Case Report

Bilateral double foramen transversarium in cervical vertebra

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Abstract

Background: The foramen transversarium is one of the most characteristic features of cervical vertebrae which differentiates cervical vertebra from the other vertebra. The foramen transversarium transmits the vertebral artery, vertebral veins, and sympathetic nerves, branches from cervicothoracic ganglion from the first to sixth cervical vertebra. The present case report is bilateral double foramen transversarium in dried cervical vertebra. The variations of foramen transversarium has developmental and vascular basis. Developmental basis is related to its development from costal and transverse element of vertebra while vascular basis is related to the variations in the development and course of vertebral artery. Entrapment of vertebral artery may lead to vertebrobasilar insufficiency leading to posterior headache, migraine and fainting attacks as vertebral artery supply spinal cord, meninges, spinal ganglion and some important structures of posterior cranial fossa. Knowledge of such morphological variations is important for neurosurgeons during posterior surgical approach of cervical spine.

Key words: cervical vertebrae, foramen transversarium, vertebral artery.

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INTRODUCTION

The transverse processes of all vertebrae have its costal element and transverse element. In case of cervical vertebrae, the transverse process presents anterior and posterior roots, anterior and posterior tubercles and a costotransverse bar connecting both the tubercles. The costal element in cervical vertebrae is represented by anterior root, anterior tubercle, costotransverse bar and posterior tubercle while posterior root presents a true transverse element and is attached to the junction of the lamina and pedicle behind the vertebral notch.[1] The costal and vertebral elements of the cervical vertebra together enclose foramen transversarium. The foramen transversarium is one of the most characteristic features of cervical vertebrae which differentiates cervical vertebra from the other vertebra. The foramen transversarium transmits the vertebral artery, vertebral veins, and sympathetic nerves, branches from cervicothoracic ganglion from the first to sixth cervical vertebra. In case of seventh cervical vertebra, it transmits only accessory vertebral veins.[2,3] The variations of foramen transversarium is not uncommon. When reviewed the literature, different variations of shape like rounded, quadrangular, oval and ir-regular and size with varied variations of number like duplication, unilateral or bilateral, absent or incomplete.

The variations of foramen transversarium has developmental and vascular basis. Developmental basis is related to its development from costal and transverse element of vertebra while vascular basis is related to the variations in the development and course of vertebral artery. Knowledge of such morphological variations is important for neurosurgeons during posterior surgical approach of cervical spine. Maintaining the vertebral artery intact constitutes an important concern during cervical surgical procedures.[4] The present case report is about duplication of foramen transversarium in typical cervical vertebra.

CASE REPORT

During routine bone demonstration in the class of cervical vertebrae, we found one typical cervical vertebra showing bilateral double foramen transversarium. Normally we find only one foramen transversarium in the transverse process of cervical vertebra. Out of the two foramina, one was large occupying maximum space of transverse process. The shape of this large Primary foramen was round. The size of this primary foramen was not uniform on right and left side with left sided foramen little larger than right side. Near this primary foramen, one small foramen found posteriorly on both the transverse processes. The two foramina were separated by very thin bone bar. Shape of this accessory small foramen was oval. When compared, the left sided accessory foramen was little larger compared to right side. No other cervical vertebrae in the department showed similar variation.

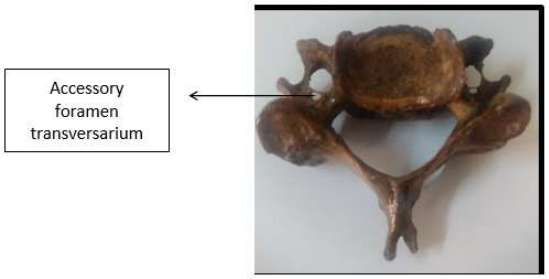

Figure 1

DISCUSSION

Duplication of foramen transversarium is also called as 'Foramen bipartita'[5] The varied incidance of such duplication is mentioned in different studies in the literature. The author Chaudhary *et al.,*[6] Kaya[7] and Apurba Patra[8] reported very high incidence rate of 23.15, 22.72 and 22 respectively in their study while Author Murlimanju[9] and Katkireddy[10] reported very low incidance rate of 1.6 and 3 respectively in their study. The variations of foramen transversarium are significant clinically. It might be due to double rib bone element on the same side fusing to the original transverse process resulting in unusual number of foramen transversarium. Some authors mentioned in their study that vertebral vessels play an important role in the development of the foramen transversarium. According to them, the variations in the presence, number and course of vertebral vessels manifests in the different variations of foramina. Some authors also estimated, knowledge of such morphological variations of foramen transversarium can be utilized for analysing variations of vertebral artery and it's clinical implications.[11,12] Embryologically, the vertebral artery is developed from the fusion of longitudinal anastomosis that link the cervical intersegmental arteries from the primitive dorsal aorta. In the course of development, all the intersegmental arteries regress except the seventh intersegmental artery which gives rise to proximal part of subclavian artery and hence vertebral artery.[13] Author Sim *et al.*[14] stated that during development if some portion of the primitive dorsal aorta does not degenerate along with the two intersegmental arteries which connect the vertebral artery then it may lead to the duplication of vertebral artery which may pass through double foramen transversarium. According to the author large left sided vertebral artery compared to the right vertebral artery may be one of the reason for difference in the size of foramen on right and left side. In our case report, we also found large left primary and accessory foramen transversarium compared to those of left side. As per author M Y Dofe[15] vertebral artery enters the foramen transversarium of vertebra at C6 in 88% of cases, and C7 and C5 in only 5% and 7% of cases. So variations in the course of vertebral artery will lead to variations of presence or abesence of foramina. Author Nilofer[11] also mentioned that absence of foramen transversarium may indicate bypassing of vertebra by vertebral artery.As per some authors tortuosity of vertebral artery may be one of the factors responsible for the duplication of foramen transversarium. As foramen transversarium transmits vital structures like vertebral artery, vertebral vein and branches from cervicothoracic ganglion, variations related to it affect all these structures[1] Entrapment of vertebral artery may lead to vertebrobasilar insufficiency leading to posterior headache, migraine and fainting attacks as vertebral artery supply spinal cord,meninges, spinal ganglion and some important structures of posterior cranial fossa.[8] In our case report, we found accessory foramen positioned posterior to the primary foramen which is in aggreement with the findings of study by M Y Dofe[15]. In addition, author M Y Dofe[15] also mentioned that unilateral duplication of foramen transvarsarium is more common than bilateral.The knowledge of surgical anatomy of foramen transversarium is also significant in accessing radiographic films like CT and MRI.[16]

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