Odontoid anterior screw fixation

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Introduction

The surgical stabilization of an odontoid fracture may be done either using an anterior odontoid screw fixation or a posterior C1–C2 fusion. Anterior odontoid screw fixation has the advantages of preserving atlanto-axial motion and is minimally invasive in terms of the exposure and muscle damage. It is imperative that anatomical closed reduction of the fracture be achieved to consider anterior fixation.

Case description

The patient was a 35-year-old healthy male who presented with severe suboccipital pain and painfully restricted neck movements after a road traffic accident. Radiographs and CT scan showed an Anderson and D'Alonzo type II odontoid transverse fracture with anterior displacement and angulation.

In view of the high incidence of non-union associated with displaced type II odontoid fractures it was decided to reduce and stabilize the fracture using an anterior screw.

Surgical procedure

The patient was positioned supine on a radiolucent table with the head placed in a head ring. Alternatively a Mayfield pin headrest may be used. Under biplane fluoroscopy anatomic reduction was obtained. A radiolucent bite block or a wad of gauze in the mouth facilitates visualization of the odontoid in the AP plane. The adequacy of the trajectory of the drill and the level of the skin incision was assessed by placing a guide wire by the side of the neck along the trajectory of the screw under fluoroscopy. The entry point of the guide wire is usually at the C5–6 level where a 1 cm transverse incision is made. Blunt finger tip dissection was carried down to the anterior aspect of the C2–3 disc space using the Smith-Robinson approach. The entry point is on the anterior aspect of the inferior end plate of C2 in the midline. The trocar and cannula with the guide wire were gently guided to the starting point taking care not to injure the longitudinal structures of the neck. Under biplane fluoroscopic visualization, the guide wire was passed into the base of C2 across the fracture site up to the cortical tip of the odontoid. Care was taken to avoid penetrating the cortex. The trocar was removed and using a 2.5 mm drill and tap the screw path was prepared. During drilling and tapping care was taken to prevent inadvertent cephalad migration or pulling out of the guide wire. The length of the screw was measured using a depth gage. A proper length screw is important to achieve a lag effect and compression across the fracture site. A 3.5 mm lag screw was then passed across the fracture site to engage

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cortex of the dens fragment. Care must be taken to ensure that the screw threads cross the fracture site.

Post-op procedure

Postoperatively the patient wears a Philadelphia collar for a period of 6 weeks. The postoperative radiographs and CT scan are assessed for adequacy of reduction, screw position and to ensure that the screw threads have completely crossed the fracture site.

Discussion and conclusion

Type II odontoid fractures have high non-union rates (26–80%) when treated conservatively in a halo-vest. Risk factors for non union include angulation more than 10°, displacement of more than 4–5 mm, patient age more than 50, smoking, posterior displacement and loss of reduction in a halo vest. Surgical stabilization is the preferred treatment of displaced type II odontoid fractures.

The choice of surgical stabilization is between anterior odontoid screw fixation or posterior C1–C2 fusion. The advantages of anterior odontoid fixation over posterior arthrodesis are preservation of atlanto-axial motion, less trauma to soft tissues, no morbidity of bone graft harvesting for fusion and that it can be used even in the presence of C1 ring fractures. Anterior stabilization is the procedure

of choice in Type II and shallow type III fractures with a high reported union rate of 92–100%. It is contraindicated in patients younger than 7 years, oblique fractures (anterior inferior to posteriorsuperior), disruption of atlantal transverse ligament, non unions, pathologic fractures, osteoporosis, patients with short/thick neck or cervical kyphosis, thoracic kyphosis or barrel chest and odontoid fractures associated with comminution of one or both atlanto-axial joints.

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