

Morphometric Study of Atlas Vertebra in Rewa RegionP.G.Khanwalkar¹, Bhaskar B.Reddy²¹Professor & and Head, ²Assistant Professor, Department of Anatomy, Shyam Shah Medical College, Rewa, Madhya Pradesh**Correspondence Author:** Bhaskar B.Reddy, Assistant Professor, Department of Anatomy, Shyam Shah Medical College, Rewa, Madhya Pradesh**Type of Publication:** Original Research Paper**Conflicts of Interest:** Nil**Abstract**

Introduction: Atlas is the first cervical vertebra. It articulates with the occipital bone above and the axis vertebra below. It plays an important role in movement of the skull and the neck. Atlas vertebra is also an important part of bony anatomy of Cranio-vertebral Junction. The stability of the atlas is provided by two symmetrical lateral masses that are united by anterior and posterior arches. These lateral masses are thick, supportive elements composed of both superior and inferior articular facets.

Materials and Methods: For the study of various metric parameters, 40 atlas vertebrae were used. Maximum anteroposterior (AP) and transverse (T) diameter of Superior articular facets (SAF) and Inferior articular facets (IAF) were measured with Vernier calipers and the data were analyzed.

Results and Conclusion: The mean values obtained for all the parameters were more or less similar to other studies. In the present study, the AP diameters of SAFs were less as compared to the western population. The values of AP & T diameter of IAF was also found less in Indian population. The knowledge of the dimensions of the SAF (AP:18.45 mm; T: 10.21mm) and IAF (AP:16.62 mm; T:14.24 mm) help in safe planning of the screw placement during Cranio-vertebral Junction surgery.

Keywords: Atlas, Cranio-vertebral junction, Superior articular facets, Inferior articular facets

Introduction

Atlas is the first cervical vertebra. It is ring shaped and does not have a body like other cervical vertebrae. It has two arches named anterior and posterior arches. The anterior arch is shorter than the posterior arch and articulates with the dens of the axis vertebra. The posterior arch bears a groove on its superior surface for the vertebral artery and the dorsal ramus of the first cervical spinal nerve. The atlas holds the globe of the skull and is devoid of body and spine and is composed of an anterior arch and posterior arch with laterally projecting transverse processes which resemble an irregular ring.^{1&2}

The stability of the atlas is provided by two symmetrical lateral masses that are united by anterior and posterior arches. The posterior arch of the atlas forms about 3/5th of the atlantal ring. These lateral masses are thick, supportive elements composed of both superior and inferior articular facets superior articular facets which are present on the atlas vertebrae face supero medially and are well known for nodding movements and for bearing the weight of the head. Inferior articular facets are flat and facing posteromedially.³

Materials & Methods

This study is carried out in the department of Anatomy, Shyam Shah Medical College, Rewa, Madhya Pradesh, on a total of 40 atlas vertebrae.

Measurements: For measuring the parameters of the bone reference points were obtained from published data of Naderi et al.⁴

Maximum Antero-posterior Diameter (length) of superior articular facet: Two points were taken, one on the anterior limit of SAF and other on its posterior limit then length was measured (in mm) along its principal axis directed anteromedially.

Maximum Transverse Diameter (width) of superior articular facet: Two points were taken, one on the medial limit of SAF and other on its lateral limit then width was measured (in mm) perpendicular to the principal axis.

Maximum Antero-posterior Diameter (length) of inferior articular facet: Two points were taken, one on the anterior limit of IAF and other on its posterior limit then length was measured (in mm) along its principal axis directed anteromedially.

Maximum Transverse Diameter (width) of inferior articular facet: Two points were taken, one on the medial limit of IAF and other on its lateral limit then width was measured (in mm) perpendicular to the principal axis. All the measurements were subjected to statistical analysis.

Observations & Results

Mean values for Superior Articular Facet (AP:18.45 mm; T: 10.21mm) and IAF (AP:16.62 mm; T:14.24 mm)

Table1. Analysis of Measurements

Parameter	St. deviation	Mean	Median	Min	Max
Length of the SAF	2.06	18.45	17.88	15.92	23.24

Width of the SAF	2.84	10.21	9.45	7.45	16.58
Length of the IAF	1.62	16.62	16.2	13.87	20.65
Width of the IAF	2.47	14.24	15.1	7.21	19.42

Table 2: Comparison of Maximum Antero-Posterior Diameter of Superior Articular Facet of atlas.

Author	Origin	Measurements	
		Right	Left
Kandziora et al (2001) ⁵	European	25.3 ± 2.22	
Naderi et al (2003) ⁴	Turkish	19.9 ± 2.4	
Koing et al (2005) ⁷	German	22.7 ± 3.0	22.8 ± 4.2
Sengul et al (2006) ⁶	Turkish	19.9 ± 3.4	18.6 ± 3.2
Gomez-Olivencia et al (2007) ⁸	Spanish	23.7 ± 1.8	23.5 ± 1.7
Rocha et al (2007) ⁹	American	23.9 ± 2.5	23.6 ± 2.5
Cacciola et al (2004) ¹³	Indian	19.73	
Gosavi and Vatsalawamy (2012) ¹¹	Indian	21.24 ± 2.39	21.0 ± 2.52
Gupta et al (2013) ¹⁰	Indian	19.73	
Kaur et al (2014) ³	Indian	21.52 ± 2.36	21.5 ± 2.07
Rekha et al (2016) ¹²	Indian	22.33 ± 2.1	22.2 ± 5

			2.1
Present Study	Indian	18.45 ±2.06	

Table 3: Comparison of Maximum Transverse Diameter of Superior Articular Facet of atlas.

Author	Origin	Measurements	
		Left	Right
Koing et al (2005) ⁷	German	11.6 ± 2.0	11.2 ± 1.5
Sengul et al (2006) ⁶	Turkish	9.6 ± 1.9	9.8 ± 1.5
Gomez-Olivencia et al (2007) ⁸	Spanish	10.4 ± 1.2	10.5 ± 1.0
Cacciola et al (2004) ¹³	Indian	11.12	
Gosavi and Vatsalaswamy (2012) ¹¹	Indian	10.36 ± 1.72	10.47 ± 1.61
Gupta et al(2013) ¹⁰	Indian	11.12	
Kaur et al(2014) ³	Indian	11.21 ± 1.47	11.32 ± 1.53
Rekha et al(2016) ¹²	Indian	8.7 ± 2.0	9.6 ± 2.3
Present Study	Indian	10.21 ± 2.84	

Table 4: Comparison of Maximum Antero-Posterior Diameter of Inferior Articular Facet of atlas.

Author	Origin	Measurements	
		Left	Right
Koing et al (2005) ⁷	German	18.5 ± 3.2	19.0 ± 2.5
Sengul et al (2006) ⁶	Turkish	17.1 ± 2.6	17.5 ± 2.4
Gomez-Olivencia et al (2007) ⁸	Spanish	16.3 ± 1.3	16.2 ± 1.2
Rocha et al (2007) ⁹	American	18.8 ± 1.7	18.7 ± 1.6
Cattrysse et al (2008) ¹⁴	Belgium	17.0 ± 1.8	16.6 ± 1.6
Cacciola et al (2004) ¹³	Indian	15.76	
Gosavi and Vatsalaswamy (2012) ¹¹	Indian	16.57 ± 1.91	16.50 ± 1.67
Gupta et al(2013) ¹⁰	Indian	15.76	
Kaur et al(2014) ³	Indian	17.54 ± 1.5	17.7 ± 1.6
Rekha et al (2016) ¹²	Indian	17.99 ± 1.6	17.81 ± 2.3
Present Study	Indian	16.62 ± 1.62	

Table 5: Comparison of Maximum Transverse Diameter of Inferior Articular Facet of atlas.

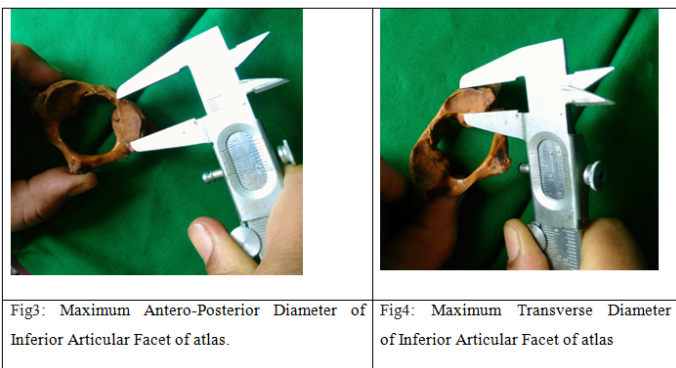
Author	Origin	Measurements	
		Left	Right
Koing et al (2005) [7]	German	15.9 ± 1.9	16.2 ± 1.0
Sengul et al (2006) [6]	Turkish	14.6 ± 2.5	14.6 ± 2.5
Gomez-Olivencia et al (2007) [8]	Spanish	15.5 ± 1.0	15.8 ± 1.2
Rocha et al (2007) [9]	American	16.6 ± 2.0	16.4 ± 2.0
Cattrysse et al(2008) [15]	Belgium	16.9 ± 1.6	17.2 ± 2.0
Cacciola et al (2004) [13]	Indian	15.22	
Gosavi and Vatsalaswamy (2012) [11]	Indian	14.01 ± 1.93	14.42 ± 1.67
Gupta et al (2013) [10]	Indian	15.22	
Kaur et al(2014) [4]	Indian	14.99 ± 1.65	14.94 ± 1.51
Rekha et al (2016) [12]	Indian	14.84 ± 1.3	14.49 ± 1.8
Present Study	Indian	14.24 ± 2.47	



Fig1:Maximum Antero-Posterior Diameter of Superior Articular Facet of atlas



Fig2: Maximum Transverse Diameter of Superior Articular Facet of atlas



Discussion

The average anteroposterior diameter of SAF on both the sides of atlas was maximum in European, American, Spanish and German population where as in Indian and Turkish population the values were less than the other studies. The average transverse diameter of SAF was less in Indian, Turkish population and in present study it was similar to other studies. IAF had maximum antero posterior and transverse diameter in American and German population. The values of IAF in Spanish population correlated with the values in Indian population.

Summary & Conclusions

In conclusion, the measurements of the atlas are comparable to that in other populations. The knowledge of the dimensions of the SAF (AP:18.45 mm; T: 10.21mm) and IAF (AP:16.62 mm; T:14.24 mm) help in safe planning of the screw placement during Cranio-Vertebral Junction surgery.

Declarations

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Conflict of interest: None

Ethical approval: Study involved only dry human skeletal material, so ethical approval is not required

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