



# A posterolateral vertebral artery tunnel of atlas vertebra — a case report

Published online July 23rd, 2013 © <http://www.ijav.org>

SEEMA \*

Maninder SINGH

Anupama MAHAJAN

Department of Anatomy, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, INDIA.



\* Dr. Seema  
Associate Professor  
Department of Anatomy  
Sri Guru Ram Das Institute of Medical Sciences and Research  
Vallah, Amritsar, INDIA.  
☎ +91 991 4754354  
✉ [drseema16@gmail.com](mailto:drseema16@gmail.com)

Received February 8th, 2012; accepted October 16th, 2012

## Abstract

In usual circumstances there is a shallow or deep groove on the superior surface of posterior arch of the atlas vertebra for the lodgment of the third part of the vertebral artery. Sometimes this groove is converted into a tunnel by the simultaneous presence of lateral and posterior ponticles arising from the superior surface and posterior end of the lateral mass of the atlas vertebra. The present study comprised of 55 adult atlas vertebrae, which were studied for the presence of retroarticular vertebral artery canal either complete or incomplete in formation. Out of these only one specimen had the complete retroarticular canal on left side and incomplete canal on the right side. This variation may be important for the orthopedic surgeons, neurosurgeons, radiologists and anthropologists.

© *Int J Anat Var (IJAV)*. 2013; 6: 118–119.

**Key words** [posterior arch] [tunnel] [ponticle] [retroarticular] [anthropology]

## Introduction

The vertebral artery while ascending through the foramina transversaria of lower six vertebrae, reaches lateral to the lateral mass of atlas vertebra. From here, turning posteriorly and laterally, it lies in a groove on the superior surface of the posterior arch of atlas. Thereafter it enters the foramen magnum to supply the intracranial structures [1]. This groove may be converted into a complete canal for the passage of vertebral artery [2]. A number of terms were used for this canal as retroarticular vertebral ring [3], retroarticular canal [4], retrocondylar vertebral artery ring [5]. Physicians, neurologists and surgeons operating in the area of atlas vertebra should be aware of this variation as a cause of vertebro-basilar insufficiency.

## Case Report

In the present specimen of atlas, there was a complete tunnel formation on the left side. The bridge over the groove for the vertebral artery was further having a small complete foramen in it. For what structure it is there is not known. On the right side there were posterior and lateral ponticles but no complete canal was there.

## Discussion

The formation of posterolateral tunnel for the vertebral artery is due to the ossification of lower border of posterior atlantooccipital membrane [1]. The vertebral artery during its course can be compressed or damaged by from the external causes like bony, ligamentous or any muscular factors. This formation of the canal around the vertebral artery may compress the vertebral artery as it passes from the foramen transversarium of atlas vertebra to the foramen magnum [6]. It is severe during the extreme rotatory movements carried during therapeutic manipulation of the cervical spine [7]. It can result in reduced blood flow to the brain causing vertebro-basilar ischemia. Complete tunnel is found commonly in males and incomplete in females [8]. It is considered as genetic feature due to ossification in course of aging; as a remnant of proaltas also known as occipital vertebra represent the rudimentary transverse process of the proatlas [9]. Dhall et al. found an increase in incidence of the lateral and posterior ponticles on the left side [10]. Reason given was asymmetry due to unequal weight bearing due to left tilted head posture. Good results were found in these cases after fracturing the posterolateral canal so decompressing the artery. This tunnel when present can



**Figure 1.** Atlas vertebra showing posterolateral vertebral artery tunnel on left side (superior aspect).



**Figure 2.** Atlas vertebra with the posterolateral tunnel on left side (inferior aspect).

make the lateral mass screw fixation difficult. This variation is also of considerable importance to a radiologist as it is visible on radiology and can point towards the underlying disease process.

### Conclusion

This variation should be known before the surgery at the craniovertebral junction as the screw fixation

in the lateral mass of atlas vertebra or any surgical manipulation of the cervical spine. This tunnel can increase the possibility of intraoperative complications. It should be kept as a predisposing factor for vertebrobasilar insufficiency, especially on rotating the neck.

### References

- [1] Williams PL, Warwick R, Dyson M, Bannister LH. Skeletal System. In: Standring S, ed. *Gray's Anatomy*. 40th Ed., Edinburgh, Churchill Livingstone. 2008; 425–736.
- [2] Simsek S, Yigitkanli K, Comert A, Acer HI, Seckin H, Er U, Belen D, Tekdemir I, Elhan A. Posterior osseous bridging of C1. *J Clin Neurosci*. 2008;15: 686–688.
- [3] Lamberty BG, Zivanovic S. The retroarticular vertebral artery ring of atlas and its significance. *Acta Anat (Basel)*. 1973; 85: 113–122.
- [4] Mitchell J. The incidence and dimensions of the retroarticular canal of the atlas vertebra. *Acta Anat (Basel)*. 1998; 163: 113–120.
- [5] Mitchell J. The incidence of the lateral bridge of atlas vertebra. *J Anat*. 1998; 193: 283–285.
- [6] Tubbs RS, Johnson PC, Shoja MM, Loukas M, Oakes WJ. Foramen arcuale: anatomical study and review of the literature. *J Neurosurg Spine*. 2007; 6: 31–34.
- [7] Fast A, Zinicola DF, Marin EL. Vertebral artery damage complicating the cervical manipulation. *Spine (Phila Pa 1976)*. 1987; 12: 840–842.
- [8] Stubbs DM. The arcuate foramen. Variability in the distribution related to race and sex. *Spine (Phila Pa 1976)*. 1992; 17: 1502–1504.
- [9] Buna M, Coghlan W, deGruchy M, Williams D, Zmiyowsky O. Ponticles of the atlas: a review and clinical perspective. *J Manipulative Physiol Ther*. 1984; 7: 261–266.
- [10] Dhall U, Chhabra S, Dhall J. Bilateral asymmetry in bridges and superior articular facets of atlas vertebra. *J Anat Soc India*. 1993; 42: 23–27.