Original Research Article

Observational Study of Atlas Vertebra in South Karnataka Population with Special Reference to Retro Articular Canals and Foramina Transversarium

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Abstract

Introduction: Atlas Vertebra (1st cervical vertebra) is called "atypical vertebra" and has unusual shape and architecture. The dimensions of atlas vertebra are most essential in the technique of cranio-vertebral region stabilization. The Retroarticular canals and foramina transversaria are important for transoral transpalatinal approaches to clivus, atlas and axis.

Aim and objectives: To study the incidence of Retroarticular canals and symmetry of foramina transversaria.

Materials and Methods: The material for the present study consists of 100 adult intact human atlases of unknown sexes. They were collected from the department of anatomy, MS Ramaiah Medical College.

Results: Total number of incidences of retroarticular canals were 10 , 6 were present on right and 4 were on left, Out of 6 on right side 3 were complete and 3 were incomplete ,on left side 2 were complete and 2 were incomplete. The foramina transversaria are more prominent on right side in 29 vertebrae as compared to left prominence, which was observed only in 15 atlas vertebrae. But in majority of cases (60 atlas vertebrae) the foramina transversaria are equal in size.

Conclusion: The study was conducted in 100 atlas vertebrae The observations on retroarticular canals and symmetry of foramina transversaria did show significant results. This study will be useful for the forensic anatomists, forensic anthropologists, radiologists, neurosurgeons and orthopedic surgeons.

Key words: Atlas vertebra, Retroarticular canals, symmetry of foramina transversaria.

Introduction

Atlas vertebra is the first cervical vertebra, which supports the cranium and helps in the transmission of weight to the axial skeleton.[1]

A three-dimensional understanding of the anatomy is crucially important for any kind of surgery, many authors have been studied about retroarticular canals, where the vertebral artery passes over the posterior arch of atlas vertebrae.

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These canals are unilateral or bilateral. When present, they reduce space available for the vertebral artery and compromise the blood flow in the vessel[2]

The retroarticular canal has been implicated in compression of the vertebral artery, where it passes over the posterior arch of the atlas vertebra, during extreme rotational movements of the head and neck[3]

The Data on variations in the foramina transversarium will be valuable particularly for orthopedic surgeons to manipulate during surgery in this region.

Aims and Objectives

- To study the incidence of Retroarticular canals and symmetry of foramina transversaria

Materials and methods

The material for the present study consists of 100 adult intact human atlases of unknown sexes. They were collected from the department of Anatomy, MS Ramaiah Medical College

Sample size: In the present study the sample size is 100. It is estimated based on precision. Precision consists of significance levels and the allowable error. In this study, 5% significance level and various levels of significance are considered

Exclusion Criteria

1. Broken, undeveloped and porous bones.
2. Macerated bones
3. Bones exhibiting variations were not included in taking measurements.

Results

Table 1: Incidence of retroarticular canals

Incidence	Retroarticular canals	
	Right	Left
Nil	94 (94.0%)	96 (96.0%)
Complete	3 (3.0%)	2 (4.0%)
Incomplete	3 (3.0%)	2 (2.0%)
Total number of incidence of retroarticular canals	6 (6.0%)	4 (4.0%)

Total number of incidences of retroarticular canals were 10 , 6 were present on right and 4 were on left, Out of 6 on right side 3 were complete and 3 were incomplete,on left side 2 were complete and 2 were incomplete.

Table 2: Symmetry of foramina transversarium

Symmetry of foramina transversarium	Wider Number	Percentage 95%CI
Right. Prominence	15	15.0 (9.31-23.28)
Left. Prominence	29	29.0 (21.01-38.54)
No changes	56	56.0

The foramina transversaria also are more prominent on right side in 29 vertebrae as compared to left prominence, which was observed only in 15 atlas vertebrae. But in majority of cases (60 atlas vertebrae) the foramina transversaria are equal in size.

Discussion

In the present study an observation was made on retro articular canals. 94 vertebrae on the right side (94%) and 96 vertebrae on the left side (96%) did not show the presence of retro articular canals, whereas 5 atlas vertebrae showed presence of retro articular canal on the right side (5%) and 3 atlas vertebrae showed presence of retro articular canal on left side (3%) unilaterally. The bilateral presence of retro articular canal was observed in 1 atlas vertebrae (1%).

The observations on retroarticular canals were made by Gupta et al in 1979 and they found 14 unilateral (11.40%) and 9 bilateral (7.33%) canals which are higher as compared to our study.

Mitchell J[3]., made observations in 1354 atlas vertebrae, in which 9.8% of left or right sides were classified as having complete retro articular canals out of which 11.7% were right only, 24.6% were left only and 31.8% showed bilateral canals. The incidence did not increase with age and was lower in whites than in blacks with white males having the lowest and white and black females having the highest incidence of the canal. The observation in the present value coincides with the values in the whites. The difference in the dimensions of retro articular canals will decrease the cross-sectional area of the space available for

the vertebral artery passing through it and may compromise blood flow in the vessel.

Mahdi Hasan[4] in 2001 stated that the presence of retroarticular canals is a normal feature in monkeys and the other lower animals but its presence in human atlas vertebrae for the 3rd part of vertebral artery is not reported as normal. Mehadi Hasan et al[4] made an observation on 350 dried and macerated North Indian atlas vertebrae of either sex and found a partial canal in 34 vertebrae and complete canal in 28 vertebrae, thus coinciding with the values of the present study.

Belodi AK et al[5] (2005) reported that the retro articular canals were observed in 3 out of 34 atlas vertebrae, one atlas vertebra had unilateral canal and 2 bones had bilateral canals.18 This indicates a higher value compared to present study.

The foramina transversaria were studied for the symmetry and duplication. None were found among the duplications whereas asymmetry was noticed in many. Among the 100 atlas vertebrae left foramina transversaria are prominent on left side in 29% of cases and right prominent in 15 atlas vertebrae (15%) foramina transversaria are equal in size on both sides in 60 atlas vertebrae (60%).

Tiatz et al (1978) have discussed at length the causation of the absence of foramina transversaria and correlation with the size of the foramen transversarium and the vertebral artery. They have also discussed the implications in case of duplicated foramen. The present investigations do not offer any additional information on these aspects.[6] However; it was observed that foramen transversaria is not always round in shape.

Conclusion

The study was conducted in 100 atlas vertebrae The observations on retroarticular canals and symmetry of foramina transversaria did show significant results. This study will be useful for the forensic anatomists, forensic anthropologists, radiologists, neurosurgeons and orthopedic surgeons.

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