

Bilateral carotico-clinoid foramen

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ABSTRACT

The carotico-clinoid foramen is the result of ossification either of the carotico-clinoid ligament or of a dural fold extending between the anterior and middle clinoid processes of the sphenoid bone. It is anatomically important due to its relations with the cavernous sinus and its contents, sphenoid sinus and pituitary gland. A case of bilateral foramen carotico-clinoid and interclinoid bar has been reported while teaching the cranial cavity to MBBS students. This carotico-clinoid foramen is seen as a consequence of fusion of anterior and middle clinoid processes. The existence of a bony caroticoclinoid foramen may cause compression, tightening or stretching of the internal carotid artery. Further, removing the anterior clinoid process is an important step in regional surgery. The presence of a bony carotico-clinoid foramen may have high risk. Therefore, detail knowledge of type of ossification between the anterior and middle clinoid processes is necessary to increase the success of regional surgery.

Key Words: Foramen, carotico-clinoid foramen, clinoid processes, bilateral, significance

Introduction

Cranial cavity is conventionally divided into three fossae viz. Anterior, middle and posterior cranial fossae and it depicts 3 pairs of clinoid processes. Anterior clinoid processes formed by medial end of lesser wing of sphenoid and it overhangs the optic canal, middle clinoid processes are small eminences at lateral ends of anterior boundary of sella turcica and posterior clinoid processes are lateral ends of upper border of dorsum sellae. [1] In the living a caroticoclinoid ligament connects anterior and middle clinoid processes. Similarly anterior and posterior or middle and posterior clinoid processes may also be connected by ligamentous bridges. [2] Ossification of the caroticoclinoid ligament between anterior and middle clinoid processes is termed as caroticoclinoid bridge and it leads to formation of caroticoclinoid

foramen of Henle. Later transmits one of the segments of internal carotid artery. Ossification of ligament between anterior and posterior clinoid processes is known as interclinoid osseous bridge or sella turcica bridge. Rarely, all three processes may be fused with each other.

Case Report

Material for present report comprised of one dry skull belonging to a student of MBBS 1st year and vernier calliper was used for measurements. In this skull, the anterior and middle clinoid processes were found to be linked by a bony bridge on both the sides thus forming a bilateral foramen carotico-clinoidium. (Fig. 1) On the right side the antero-posterior diameter was 3.22mm and transverse diameter was 5.02mm. The corresponding values on left side were 4.30mm and 5.67mm. There was no

tendency of fusion between anterior and posterior or between middle and posterior clinoid processes on either side.

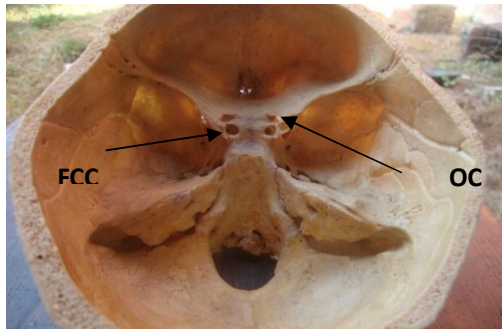


Fig. 1 Showing bilateral Foramen Carotico clinoidum (FCC), optic canal (OC)

Discussion

The word 'Clinoid' is derived from Greek word 'Cline' means a bed and 'oid' which means 'similarity to'. It also derived from Greek word 'klinein' or the Latin word 'clinare' both of which mean sloped or inclined. Thus the anterior and posterior clinoid processes surround the sella turcica like four corners of a four poster bed.^[3]

The incidence of incomplete unilateral foramina varies from 8-35% while a bilateral and complete foramina are very rare found in 0.2-4% of population.^[4] A racial variation has also been reported in this foramen. A high incidence has been noted in Turkish (35.67%) and caucasian Americans (34.84%) while a low incidence was found in Koreans (15.7% and Japanese (9.9%).^[4] Regarding the sexual variations, contradictory results have been reported by different workers. While Freire et al,^[5] 2011 found it to be more common in females, Lee et al,^[6] and Dido & Ischida,^[7] found it otherwise i.e more in males. When unilateral it is more commonly present on right side.^[8]

High incidence (15-38%) of this foramina has been associated with the Idiots, Criminals, Epileptics and those with hormones disturbances.^[9] The Interclinoid bars between the three clinoid processes

have been classified into 4 types by Rani et al.^[10]

- Type 1- Bridge between anterior and middle clinoid processes i.e carotico-clinoid foramen
- Type 2- bridge between anterior, middle and posterior clinoid processes.
- Type 3- bridge between anterior and posterior clinoid processes i.e sella turcica bridge.
- Type 4-Bridge between middle and posterior clinoid processes.
- Thus the skull being reported here falls into type 1.

Ontogenically, different theories have been postulated. While Hasan^[11] is of the view that this foramen is because of ossification of interclinoid ligament/dural fold between anterior and middle clinoid processes. Lang^[9] believed that sellar bridges are laid down in cartilage at an early stage of development and ossify in early childhood. Phylogenically, Schaffer^[12] believed that the bony bridge between the clinoid processes is a persisting vestige of primitive cranial wall.

This foramina has a great clinical significance. Knowledge of these foramina may be helpful for neurosurgeons, neurophysicians, endocrinologists, radiologists, anatomists and biological anthropologist.

Neurosurgeons have to approach the parasellar region of central skull base in cases of aneurysm of the intracavernous and clinoid segment of the internal carotid artery, carotico-clinoid fistula and tuberculum sella meningiomas. In these cases removal of the anterior clinoid process becomes mandatory for proper visualization of the structures. Presence of an osseous bridge between the tip of anterior clinoid process and either middle or posterior clinoid process (i.e type 1, 2 or 3) makes removal of anterior clinoid process more difficult and even enhances the risk of haemorrhage, especially if an aneurysm is present.^[8] Internal carotid artery in clinoid space (the clinoid segment) and oculomotor nerve may be damaged

during the removal of the anterior clinoid process. Drilling of the anterior clinoid process may also cause inadvertent injury to the optic nerve. ^[12]

Neurophysicians must consider the existence of type 1 interclinoid bar or carotico clinoid foramen which may cause compression, tightening or stretching of the internal carotid artery leading to different type of TIAs and headache. It is attributed to a larger diameter of artery as compared to carotico-clenoid foramen. ^[13] A sella turcica bridge (type 3) may press upon trochlear and abducent nerves. CCF is strategically important due to its relations with the cavernous sinus and its contents and sphenoid sinus. ^[2]

Sellar bridges can cause several endocrinological problems in embryonic life which may be attributed to their close approximation to hypothalamus and hypophysis cerebri. A CCF may confuse radiologists while doing carotid arteriograms and pneumatization or marrow density assessment of anterior clinoid process. It is important for an anatomists/ embryologist to know about this variant and to explain the same on ontogenic basis. ^[14] Physical anthropologists are interested in the factors which are responsible for causation of such variants like age, sex, race, regional variations and hereditary influences.

Conclusion

Knowledge of the prevalence of the caroticoclinoid foramen helps the neurosurgeons for preoperative scanning and precautions can be taken to prevent fatal complications during surgery. The osseous caroticoclinoid foramen is an underestimated structure which has important neuronal and vascular relations and is both clinically and surgically important. Detailed anatomy of caroticoclinoid foramen and its content can

increase the success of diagnostic evaluation and surgical approaches to the region.

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