Rotation of the head — a hazardous procedure in the injured patient

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Summary
Rotation of the head and neck in patients with upper cervical spinal injury may precipitate spinal cord damage. Turning the head to obtain lateral skull radiographs is contraindicated in the injured patient. Two cases in which spinal cord injury occurred as a result of this procedure are presented. The hazards of such rotation are emphasized, and the diagnostic advantages of the horizontal-beam lateral skull radiograph are discussed.

In the emergency management of the injured there are few situations more critical than the assessment of patients with suspected spinal injury. Careless handling during transportation to hospital or during initial examination could precipitate permanent spinal cord damage. At present there is no effective treatment which will reverse such a condition, and simple first-aid measures to prevent the onset of spinal cord damage or aggravation of existing injury are therefore of more value than the most sophisticated medical treatment after paralysis has developed.

The frequency of painful neck injuries without spinal cord involvement may lull the doctor into a sense of false security, since 60% of patients with cervical spine fractures escape initial spinal cord injury.1 Patients with torn ligaments, disrupted intervertebral discs or fractured or dislocated articular facets have unstable spines. Because of this, a high index of clinical suspicion of spinal injury is essential. In a recent review of 300 patients with acute cervical spinal injury, Bohlman2 found there was a delay in the diagnosis of spinal injury in one-third of the patients.

Delay in the diagnosis of spinal injury is, in our experience, frequently due to inadequate demonstration of the lower cervical spine and failure to radiograph the cervical spine after trauma to the head.3,4 However, a particularly dangerous manoeuvre is rotation of the head to obtain a lateral skull radiograph in the patient with head and/or spinal injury, especially if the level of consciousness is decreased.

Two case histories (one of which has been briefly reported)5 which emphasize some important criteria for the handling and radiography of the injured patient are presented.

Case reports
Case 1
A young man was injured in a road accident. On arrival at hospital he was conscious, talking and showed no evidence of neurological deficit suggestive of spinal cord damage. On clinical examination there was a laceration on the left temporal region, and fractures of the left femur and humerus were suspected. The patient complained of neck pain, and radiographs of the cervical spine, skull and affected limbs were therefore requested. The patient, who had by then become restless, was transferred to the X-ray department without immobilization of the head or neck. All the required radiographs were obtained with the patient in the supine position. Subsequently respiration ceased and he was immediately intubated, remaining thereafter on assisted ventilation. Further examination showed that the respiratory arrest was due to complete tetraplegia. The patient remained paralysed until his death 10 days later. Extensive softening of the upper cervical spinal cord but no cerebral injury was demonstrated post mortem. Unfortunately detailed dissection of the upper cervical spine for ligamentous damage was not performed.

The supine lateral skull radiograph in this case was obtained by rotating the head to one side (Fig. 1). The axis and lower cervical spine are not seen in the true lateral projection as would be the case had the head been maintained in the 'brow up' position for a horizontal-beam lateral view. The lateral radiograph of the cervical spine demonstrates marked prevertebral soft-tissue swelling in relation to the atlas and axis (Fig. 2). After skull traction had been applied an abnormal increase in the distance between the base of skull and the atlas was evident, indicating atlanto-occipital subluxation (Fig. 3).

Case 2
A 14-year-old girl fell from a train, sustaining scalp lacerations. On arrival at a small country hospital she was conscious and talking, showing no signs of neurological deficit. Radiographs of the skull were requested but showed no evidence of fracture. Next day she was unable to move her limbs and on clinical examination was found to be tetraplegic with spinal cord

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Fig. 1. Case 1. Lateral skull radiograph obtained by rotating the head, evident from the obliquity of the axis and lower cervical spine.

Fig. 2. Lateral cervical spine radiograph after supine skull traction, demonstrating increased base of skull to atlas distance with atlanto-occipital subluxation.

Fig. 3. Lateral cervical spine radiograph after skull traction, demonstrating marked prevertebral soft-tissue swelling with atlanto-occipital subluxation.
Fig. 2. Case 1. Marked widening of the retropharyngeal soft-tissue space is evident.

Fig. 3. Case 1. There is abnormal separation (arrowed) between the base of the skull and the atlas.

Fig. 4. Case 2. Lateral skull radiograph obtained by rotating the head, evident from the obliquity of the axis and lower cervical spine.

injury at the C4/C5 level. Cervical spine radiographs (of poor diagnostic quality) revealed anterior subluxation of C3 on C4 suggestive of flexion trauma. Review of the lateral skull radiograph (Fig. 4) indicated that this had been obtained by rotating the head to one side, as is evident from the appearance of the upper cervical spine.

Discussion

Upper cervical spinal injuries are likely to occur in conjunction with trauma to the head. In an analysis of acute cervical spinal injuries, 50% of patients showed evidence of concurrent head trauma. The atlas and axis with the occipital condyles act as a unit which is functionally, embryologically and anatomically distinct from the lower cervical spine. Fractures of the upper cervical spine seldom cause neurological deficit, because the diameter of the cervical spinal canal is widest at the C1-C2 level; this is also the point at which the canal-to-cord area ratio reaches its maximum.

Because of the absence of neurological damage, a fracture of the upper cervical spine is more likely to be overlooked if the patient's level of consciousness is lowered. In this instance the head and neck must be treated as one unit, particularly if there is evidence of scalp or facial injury. If the patient complains of neck pain, immobilization by halter traction or sandbags is essential until cervical spinal injury has been excluded.

Radiographic examination of the supine patient with suspected head or cervical spinal injury must be carried out with the patient's head and neck remaining in the neutral position; the horizontal-beam lateral view is therefore used for both the skull and cervical spine. This projection allows for inspection of the prevertebral soft-tissue space (Fig. 5). An increase in the diameter of the space may be the only indication of an unsuspected upper cervical injury.

Lateral views of the skull obtained by turning the head onto the side are not contraindicated if the patient is being radiographed for a non-traumatic condition, but this procedure is unsafe in the injured patient. The rotation of the head and neck may cause spinal cord compression if there is a fracture of the odontoid peg, a ruptured transverse ligament of the atlas, or atlanto-axial subluxation. Rotation of the atlas on the axis beyond the physiological range of movement has been shown to produce reduction of blood flow in the contralateral vertebral
artery, compression of the anterior aspect of the dural sac due to protrusion of the odontoid tip, rupture of the cervical discs and widening of the atlanto-axial articulations. Because rotation of the skull occurs at the atlanto-axial joints and not at the atlanto-occipital joints as is sometimes thought, a prone lateral skull view provides true lateral projection of the skull and atlas only; visualization of the axis and the remaining cervical vertebrae is obliquely distorted (Fig. 6). As a result of this, radiological diagnosis of fractures or displacement of the axis is virtually impossible. In addition, the oropharynx is not seen in the lateral projection, and soft-tissue swelling as an indication of prevertebral haematoma therefore cannot be assessed.

REFERENCES


Toxic shock syndrome in a 6-year-old girl

A case report and review

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Summary

A retrospectively diagnosed case of toxic shock syndrome in a 6-year-old girl is described. This recently described disease, which occurs mostly in menstruating women, is characterized by fever, hypotension, a rash and multi-organ dysfunction. Evidence as to the role of a *Staphylococcus aureus* exotoxin in the aetiology of the disease is presented, and the diagnosis and treatment are discussed.

Toxic shock syndrome (TSS) was first described in 1978 in 7 children aged between 8 and 17 years. It became recognized as an important disease only in 1980 when several cases in menstruating women were reported. The purpose of this article is to report what in retrospect is believed to be a case of TSS in a child seen in Johannesburg, and to review current knowledge about this disorder.