that inexperienced doctors, attempting to follow the rule, might place too much reliance on the presence of one or more of the low risk criteria. The hierarchical design of the algorithm means that this is a particular hazard when the mechanism of injury is uncertain. We therefore recommend that there should be a very low threshold for assuming a dangerous mechanism. Alternatively, in cases where there is

no history of head injury, the British guidelines,⁴ which do not depend on mechanism of injury, should be consulted.

CONTRIBUTORS

Grizelda George wrote the paper, assisted by the other authors. Hannah Oag saw the patient at presentation in the ED. The patient was admitted under the care of Bijan Shafighian, consultant trauma surgeon, and scanned by Brendan Barry, consultant radiologist.

ACKNOWLEDGEMENTS

We should like to thank Bryan Todd for criticising the manuscript.

Authors' affiliations

B Barry, G George, H Oag, B Shafighian, Horton Hospital, Oxford Radcliffe Hospitals NHS Trust, Banbury, Oxon, OX16 9AL, UK

Competing interests: none declared

Informed consent was obtained for publication of the person's details in this report

Correspondence to: Grizelda George, Emergency Department, Horton Hospital, Oxford Radcliffe Hospitals NHS Trust, Banbury, Oxon, OX16 9AL, UK; grizelda.george@orh.nhs.uk

Accepted for publication 10 May 2006

REFERENCES

- 1 **National Institute for Clinical Excellence**. Selection of patients for imaging of the cervical spine. In: *Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults*. Clinical Guideline 4. London: NICE, June 2003.
- 2 **Stiell IG**, Wells GA, Vandemheen KL, *et al*. The Canadian cervical spine radiography rule for alert and stable trauma patients. *JAMA* 2001;**286**:1841–8.
- 3 **D'Costa H**, George G, Parry M, *et al*. Pitfalls in the clinical diagnosis of vertebral fractures: a case series in which posterior midline tenderness was absent. *Emerg Med J* 2005;**22**:330–2.
- 4 **Oakley P**, Brohi K, Wilson A, *et al*. Guidelines for the initial management and assessment of spinal injury. British Trauma Society 2002. *Injury* 2003;**34**:405–25.