A Morphologic And Morphometric Study Of The Foramen
Lacerum In Adult Human Skulls: An Osteological Study In
Upper Egypt

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Abstract
Background: Foramen lacerum is one of the foramen at the base of skull lies between
the occipital bone and the petrosal portion of the temporal bone and sphenoid bone It
allows passage of internal carotid artery ,ascending pharyngeal artery and emissary
veins from the cavernous sinus. Variability in anatomical aspect of this foramen has
been studied by many workers in different part of the world.
Aims & Objective: To study the variability in shape and size of foramen lacerum.
Materials and Methods: Present study has been designed to study on 100 skulls
(100×2=200 foramen).
Result: The mean AP. diameter on right was 10.89mm,and on left it was 10.88mm.The
mean transverse diameter on right was 6.85mm, on the left 6.59mm.
Conclusion: The clinical significance of foramen lacerum is important during
surgeries. Therefore, the dimensions of foramen lacerum is much necessary.
Key words: Foramen lacerum, internal carotid artery, cavernous sinus.

INTRODUCTION
Foramen lacerum is a hole that is found at the base of the skull, with a
characteristic triangular shape. These are the elements that surround the
foramen lacerum and practically contribute to its formation: sphenoid
bone (anterior border), petrous temporal bone (more exactly, its apex)
and the occipital bone (specifically, the basilar part) (Standring, 2008). It is
known that foramen lacerum is located anteriorly and medially from the
carotid canal. The hole is covered by cartilage (connective tissue) in the
postnatal period (Drake et al., 2015).
It measures approximately 9 mm in length and 7 mm in breadth. The
foramen lacerum is filled with connective tissue and transmits the
small meningeal branches of the ascending pharyngeal artery and emissary veins from the cavernous
sinus. The internal carotid artery passes along its superior surface
but does not traverse it (Lang, 2001).
In the foramen lacerum the greater
petrosal nerve joins with the deep
petrosal nerve to form the nerve of the
pterygoid canal. The deep petrosal
nerve carries sympathetic and the
greater petrosal nerve carries parasympathetic fibers of
the autonomic nervous system to blood
vessels, mucous membranes, salivary
glands, and lacrimal glands (Snell,
2012).
Some emissary veins pass through
the foramen lacerum. These connect the
extracranial pterygoid plexus with the
intracranial cavernous sinus and
present an unopposed route
for infection (Standring, 2008).
The foramen lacerum has been
described as a portal of entry into
the cranium for tumours,
including nasopharyngeal
carcinoma, juvenile angiofibroma,
adenoid cystic carcinoma, malignant
melanoma, and lymphoma
(Christodouleas et al., 2010).
Material and methods
The present study was undertaken on 100 dry, adult human skulls randomly selected obtained from Anatomy department of medical College of Qena, Sohag, Assiut and El-Minia university.

a. Morphological study:
The observations were measured on both Right & Left sides in each skull measured. The antero-posterior and transverse diameter of the foramen were measured (Kumar, 2015). The average, largest, and smallest sizes of the different foramina were listed. All these data were measured using a digital vernier calliper with an accurate resolution up to 0.01mm (Sethi et al., 2014).

b. Morphometric analysis:
Statistical evaluations were performed for each measurement. The mean, standard deviation, a paired comparisons t-test, and value were performed to determine if there was a significant difference between the right and left sides (Sangari et al., 2015). The metric data was analysed statistically with SPSS version 16 using student’s t-test, with P value<0.05 taken as significant (Sethi et al., 2014).

Results
On the right side: Anteroposterior (AP) diameter varied between smallest and largest diameters: 4.32-16.33 mm. Transverse diameter varied between 3.21-19.04mm.

On the left side: AP diameter varied from 4.69-16.48mm with mean. Transverse diameter varied from 2.97-17.79mm with mean. The mean AP. and T. diameter were shown in table 1 and chart 1.

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<tr>
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<th>AP. diameter</th>
<th>Transverse. diameter</th>
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<tbody>
<tr>
<td>Right</td>
<td>10.89±2.839mm</td>
<td>6.85±3.15mm</td>
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<tr>
<td>Left</td>
<td>10.88±2.96mm</td>
<td>6.59±3.16mm</td>
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Table 1. Mean AP and T. diameter of foramen lacerum in 100 adult skulls.

Discussion
The internal carotid artery passes from the carotid canal in the base of the skull, emerging and coursing superior to foramen lacerum as it exits the carotid canal. The internal carotid artery does not travel through foramen lacerum. The segment of the internal carotid artery that travels above foramen lacerum is called the lacerum segment (Tauber et al., 1999). The foramen lacerum has been described as a portal of entry into

Chart 1. Mean AP and T. diameters of foramen lacerum in 100 adult skulls.
the cranium for tumours, including nasopharyngeal carcinoma, juvenile angiofibroma, adenoid cystic carcinoma, malignant melanoma, and lymphoma (Christodouleas, et al., 2010).

The first recorded mention of the foramen lacerum was by anatomist Wenzel Gruber in (Gruber and Wenzel, 1869). Study of the foramen has been neglected for many years because of the small role it plays in intracranial surgery (Tauber et al., 1999).

References