

## A MORPHOMETRIC STUDY OF SUPERIOR ARTICULAR FACETS IN DRY HUMAN ATLAS BONES IN GWALIOR REGION IN MADHYA PRADESH

<sup>1</sup>Dr. Rahul Sharma, <sup>2</sup>Dr. Sudhir Saxena, <sup>2</sup>Dr. Anil Sastya, <sup>2</sup>\*Dr. Manish Chaturvedi

<sup>1</sup>Demonstrator, Department of Anatomy, G.R. Medical College, Gwalior, M.P., India.

<sup>2</sup>Associate Professor, Department of Anatomy, G.R. Medical College, Gwalior, M.P., India.

**\*Corresponding Author: Dr. Manish Chaturvedi**

Associate Professor, Department of Anatomy, G.R. Medical College, Gwalior, M.P., India.

Email ID- drmanish97@gmail.com

### ABSTRACT:

**Background:** Superior Articular Facets are located on atlas vertebra facing supero medially & they occupy most of the upper surface of the lateral mass and lie obliquely, their anterior ends being always nearer to the midline than the posterior ends.

**Methodology:** A total of 57 human dried atlas were taken from the dissection hall of anatomy department of, G.R. Medical College, Gwalior, M.P. for the evaluation of the superior articular facets on the atlas vertebrae, by using dry, bony and non-pathological vertebrae. Measurements were taken by using Digital Vernier calipers.

**Results:** The mean value of superior articular facet atlas vertebra AP Diameter was  $21.184 \pm 2.23$ , Transverse Diameter was  $11.35 \pm 2.03$  on right side. The mean value of superior articular facet atlas vertebra AP Diameter was  $21.058 \pm 2.15$ , Transverse Diameter  $11.018 \pm 2.11$  on left side.

**Conclusion:** These data may be of great help in Craniovertebral decompressive and stabilising surgery and anthropological assessments.

**Key words:** - Atlas vertebra; Superior Articular Facets; Cranio-vertebral Spinal Surgery; anthropological assessments.

### Introduction

Cranio-vertebral junction surgery is an important part of spinal surgery. It involves a variety of decompressive and stabilising procedures, requiring knowledge regarding the anatomy of this region. Injuries of the upper cervical spine which cause severe disabilities following trauma, have always been an interesting focus for anatomists.<sup>[6]</sup> The atlas vertebra (C1) has many unique features. C1 vertebra is an important part of the bony anatomy of Cranio-vertebral junction. The Atlas (C1) is an atypical first cervical vertebra with unique features. In erect position the line of gravity with an average head weight of 7lbs and Atlas the first cervical vertebra supports the head.<sup>[21]</sup> Anatomically, the atlas is embedded in the neck muscles and is therefore protected from injury. The unique structure and the anatomical location of the atlas forms a safety mechanism.<sup>[8]</sup>

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.<sup>[1,2]</sup> The Superior Articular facet of Atlas is concave, directed upward medially,

kidney shaped and sometimes constricted in the middle the articular surfaces of both bones are reciprocally curved. Atlanto occipital joints are a pair of ellipsoid type of Synovial joints. Each joint is formed by superior articular facet of lateral mass of Atlas and the condyles of occipital bone. It is located at a critical point close to the vital centres of the medulla oblongata, which can get compressed by a dislocation of the atlanto-axial complex or instability of atlanto-occipital joint.<sup>[13]</sup> Movements at atlanto occipital joint take place around transverse and anteroposterior axis. The movements permitted at the atlanto occipital joint flexion and extension around transverse axis, and Lateral flexion (abduction) around the anterior posterior axis. The aim of this study was knowledge regarding C1 bony landmarks and to find out the morphometric data regarding the bony landmarks of C1 vertebra because of its clinical and surgical importance.

### Materials and methods

A total of 57 human dried atlas were obtained from the Department of Anatomy, G.R. Medical College, Gwalior, M.P. Digital Vernier calipers had been used for taking measurements.

An evaluation of the superior articular facets on the atlas vertebrae, by using dry, bony and non-pathological vertebrae. A total of 57 human dried atlas were obtained from the Department of Anatomy, G.R. Medical College, Gwalior, M.P.

### Inclusion Criteria:

- Dry, and thoroughly cleaned atlas vertebrae.
- The vertebrae were complete in all respects, in order to give the correct observations.
- The atlas vertebrae were non-pathological.

### Instrument:

The measurements of mastoid were taken on an anatomically sound basis. All measurements were taken using a digital vernier caliper, taking into account the error if any, in the instrument. A divider with fixing device was also used for taking the measurements.



Figure-1: Digital Vernier calipers

### Measurements:

Maximum Antero-posterior Diameter (length) of superior articular facet: Two points were taken, one on the anterior limit of superior articular facet 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 superior articular facet 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. The mean, median, range and standard deviations obtained were tabulated and presented for all the parameters.

**Result:**

Study was on 57 adult dry Atlas Vertebra. The mean value of superior articular facet atlas vertebra AP Diameter was  $21.184 \pm 2.23$ , Transverse Diameter was  $11.35 \pm 2.03$  on right side. The mean value of superior articular facet atlas vertebra AP Diameter was  $21.058 \pm 2.15$ , Transverse Diameter  $11.018 \pm 2.11$  on left side.

**Table: -1 Statical analysis of collected data of the present study.**

No.	N = 57	
Side	Right	Left

	AP Diameter	Transverse Diameter	AP Diameter	Transverse Diameter
Measurement Superior Articular Facet. (mean in m.m.) $\pm$ SD	21.184 $\pm$ 2.23	11.35 $\pm$ 2.03	21.058 $\pm$ 2.15	11.018 $\pm$ 2.11
Min (m.m.)	17.03	7.07	16.41	7.23
Max(m.m.)	25.06	14.26	25.03	14.76

### Discussion

The study established the existence of a definite Significant morphometric changes. Variation in size and shape of superior articular facet between the different populations being characteristic of genetic factor, environmental factors, sex, heredity, race, secular changes and bilateral asymmetry.

**Table-2: Comparison of Measurement of Superior Articular Facet in different populations.**

Population	Author	Measurement Superior Articular Facet			
		Right side		Left side	
		AP Diameter	Transverse Diameter	AP Diameter	Transverse Diameter
Maharashtra (Indian)	Gosavi and Vatsalaswamy (2012) <sup>[14]</sup>	21.24 $\pm$ 2.39	10.36 $\pm$ 1.72	21.02 $\pm$ 2.52	10.47 $\pm$ 1.61
German	Koing et al (2005) <sup>[19]</sup>	22.7 $\pm$ 3.0	11.6 $\pm$ 2.0	22.8 $\pm$ 4.2	11.2 $\pm$ 1.5
Turkish	Sengul et al (2006) <sup>[20]</sup>	19.9 $\pm$ 3.4	9.6 $\pm$ 1.9	18.6 $\pm$ 3.2	9.8 $\pm$ 1.5
Mumbai, Maharashtra (Indian)	Gupta et al (2013) <sup>[15]</sup>	19.73	11.12	19.73	11.12
Panjab	Kaur et al (2014) <sup>[16]</sup>	21.52 $\pm$ 2.36	11.21 $\pm$ 1.47	21.51 $\pm$ 2.07	11.32 $\pm$ 1.53
Karnataka	Rekha et al (2016) <sup>[17]</sup>	22.33 $\pm$ 2.1	8.7 $\pm$ 2.0	22.25 $\pm$ 2.1	9.6 $\pm$ 2.3
Haryana	Kyalvizhi et al (2017) <sup>[18]</sup>	20.56 $\pm$ 1.91	11.19 $\pm$ 2.20	19.95 $\pm$ 2.03	10.66 $\pm$ 2.79
Gwalior (Madhya Pradesh) India	Present study	21.184 $\pm$ 2.23	11.35 $\pm$ 2.03	21.058 $\pm$ 2.15	11.018 $\pm$ 2.11

### Conclusion

In conclusion, the present study which is done in Gwalior region of Madhya Pradesh India C1 bone will give a fair knowledge of superior articular facet in human beings in local population of Gwalior Madhya Pradesh and can help neurosurgeon during surgical intervention in the region. These data may be of great help in Craniovertebral decompressive and stabilising surgery and

anthropological assessments. In the present study, the AP diameters of superior articular facet were closely related to Punjab and Maharashtra population of India.

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