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Atlantoaxial manual realignment in a patient with traumatic atlantoaxial joint disruption

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ABSTRACT

We report a patient with complex traumatic translatory atlantoaxial dislocation, who we treated by joint exposure and reduction of the dislocation by facet manipulation and subsequent plate and screw atlantoaxial fixation. A 28-year-old male had fallen 7.6 m (25 feet), and following the fall had severe neck pain but no neurological deficit. Investigations revealed a fracture at the base of the odontoid process and posterior displacement of the entire atlas over the axis, resulting in a translatory atlantoaxial dislocation. Head traction failed as he developed severe vertigo following its application. The patient was operated upon in a prone position. We opened the atlantoaxial joint and realigned the facets using distraction and manipulation techniques and secured the joint using a plate and screw interarticular method. The patient tolerated the treatment well and was symptom-free after 28 months. Postoperative images showed good craniovertebral alignment. Although technically challenging, direct manipulation of the facets of the atlas and axis can result in excellent craniovertebral realignment.

1. Introduction

Traumatic atlantoaxial dislocation can sometimes pose a therapeutic challenge due to the complexity of atlantoaxial misalignment. We report a patient who developed a translatory atlantoaxial dislocation following trauma. As the patient was neurologically intact this posed an additional therapeutic challenge.

2. Case report

A 28-year-old male fell 7.6 m (25 feet) while trekking in a mountain range. He was brought to the hospital with a cervical collar in an air ambulance. Investigations revealed a Type 2 odontoid fracture and posterior and left lateral translation of the atlas over the axis. The facets of the atlas and axis were not aligned, and their articular surfaces were no longer in direct contact with each other (Fig. 1). Aside from neck pain, the patient had no other symptoms. Neurological examination did not reveal any deficit. Cervical traction was attempted but the patient developed severe vertigo following its application and the procedure was subsequently abandoned.

The patient was placed in a prone position for surgery. As he did not tolerate traction, Gardner Wells tongs were positioned but the weights were not applied. We used the same basic surgical methods as discussed previously,[1] and summarized here.

The atlantoaxial region was exposed and the dissection was extended laterally until the atlantoaxial joints on both sides were widely visualized. The C2 ganglion was sectioned to enhance the exposure. The posteriorly displaced atlas facets were identified. By extending the dissection on the undersurface of the facet of the atlas, the facet of the axis was exposed. At this stage, the traction weights (5 kg) were applied. Although the injury appeared unstable on imaging, and suggested that direct physical pressure over the posterior elements could reduce the dislocation, the bone elements needed considerable direct facetal manipulation for realignment. Traction assisted in partially realigning and distracting the facets. The facets of the atlas and axis were directly and manually distracted and realigned using an appropriately sized osteotome placed with its flat end into the joint and then turned 90°. Bone graft pieces were packed into the distracted joint. Plate and screw fixation was then performed. The C1 screws were inserted first and tightened. The C2 screw was then tightened to reduce the misalignment as described for the reduction of spondylolisthesis.[2,3]

The patient tolerated surgery well. Post-operative images showed satisfactory realignment of the atlantoaxial joints (Fig. 2). At the 28-month follow-up, the patient was asymptomatic. After questioning, the patient noticed he had a patch of numbness in the suboccipital region.

3. Discussion

We previously described a lateral mass plate and screw method of atlantoaxial fixation.[1] The procedure involved directly exposing

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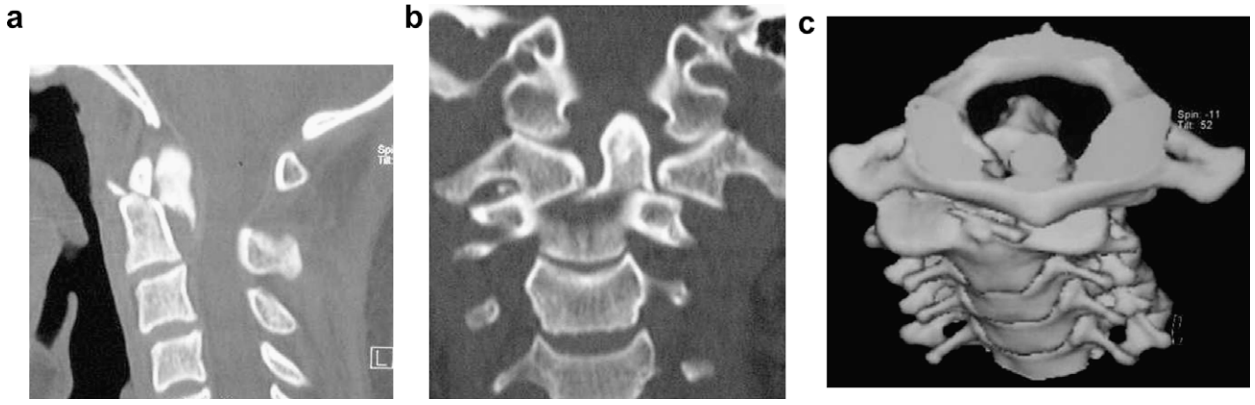

Fig. 1. (a) Sagittal CT scan showing a Type 2 fracture of the odontoid process. The body of the axis is dislocated anteriorly in relation to the fractured odontoid segment. (b) Coronal CT scan showing the lateral and posterior translatory dislocation of the atlas over the axis. (c) Three dimensional CT scan showing the posterior and left lateral translatory dislocation of the atlas over the axis. The articular surfaces of the atlas and axis are not in direct alignment.

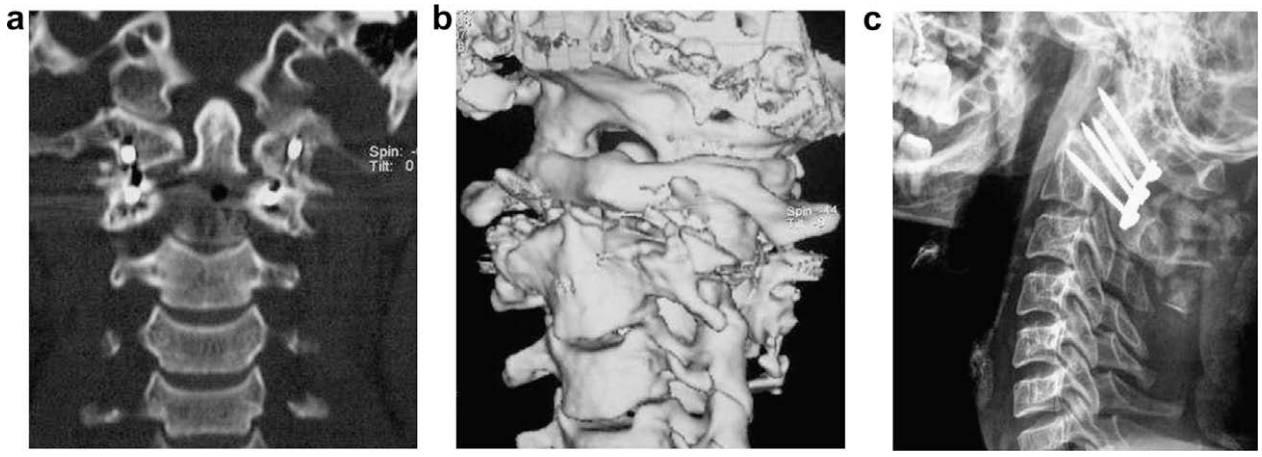

Fig. 2. (a) Postoperative coronal CT scan showing alignment of the facets of the atlas and axis and plate and screw fixation. (b) Three dimensional CT scan showing the aligned atlas and axis and the fixation. (c) Lateral radiograph showing plate and screw fixation of the atlantoaxial articulation.

the joint, denuding its articular cartilage, packing bone graft within the joint and, subsequently, plate and screw fixation of the region by implanting screws into the lateral mass of the atlas and pars of the axis. We further modified these direct exposure and manipulation of the joint techniques to reduce basilar invagination and for irreducible atlantoaxial dislocation.[4–6] Over 21 years, our experience with exposure and manipulation of joints has exceeded 550 patients.

Our patient had a translatory atlantoaxial dislocation and the atlas and axis were misaligned following a fracture of the odontoid process. As the patient was neurologically intact, the entire management was more complex. The facets of the atlas and axis were directly manipulated using facetal distraction. Screw insertion and tightening were modified to reduce the translatory dislocation. A similar technique has been used for reduction of lumbosacral spondylolisthesis.[2,3] The screw in the atlas was tightened first. The subsequent tightening of the C2 screw over a taut plate assisted in further reducing the translatory dislocation.

The sequence of screw insertion and tightening was the reverse of the technique used for patients with irreducible atlantoaxial dislocation, where the atlas vertebra is dislocated anteriorly in relationship with the axis. Exposing the joint in our patient was relatively difficult due to the severe misalignment. The C2 root ganglion was sectioned to provide a wide surgical field and the entire manipulation procedure was performed under direct vision. We, and several other authors, have suggested that the procedure used to section the C2 ganglion does not result in any significant or disabling neurological symptoms or deficits.[1,4–6] Our criteria for a successful surgery and bone fusion of the region are: (i) sustained anatomical alignment; and (ii) the absence of evidence of instability on dynamic imaging 6 months after surgery. Using these criteria, the reduction of dislocation and craniovertebral realignment were successful in our patient.[1]

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