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Case Series

Surgical management of fracture odontoid type II by anterior screw fixation: an institutional experience

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ABSTRACT

Fractures of the odontoid process (the dens) of the axis account for 10-20% of acute cervical spine fractures. Recent advances in intra-operative imaging including neuron avigation and O-arm can now increase accuracy and lower morbidity of odontoid screw placement. The present study was done in the department of surgery, in the medical college and associated hospital. During study period, total of 22 patients with type II fracture of odontoid were included in the study. All operations were done with the same technique of Cloward anterior approach using cannulated single lag screw. In the majority of patients, the follow up has been for 2 years and in 3 cases the follow up has been for one year. At the time of presentation, the major complains of the patient included in the study was of pain in neck area. The 14 patients were discharged to home on third postoperative day with Philadelphia neck collar, 6 patients with weakness stayed in hospital one week on physiotherapy and 2 patients were in ICU for three days post-operative due to associated lung contusion. Follow up CT after 1.5 and 3 months show well alignment with good fusion with no signs of mal union or pseudo arthrosis and patients were followed up for six months. Anterior screw fixation is a good technique to practice. It achieves good outcome and good fusion in young generation with horizontal fracture line.

Keywords: Horizontal fracture line, Hyperflexion, Odontoid process, Trauma

INTRODUCTION

High speed motor vehicles road traffic accidents cause injury to cervical spine with or without injury to spinal cord. One in five of such injuries involves C2 vertebra as it is the most mobile vertebra resulting in 50% of all spinal rotation movements. The commonest injury to C2 vertebra involves fracture odontoid type II. Anderson et al have classified the fractures of odontoid into three types namely type I, II and III. Although this classification is old being made in 1974 it has still stood the test of time and we today use the same classification.[1,2]

Fractures of the odontoid process (the dens) of the axis account for 10-20% of acute cervical spine fractures. Certain types of odontoid process fractures can lead to gross instability of the atlantoaxial complex and present a significant risk for a potentially catastrophic spinal cord injury. The treatment of odontoid process fractures remains controversial and ranges from external orthosis to various internal fixation techniques. Odontoid fractures represent from 15-20% of all cervical vertebrae breaks. Its occurrence increases considerably in aging people to the extent that it is the commonest cervical fracture in 7th decade and the older patients.[3-5]

Type II is the commonest and the fracture line passes through the junction of body of odontoid with the body of axis. The commonest cause of this fracture is hyperflexion injury of neck with an element of lateral bending; the injury may also cause AAD. It used to occur

in high-speed motor vehicles collision but in recent times we have observed type II fracture occurring with not so high velocity two wheelers' RTAs occurring on Indian roads.[6,7]

Currently, anterior screw insertion through odontoid process will provide better anatomical and functional outcome in cases of odontoid type II fractures if transverse ligament is intact. Through this, immediate stabilization of fracture line and preservation of rotator movement of cervical spine will be maintained.[8] Recent advances in intra-operative imaging including neuron avigation and O-arm can now increase accuracy and lower morbidity of odontoid screw placement.

CASE SERIES

The present study was done in the department of surgery, in the medical college and associated hospital. The study period was of 7 years from Jan 2010 to dec 2016. During this period of 7 years, total of 22 patients with type II fracture of odontoid were included in the study (Figure 1). The medical institute ethical committee was informed about the study and the ethical clearance certificate was obtained before the start of the study.

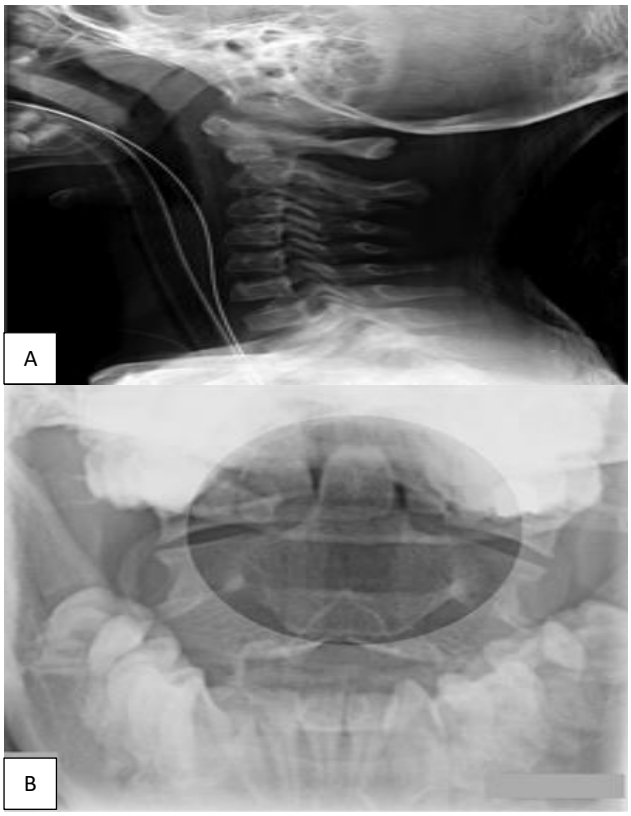

Figure 1 (A and B): Pre-operative X-rays (patients with type II fracture of odontoid).

All the included patients were informed about the study and the written informed consent was obtained before their inclusion in the study. The demographic data was recorded. Patients of both genders were included in the study. The age range of the patients included in the study was from 22 to 65 years. Most of the patients were young and few patients were old. In elderly patients the injury occurred due to relatively low velocity injury by falling on the floor or bathroom in the house.

Inclusion criteria

Patients with acute traumatic type II (a and b) odontoid fracture and surgically fit patients were included in the study.

Exclusion criteria

Patients with disrupted transverse ligament, type IIc odontoid fracture, associated Jefferson's fractures, short neck, emphysematous chest and old fractures (sclerosed edges) were excluded from the study.

All operations were done by me with the same technique of Cloward anterior approach using cannulated single lag screw. Patient was anaesthetizing in a supine position with a fiber optic laryngoscope and endotracheal tube was inserted and neck was put in extension position by keeping small bolster under the shoulder blade.

Transverse skin incision was put at the C5-6 level then subcutaneous tissue and platisma muscle was cut and with the help of finger dissection we reach up to the anterior part of the cervical vertebral body. If necessary inferior belly of omohydoid muscle must be cut.

Once we reach the body of the C5, we retract the tissue upwards to reach the upper border of C3 vertebra. Then the body of the C3 vertebra drilled in the midline with the help of asculap high-speed drill.

K-wire was passed in to the body of C2 and the odontoid process beyond the fracture line in midline. Cannulated tape passed over the K-wire and later on Cannulated lag screw was passed in such a way that the spiral part of the screw must cross the fracture line. This procedure was done with the help of image intensifier x-ray machine. Skin and subcutaneous tissues suture layer wise.

Post op period

All patients were quickly mobilized and discharged home within 48 hours. There were no immediate post op complications. There was relief in the pain in the neck and improvements in neck movements. Immediate post-operative X-ray confirmed the screw position (Figure 2). Orthosis in the form of soft cervical collar was provided to all patients for three weeks when they were called for follow up visit. In the majority of patients, the follow up has been for 2 years and in 3 cases the follow up has been for one year. Post op X-rays done at one year and two years showed good fusion. There was good fusion at the fracture site. We have not encountered any other complication.

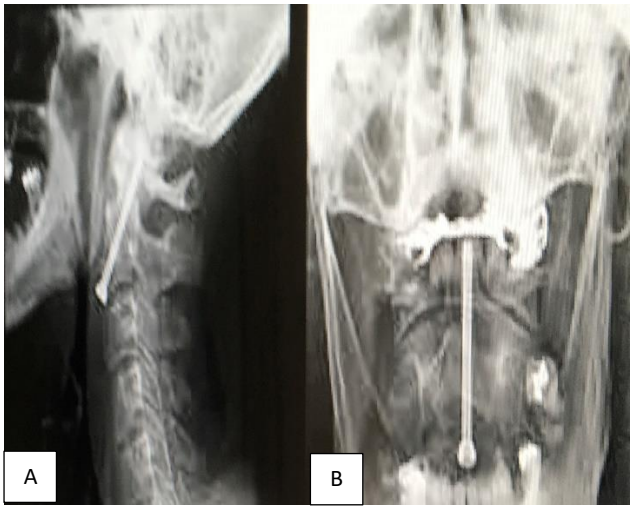

Figure 2 (A and B): Post operative X-rays (screw position).

A total of 22 patients were included in the study. All the patients included in the study did satisfy the inclusion criteria. There were 14 males and 8 females included in the study. The age range of the included patients was from 22 to 65 years. Maximum numbers of patients were young and few patients were old in age. The mean age in the study was found to be 35 years.

There were six cases in the study associated with general comorbidities. There were 9 cases in which there was no association with any trauma related injury. Rest of the 13 cases were associated with trauma related injuries. At the time of presentation, the major complains of the patient included in the study was of pain in neck area. In six of the patients there was association of upper limb weakness due to cervical cord contusion.

At the end of the study there were no intra operative complications recorded in the study. Only in one case after the period of 18 months due to accidental fall the screw got broke inside. The patient was managed conservatively and recovered nicely.

No post-operative complications related to the procedure or wound complications, 14 patients were discharged to home on third postoperative day with Philadelphia neck collar, 6 patients with weakness stayed in hospital one week on physiotherapy and 2 patients were in ICU for three days post-operative due to associated lung contusion. Total of 6 patients had post-operative dysphagia which improved spontaneously over three weeks.

All post-operative CT cervical spine done on second post-operative day show stable reduced odontoid process. Follow up CT after 1.5 and 3 months show well alignment with good fusion with no signs of mal union or pseudoarthrosis and patients were followed up for six months (Figure 3). The six cases with upper limb weakness showed improved motor power over three months on regular physiotherapy

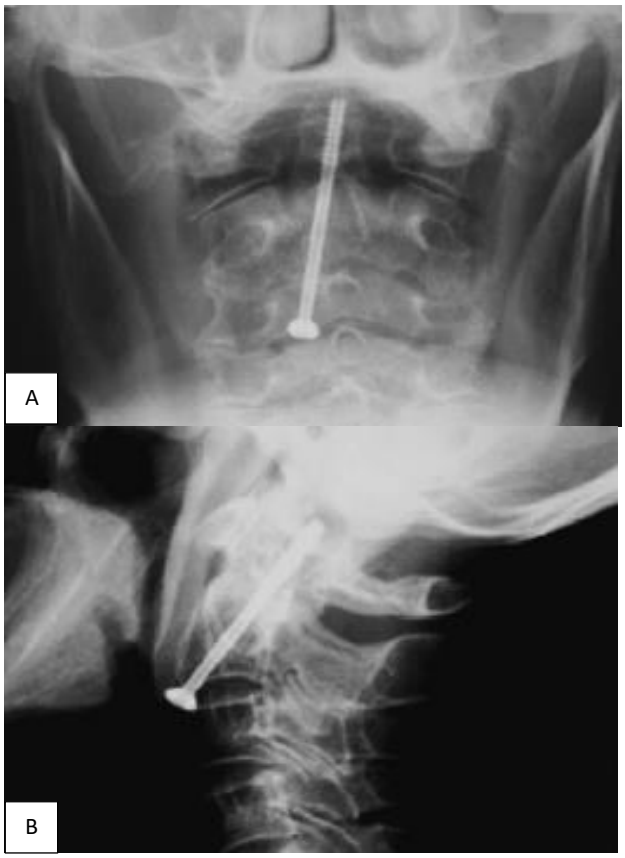

Figure 3 (A and B): Fusion of the fracture after three months.

Table 1: Age and sex demography.

Age group (Years)	Male	Female
22 to 35	7	4
36 to 60	4	2
Above 60	3	2

Table 2: Neurological examination.

Variables	Male	Female
Normal	11	6
Deficit quadriparesis/ mono paresis	3	2

DISCUSSION

Odontoid process type II fractures eventually will need fixation. Some authors prefer to conserve by wearing halo vest but this may not be suitable for many patients especially in young active working patients, more over fixation will enhance healing fusion and avoid mal-union or pseudo-arthrosis that may occur in conservative treatment.[9,10]

Anterior odontoid screw fixation is an osteosynthetic technique that provides immediate stability, preserving the majority of the remaining C1-2 motion. Most of the available evidence is based on case series. While not all patients with type II odontoid fractures are candidates for AOSF, the reported union rates are high, varying from 80% to as high as 100%. Odontoid type II fracture warrants surgical fixation. Though conservative management with halo rest is an option and still is used in some centers, surgical management is comparatively far more superior with regards to union at the fracture site.[11]

Development in neurosurgical field has evolved tremendously in recent years newer armamentarium like neuro-navigation and 'O' arm techniques have now revolutionized complicated surgeries that require a high degree of accuracy and precisions. In developing countries like ours, despite these intra-operative aids, the procedure can still be performed using pre-operative images and pertaining to basic anatomical knowledge.[12]

The anterior odontoid screw fixation is a useful technique by which we have managed successfully to treat all the patients coming to our Institution. It requires familiarity with the exposure. But it is not possible to put onlay bone grafts to achieve better fusion. Similarly, patients with short neck or barrel chest deformity are unsuitable for this technique. Horizontal fracture lines are best patients for this technique.[13] In our series, there were 4 patients with oblique fracture line but I have managed them successfully with good outcome by anterior screw technique. The success of the techniques lies in successfully aligning the fractured pieces before putting the screw.

The mean age for our patients is 37 years (compared to 35 years which is the mean age encountered by Sunil et al) which is relatively young and usually active working persons and that was reflected on treatment options considering early return to work.[12]

Odontoid screw fixations provide immediate stabilization with preservation of C1-2 motion and enhance fusion which is the ultimate goal of management. The need to do odontoid screw fixation for this kind of patients plus the absence of newly introduced intra-operative tools like O arm and neuron avigation which facilitate surgery has make it more difficult to gain increasing experience in developing countries.

We did skull traction as routine step for all patients who were helpful in alignment of fracture line and this was confirmed by intra-operative fluoroscopy. Also, it facilitates the avoidance of neck manipulations required for fracture line alignment done by Sunil et al.[12] We assured this step especially that no intra-operative electro-physiological monitoring is available in our institute. We have not assessed our fusion rates but 95% fusion rates can be achieved by this procedure.[14,15]

CONCLUSIONS

Anterior screw fixation is a good technique to practice. It achieves good outcome and good fusion in young generation with horizontal fracture line.

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