

STUDY OF CAROTICO CLINOID FORAMEN IN DRY HUMAN SKULLS OF NORTH INTERIOR KARNATAKA

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ABSTRACT

Variations in sellar region like the interclinoid bar and the carotico clinoid foramen may cause difficulty for clinoidectomy procedures. The present study is an effort to know more about carotico clinoid foramen in skulls of North Interior Karnataka region. For the present study, dry unknown human skulls were obtained from North Interior Karnataka region collected in the Department of Anatomy of BLDEU's Shri B.M.Patil Medical College, Bijapur. The carotico clinoid foramen were studied in the dry human skulls and were observed for various parameters like complete or incomplete, unilateral and bilateral. The data was analyzed statistically with chi square test. Carotico clinoid foramen was observed in 223 skulls and was found in 83(37.19%) skull bones. Amongst 223 skull bones, in 39 (17.47%) skulls the carotico clinoid foramen formed a complete foramen; and in 44 (19.71%) skulls it formed incomplete foramen. Complete bilateral carotico clinoid foramen was found in 23 skulls (10.31%) and complete unilateral was found in 16 skulls (7.16%). Incomplete bilateral carotico clinoid foramen was found in 7 skulls (3.13%). Incomplete unilateral foramen was found in 37 skulls (16.58%) on right side -20 skulls (8.96%) and left side-17 skulls (7.62%). Detailed knowledge of carotico clinoid foramen will increase the success of the regional surgery.

Key words: Carotico clinoid foramen, anterior clinoid process, middle clinoid process, Interclinoid bar.

INTRODUCTION

The carotico clinoid foramen, first described by Henle (1855), is an osseous bridge between the tip of the middle and anterior clinoid processes.¹ The ossification of the ligamentous structures in various parts of the body may result in a clinical problem such as compression to neighbouring structures or complications in regional surgery. Research studies have also reported the fact that an ossified carotico clinoid ligament makes the removal of anterior clinoid process more difficult, especially in the presence of an aneurysm.² In our study we tried to know the prevalence of carotico clinoid foramen among the skull samples studied and to classify the foramen in relation to: complete unilateral or complete bilateral and incomplete unilateral or incomplete bilateral.

METHODOLOGY

223 dry unknown human skulls were taken for the study. The carotico-clinoid foramen were studied in the dry human skulls and were observed for the following parameters:

Presence / absence of the foramen

Complete / incomplete foramen

Unilateral / bilateral foramen

Statistical Analysis: The data was analyzed statistically with chi square test. Graphs and tables were generated using Microsoft office word and excel software

Inclusion criteria: Dry unknown human skulls which were well ossified were taken.

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Exclusion criteria: Fragmented, Broken skull bones were excluded from the study.

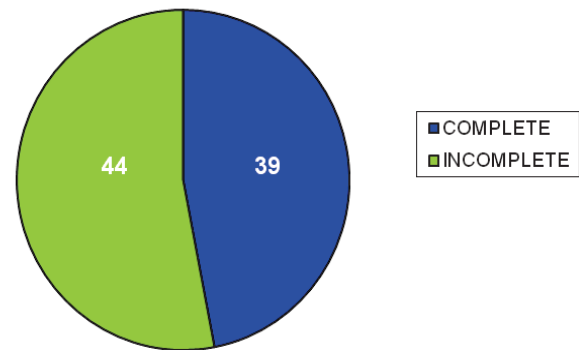
RESULTS

Presence or absence of carotico clinoid foramen: In 223 skulls used for the study, it was observed that in 83(37.19%) skull bones the carotico clinoid foramen was present.

Complete or incomplete carotico clinoid foramen: It was found that amongst 223 skull bones, in 39 (17.47%) skulls the carotico clinoid foramen formed a complete foramen; and in 44 (19.71%) skulls the carotico clinoid foramen formed incomplete foramen.

Bilateral or unilateral carotico clinoid foramen: Bilateral carotico clinoid foramen was found in 30 (13.44%) skull bones. Unilateral carotico clinoid foramen was found in 53 (23.74%) skull bones, amongst these, 29(12.99%) was found on right side and in 24 skulls (10.75%) was found on the left side.

GRAPH-2: SHOWING COMPLETE AND INCOMPLETE CAROTICO CLINOID FORAMEN



Statistically significant increase in the number of incomplete carotico clinoid foramen was observed on the right ($p < 0.05$) compared to the left side. Similarly statistically significant increase in the number of complete carotico clinoid foramen on the right ($p < 0.05$) compared to the left side. Hence the total observation of carotico clinoid foramen was more on the right side compared to the left side.

TABLE -1: SHOWING COMPLETE,INCOMPLETE AND UNILATERAL AND BILATERAL CAROTICO CLINOID FORAMEN

TABLE-1

	Side	Complete	Incomplete	Total
Unilateral	Right	9 (4.03%)	20 (8.96%)	29 (12.99%)
	Left	7 (3.13%)	17 (7.62%)	24 (10.75%)
Bilateral		23 (10.31%)	7 (3.13%)	30 (13.44%)

GRAPH-1: SHOWING UNILATERAL AND BILATERAL CAROTICO CLINOID FORAMEN

Graph 1

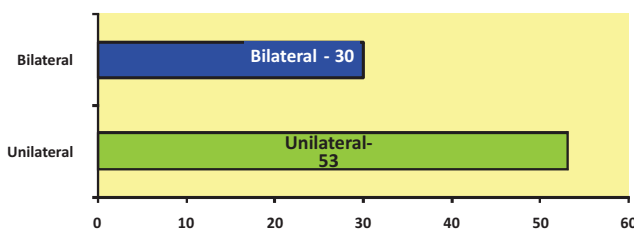


FIG-1: BILATERAL COMPLETE CAROTICO CLINOID FORAMEN

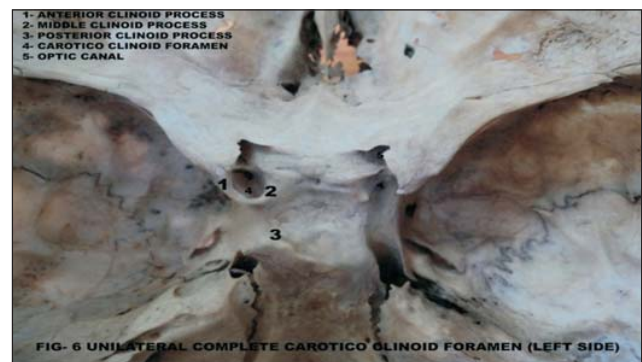


FIG-2: UNILATERAL COMPLETE CAROTICO CLINOID FORAMEN(LEFT)

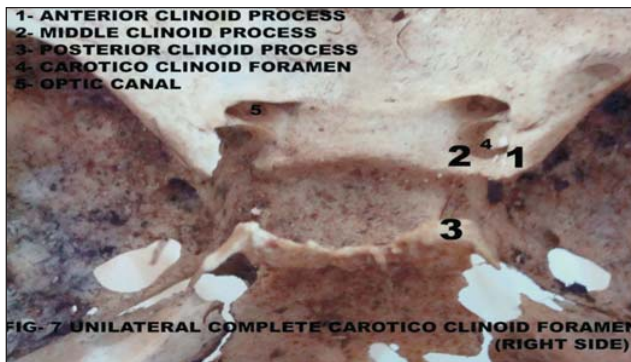


FIG:3: UNILATERAL COMPLETE CAROTICO CLINOID FORAMEN(RIGHT)



FIG:4: BILATERAL INCOMPLETE CAROTICO CLINOID FORAMEN



FIG:5: UNILATERAL INCOMPLETE CAROTICO CLINOID FORAMEN(LEFT)

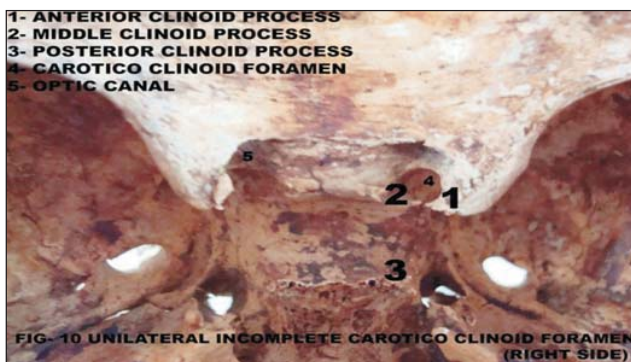


FIG:6: UNILATERAL INCOMPLETE CAROTICO CLINOID FORAMEN(RIGHT)

DISCUSSION

Certain parts of the sphenoid bone are connected by ligaments, which occasionally ossify, such as the pterygospinous (between the spine and the upper part of the lateral pterygoid plate), the interclinoid (between the anterior and posterior clinoid processes), and the carotico clinoid (between the anterior and middle clinoid processes). 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.³

The existence of a bony carotico clinoid foramen may cause compression, tightening or stretching of the internal carotid artery. Parasellar interclinoid bars are significant in surgical management while dealing with the vascular, neoplastic or traumatic lesions of the central skull base and can also compress the surrounding structures giving rise to various clinical symptoms.⁴

Removal of the anterior clinoid process is one of the most critical procedures to the successful and safe management of ophthalmic segment aneurysms and tumors located in the paraclinoid region and cavernous sinus. Special attention should be paid to the anatomic landmarks indicating the relationship between the anterior clinoid process and adjacent structures. Besides that, pneumatization of the anterior clinoid process should be evaluated preoperatively with computed tomography to avoid complications such as rhinorrhea and pneumocephalous.⁵

The presence or absence of carotico clinoid foramen was observed in 223 dry human skulls and it was found that in 83 skull bones (37.19%) the carotico clinoid foramen was present. Erturk et al., reported in a study

TABLE-2: COMPARISON OF PRESENT STUDY RESULTS WITH OTHER STUDIES

TABLE-2

Author	No. of specimens	Carotico clinoid Foramen		
		Unilateral	Bilateral	Total
Keyers (1935)	2187	-	-	27.46%
Azeredo et al. (1988)	270	6 (2.22%)	11 (4.05%)	17 (6.27%)
Inoue et al. (1990)	50	11 (22%)	7 (17%)	18 (36%)
Kee et al. (1997)	73	15.7%	1.4%	17.1%
Cireli et al. (1990)	50	3 (6%)	-	3 (6%)
Deda et al. (1992)	88	6 (6.82%)	7 (7.95%)	13 (14.77%)
Gurun et al. (1994)	198	16 (8.08%)	11 (5.55%)	27 (13.63%)
Erturk et al. (2002)	171	41 (23.98%)	20 (11.69%)	61 (35.67%)
Turkish Population (2004) Results presented for the Turkish population are averages of the results of Turkish authors (Cireli et al. 1990, Deda et al. 1992, Gurun et al. 1994 & Erturk et al. 1999)	507	66 (13.02%)	38 (7.5%)	104 (20.51%)
Present study (2010)	223	16 (7.16%) Complete	23 (10.31%) Complete	39 (17.47%) Complete
		37 (16.58%) Incomplete	7 (3.13%) Incomplete	44 (19.71%) Incomplete
		53 (23.74%) Total	30 (13.45%) Total	83 (37.19%) Total

involving 119 dry skulls and 52 cadaveric heads of Turkish population that carotico clinoid foramen was observed in 36.97% and 32.69% respectively; the total incidence being 61(35.67%)¹. Keyes observed 34.84% incidence of clinocarotid canal (carotico clinoid foramen) in American population⁶ which is similar to the present study. Rani Archana observed, out of the 250 dried Indian human skulls 30 (12%) skulls showed carotico clinoid foramen⁷ which is less when compared to the present study.

In the present study it was found that amongst 223 skull bones, in 39 (17.47%) skulls the carotico clinoid foramen formed a complete foramen; and in 44 (19.71%) skulls the carotico clinoid foramen formed incomplete foramen. Erturk M in 119 dried human skulls and 52 cadavers observed the complete-type carotico clinoid foramen in 14 (4.09%) of the specimens, and the incomplete type in 51(14.91%)¹ which was less when compared to the present study. In Lee HY's study in 73 dried Korean skulls⁸, complete carotico clinoid foramen was observed

in 4.1% of 146 sides and an incomplete type was observed in 11.6% which is less when compared to present.

In the present study bilateral carotico clinoid foramen was found in 30 (13.45%) skull bones and unilateral carotico clinoid foramen was found in 53 (23.74%) skull bones. In study of Erturk M, evaluating bony and cadaver specimens together, the total incidence of carotico clinoid foramen was 35.67%, and 20(11.69%) for bilateral carotico clinoid foramen and 41 (23.98%) for unilateral¹, which was similar to the present findings. In 270 dry human skull study by Azeredo RA, the fusion between the anterior and middle clinoid processes occurred in 17 cases (6.27%), out of which, in 11 cases (4.05%) occurred bilaterally⁹.

In the Present study, unilateral carotico clinoid foramen was found in 29 skulls (12.99%) on right side, and in 24 skulls (10.75%) it was found on the left side. The incidence of foramen was little higher on the right side than on the left side. Similar results were found in Turkish study,

by Erturk M showing the incidence of unilateral carotico clinoid foramen higher on the right side [24 (12.28%)] than the left side [21 (11.7%)].¹ In Ozdogmus et al's study, out of the 27 complete ossifications, 15 were observed on the right and 12 were observed on the left. Of the 18 incompletely ossified carotico clinoid ligaments, 9 were observed on the right and 9 were on the left.¹⁰

In the present study complete bilateral carotico clinoid foramen was found in 23 skulls (10.31%) and complete unilateral was found in 16 skulls (7.16%) in which, 9 (4.03%) were on right side and 7 (3.13%) on left side. Incomplete bilateral carotico clinoid foramen was found in 7 skulls (3.13%) and incomplete unilateral carotico clinoid foramen was found in 37 skulls (16.58%); amongst these, 20 skulls (8.96%) had incomplete foramen on the right side and 17 skulls (7.62%) had incomplete left carotico clinoid foramen. Gupta N in his study of 70 sides in thirty five skulls reported the presence of carotico clinoid foramen in 14 (20.0%) cases. Out of which complete foramen was in 3 (right side, 4.3%) and partial in 8 (6 right, 2 left, 11.4%).¹¹

CONCLUSION

Knowledge of the prevalence of carotico clinoid foramen helps the neurosurgeons for pre-operative scanning and precautions can be taken to prevent fatal complications during surgery. The osseous carotico clinoid foramen is an underestimated structure which has important neuronal and vascular relations and is both clinically and surgically important. Detailed anatomy of the carotico clinoid foramen and its content can increase the success of diagnostic evaluation and surgical approaches to the region.

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