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Original Research Article

STUDY ON THE INCIDENCE OF THE CAROTICO-CLINOID FORAMEN IN THE SOUTH INDIAN DRY ADULT SKULLS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Existence of the carotico-clinoid foramen causes compression of the clinoid segment of internal carotid artery and also increases the risk of hemorrhage while dealing performing various surgical procedures related to para clinoid aneurysms and tumors of this region. The present study was aimed to find out the incidence of the carotico-clinoid foramen in south Indian population.

Materials and Methods: The present study consisting of 35 adult human South Indian dried skulls. 70 carotico-clinoid ligaments were studied in 35 skulls. All the skulls were observed to note the presence/absence of carotico-clinoid foramen; complete/incomplete foramen and unilateral /bilateral foramen. All the observed variations were photographed.

Results: Out of 35 skulls, 7 skulls were showing the presence of the carotico-clinoid foramen. The bilateral complete type was observed in 2 skulls, unilateral complete was observed in 2 skulls on right side, and unilateral incomplete was observed in 2 skulls on right side and 1 skull on left side. Therefore a total of 9 carotico-clinoid foramina were observed.

Conclusion: Anatomical knowledge on the incidence of the carotico-clinoid foramen would be of valuable information to the neurosurgeons dealing with the lesions of internal carotid artery and cavernous sinus, especially while performing surgical procedures to decompress the internal carotid artery.

KEY WORDS: Carotico-clinoid foramen, Carotico-clinoid ligament, Anterior clinoid process, Sphenoid bone, Aneurysms.

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INTRODUCTION

Carotico-clinoid Foramen is an osseous bridge extending from the tip of the anterior clinoid process to middle clinoid process of sphenoid bone [1]. The carotico-clinoid foramen is formed by the ossification of the fibrous carotico-clinoid ligament or the dural fold present between the anterior and the middle clinoid processes of the

sphenoid bone. When there is no ossification of the carotico-clinoid ligament, only a space between the anterior and middle clinoid processes is observed which is known as clinoid space [2]. The carotico-clinoid foramen gives passage to clinoid segment of internal carotid artery [1]. The ossification of fibrous ligaments is considered as a normal physiological process that occurs with aging; however, this process is an exception when one considers the formation of the carotico-clinoid foramen. Study by Hochstetter and Kier revealed the presence of this foramen in fetal and Juvenile skulls [3,4].

The presence of ossified carotico-clinoid foramen leads to compression, tightening or stretching of the clinoid part of the internal carotid artery and leading to changes in the internal carotid artery. These changes in the internal carotid artery may cause compression of the cavernous sinus in all most all cases [5].

The paraclinoid aneurysms are treated by removing the anterior clinoid process. This treatment is more difficult when the carotico-clinoid foramen is present, causing a higher possibility of serious bleeding in this region. This is one of the most critical surgical procedures to the successful and safe management of ophthalmic part aneurysms and tumors located in the para clinoid region and cavernous sinus [6].

The presence of a carotico-clinoid foramen is of great clinical and surgical importance to neurosurgeons as it intervenes in the mobilization of the cavernous part of the internal carotid artery. A preoperative detection of the ossified carotico-clinoid foramen, by CT imaging, has a huge clinical significance in surgical procedures involving the cavernous part of the internal carotid artery. The present study was carried out to find the incidence of the carotico-clinoid foramen which would help the neurosurgeon while dealing with lesions of internal carotid artery and cavernous sinus.

MATERIALS AND METHODS

The present study was carried out on 35 adult human south Indian dried skulls collected from the department of Anatomy, Kamineni institute of medical sciences. The skulls with a damaged carotico-clinoid region including anterior clinoid process were excluded from the study. 70 carotico-clinoid regions (35 right and 35 left) were studied in 35 skulls. All the skulls were observed to note the presence or absence of carotico-clinoid foramen. The ossified carotico-clinoid foramen was classified into 2 groups – a) Complete and b) Incomplete. Complete is the type where the complete carotico-clinoid ligament is ossified and when only part of the ligament is ossified with a space that is considered as incomplete. The presence of carotico-clinoid foramen unilateral or bilateral was also recorded. All the observed variations were photographed and recorded.

RESULTS

Out of 35 skulls, only 7 skulls were showing the presence of carotico-clinoid foramen. Bilateral complete type was observed in 2 (5.7%) skulls in which one specimen was showing much thicker bony bar extending from the anterior clinoid process to middle clinoid process (Figure 1) whereas in another specimen there was a thin bony plate connecting anterior clinoid process to middle clinoid process (Figure 2), unilateral complete was observed in 2 (5.7%) skulls on right side (Figure 3 & 4), unilateral incomplete was observed in 2 (5.7%) skulls on right side (Figure 5 & 6) and 1 (2.8%) skull on left side (Figure 7). The incidence of carotico-clinoid foramen was shown in table 1. Therefore the incidence of the presence of carotico-clinoid foramen was reported as 12.8% in which 8.57% was complete and 4.28% was incomplete. The incidence of complete and incomplete carotico-clinoid foramen was observed to be more on the right side when compared with the left side.

Fig. 1: Showing bilateral complete carotico-clinoid foramen.

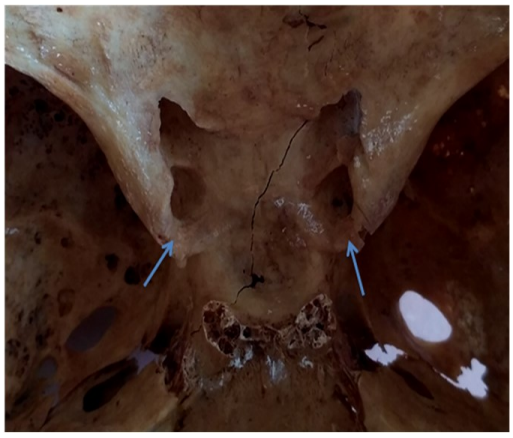

Fig. 2: Showing bilateral complete carotico-clinoid foramen.

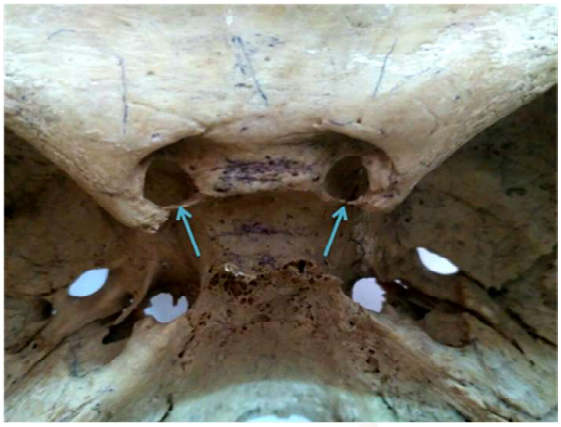

Fig. 3: Showing unilateral complete carotico-clinoid foramen on right side.

Fig. 4: Showing unilateral complete carotico-clinoid foramen on right side.

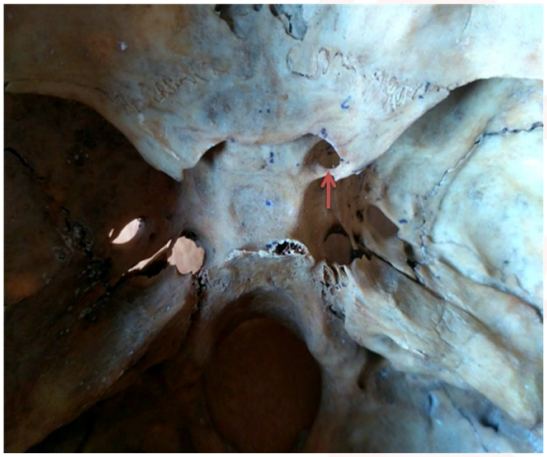

Fig. 5: Showing unilateral complete carotico-clinoid foramen on right side.

Fig. 6: Showing unilateral complete carotico-clinoid foramen on right side.

Fig. 7: Showing unilateral incomplete carotico-clinoid foramen on left side.

Table 1: Showing the incidence of the carotico-clinoid foramen.

	Side	Incomplete	Complete
Unilateral	Right	2	2
	Left	1	0
Bilateral	Right & Left	0	2

DISCUSSION

Anomalies of sellar region may confusion theclinicians in the evaluations of MRI or CT scans and also affect the regional surgery planning [8]. The presence of caritico-clinoid foramen causes compression of internal carotid artery [5]. In case of the paraclinoid aneurysms, the anterior clinoid process is removed as a treatment for this disease. This procedure becomes more difficult when the carotico-clinoid foramen is present which will be causing higher possibility of severe hemorrhage in

this region [6].

In the present study the incidence of presence of carotico-clinoid foramen was reported as 12.8% in which 8.57% was complete and 4.28% was incomplete. Guptha et al observed carotico-clinoid foramen in 22% cases in which 6 % were complete and 16 % were incomplete. Lee H. Y's study in 73 dried Korean skulls, complete carotico clinoid foramen was observed in 4.1% and an incomplete type was observed in 11.6%.The present study results were not correlating with above studies as the incidence of complete type is more in the present study than incomplete type [9,10].

The incidence of bilateral complete type of carotico-clinoid foramen in our study is 5.7%; which is similar with the previous studies by Usha Kothandaraman et al., and Gupta N et al., where they have found it as 5% and 4% [10,11].

Deopujari et al., found bilateral carotico-clinoid foramen in and 9.2% which is higher than the present study [12]. Freire et al reported bilateral complete carotico-clinoif foramen in 2.5% of skulls which is much lesser than the present study [2].

In the present study, the incidence of the carotico-clinoid foramen on the right side is more than the left side which is correlating with other Indian studies. Sanobar I et al., found the incidence on the right side as 8% and on the left side as 2%. Desai S et al., found the incidence on the right side as 12.99% skulls and 10.75% on the left side whereas in the present study the incidence of right unilateral is 11.42% and left unilateral are 2.85%. Thus the present study was supported by above studies by Indian authors that the incidence is higher on the right side than the left side [13,14].

In Koreans, Alaskan Eskimos, Sardinians, Caucasian Americans and in Turks the incidence of the presence of the carotico-clinoid foramen was 15.7%, 17%, 23.4%, 34.84% and 35.67% respectively which is much higher than the south Indian population where it was 12.8%. In Japanese it was 9.9% which is lesser than south Indian population [15].

Thus the incidence of occurrence of the carotico-clinoid foramen differs in various ethnic population groups.

CONCLUSION

Anatomical knowledge on the carotico-clinoid foramen and the incidence of the carotico-clinoid foramen in the south Indian population could be of the valuable guidance to the neurosurgeons while dealing with diagnostic and surgical procedures in carotico-clinoid and anterior clinoid process region which also increases the success rate of diagnostic evaluation and surgical approaches in this region while performing anterior clinoidectomy in the treatment of para clinoid aneurysms and tumors of this region.

Conflicts of Interests: **None**

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