

# Anterior Transcervical Lag Screw Fixation of Type II Odontoid Fracture



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## Abstract

Odontoid fracture comprises approximately 20% of all cervical spine fractures. Among them type II fracture accounts for about 65-74%. Presently, direct anterior screw fixation is considered to provide successful outcome with fracture healing of 80% and also preserve C1/C2 rotation movement with benefit of early mobilization and rapid return to normal life style. Recent fracture (<6months) have a high fusion rate of 90% with this approach and for remote fracture (≥18months) it reduces to 25%. Here we present a case report of an 18 years old female with type II odontoid fracture and underwent anterior transcervical lag screw fixation under C-arm guidance.

**Key words:** C-arm guidance, Cervical Spine, Odontoid fracture, Transcervical lag screw fixation

## Introduction

Odontoid fracture accounts for approximately 20% of all the cervical spine fractures.<sup>1</sup> They are also the most common spinal fractures in patient older than 80 years.<sup>2</sup> They are classified into 3 categories according to Anderson & D'Alonso depending upon location and extent of fracture line.<sup>3</sup> The most common is type II fracture which accounts for 65-74% and is also known to be relatively unstable.<sup>3,4</sup>

The most appropriate treatment for type II odontoid fracture is controversial.<sup>4,5</sup> Some believe posterior C1-

C2 fusion has best clinical results especially in elderly patients.<sup>6,7</sup> Direct anterior screw fixation; however, is an effective and safe method for treating recent odontoid fractures (<6 months), while lower rate of fusion is found in remote fractures (≥18 months).<sup>8,9,10</sup> This approach is suitable only in cases with intact transverse ligament<sup>11</sup> and a fracture line extending from anterior-superior to posterior-inferior.<sup>5,12</sup> Here we present a case report of an 18-year-old female with type II odontoid fracture who underwent anterior transcervical lag screw fixation under C-arm guidance, as not much has been reported on this entity from our country Nepal.<sup>13</sup>

## Case Report

An 18-year-old female presented to our casualty with alleged history of fall from a one-storied building of about 10 feet height. She had loss of consciousness for about a minute and severe pain over the nape of the neck. Clinically, she had stable vitals and a Glasgow coma scale (GCS) of 15/15. Motor examination revealed power of 5/5 in all major muscle groups of upper and lower limbs with intact sensation on all dermatomes. Screening X-ray cervical spine and subsequent computed tomography (CT) scan of the cervical spine revealed a type II odontoid fracture (Figure 1). Magnetic Resonance Imaging (MRI) of the cervical spine did not show any cervical cord injury and the transverse ligament was intact (Figure 2). CT scan of the brain was also normal.

The Philadelphia cervical collar applied in the casualty was hence continued and she was admitted for surgical stabilization.

Awake fiber-optic nasotracheal intubation was done and the patient placed supine with the neck extended.

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A small, transverse skin incision made at the level of cricothyroid (C5-6 level). Prevertebral fascia was reached, dissecting in the avascular plane, retracting the trachea and oesophagus medially and sternocleidomastoid muscle and carotid sheath laterally. Dissection carried cranially and C2-3 interspace identified fluoroscopically. A midline gutter was cut on the anterior body of C3 vertebra and C2-3 disc and the antero-inferior endplate of C2 vertebra visualized. A 2mm Kirschner (K) wire drill was drilled cranially through the C2 vertebral body fracture line, up to the cortex of the odontoid tip, under real-time fluoroscopic guidance. The drill hole was tapped over the K-wire and

the length of the screw required measured. A non-self-tapping, lag screw was then cannulated just upto the apical cortex of the odontoid tip. The wound was closed in two layers on a suction drain.

Postoperatively her neurology was intact and there were no complications. Postoperative x-ray of cervical spine revealed proper position of lag screw (Figure 3). Philadelphia collar was applied for 14 days. Flexion and extension X-ray cervical spine done after 3 months showed adequate fusion of the fractured segment. Rotatory movement at the neck was preserved and the patient did not have any problem during this follow up.

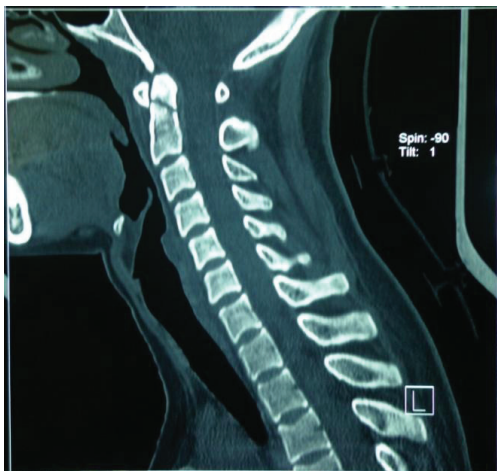


Figure 1: Sagittal section CT scan of cervical spine showing type II odontoid fracture without displacement.



Figure 3: Postoperative lateral radiograph showing proper reduction and fixation of type II odontoid fracture with single lag screw.

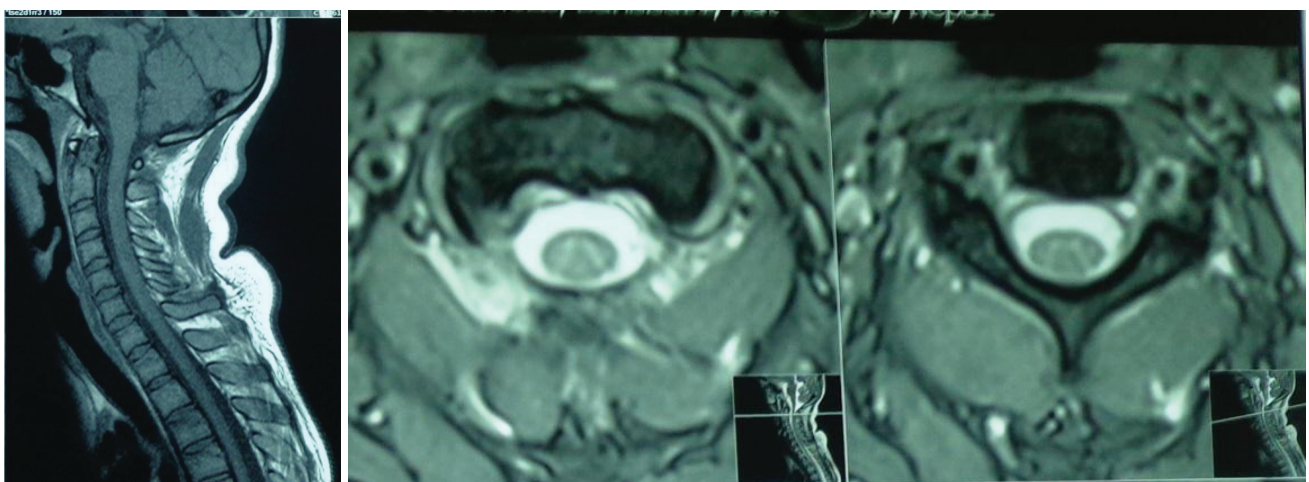


Figure 2: T1 and T2 weighted MRI of the cervical spine shows intact cervical cord and the transverse ligament (arrow).

### Discussion

When this patient was operated on, real time biplaner imaging was not available even in a tertiary centre as ours, and the radiographer had his share of activity in guiding the surgeons in planning the trajectory of the screw. Appropriate treatment for type II dens fracture remains controversial.<sup>4,5</sup> Posterior C1-C2 fusion gives best clinical results especially in elderly patients<sup>6,7</sup> however, it compromises the C1-C2 rotational movement of the neck which is 50% of the total cervical rotatory movement.<sup>8</sup> Direct anterior screw fixation has been shown to result in successful fracture healing in 80% cases<sup>6,14</sup> moreover it preserves C1-C2 rotatory movement and also allows early mobilisation as well as rapid return to normal lifestyle<sup>10,15</sup> as can be instanced in our case. There can be many technical problems during anterior screw fixation as inability to gain access to the dens while keeping the fracture reduced and displacement of screws, as well as non-union in osteoporotic bones of elderly patients.<sup>6</sup> The effectiveness of the fusion is also determined by the orientation of the fracture line. The rate of anatomical bone fusion in recent fractures was found significantly higher in fractures oriented horizontally and posterior oblique direction compared to anterior oblique direction.<sup>8</sup> Our patient had a fracture line that was directed in posterior oblique direction and hence was a suitable candidate for screw fixation. The fusion rate is about 90% when operated within 6 months but this significantly reduces to 25% for remote fracture ( $\geq 18$  months).<sup>8,10,15</sup> Anterior screw fixation is avoided when ligament injury is present.<sup>8</sup> Due to unstable nature of type II odontoid fracture, it is important to treat it as early as possible to prevent disastrous consequences.

### Conclusion

Anterior transcervical lag screw fixation can be considered as the choice of surgical treatment in Type II Odontoid fracture though it is suitable only in cases with intact transverse ligament and a fracture line extending horizontally or postero-inferiorly. This surgical technique confers immediate stability and adequate fusion without significant major complications. Also, C1-C2 rotation movement of neck is preserved and early mobilization can be achieved.

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senior author of this article had been actively involved in the neurosurgical field in Nepal over the last three decades and this was the first surgery of this kind performed by him in Nepal. Though regularly practiced around the world, we did not find evidence in literature of such surgical endeavor in this part of the world, then.

**Conflict of Interest:** None

**Source(s) of support:** None

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