OSSIFICATION OF INTERCLINOID LIGAMENT AND ITS CLINICAL SIGNIFICANCE

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***Abstract*: To know a detailed anatomical knowledge of interclinoid ligament which can increase the success of diagnostic evaluation and surgical approaches. Interclinoid ligament is seen in middle cranial fossa which connects the anterior and posterior clinoid processes,when it ossifies.The ligamentous or bony interclinoid connections have important neuronal and vascular relations.The occasional presence of this ossified ligament leads to the compression of internal carotid artery interrupting the blood flow and also compress the cranial nerves.**

This study will be performed on 50 dry human skulls of unknown age and sex belonging to department of antomy in saveetha dental college.In all the skulls, the anterior,middle and posterior clinoid process and the incidence of the interclinoid process will be examined.The ossified interclinoid ligament is an underestimated structure which is clinically and surgically important.The main reason of this study is to present the ossified interclinod ligament morphologically and to consider its possible impact on surrounding tissues.

***Keywords*: Interclinoid ligament,ossification.**

INTRODUCTION:-

There are three clinoid processes which is saddle shaped depression on intracranial surface of body of sphenoid bone. They are anterior, middle and posterior clinoid process respectively.It is present on either side of sella turcica.The anterior clinoid process is formed anteriorly and on the sides by frontal bone.Posteriorly it is separated from the middle cranial fossa by the free posterior border of the lesser wing of the spheniod and anterior margin of sulcus chiasmaticus[1]. Ossification of interclinoid ligament that connecting anterior and posterior clinoid processes is termed as interclinoid osseous bridge or sella Turcica Bridge. Thus ossification of the ligaments connecting the clinoid processes of the sphenoid bone may give rise to bony bridges.
Bridge formation occur either between the anterior and the middle (carotico-clinoid bridge; carotico-clinoid foramen of Henle), the anterior and the posterior (sella turcica bridge), or between the middle and posterior clinoid processes. In rare instances, the three processes fuse with each other[2]. The ligamentous form of interclinoid ligament is important in the aneurysms surgery of the intracavernous portion of the internal carotid artery [3,4] and also surgery for tuberculum sella meningiomas[5]. Though it has numerous neuronal and vascular relationship removing the anterior clinoid process in exposing the structures in the cavernous sinus and is highly complicated. The presence of ossified interclinoid ligament makes the removal of the anterior clinoid process more difficult and increases the risks especially in the presence of an aneurysm [2].

Therefore, to obtain a a good result from these surgeries, detailed anatomical knowledge of the region and the type of ossification between the anterior and posterior clinoid process is very necessary. The aim of the present study, is to investigate the frequency of ossification of interclinoid ligament in many dry skulls. Further, the clinical importance of osseus interclinoid ligament is discussed.

MATERIALS AND METHODS :-

This study has been conducted in 50 dry skulls at the Department of Anatomy, Saveetha Dental College And Hospitals and was observed that interclinoid ligaments are seen as a consequence of fusion of anterior, middle and posterior clinoid processes.
The incidence of interclinoid ligament was observed and then classified.For the classification of the interclinoid bars, the method proposed by Rani Archana and the method proposed by Keyers were used.

Rani Archana classified interclinoid bars into three types:-

Type I: - Bridge present between anterior and middle clinoid. process(caroticoclinoidforamen).

Type II: - Bridge between anterior, middle and posterior clinoid process.

Type III (sella turcica bridge):- Bridge between anterior and posterior clinoid process.

Keyers further classified each type of bridge into twosubtypes depending upon the extent of fusion between the bony bars arising from the respective clinoid process.

a. Complete type: - A complete fusion between two bony bars

b. Incomplete type: - If a spicule of bone was extending from one clinoid process towards the other with a gap in between.

RESULTS :- In the present study out of 50 skulls the total incidence of the type 1 interclinoid ligament was 50%. About 42% is the total incidence of type 2 ligament and in case if type 3 it was 4%.

	BILATERAL		UNILATERAL (right)		UNILATERAL (left)		TOTAL INCIDENCE	
	No	%	No	%	No	%		
COMPLETE	7	14%	2	4%	4	8%	13	26%
INCOMPLETE	2	4%	4	8%	6	12%	12	24%
TOTAL	9	18%	6	12%	10	20%	25	50%

TYPE 1 – between anterior and middle clinoid process

	BILATERAL		UNILATERAL (right)		UNILATERAL (left)		TOTAL INCIDENCE	
	No	%	No	%	No	%		
COMPLETE	4	8%	6	12%	2	4%	12	24%
INCOMPLETE	2	4%	4	8%	3	6%	9	18%
TOTAL	6	12%	10	20%	5	10%	21	42%

TYPE 2 :- between anterior,middle and posterior clinoid process

	BILATERAL		UNILATERAL (right)		UNILATERAL (left)		TOTAL INCIDENCE	
	No	%	No	%	No	%		
COMPLETE	1	2%	2	4%	0	0%	3	6%
INCOMPLETE	1	2%	0	0%	0	0%	1	2%
TOTAL	2	4%	2	4%	0	0%	2	8%

TYPE 3:- between anterior and posterior clinoid process

	BILATERAL		UNILATERAL (right)		UNILATERAL (left)		TOTAL INCIDENCE	
	No	%	No	%	No	%		
COMPLETE	10	20%	3	6%	4	8%	17	34%
INCOMPLETE	2	4%	4	8%	6	12%	12	24%
TOTAL	12	24%	7	14%	10	20%	29	58%

Incidence of caroticoclinoid foramen

	BILATERAL		UNILATERAL (right)		UNILATERAL (left)		TOTAL INCIDENCE	
	No	%	No	%	No	%		
COMPLETE	1	2%	2	4%	0	0%	3	6%
INCOMPLETE	0	0%	0	0%	0	0%	0	0%
TOTAL	1	2%	2	4%	0	0%	3	6%

Incidence of sella turcica bridge

DISCUSSION:

The ossified interclinoid ligament form bridges between anterior and posterior clinoid process of the sphenoid bone.Various theories have been postulated to explain the formation of these interclinoid osseous bridges.Formation of the sellar bridges may result directly from the pattern of sphenoid development or can be dictated by the physiological activities of chemical compounds that are involved in embryogenesis and build up the bones. Intracranial calcification is a condition in which mineral calcium and sometimes other chemical compounds are deposited on the soft tissue structures, causing it to harden. This may be due to calcium deposition on soft tissue (protein dependant) and ranges from minimal to massive and clinically significant [6,7].Proteins play an essential role in promoting or slowing down the calcification process. Some proteins seem to start the crystallising process in tissues containing high levels of calcium. Others control the mechanism of hardening an ossifying structure or inhibit this process.[8, 9].

In the present study the total incidence of type 1 bridges was 50%.the incidence of bilateral type 1 bridges (9%) was less than unilateral bridges (16%). The bilateral type observed was less than observed by Keyers (23.45) and more than observed by Rani Archana ,while the unilateral was almost similar and comparable(13%). (Table 4)

Table 4 :- comparision of type 1 interclinoid ligament

NAME OF AUTHORS	TOTAL INCIDENCE	BILATERAL	UNILATERAL
Keyers	34.84%	23.34%	11.34%
Erturk	35.6%	-	-
Rani Archana	12%	2.8%	9.2%
Present author	50%	6%	4.5%

In this study total incidence of type 2 bridge was 42%.The bilateral incidence was 12% whereas the the unilateral incidence together was 30%.the unilateral right showed more incidence (20%) than unilateral left which showed only 10%. Complete type 2 bridge (24%) was more observed as compared to incomplete type 2 bridge(18%).(table 5)

Table 5 :- comparison of type 2 interclinoid ligament

NAME OF AUTHORS	TOTAL INCIDENCE	BILATERAL	UNILATERAL
Keyers	7.82%	-	-
Rani Archana	5.6%	8%	4.8%
Present author	42%	12%	30%

Total incidence of type 3 bridge was 8% in the present study which is almost the same that of other study except the incidence observed by Keyers (.86%) and Ertuk (8.18%).Rani Archana observed incomplete type 3 bridge more as compare to complete type 3 bridge. But in this study the complete bridge (6%) was more than incomplete (2%).table 6

Table 6 :- comparison of type 3 interclinoid ligament.

NAME OF AUTHORS	TOTAL INCIDENCE	BILATERAL	UNILATERAL
Keyers	.86%	-	-
Erturk	8.86%	-	-
Rani archana	4%	.8%	3.2%
Present author	8%	4%	4%

Total incidence of caroticoclinoid foramen was 58%. The incidence of complete caroticoclinoid foramen (34%) was more compared of incomplete type in present study but in other studies incomplete type was more common. The bilateral type was more than unilateral type.

Unilateral left showed more incidence than unilateral right. (table 7)

Table 7 :- comparison of incidence of caroticoclinoid foramen

NAME OF AUTHORS	COMPLETE TYPE	INCOMPLETE TYPE	TOTAL
Keyers	7.1%	19.2%	26.3%
Erturk	4.09%	14.91%	19%
Present author	34%	24%	58%

Caroticoclinoid foramen :-

The sella turcica bridge which is seen between anterior and posterior clinoid process was observed more in unilateral right type. It was total absent in unilateral left type and was about 2% in bilateral type. Hence total incidence observed was 8% which is nearer to the incidence

observed by keyers(8.68%) and Azeredo (9%). (table 8)

Table 8:- comparison of incidence of sella turcica bridge

AUTHOR	SELLA TURCICA BRIDGE
Keyers	8.68%
Azeredo	9%
Present author	8%

Sella turcica :-

It is a challenging task for neurosurgeons 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-cavernous fistula and tuberculum sella meningiomas.

This bar might influence the blood flow in the internal carotid arteries or cause dysfunction of the muscles of eyes owing to possible compression of occulomotor nerve. The internal carotid artery passes through the foramen clinoideo-caroticum as it turns upwards to supply brain. While on one hand, the foramen gives a safety cover to the artery, on the other hand, it may confuse the radiologist doing carotid arteriogram[10].

CONCLUSION :-Among four types of interclinoid bars type I was more commonly found in present study. No skull showed contact subtype. The knowledge of interclinoid bars is important for neurosurgeons to provide information on the limited intraoperative view and reduce mortality and morbidity in surgical approaches[11].

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