A Study Of Accessory Foramen Transversarium In Dry Cervical Vertebrae And Its Clinical Implications

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Abstract: Background & Objective: The foramen transversarium in the transverse process is the characteristic feature for cervical vertebrae and distinguish it from other vertebrae. It transmits the vertebral artery, vertebral vein and sympathetic nerves. These foramina show variations in its size, shape and number. The present study was done to find out the incidence of accessory foramen transversarium and compare it with other study. Methodology: A total 150 dried cervical vertebrae were observed macroscopically for accessory foramen transversarium in the department of anatomy. Results: Out of 150 vertebrae, accessory foramen transversarium was found in 41(27.33%) vertebrae. Among 41 vertebrae unilateral accessory foramen transversarium was found in 27(18%) vertebrae and bilateral was found in 14(9.33%) vertebrae. Conclusion: The knowledge of accessory foramen transversarium is useful for spine surgeons in surgery around cervical vertebrae. It helps radiologists in interpretation of computed tomogram and magnetic resonance image scans. It is also helpful for anatomist, anthropologist and clinicians. [Gujar S NJIRM 2015; 6(6): 27-30]

Key Words: Accessory Foramen transversarium, Cervical vertebrae, Vertebral artery

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Introduction: The cervical vertebrae are identified by the presence of foramina transversaria in transverse process. The transverse process has anterior and posterior roots which end in tubercles joined by the costotransverse bar. The costal element is represented by the anterior root, anterior tubercle, costotransverse bar and the posterior tubercle. The costotransverse bars are grooved by the anterior primary rami of the corresponding cervical nerves. The foramen transversarium in all cervical vertebrae except seventh transmits the vertebral artery, the vertebral veins and a branch from the inferior cervical ganglion[1].

These foramina are known to exhibit variations with respect to the shape , size and numbers. Under such circumstances the course of vertebral artery may be distorted. The variations in number and size of foramina transversarium of cervical spine may be one of the causes for complaints like headaches, migraine and fainting attacks, usually due to compression of the vertebral artery[2].

Surgical anatomy and morphology is useful to the operating spine surgeons and radiologist while doing computed tomography and magnetic resonant imaging scans. Maintaining the vertebral artery is an important concern during cervical spine surgeries since even minor lesions will lead to serious haemorrhage or death. There are anatomical studies under taken to minimize such accidental intra operative lesions of these arteries[3].

The objective of present study was to find incidence of accessory foramen transversarium in dried cervical vertebrae.

Material and Methods: The present study was conducted in department of anatomy at C.U Shah Medical College, Surendrangar. A total number of 150 dried cervical vertebrae of unknown age and sex were collected and examined macroscopically for existence of the accessory foramen transversarium on both sides. Defective bones were excluded from the study. Vertebrae with accessory foramen transversarium were photographed. The data were complied and analysed.

Results: Out of 150 cervical vertebrae the double foramen transversarium was found in 41 vertebrae(27.33%). Among 41 vertebrae unilateral accessory foramen transversarium was found in 27(18%) and bilateral accessory foramen transversarium was found in 14(9.33%) vertebrae. Thus unilateral accessory foramen transversarium was more common than bilateral.

Table 1: Incidence of accessory foramen transversarium

Bilateral accessory foramen	14	Complete (Fig:1)	12
		Incomplete(Fig:2)	2
Unilateral accessory foramen	27	Complete(Fig:3)	21
		Incomplete(Fig:4)	6

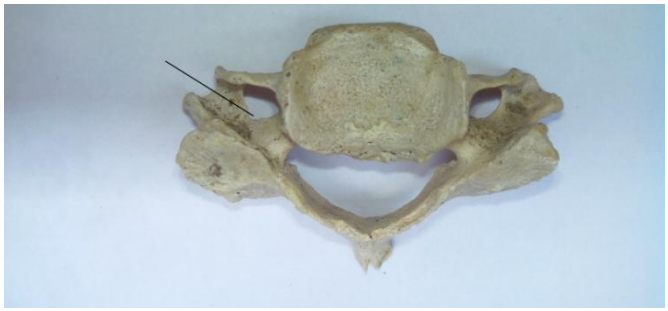
Figure 1: Bilateral Complete Accessory Foramen Trasversarium

Figure 2: Bilateral Incomplete Accesory Foramen Trasversarium

Figure: Unilateral Complete Accessory Formaen Trasversarium

Discussion: The foramen transversarium is a result of the special 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. The vertebral vessels and nervous plexus are caught between these two bony parts. The foramen transversarium is closed laterally by the costotransverse bar, a thin plate of bone connecting the rib element to the original transverse process[4] .The vertebral artery is developed from cervical intersegmental arteries arise from the dorsolateral aspect of the dorsal aorta. These arteries link up with one another and form the longitudinal anastomotic channels. Except the seventh cervical intersegmental artery , rest of the arteries regress and modified to form the vertebral artery[5].

Figure 4: Unilateral Incomplete Accessory Foramen Trasversarium



Failure in controlled regression of intersegmental arteries leads to duplication of the vertebral artery. The vertebral vessels passes through foramen transversarium, so variations in vessels might lead to variations in foramen. Since the vertebral vessels are the factors behind the formation of the foramen transversarium, it can be assumed that the variations in the presence and course of the vertebral arteries will manifest as variations of the foramen transversarium. In contrast variations in foramen transversarium can be useful in estimating variations of the vessels[4].

Many studies have been conducted in the past by different authors (Table II). In 1978, Taitz et al. studied on 480 dried cervical vertebrae & reported 34 cases(7%) of accessory foramen transversarium. Das et al. found only 2 case(1.5%) of double foramen transversarium out of 132 cervical vertebrae. Sharma et al. observed accessory foramen transversarium in 8% cases among 200 cervical vertebrae, in which bilateral accessory foramen transversarium was more common(4.5%) than unilateral(3.5%). Kaya et al. studied on 22 Byzanthine cervical vertebrae and observed that unilateral accessory foramen transversarium was more (13.63%) common than bilateral(9.09%). Murlimanju et al. found only six (1.6%) vertebrae with accessory foramen transversarium among 363 cervical vertebrae in which

5 had bilateral and 1 had unilateral accessory foramen transversarium.

Table 2: Comparison of studies about incidence of accessory FT(foramen transversarium)

Authors	No of specimen	Incidence of accessory FT	Unilateral accessory FT	Bilateral accessory FT
Taitz et al[4]	480	7%	-	-
Das et al[6]	132	1.5%	-	-
Sharma et al[7]	200	8%	3.5%	4.5%
Kaya et al[8]	22	22.7%	13.63%	9.09%
Murlimanju et al[9]	363	1.6%	1.3%	0.3%
Chaudhari et al[10]	133	23.15%	14.73%	8.42%
Rathnakar et al[11]	140	5.7%	3.6%	1.42%
Chandravadiya et al[12]	210	4.76%	3.8%	0.95%
Patil et al[13]	175	5.71%	3.42%	2.28%
Murugan et al[14]	150	12.6%	10.6%	2%
Katikireddi et al[15]	100	3%	2%	1%
Shital et al[16]	210	16.19%	9.52%	6.67%
Mishra et al[17]	220	14.09%	4.54%	9.54%
Apurba Patra et al[18]	150	22%	10.67%	11.33 %
Akhtar et al[19]	174	14.36%	11.49%	2.87%
Present Study (2015)	**150**	**27.33%**	**18%**	**9.33%**

Recent study by Murugan et al, Shital et al and Mishra et al had found 12.6%, 16.19% & 14.09% incidence of accessory foramen transversarium. Chaudhari et al and Patra et al had found 23.15% & 22% incidence of accessory foramen transversarium. In our study we found 41 vertebrae(27.33%) with accessory foramen transversarium out of 150 vertebrae which is highest among all previous studies. Among 41 vertebrae unilateral accessory foramen transversarium was found in 27(18%) and bilateral accessory foramen transversarium was found in 14(9.33%) vertebrae. We also found that unilateral accessory foramen was more common than bilateral that is similar to all previous studies except Sharma et al , Mishra et al and Patra et al.

Conclusion: The knowledge of variation in foramen transversarium is important clinically. Variation in course of vertebral artery may seen in such cases that may lead to compression and subsequent neurological symptoms. 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.

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Conflict of interest: None
Funding: None
Cite this Article as: Gujar S, Oza S, Shekhawat J. A Study Of Accessory Foramen Transversarium In Dry Cervical Vertebrae. Natl J Integr Res Med 2015; 6(6): 27-30