Treatment of Jefferson fracture with a halo apparatus

Report of two cases

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Two patients with bursting fractures of the atlas vertebra are presented. The use of a halo apparatus as an effective alternative to bedrest and cervical traction in these patients is discussed. Polytomography was helpful in establishing an accurate diagnosis.

KEY WORDS • halo device • cervical spine injuries • atlas vertebra • Jefferson fracture

Bursting fractures of the atlas have traditionally required several weeks of bedrest, often with cervical traction, followed by ambulatory immobilization of the neck. In our experience this mode of therapy is uneconomical and poorly tolerated by the neurologically intact patient, especially if cervical traction is employed. The use of the halo apparatus for external splinting of other cervical spine injuries has significantly shortened hospitalization and enabled the patient to walk early. We are reporting the satisfactory results achieved when the halo device was used in the treatment of two patients with bursting fractures of the atlas vertebra.

Case Reports

Case 1

This 52-year-old school principal tripped during a basketball game, striking the vertex of his skull against a cement wall. He did not lose consciousness, but had immediate severe occipital pain and limitation of neck motion.

Examination. Musculoskeletal examination revealed marked tenderness and restricted motion of the neck, especially in rotation. Neurological examination was normal. Cervical spine films showed only a nondisplaced fracture that involved the posterior arch of C-I (Fig. 1 upper left). As the patient could not cooperate for an open-mouth odontoid view due to pain and neck stiffness, tomography was performed; it demonstrated a classical bursting fracture, or Jefferson fracture, of the atlas (Fig. 1 lower left).

Hospital Course. The usual therapy of bedrest with a soft cervical support was instituted, but the suboccipital pain remained intolerable despite intramuscular Valium and morphine. The day after admission, the application of Crutchfield tongs with 10 pounds of traction resulted in pain relief. One
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day later the patient became resistant to the idea of being confined; he turned on his side in the Stryker bed, climbed out of bed with his tongs attached, and ultimately required body restraints with further sedation. A trial of removing the cervical traction resulted in the return of severe suboccipital pain. Clinical and laboratory evaluation failed to indicate any cause for the agitated behavior other than the psychological stress of confinement. Seven days after admission a plaster jacket and halo device were applied. Within 48 hours the patient could walk, had returned to his normal mental state, and was discharged.

Follow-up Evaluation. The halo apparatus was removed after 9 weeks. Examination at this time showed restricted but pain-free motion of the neck, no neurological deficits, and no occipitoatlantoaxial instability demonstrable on dynamic cervical spine films. The patient was next seen 4 months after his injury and showed no evidence of pain or instability. Repeat tomography (Fig. 1 lower right) 6 months after the injury, revealed no change in the position of the fracture fragments. On last examination, 8 months after his accident, the patient was free of cervical pain and had nearly normal flexion and extension of his neck, but was limited to 30° of rotation.

Case 2

This 18-year-old man was involved in an automobile accident, sustaining a concussion, an open depressed skull fracture, a LeFort III...
facial fracture and a Jefferson fracture of the atlas (Fig. 2). Tracheostomy was required for airway maintenance and the skull fracture and facial fracture were attended to surgically during the first 24 hours. For the first postoperative week the patient was able to tolerate bedrest as the prescribed treatment for his C-1 fracture.

Because he was anxious to be up and about, a plaster jacket with halo was applied 14 days after his injury (Fig. 3). The halo was removed after 10 weeks. Examination at this time revealed pain-free but obviously limited motion of the neck and no neurological deficits. Dynamic cervical spine films at this time showed no instability. It was elected to place this vigorous young man in a four-poster brace for 3 months, which he is wearing now, prior to the beginning of physical therapy.

Discussion

Case 1 presented with the classical mechanisms of injury and symptomatology of a Jefferson fracture. The seriousness of the trauma to the patient in Case 2, however, precluded obtaining the details of his injury. Force applied to the vertex of the skull is distributed centrifugally upon the ring of the atlas, and if great enough, it results in fracture of this ring at its weaker points, vertebral grooves and anterior arch, with separation of the two lateral articular masses. Suboccipital pain and neck stiffness are widely reported as characteristic of high cervical fractures. Tomograms of the atlas in the anteroposterior projection were helpful in identifying the separation of the lateral masses from one another; standard open-mouth odontoid films were unobtainable due to associated injuries or lack of patient cooperation. These two cases demonstrate the necessity of performing tomograms if a posterior arch fracture of the atlas is present on plain films and satisfactory open-mouth odontoid views are not obtained.

Potentially unstable cervical fractures, such as a burst fracture of the atlas, have traditionally been managed by external splinting at bedrest while fusion occurs primarily, or by surgical fixation with fusion. With the Jefferson fracture, as with the hangman's fracture, surgical fusion is rarely necessary due to the usually excellent results obtained with immobilization at bedrest in
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these fractures. Early application of the halo apparatus was a preferable alternative to bedrest and skeletal traction for our two patients. Applying the halo is not difficult and complications of its use are few. Cervical stability was documented by dynamic spine x-ray films upon removal of the halo apparatus 9 to 10 weeks after application. Pain-free functional motion of the neck was achieved with physical therapy.

We feel that the use of the halo achieved satisfactory therapeutic results as well as the physical, emotional, and economic benefits of an early ability to walk for patients with burst fractures of the atlas. In general, the halo should be an effective and preferable alternative to cervical traction at bedrest for all neurologically intact patients with cervical spine injuries.

References


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