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## Morphometric measurements of odontoid process of Jammu region

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**Abstract**

The odontoid which is the upward projection of the axis vertebra is structurally very important stabilizing structure, whose fracture can result into serious disability or death. The fractures of odontoid are not uncommon, but being very close to vital structures are difficult to fix. The knowledge of morphometry of odontoid in Jammu region will help the surgeons of this area to plan the treatment accordingly.

**Keywords:** Axis, odontoid, cervical spine

**Introduction**

The most distinctive characteristic feature of second cervical vertebra is the presence of stout conical mass projecting upwards from the body of the second cervical vertebra and is called as odontoid or dens. On its anterior surface is an oval or nearly circular facet for articulation with that of the anterior arch of atlas<sup>[1]</sup>. The odontoid is body of the 1<sup>st</sup> vertebral body which developmentally has found its attachment to the body of second vertebral body to provide rotation and stability to the cervicocranial area<sup>[2, 3]</sup>. When the head rotates side-to-side, the atlas bone rotates around this peg-like odontoid process. This is the reason why the second cervical vertebra is also called the axis bone. Axis acts as a pivot or axle for rotation of the atlas and the head around the strong dens. The transverse ligament of atlas keep the dens in position and lodges itself in a groove behind the dens, this forms the neck of the dens. AT the level of neck, the body fuses with the dens and is the constricted portion. The pair of alar ligament is attached to the sloping flat surfaces below the tip and they diverge upwards for attaching with the foramen magnum<sup>[3]</sup>.

The fractures of odontoid are reported to be 3-5 % of cervical spine injuries and the odontoid fractures are treated either with anterior screw fixation or posterior stabilisation<sup>[4, 5]</sup>. The authors has conducted the morphometric study on the odontoid of the dry human axis to aid the surgeons in planning their treatment.

**Material and Methods**

We had 12 Axis bones to study. We had studied the following parameters of odontoid on vertebrae (as shown in figure).



**Fig 1:** Parameters of Odontoid Process

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- 1. Height of odontoid along with body (ad):** Point taken from the tip of the odontoid process to the lower border of the body in midline anteriorly.
- 2. Height of odontoid (bd):** Is taken from the line joining the superior articular facets of the axis upto the apex of the odontoid process in the midline anteriorly.
- 3. Cylindrical Height (bc):** Is taken from the line joining the superior articular facets of the axis upto the maximum transverse diameter of the dens.
- 4. Conical Height (cd):** Conical height of the odontoid is the height of the cone like culmination of the odontoid

from its cylindrical are. It is measured by subtracting the cylindrical height from the total height of the dens.

- 5. Width of Odontoid at neck (kl):** The mediolateral width at neck was measured.

The instruments used for measuring dimensions were the pointed divider, which was closely approximated and then was put on a scale to get the dimensions.

### Observations and Results

The measurements of different parameters are illustrated in table:

**Table 1:** Diamensions of Odontoid Process (in mm)

	Height of Body+Dens = anterior height of axis	Height of dense	Cylindrical height of dense(CH)	Cone(Dense-CH)	Narrowest anterior Width at neckbase
1	33	18	7	11	7
2	32	12	8	4	8
3	36	18	10	8	9
4	29	12	6	6	8
5	35	16	9	7	8
6	35	14	7	7	8
7	35	16	9	7	7
8	38	19	11	8	9
9	35	16	9	7	8
10	30	12	7	5	11
11	40	19	9	10	8
12	34	16	8	8	9

The averages were not worked upon because, there was a wide variation in all the values and the mean cannot be generalised and applied on all. So we have grouped them as per their individual values.

Out of twelve odontoid smallest anterior height of axis was 29 mm in one odontoid. In the others the height was 30 mm in one, 32 in one, 33 in one, 34 in one 35 in four, 36 in one, 38 in one and 40 in one. This wide range will ask the surgeons to have devices of different length available to him during the surgery. The reported height in the similar studies has been 34.33, and 34.17 and 38.7 respectively [6, 7, 8].

The height of dense was 12 mm in three, 14mm in one, 16mm in three, 18mm in two and 19 mm in two bones.

The cylindrical height was 6 mm in one, 7 mm in three, 8 mm in two, 9 mm in four, 10mm in one, 11 mm in one axis bone.

Height of Cone was 4 mm, 5 mm and 6mm in one each axis, 7 mm in four, 8mm in three, 10 mm in one and 11 mm in one.

The narrowest width was 7mm in one, 8 mm in six, 9 mm in three and 11 mm in one axis bone.

The dense height has been reported 17 to 19.8 by Teo EC *et al.* [9] we could not find any similar study for comparing Cylindrical Height, Height of Cone and narrowest width.

The combined height of the body and the height of dens, narrowest width of odontoid, cylindrical height of dens and conical height of dens is needed for choosing the right device for fixing the odontoid fractures. Odontoid fractures commonly occur at junction of the body and odontoid, middle of the odontoid and upper third of the odontoid [4, 5].

### Conclusion

The morphometry of the odontoid is important to the surgeons who need to fix the fractures anteriorly.

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