



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2019; 5(7): 224-225  
www.allresearchjournal.com  
Received: 08-05-2019  
Accepted: 12-06-2019

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## Anterior screw fixation for odontoid fractures: No scope for second screw

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### Abstract

The anterior screw fixation for fracture odontoid is a necessity because this injury causes life threatening instability. Though the biomechanical demand is two screw fixation but the odontoid cannot host more than one screw as we have found in this study.

**Keywords:** Dens fractures, screw fixation, axis

### Introduction

The most characteristic feature of second cervical vertebra is the presence of tooth like process, the dens (Odontoid process), which projects upwards from the superior surface of the body of axis. The dens acts as a pivot around which the atlas with skull rotates. It presents a base which is attached to the superior surface of the body and an apex which projects upwards and ends in a conical extremity. Posteriorly there is a shallow transverse groove for the transverse ligament of the atlas at neck of the dens<sup>[1]</sup>.

The odontoid fractures are approximately 4-6% of cervical spine injuries<sup>[2-4]</sup>. By being the crucial stabilising structure, its fracture puts the spinal cord under high risk of compression immediately at injury which may result into the varying level of neurological deficit or death, or the chronic instability may cause pain or neurological deficit<sup>[2-4]</sup>.

The widely practised treatment is anterior fixation of the fracture through 4.0 mm partially threaded Cannulated Cancellous screws. We at this centre began the surgery for such fractures in Jan 2018 and could negotiate only one screw across the odontoid. Since single screw is rotationally unstable some authors have recommended two screws for fixation<sup>[5,6]</sup>.

We under took a Morphometrical analysis of the odontoids available with us to ascertain whether the odontoid can host two 4 mm Cancellous Cannulated screws or not.

### Material and Methods

We had collected the dry human axis vertebra from all the sources and were 12 in number. The following values were collected.

1. Vertical height of odontoid
2. Cylindrical height of odontoid
3. Conical height of odontoid
4. The minimum Mediolateral width of odontoid
5. The minimum AP width of odontoid.

The 4.0 mm Cancellous Cannulated screw was inserted at ideal position in one of the odontoid with the dimensions close to the mean dimensions and then the same odontoid was bisected transversely at the base and the remaining bone was evaluated for its capacity to host another 4.0 mm Cancellous Cannulated screw.

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**Observations and Discussion**

**Table 1:** The measurements of different parameters are illustrated in

	Height of body + Dens = anterior height of axis	Height of dense	Cylindrical height of dense (CH)	Cone (Dense-CH)	Mediolateral Width at neck	AP width at neck
Range (mm)	29-40	12- 19	6-11	4-11	7 -11	8-12
Mean (mm)	34.4	15.6	8.3	7.4	8.3	9.7



**Conclusion**

The odontoid fractures which amounts to approximately 5% of cervical spine injuries, has found more interest in fixations because of the availability of technique and training. The odontoid in this region are morphometric ally smaller than the other published studies and can hold only one 4 mm Cancellous Cannulated screw.

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For a screw to hold at least 2 mm bone is needed all around for its threads to have purchase of the bone. After putting the first 4 mm screw the remaining space available was 6mm Anteroposteriorly. This space is not adequate to host a second Screw. Because the circumferential rim of bone needed for having adequate purchase is not available for inserting a 4 mm screw.

Though the single screw is rotationally unstable, yet, for the paucity of the bony space only single screw can be placed in a odontoid as per our findings.

The authors advocating two screws for the odontoid screw fixation [4] are biomechanically correct in advising for preventing rotation, but, if we have to adopt this advise, we will have to decrease the width of the screws for our patients. On searching the literature we could not find a similar study to compare the remaining bone available at odontoid for fixation.