DOUBLE FORAMEN TRANSVERSARIUM IN CERVICAL VERTEBRA: MORPHOLOGY AND CLINICAL IMPORTANCE

Laxmi Chandravadiya1*, Shailesh Patel2, Jatin Goda1, Vipul Chavda4, Srushti Ruparelia2, Shamin Patel3

1 Resident, 2 Associate Professor, 3 Professor & Head, Department of Anatomy, Government Medical College, Bhavnagar
4 Assistant Professor, Department of Physiology, PDU Medical College, Rajkot

INTRODUCTION
The cervical vertebrae are identified by the presence of foramen transversarium (FT) in the transverse processes. This foramen transmits the vertebral artery, vertebral vein and sympathetic fibers from the inferior cervical ganglion. C7 vertebra transmits only vertebral vein, sometimes this foramen is small or absent.1 Transverse process has anterior and posterior roots; terminating laterally as tubercles. Both these tubercles are joined by costo-transverse bar. Double foramen transversarium is a rare condition and this type of variation may affect the course of the vertebral artery. Variations in the number and size of the FT of the cervical vertebra may result in headack, migraine and fainting attack due to compression of vertebral artery.1 The vertebral vessels in such situations may be compressed by head movements and may give rise to vascular insufficiency. Clinically this type of variations is important for the radiologist while doing computed tomographic and magnetic resonant imaging scan.

ABSTRACT
BACKGROUND: The purpose of this study is to investigate the incidence of double foramina transversaria in cervical vertebrae and its morphological and clinical importance. MATERIALS AND METHODS: Total 210 human dried cervical vertebrae were taken from the department of Anatomy, Government medical college Bhavnagar. All the vertebrae were observed macroscopically for the presence of double foramen transversarium. RESULTS: Out of 210 cervical vertebrae, double foramen transversarium was observed in 10 vertebrae (4.76%), among them unilateral double foramen was found in 8 vertebrae (3.80%) and the bilateral was found in 2 vertebrae (0.95%). CONCLUSION: Unilateral double foramen transversarium were more common than bilateral. 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 Vertebra, Foramen Transversarium

ORIGINAL ARTICLE

BACKGROUND: The purpose of this study is to investigate the incidence of double foramina transversaria in cervical vertebrae and its morphological and clinical importance. MATERIALS AND METHODS: Total 210 human dried cervical vertebrae were taken from the department of Anatomy, Government medical college Bhavnagar. All the vertebrae were observed macroscopically for the presence of double foramen transversarium. RESULTS: Out of 210 cervical vertebrae, double foramen transversarium was observed in 10 vertebrae (4.76%), among them unilateral double foramen was found in 8 vertebrae (3.80%) and the bilateral was found in 2 vertebrae (0.95%). CONCLUSION: Unilateral double foramen transversarium were more common than bilateral. 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 Vertebra, Foramen Transversarium

INTRODUCTION

This variation of foramina transversaria is also important for surgeon during posterior cervical surgery. There are various studies on the origin and course of vertebral artery but there is a paucity of studies regarding the morphology of accessory foramen transversarium in the cervical vertebrae and its incidence. Objective of our study was to study the morphology of double FT and to calculate its incidence. The foramina were macroscopically analysed and the incidence of double FT was calculated.

MATERIALS AND METHODS

This study was conducted using 210 dried human cervical vertebrae obtained from Department of Anatomy, Government Medical College, Bhavnagar. Among them 120 were typical cervical vertebrae (C3, C4, C5, and C6) and 90 were atypical cervical vertebrae (C1, C2 and C7). Each cervical vertebra was examined macroscopically for the presence of the double foramen transversarium on both the side. Defective bones were excluded from the study. Vertebrae having double FT were photographed. The data was compiled and analysed using Microsoft Excel software.

RESULTS

Out of 210 cervical vertebrae the double foramen transversarium was found in only 10 vertebrae. The incidence of which is calculated as 4.76%. Among them unilateral duplication was found in 8 vertebrae (3.80% of total) and bilateral duplication was found...
in 2 vertebrae (0.95% of total). Thus, unilateral double foramen was more common than bilateral one. Further, the accessory foramina were smaller than the regular foramina. Also the double foramina were observed only in the lower cervical vertebrae (C₅, C₆, C₇). Each vertebrae was having atleast one foramen transversarium on either side.

Table 1: showing the incidence of double FT in lower cervical vertebrae

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of vertebrae examined</th>
<th>Vertebral artery</th>
<th>Vertebral artery</th>
<th>Total</th>
<th>Incidence in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₅</td>
<td>30</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6.67</td>
</tr>
<tr>
<td>C₆</td>
<td>30</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>20.0</td>
</tr>
<tr>
<td>C₇</td>
<td>30</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>6.67</td>
</tr>
</tbody>
</table>

Figure 1: Typical Cervical Vertebra with unilateral double FT

The foramen transversarium 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 vertebra. It is closed laterally by the costotransverse bar. Regarding the vertebral artery; Sim et al. described that 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 artery. The vertebral arteries supply the cervical part of spinal cord, spinal ganglions, meninges and duramater in the posterior cranial fossa. The transverse foramen of the seventh cervical vertebra contains some branches of vessels and nerves as well as fibrous and adipose tissues. We found out 10 vertebrae out of 210 that are having double FT either unilaterally (8) or bilaterally (2). Further, double FT was seen only among the lower cervical vertebrae i.e. from C₅ to C₇. The percentage of occurrence of double FT in our study was 4.76%. In a study utilizing 132 human cervical vertebrae conducted by Das Srijit the incidence of double FT was 1.5%. Taitz et al. reported the incidence of 7% among the 480 vertebrae they studied. As the vertebral vessels are the important in the formation of the foramen transversarium, it can be apparent that variations in the presence and course of the vertebral vessels will result in variation in foramen transversarium. A narrowing of the foramina indicates narrowness of the vessels and so on. El Shaarawy et al. observed that the accessory foramina transversaria were most common at the lower cervical vertebrae (C₅, C₆ and C₇), mostly in C₆. The surgical anatomy of the foramen transversarium and vertebral artery are important to the neurosurgeons and radiologists. Their anatomy and morphology is useful to the operating spine surgeons and radiologists in the interpretation of radiographic films and computed tomogram scans. Compression of the vertebral artery may lead to neurological and hearing disturbances.

CONCLUSION

In our study we observed the double foramen transversarium in 4.76% of the cases. The unilateral double foramen was more common than the bilateral. All the double foramina were observed in the lower cervical vertebrae (C₅, C₆, C₇). 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. Also the knowledge of this type of variation is important for the neurosurgeon during posterior cervical surgery. It is also useful for radiologist during CT and MRI scan. Our study will provide further information on incidence and morphological basis of foramina transversarium. It will help in radiological imaging, neurological diagnosis and in complex surgical procedures in the cervical area.

ACKNOWLEDGEMENTS

I am very thankful to my PG guide Dr. S. M. Patel and all the staff of department of anatomy, government medical college, Bhavnagar for helping me during this entire study.

REFERENCES


