

Variations in Transverse Foramina of Cervical Vertebrae: Morphology & Clinical Importance

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ABSTRACT:

Background: The purpose of this study is to investigate variations in transverse foramina in the cervical vertebrae and its morphological and clinical importance. **Materials and Method :** The variations in the number and size of transverse foramina was studied in total 200 human dried cervical vertebrae, which were taken from the Department of Anatomy, B.J.Medical College, Ahmedabad. All the vertebrae were observed for variation in number and size of transverse foramina. **Results:** Out of 200 cervical vertebrae, complete double transverse foramina were observed in 40 vertebrae (20%), among them unilateral double foramina were found in 31 vertebrae (15.5%) and the bilateral double foramina were found in 9 vertebrae (4.5%). Incomplete double transverse foramina were observed in 22 vertebrae (11%), among them unilateral double foramina were found in 16 vertebrae (8%) and bilateral double foramina were observed in 6 vertebrae (3%). **Conclusion:** Complete unilateral double transverse foramina of cervical vertebrae were more common than bilateral. Also unilateral small size transverse foramina of cervical vertebrae were also common. This variation is important for the neurosurgeon during cervical surgery. Under such condition the course of the vertebral artery may be distorted. It is also useful for Radiologist during CT and MRI scan.

Keywords: Cervical Vertebrae, Transverse Foramina, Vertebral Artery.

Introduction

In cervical vertebrae, the costal & transverse elements are connected to each other around the foramen transversarium of the transverse process. The costal element is represented by the anterior root, anterior tubercle, costotransverse bar & posterior tubercle. The transverse element is represented by the posterior root³.

The cervical vertebrae are identified by transverse foramina in the transverse process. This foramen transmits vertebral artery, vertebral vein & sympathetic fibres from the inferior cervical ganglion. C7 vertebra only transmits vertebral vein, sometimes this foramen is small or absent².

Cervical vertebrae are smaller and more delicate than those of the other regions of human vertebral column. At the same time, the foramen transversarium present an array of morphological varieties, resulting in a wide variation of forms of cervical vertebrae. Most often, there is a single foramen per process, but it is by no means a

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rule. Supernumerary foramina can change the form of the structures passing through them, leading to consequences for the functioning of the organism⁵. Variations in the number and size of the foramen transversarium of the cervical vertebrae may result in headache, migraine and fainting attack due to compression of vertebral artery².

The foramen transversarium were macroscopically analysed and the incidence of variations in foramen transversarium was calculated.

Material & Methods

The variations in the number and size of transverse foramina were studied in total 200 human dried cervical vertebrae, which were taken from the Department of Anatomy, B.J.Medical College, Ahmedabad.

All the vertebrae were observed for variation in number and size of transverse foramina. Defective vertebrae were excluded from the study. Vertebrae having variations in transverse foramina were photographed. The data was compiled and analysed using Microsoft Excel software. Both these tubercles are joined by costo-transverse bar. Variations in transverse foramina may affect the course of vertebral artery. Headache, migraine & fainting attack may result due to compression of vertebral artery. Clinically, these types of variants are important for the radiologist during CT & MRI scan.

Results

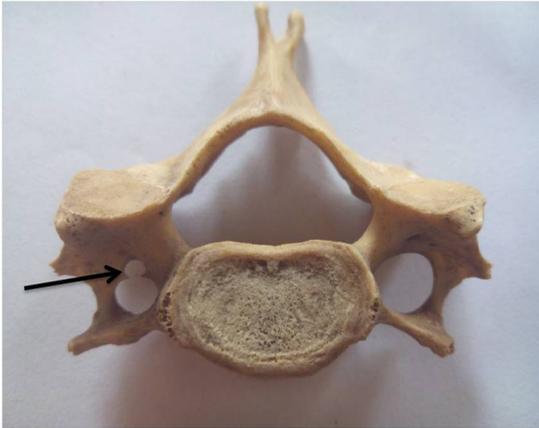
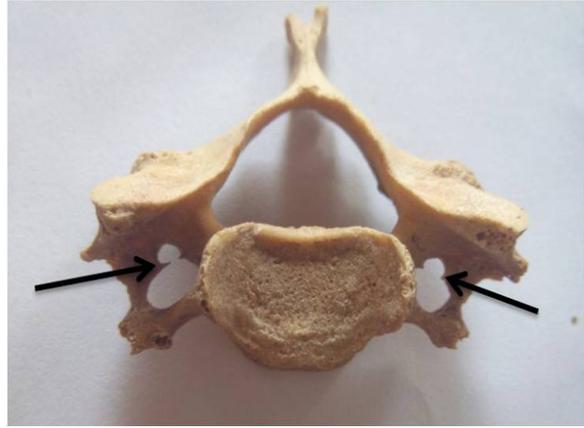
Out of 200 cervical vertebrae, complete double transverse foramina were observed in 40 vertebrae (20%), among them unilateral double foramina were observed in 31 vertebrae (15.5%) and the bilateral double foramina were observed in 9 vertebrae (4.5%).

Incomplete double transverse foramina were observed in 22 vertebrae (11%), among them unilateral double foramina were observed in 16 vertebrae (8%) and bilateral double foramina were observed in 6 vertebrae (3%).

Table 1 - Variations in transverse foramina

Variations in transverse foramina	U/L	Percentage (%)	B/L	Percentage (%)	Total (Percentage %)
Vertebrae with complete double transverse foramina	31	15.5	9	8	40 (20%)
Vertebrae with incomplete double transverse foramina	16	4.5	6	3	22 (11%)

U/L – unilateral, B/L- bilateral

Image 1- U/L Incomplete Double Transverse Foramina**Image 2- B/L Incomplete Double Transverse Foramina****Image 3- U/L Complete Double Transverse Foramina****Image 4- B/L Complete Double Transverse Foramina**

Discussion

Transverse foramen is formed by the particular formation of the cervical transverse processes. It is formed by the vestigial costal element fused to the body and the true transverse process of the vertebra¹. It is closed laterally by the costotransverse bar⁸.

In vertebral artery, some portion of the primitive dorsal aorta may not degenerate along with the two intersegmental arteries which connect the vertebral artery and this arrangement may lead to double origin and duplication of the vertebral artery⁷. The transverse foramen of the seventh cervical vertebra contains some branches of vessels and nerves as well as fibrous and adipose tissues⁴.

The morphological knowledge of this type of variation is clinically important because the course of the vertebral artery may be distorted under such condition. The compression or other pathology of such aberrant artery may lead to neurological symptoms and at times hearing disturbances.

The presence of extra foramina in the transverse processes may indicate multiplication of the number of structures running through them. Although the clinical significance of the fact is not completely clear. Exact identification of supernumerary transverse foramen may prevent damaging such structures during surgery⁷.

Conclusion

In our study we observed the complete double transverse foramina in 20% of the cases. The unilateral double foramina were more common than the bilateral. This study will provide further information on incidence and morphological basis of transverse foramina.

It is also useful for radiologist during CT and MRI scan. It will help in radiological imaging, neurological diagnosis and in complex surgical procedures in the cervical area. This variation of transverse foramina is also important for surgeon during posterior cervical surgery.

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