USE OF CT FOR ANALYSIS OF THE VERTEBRAL FORAMEN IN THE HOSPITAL OF QUERÉTARO

RESUMEN

Objetivo: Determinar la morfología del foramen vertebral y su distancia de la línea media. Métodos: Se evaluaron 20 tomografías cervicales del archivo radiográfico de 12 hombres y 8 mujeres, de 18 a 74 años de edad, del segmento C1 a C6, realizando la medición del diámetro del foramen y su distancia de la línea media. Se buscaron las anomalías morfológicas del foramen vertebral, usando un equipo Philips Ingenuity CT y software Phillips IntelliSpace Portal. Resultados: La edad promedio fue de 47 años; el segmento con más anomalías fue C1, con 10% (aumento del diámetro del foramen), seguido de C2 y C6 con 5% (hipotrofia del foramen vertebral); el promedio del diámetro del segmento C1 a C6 fue 6,081 mm y el promedio de distancia de la línea media al foramen vertebral de C2 a C6 fue 13,215 mm. El mayor diámetro del foramen vertebral fue en C2, con promedio de 6,67 mm y el menor fue en C4, con promedio de 5,75 mm; la mayor distancia de la línea media al foramen vertebral correspondió en C1 con promedio de 22,59 mm y el menor fue en C4, con promedio de 12,13 mm. Conclusiones: Se determinó el promedio del diámetro del foramen vertebral y su distancia a la línea media, estableciendo una zona de seguridad para procedimientos. En nuestra ciudad no existe un estudio que determine promedios del diámetro del foramen vertebral, la distancia de la línea media y sus anomalías. Es preciso contar con tomografía y hacer un plan preoperatorio para evitar las complicaciones asociadas con alteraciones morfológicas.

Descritores: Conducto vertebral; Columna vertebral/anatomía & histología; Arteria vertebral; Tomografía.
INTRODUCTION

Currently, at the Hospital General de Querétaro, anterior cervical approach procedures are performed and, although it is rare in this type of procedure, the consequences can be catastrophic, since they are associated with complications such as fistulas, pseudo-a-neurysms, hemorrhages, thrombosis, cerebral ischemia, embolism, infection, and death.¹

The lesion rates reported in the United States range from 0.3% to 0.5%.² ³ In posterior approach surgeries, the rates reported are variable and depend on the instrumentation technique used. They range from 4.1% to 8.2% for transarticular screws (C1-C2), and there are no lesions reported for subaxial lateral mass screws.⁴

Currently, morphometric evaluations of the cervical pedicles have already been reported in studies involving small numbers of vertebrae in cadavers, as well as in older adults, who, because of their condition, present degenerative changes.⁷

Previous studies include patients with degenerative symptoms of the cervical spine or are specifically focused on the Asian population.

We believe that such data will provide the surgery with an improved understanding of pedicle anatomy and improve decision-making.

Therefore, the purpose of this review is to understand the morphology of the vertebral foramen through operative planning using computed axial tomography, which improves the understanding of the specific morphology of each patient, benefiting preoperative decision making and reducing the risk of a lesion of the vertebral artery.

METHODS

For this study, 20 simple cervical tomographies from the digital radiography archive were evaluated.

Patients with a history of chronic or acute traumatic cervical abnormalities, symptoms suggesting degenerative or inflammatory disease, evidence of infectious or neoplastic conditions, and congenital malformations of the cervical spine were included.

Patients with incomplete or not assessable tomographies were excluded.

An informed consent form was obtained from all the study participants and the study was approved by the Institutional Review Board as registration number (304/17-10-20 VI).

PHILIPS Ingenuity CT equipment and IntelliSpacePortal software were used for all patients, with 3.0 mm helical scans of the cervical spine and reconstruction intervals of 1.5 mm. The scans were performed with the patients in a supine position and the neck in a neutral position. The morphological characteristics were obtained for cervical vertebrae C1 to C6. A total of 12 men and 8 women ranging from 18 to 74 years of age were analyzed.

The program measured the diameter of the vertebral foramen and the distance from the foramen to the midline. We looked for anomalies in the morphology of the vertebral foramen (VF), (Figure 1)

The mean age was 47 years. The segment where the most anomalies were found was C1, with 10% (increase in the diameter of the foramen), (Figure 2), followed by C2 and C6, each with 5% (hypotrophy of the vertebral foramen).

The mean diameter of the vertebral foramen of the C1 to C6 segment was 6.081 and the mean distance from the midline to the vertebral foramen of C2 to C6 was 13.215 mm. (Table 1)

The vertebral foramen of C2 had the greatest mean diameter at 6.67 mm and of C4, the smallest mean diameter at 5.75 mm. C1 had the greatest mean distance from the midline to the vertebral foramen at 22.59 mm and C4 had the smallest mean distance at 12.13 mm. (Table 1)

DISCUSSION

In this study, the mean diameter of the vertebral foramen and the mean distance from the foramen to the midline were determined, establishing a safety zone for procedures. No study exists for our population that determines the mean of the vertebral foramen and the midline, or their anomalies. It is necessary to have a tomography and to conduct preoperative planning to avoid possible complications associated with morphological changes.

CONCLUSION

At present, there are no studies to determine which is the morphological change most common in the vertebral foramen, in our study it is a decrease in the diameter of the foramen, which could affect the diameter of the vertebral artery, so that a lesion of the foramen and consequently of the contralateral side of said anomaly
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It could have catastrophic consequences, as previously mentioned. It was also determined that the mean distance from the vertebral foramen to the midline in the corresponding bodies from C2 to C6 is 13.12 mm, which could be used as a safety range when working with the drill in this area during anterior approach surgery. (Figure 3)

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