To Determine the Incidence of Accessory Foramen Transversarium

Rachna Magotra, Shahnaz Choudhary, Ashwani K Sharma, Nusrat Jabeen

Abstract

To find the incidence of accessory foramen transversarium in dried cervical vertebrae. 150 dried cervical vertebrae were collected from Postgraduate department of Anatomy Government Medical College Jammu and examined for the accessory foramen transversarium. Out of 150 cervical vertebrae, only 24 had accessory foramen transversarium with preponderance in sixth cervical vertebrae. Amongst the vertebrae with accessory foramen transversarium, 14 were bilateral and 10 were unilateral. In the present study the incidence of accessory foramen transversarium was 16%. This is important for Radiologists to interpret Computed Tomography Images and Magnetic Resonance Imaging of cervical spine.

Key Words

Cervical Vertebrae, Foramen Transversarium, Accessory Foramen Transversarium, Vertebral Artery

Introduction

All seven cervical vertebrae have a foramen - the foramen transversarium in the transverse process. Anterior to the foramen is the bar of bone - the costal process - which projects laterally from the body to the end of anterior tubercle. The costal process corresponds to the ribs. Behind the foramen the true transverse process projects laterally from the junction of the pedicle and the lamina. It ends in the posterior tubercle. A bar of bone the costotransverse bar unites the anterior and posterior tubercle and completes the foramen transversarium. It is concave superiorly and has a ventral ramus of the corresponding spinal nerve. The foramen transversarium transmits the vertebral artery (C1 to C6) only, vertebral veins and sympathetic plexus (1).

Presence of another foramen apart from foramen transversarium in the transverse process of cervical vertebrae is called accessory foramen transversarium which is smaller in size than the primary foramen. Generally, it is found in the sixth cervical vertebra and less frequently in other typical cervical and 7th cervical vertebrae. This accessory foramen transversarium lies posterior to the normal foramen transversarium (2).

Formation of foramen transversarium occurs due to the fusion of costal element of developing cervical transverse process with the transverse element of the developing vertebrae. During this interaction the vertebral vessels and nerve plexuses are caught between these two bony parts. So the course of vertebral vessels determines the formation of foramen transversarium.

The aim of this study is to find out the incidence of accessory foramen transversarium in cervical vertebrae.

Material and Methods

The present study was conducted on 150 dried cervical vertebrae obtained from the Postgraduate Department of Anatomy Government Medical College. Only complete vertebrae, which were not broken, were included in the study. All the vertebrae were observed grossly, for the presence of accessory foramen transversarium. A fine needle was passed through these foramina to observe their patency. All the vertebrae having accessory foramen transversarium were photographed and the findings were tabulated.

Results

Out of 150, only 24 cervical vertebrae had accessory foramen transversarium. Amongst them 14 (58%) had bilateral accessory foramen transversarium (Fig-I) and
9 (42%) had unilateral accessory foramen transversarium (6 on the right side and 4 on the left side) (Fig-2, 3) (Table-1). No accessory foramen transversarium was present in first, second and seventh cervical vertebrae (Atypical cervical vertebrae). It was only present in third, fourth, fifth and sixth cervical vertebrae (Typical cervical vertebrae). The incidence of accessory foramen transversarium in 150 cervical vertebrae was 16%. Amongst the vertebrae with accessory foramen transversarium, 2 were C3 (8.34%), 3 were C4 (12.5%), 5 were C5 (20.83%) and 14 were C6 (58.33%) (Fig-3). Absence of foramen transversarium and double accessory foramen transversarium was not seen in our study.

Table1. Showing Number Vertebrae

<table>
<thead>
<tr>
<th>Number of Vertebrae</th>
<th>Vertebrae with AFT</th>
<th>Bilateral AFT</th>
<th>Unilateral AFT Left</th>
<th>Unilateral AFT Right</th>
<th>% Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>24</td>
<td>14</td>
<td>4</td>
<td>6</td>
<td>16%</td>
</tr>
</tbody>
</table>

Discussion
Variations in the foramen transversarium are important as they depict variations in the vertebrate artery. In the present study we studied 150 cervical vertebrae and incidence of accessory foramen transversarium was 16% with bilateral preponderance. A number of studies have been done previously to show the incidence of accessory foramen transversarium (Table-2).

Sharma et al 2010(4) studied 200 cervical vertebrae and only 16 had accessory foramen transversarium (8%). Out of 16 vertebrae, it was present unilaterally in 7 and bilaterally in 9. This is in accordance to our study.
Table 2 Comparison of Various Studies

<table>
<thead>
<tr>
<th>S.N.O</th>
<th>Authors</th>
<th>Unilateral Aft-Rt</th>
<th>Unilateral Aft-Lt</th>
<th>Bilateral Aft</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sharma et al (4)</td>
<td>07</td>
<td>00</td>
<td>09</td>
</tr>
<tr>
<td>2</td>
<td>Murlimanju et al (7)</td>
<td>04</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>3</td>
<td>Rathnakar et al (8)</td>
<td>05</td>
<td>00</td>
<td>02</td>
</tr>
<tr>
<td>4</td>
<td>Mishra et al (5)</td>
<td>10</td>
<td>00</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>Gujar et al (9)</td>
<td>27</td>
<td>14</td>
<td>00</td>
</tr>
<tr>
<td>6</td>
<td>Patra et al (6)</td>
<td>16</td>
<td>00</td>
<td>17</td>
</tr>
<tr>
<td>7</td>
<td>Oviya et al (10)</td>
<td>02</td>
<td>04</td>
<td>05</td>
</tr>
<tr>
<td>8</td>
<td>PRESENT STUDY</td>
<td>06</td>
<td>04</td>
<td>14</td>
</tr>
</tbody>
</table>

More bilateral incidence than unilateral was also observed by Mishra et al, 2014 (5) and Patra et al, 2015 (6). Murlimanju et al, 2011 (7) observed 373 vertebrae and only 6 (1.6%) had accessory foramen transversarium. In this study the incidence was more unilateral than bilateral.

More unilateral incidence was observed by many authors like Ratnakar et al, 2013 (8) and Gujar et al, 2015 (9). Murlimanju et al, 2011 (7) also observed double accessory foramen transversarium which was not found in the present study.

The presence of accessory foramen transversarium may be correlated to variations in vertebral artery, the knowledge of which is important for clinicians as vertebral artery insufficiency may lead to headaches, migraine, vertigo and fainting attacks.

Moreover the presence of accessory foramen transversarium is related to duplication of vertebral artery which is a rare condition and seen in 1% of dissections, Oviya et al, 2016 (10).

It is also important for the radiologists to have the knowledge of this variation while reporting Computed Tomography and Magnetic Resonance Imaging of cervical spine.

**Conclusion**

We found accessory foramen transversarium in 16% of cervical vertebrae. It was more common bilaterally (58.33%) than unilaterally (41.67%). It is more prevalent in sixth cervical vertebrae (58%).

**References**