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RESEARCH ARTICLE

A STUDY ON INCIDENCE OF ZYGOMATICOFACIAL FORAMEN IN DRIED HUMAN SKULLS OF NORTH INDIAN POPULATION

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Abstract

Background: Zygomaticofacial foramen is present on the lateral surface of zygomatic arch near its orbital border. It transmits the Zygomaticofacial nerve and vessels. A significant amount of variation has been reported in the incidence of Zygomaticofacial foramen among different population due to the regional variance in anthropometry of humans.

Objective: The main objective behind this study was to assess the differences in the incidence of Zygomaticofacial foramen in adult dried human skulls of North Indian population.

Methods: The study was carried out at Department of Anatomy, PGIMS Rohtak on 70 dried human skulls, out of which 44 skulls were of males and 26 skulls were of females. The zygomatic arch of skull was studied for the frequency variations of Zygomaticofacial foramen from no foramina to as many as four foramina.

Results: It was found that frequency of single and double foramina and absence of foramina was more in males, whereas frequency of triple and four foramina was more in females. Frequency of double and triple foramina was more on right side, whereas frequency of single and four foramina and absence of foramina was more on left side.

Conclusion: The anatomical knowledge of the frequency variations of Zygomaticofacial foramen is essential for surgeons in various surgical procedures.

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Introduction:-

The shape of each zygomatic bone is roughly quadrangular. It forms the prominent part of cheek. It takes part in the formation of inferior and lateral walls of the orbit and the boundaries of the temporal and infratemporal fossae and completes the zygomatic arch. It has three surfaces, five borders and two processes. The lateral surface is curved outwards and has Zygomaticofacial foramen close to its orbital border. Frequently, we observe two foramen on each side but sometimes, the foramen is absent. Zygomaticofacial nerve and vessels passes through this foramen. The Zygomaticofacial nerve passes over the inferolateral angle of the orbit, penetrates the orbicularis oculi muscle and comes out through the Zygomaticofacial foramen. The Zygomaticofacial nerve gives sensory supply to the

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prominent part of the cheek. It forms plexus with the zygomatic branches of facial nerve and palpebral branches of the maxillary nerve. Sometimes the nerve is absent (Standring and Berkovitz, 1999).

Frequency of the Zygomaticofacial foramen is used as a differentiating point for studying the variations between different populations. Zygomaticofacial foramen with its structures serves as an important anatomical landmark for locating inferior orbital fissure during Orbitozygomatic craniotomy, for nerve block, Malar reduction surgeries, in management of infraorbital tumors, Plastic and Reconstructive surgeries (Kumar and Kesavi, 2014). During facial surgery, the zygomatic nerve and its branches are at a risk of damage in the periorbital region (Mangal et al., 2004). Blind surgical procedures in this area have the probability to damage the arteries passing through the Zygomaticofacial foramen and it will result in postoperative hematoma (Williams 2002).

Since there is very scanty literature regarding the incidence of Zygomaticofacial foramen in North Indian population, so, the present study was designed to study its incidence in both males and females in dried skulls of North Indian population.

Material and Methods:-

The study was performed in Department of Anatomy at Pt. B.D. Sharma PGIMS, Rohtak, Haryana in the year 2023-24 on 70 dried human skulls out of which 44 were of males and 26 were of females. Skulls with broken or damaged zygomatic bone were excluded from the study. Zygomatic bone of both right and left sides was studied for the Zygomaticofacial foramen and their number was noted down in both males and females. Photographs were taken and results were compared with those of previous studies.

Results:-

Following observations were made:-

1. Absence of Zygomaticofacial Foramen:- In the present study, Zygomaticofacial Foramen was absent in 17.9% of the skulls with an incidence of 19.3% in males, 15.4% in females, 17.1% on right side and 18.6% on left side (Figure 1) (Table 1 & 2).
2. Single Zygomaticofacial Foramen:- In the present study, Zygomaticofacial Foramen was single in 40.7% of the skulls with an incidence of 42% in males, 38.5% in females, 40% on right side and 41.4% on left side (Figure 2) (Table 1 & 2).
3. Double Zygomaticofacial Foramen:- In the present study, Zygomaticofacial Foramen was double in 27.9% of the skulls with an incidence of 28.4% in males, 26.9% in females, 30% on right side and 25.7% on left side (Figure 3) (Table 1 & 2).
4. Three Zygomaticofacial Foramen:- In the present study, three Zygomaticofacial Foramen were found in 10.7% of the skulls with an incidence of 8% in males, 15.4% in females, 11.5% on right side and 10% on left side (Figure 4) (Table 1 & 2).
5. Four Zygomaticofacial Foramen:- In the present study, four Zygomaticofacial Foramen were found in 2.8% of the skulls with an incidence of 2.3% in males, 3.8% in females, 1.4% on right side and 4.3% on left side (Figure 5) (Table 1 & 2).

Figure 1:- Absence Of Zygomaticofacial Foramen.



Figure 2:- One Zygomaticofacial Foramen.



Figure 3:- Two Zygomaticofacial Foramen.



Figure 4:- Three Zygomaticofacial Foramen.



Figure 5:- Four Zygomaticofacial Foramen.

Table 1:- Incidence Of Zygomaticofacial Foramen In Males & Females.

GENDER	INCIDENCE OF ZYGOMATICOFACIAL FORAMEN				
	ABSENT (%)	ONE (%)	TWO (%)	THREE (%)	FOUR (%)
MALES (n=44x2)	17 (19.3%)	37 (42%)	25 (28.4%)	07 (8%)	02 (2.3%)
FEMALES (n=26x2)	08 (15.4%)	20 (38.5%)	14 (26.9%)	08 (15.4%)	02 (3.8%)
TOTAL	25 (17.9%)	57 (40.7%)	39 (27.9%)	15 (10.7%)	04 (2.8%)

Table 2:- Incidence Of Zygomaticofacial Foramen On Right and Left Sides.

SIDE	INCIDENCE OF ZYGOMATICOFACIAL FORAMEN				
	ABSENT (%)	ONE (%)	TWO (%)	THREE (%)	FOUR (%)
RIGHT (n=70)	12 (17.1%)	28 (40%)	21 (30%)	08 (11.5%)	01(1.4%)

LEFT (n=70)	13 (18.6%)	29 (41.4%)	18 (25.7%)	07 (10%)	03 (4.3%)
TOTAL	25 (17.9%)	57 (40.7%)	39 (27.9%)	15 (10.7%)	04 (2.8%)

Discussion:-

The fate of Zygomaticofacial neurovascular bundle in the cases of absence of Zygomaticofacial foramen has not been explained in the available literature. This point could not be explained even in the present study since the present study has been done in dry skulls which is the limitation of the study. Since the cone-beam computed tomography (CBCT) has an outstanding precision in assessing the Zygomaticofacial foramen (Del Neri et al., 2013), future studies can be planned using CBCT to assess the fate of neurovascular bundle in cases of absence of Zygomaticofacial foramen combined with the detailed medical history of cases.

A number of studies have been done regarding the incidence of Zygomaticofacial foramen (Table 3 & 4). But no such study was found in skulls of known sex. Also there is scarcity of literature regarding incidence of Zygomaticofacial foramen in dried skulls of North Indian population.

Table 3:- Incidence Of Zygomaticofacial Foramen On Both Sides In Different Regional And International Population.

AUTHOR	POPULATION	SIDE	ZYGOMATICOFACIAL FORAMEN				
			ABSENT	ONE	TWO	THREE	FOUR
Lone et al., 2016	Mumbai	RIGHT	17.1%	68.6%	12.8%	1.4%	-
		LEFT	20%	65.7%	11.4%	2.8%	-
Ongeti et al., 2008	Kenyan	RIGHT	-	42%	35%	23%	-
		LEFT	-	52%	31%	17%	-
Kumar and Kesavi, 2014	Chennai	RIGHT	18%	46%	31%	4%	2%
		LEFT	16%	51%	26%	6%	1%
Present study	North Indian	RIGHT	17.1%	40%	30%	11.5%	1.4%
		LEFT	18.6%	41.4%	25.7%	10%	4.3%

Table 4:- Incidence Of Zygomaticofacial Foramen In Different Regional And International Population.

AUTHORS	POPULATION	ZYGOMATICOFACIAL FORAMEN					
		ABSENT	ONE	TWO	THREE	FOUR	FIVE
Aksu et al., 2009	West Anatolian	15.6%	44.4%	28.1%	6.3%	4.4%	1.3%
Hwang et al., 2007	Korean	9.2%	50.9%	30%	9%	0.9%	-
Loukas et al., 2008	American	39%	40%	15%	5%	1%	-
Del Neri et al., 2013	Brazilian	19%	44%	28%	8%	1%	-
Mangal et al., 2004	Delhi	21.8%	44.9%	27.9%	5.1%	0.3%	-
Present study	North Indian	17.9%	40.7%	27.9%	10.7%	2.8%	-

Conclusion:-

The frequency of Zygomaticofacial foramen was variable from being absent to as many as four foramina i.e. absent in 17.9%, one in 40.7%, two in 27.9%, three in 10.7% and four in 2.8% of dried skulls. Frequency of single and double foramina and absence of foramina was more in males, whereas frequency of triple and four foramina was more in females. Frequency of double and triple foramina was more on right side, whereas frequency of single and four foramina and absence of foramina was more on left side.

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