

Clinical Case of the Month

Cervical vertebral fracture: orthopaedic issues

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Case presentation

A 19-year-old man is injured in an automobile accident and is admitted to the spinal injury service 13 h later.

Examination reveals complete tetraplegia at C6 level, ASIA impairment scale A, according to the ASIA and IMSOP International Standards. There are no other injuries.

Radiographs and CT scan reveal a C7 fracture, with bone fragments within the vertebral canal (Figures 1 and 2).

Please discuss your management of this patient

First opinion

TEP Barros, MD

In a young patient with complete tetraplegia caused by a compression flexion (CF) fracture as presented in this case, halo traction in the emergency room is indicated. Axial traction for this kind of injury usually results in partial improvement of the alignment and is maintained until the patient has operative treatment.

In our service we would recommend for a well defined compressive lesion as is seen in the present case, an anterior approach with corpectomy of C7 and an autogenous iliac crest graft from C6 to T1 and plate fixation. We have been performing anterior plate fixation since 1976. In the postoperative period the patient requires a Philadelphia collar. Rehabilitation is started immediately after the surgery, without the necessity of prolonged bedrest.

Second opinion

JF Zigler, MD

It is often helpful to consider spinal trauma as consisting of two separate injuries: a mechanical injury potentially destabilizing the spinal column, and a neurological injury affecting the function of the spinal cord/or nerve roots. Treatment decisions should consider both aspects of the injury. Even if a patient has a complete cord injury, consideration must be given to the lowest functional nerve roots, and efforts made to maximize the potential for root recovery.

Surgery must be planned to minimize the number of levels which are instrumented and fused. Tetraplegic patients will depend heavily on available neck motion to operate wheelchairs and functional devices, and procedures that fuse long segments of the cervical spine should be avoided.



Figure 1 Sagittal image of the cervical spine showing C7 fracture

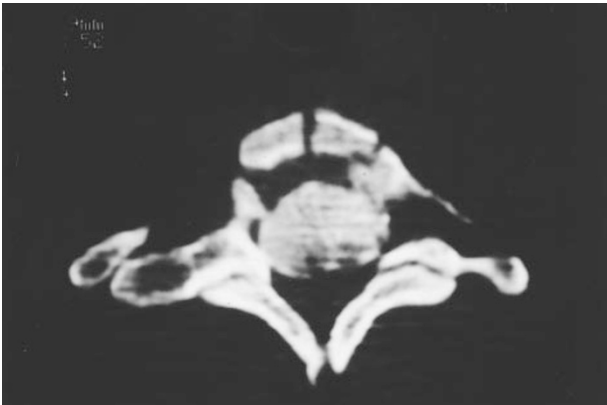


Figure 2 Axial CT showing canal compromise

In the management of this specific C7 CF5¹ fracture, we would recommend careful examination of the radiographs and CT scans to rule out laminar fractures above and below the level of injury. If the posterior elements of C6 and T1 were not fractured, we would recommend early posterior cervical fusion using single-strand interspinous wiring from C6 to T1, with autogenous iliac crest bone graft.² We would likely perform this procedure under local anaesthesia.³ The patient would start an aggressive rehabilitation program wearing a Philadelphia collar, from the first postoperative day, without the restriction of upper extremity range of motion and strengthening that would be necessary if he had been immobilized with a halo vest. The fusion rate with this technique approaches 100% at 12 weeks.

An anterior decompressive procedure would be considered if a compressive lesion were demonstrated on CT, MRI, or myelography. A C7 vertebrectomy for decompression would be done, using autogenous anterior iliac crest as a strut graft. The previously placed wire and fusion would serve as a tension band against which the bone graft could be solidly placed into the endplates of C6 and T1.

As demonstrated by Bohlman and associates,⁴ surgical decompression can increase the potential for root recovery in complete SCI.

Following surgery, the patient must have an intensive rehabilitation program stressing maximization of his functional abilities. A narrow early window of opportunity exists in the first few months after injury when the individual is highly motivated and needs to be taught the skills he will require for the rest of his life. Every effort should be made by his surgeon to allow maximal participation, without requirements for prolonged bedrest or restrictive orthoses.

References

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Third opinion

TJ Pentelenyi, MD

The patient is a 19 year-old man with a C7 fracture-dislocation with bone-fragments in the spinal canal, and a complete spinal cord lesion with symptomatology at the level C6 who was admitted to the spinal injury center 13 h after injury.

The injury was more than 8 h before admission, therefore neuroprotective methylprednisolone megadose treatment is contraindicated.

Operative treatment is indicated: by a ventral approach, removal of the fragmented C7 body and the discs above and below, removal of the bone fragments and pieces of torn discs from the spinal canal, decompression of the spinal cord and nerve roots, intraoperative reduction, cortico-fixation with titanium plate and screws. If proper documentation does not show ventral or posterior postoperative instability, an early rehabilitation program should be started.

Fourth opinion

RE Balderston, MD

This patient has sustained a Stage V flexion compression injury according to the classification of Allen and Ferguson. This fracture is highly unstable and the patient will develop a significant kyphosis if treated non-operatively.

Our current method of treatment of such a fracture would include closed reduction with Gardner-Wells long traction. Usually, 20 to 30 lbs of traction is all that is needed to improve the alignment of C6 on T1. The patient then requires an anterior corpectomy of C7 with plate fixation and iliac crest graft from C6–T1. The patient would not require a posterior operation and would probably require a Philadelphia collar for postoperative immobilization. Should the bone quality be poor or the patient be uncooperative, then a postoperative halo vest would be utilized.

Fifth opinion

WS El Masry, FRCS

Although this injury is unstable in the short term I am almost certain that with 6 weeks bed rest and traction followed by 6 weeks bracing in a Philadelphia collar, the fracture will become biomechanically stable.

There is clearly 50% canal encroachment and I understand that there is complete loss of motor power and complete loss of all sensory modalities at 13 h post injury.

I would manage this patient conservatively,¹ with 6 weeks of bed rest and 6 lbs traction: on extension followed by mobilization in a hard collar for a further period of about 6–8 weeks. At the end of this period I would perform dynamic views of the cervical spine in order to confirm stability or extend the period of bracing for 2–4 extra weeks. I would encourage the patient to do neck extension at about 10 weeks post injury onwards.

I base this treatment on the fact that this injury will become stable and that if he is neurologically truly complete he will have a 10% significant chance of neurological improvement if he falls into the Frankel B or C grade, the incidence of recovery will be higher.²

References

- 1 Frankel HL *et al*. 'The Value of Posterior Reduction in the Management of Closed Injuries of the Spine with Paraplegia and Tetraplegia'. *Paraplegia* 1969; **7**: 179–192.
- 2 El Masry WS, Katoh S. 'Neurological Outcome in Conservatively Treated Patients with Incomplete Closed Traumatic Spinal Cord Injury'. *Spine* 1996; **21**: 2345–2351.

Sixth opinion

PR Meyer Jr, MD, MM

Since 1972, 2473 cervical spine injuries have been managed by the Northwestern University's Acute Spine Center, representing all varieties of injury. Of all fracture patterns, the single most unstable injury pattern was the one with posterior retropulsion of superior vertebra on the next inferior vertebra as is presented in this case.

When managing the above fracture pattern, operative stability is most effectively gained by means of an anterior approach. Either an interbody discectomy and fusion above and below the fractured vertebra, or a corpectomy of the retrodisplaced vertebral body with an inlay autogenous bone graft, supplemented by an anterior (AO) plate and screw procedure is utilized for surgical decompression of the neural canal and spinal stabilization. Due to the fracture pattern, there is an increased potential for traumatic kyphosis to occur at the fracture site. Although posterior element surgery might appear more logical, this approach is not recommended due to the presence of significant fracture instability.

Occasionally, supplemental posterior surgery may be required, depending on the comfort level of the surgeon. Either way, postoperative orthotic immobilization in a halo vest is required (8–12 weeks).