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Research article

INCIDENCE AND LOCATION OF ZYGOMATICOFACIAL FORAMEN IN ADULT HUMAN SKULLS

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ABSTRACT

This study was to investigate the morphology, topographic anatomy and variations of Zygomaticofacial foramen (ZFF). Frequency variations and Location/distance of ZFF from surrounding standard landmarks were evaluated in 100 adult human dry skulls. The frequency of ZFF was varied from being single to as many as four foramina and absence of ZFF, which was classified into Type I – V for single, double, triple, four foramina and absence of ZFF respectively. The frequency (%) of these types was Type I: 46 & 51, Type II: 31 & 26, Type III: 4 & 6, Type IV: 1 & 1 and Type V: 18 & 16 respectively on right & left sides of the skulls. The mean distance of Zygomaticofacial foramen from Zygomaticomaxillary suture, nearest part of Orbital margin, Frontozygomatic suture, Zygomaticotemporal suture and Zygomatic angle was 13.8 & 12.2mm, 6.8 & 6.9mm, 24.8 & 26.7mm, 20.8 & 21.5mm and 12.4 & 13.5mm respectively on right & left sides of skulls. Knowledge on these variables will be helpful for surgeons for various surgical procedures like Orbitozygomatic craniotomy, for nerve block and Malar reduction surgeries.

Keywords: Zygomaticofacial foramen, Orbital margin, Zygomaticbone, Zygomaticofacial nerve

INTRODUCTION

Zygomaticofacial foramen (ZFF) usually situated on the Zygoma nearer to infraorbital margin.[1] Zygomaticofacial nerves and vessels emerge out through this foremen.[1, 2] It is more predominant on right side in male and left side in female population.[3] The location and frequency of ZFF vary significantly among individuals and races due to the difference of anthropometry of human from region to region. Current understanding on ZFF is very limited in the Indian population. ZFF with its structures serves as an important landmark for locating inferior orbital fissure during Orbitozygomatic craniotomy,[4] for nerve block, Malar reduction surgeries[5], in management of infraorbital tumors, Plastic and Reconstructive surgeries. Hence this study has been aimed to evaluate the location and frequency variations of ZFF in adult human dry skulls.

MATERIALS AND METHODS

Study has been conducted in the Department of Anatomy, Sri Ramachandra Medical College and Research Institute, Chennai. A total of 100 adult dry skulls were collected from the dissection hall and observed for frequency variations of ZFF. Distance of Zygomaticofacial foramen from Zyomaticomaxillary suture, nearest part of Orbital margin, Frontozygomatic suture, Zygomaticotemporal suture and Zygomatic angle (fig: 1) has been measured with digital vernier caliper on both sides (Right and Left) of the skull and compared.

Specimens with very small decalcified pits were excluded.

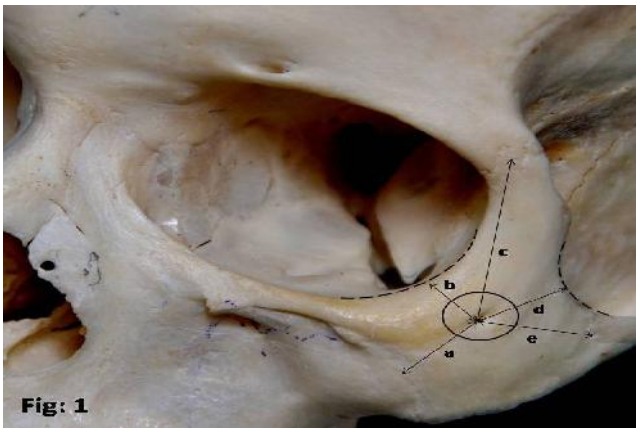

Fig 1: Showing the distance from ZFF (encircled) to Zygomaticomaxillary suture (a), nearest part of Orbital margin (b), Zygomaticofrontal suture (c), Zygomatic angle (d), Zygomaticotemporal suture (e)

Observations:

A total of 100 dry skulls were examined.

The frequency of ZFF were varied from being absent to as many as four foramina. Based on it all the skulls were classified in to following types.

Type I: Single Foramen (fig: 2)

Type II: Double Foramina (fig: 3)

Type III: Triple Foramina (fig: 4)

Type IV: Four Foramina (fig: 5)

Type V: Absence of ZFF (fig: 6)

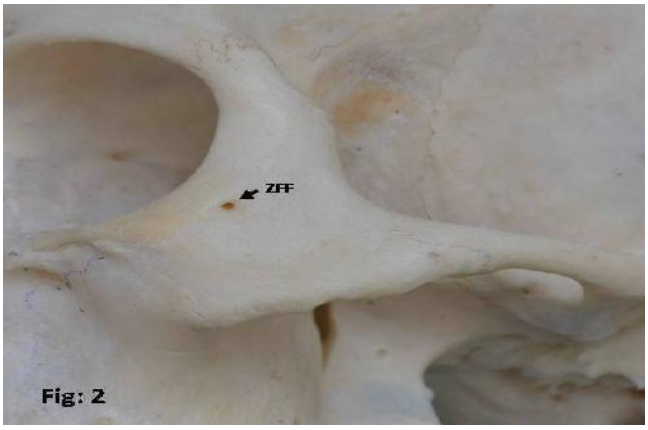

Fig 2: Type I: Single Foramen

Fig 3: Type II: Double Foramina

Fig 4: Type III: Triple Foramina

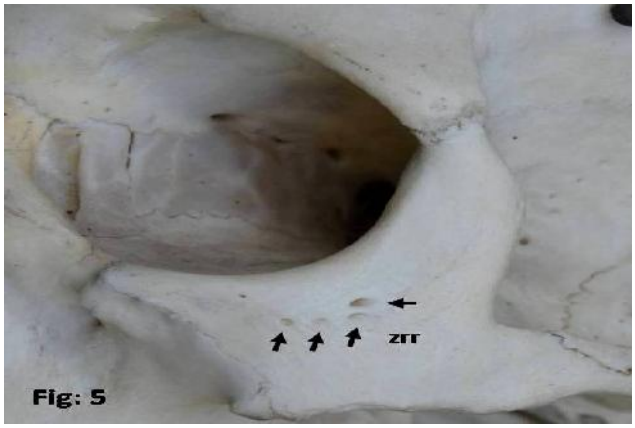

Fig 5: Type IV: Four Foramina

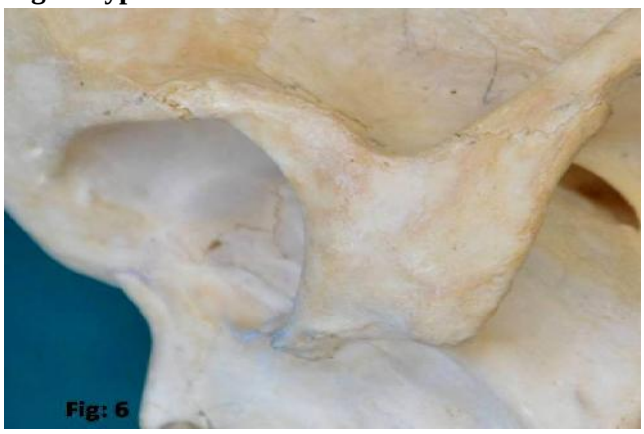

Fig 6: Type V: Absence of ZFF

Table 1: Frequencies of different types of Zygomaticofacial foramina

SIDE	Type I (%)	Type II (%)	Type III (%)	Type IV (%)	Type V (%)
RIGHT	46	31	4	2	18
LEFT	51	26	6	1	16

The mean distance of ZFF from Zyomaticomaxillary suture, nearest part of Orbital margin, Frontozygomatic suture, Zygomaticotemporal suture and Zygomatic angle was 13.8 & 12.2mm, 6.8 & 6.9mm, 24.8 & 26.7mm, 20.8 & 21.5mm and 12.4 & 13.5mm respectively on right & left sides of skulls.

DISCUSSION

In the present study absence of ZFF (Type V) has been found in 18 & 16% of right & left sides of skulls. Aksu F et al[6] stated absence of ZFF at 15.6% of cases which includes both right and left side skulls. Whereas Marios Loukas et al[7] quoted absence of ZFF at 1% among 200 specimens. Cajeron DM et[8] al found ZFF in 38 and 13% of right and left of the skulls which is lower than our study (right: 82 and left: 84%).

In line with most of the studies frequency of ZFF was ranging from absent to as many as four but Aksu F et al[6] found five foramina in 1.3% of skulls (5 of 160sides, i.e. 80 skulls). Based on the frequency of ZFF we classified them into Type I – V as mentioned earlier.

Type I to IV were occurred in 46 & 51%, 31 & 26%, 4 & 6% and 1 & 1% of right & left sides of the 100 skulls. In the similar study with 100 sample conducted by Ongeti et al[9] only three types i.e. from Type I, II and III of our study were reported in 42 & 45%, 35 & 31% and 23 & 17% of right and left side of skulls respectively. Among these types only Type I and II are similar to present study and Type III was with higher frequency than the present findings.

Likewise, the current study is showing the wide variations from the existing studies in the frequency of ZFF (table 2).

The mean distance of ZFF from Zygomaticomaxillary suture was 13.8mm (right) and 12.2mm (left) among 100 skulls whereas it was 18.8mm in the study by Aksu F et al[6].

The mean distance of ZFF from nearest part of Orbital margin was 6.8 & 6.9 mm (right & left) respectively in our study which is higher than Aksu F et al[6] (5.94mm) and Hwang SH et al[5] (7.61mm).

ZFF situated in 24.8mm (right) & 26.7mm (left) distance from Frontozygomatic suture which is almost similar to the Martins C et al (25mm)[4] and Aksu F et al[6] (26.2mm).

Likewise the mean distance of ZFF from Zygomaticotemporal suture was 20.8mm (right) & 21.5mm (left) and Zygomatic angle was 12.4mm (right) & 13.5mm (left) in the present study.

The etiology behind the absence of ZFF and the path by which the neurovascular bundle emerges out in such cases has not reported in the existing literature and the same could not be evaluated in the present study because of the fact that present study has been conducted in the dry skulls, which holds the limitation of the study. Since the cone-beam computed tomography (CBCT) has an excellent accuracy in evaluating the ZFF[10], further studies can be conducted using CBCT to evaluate the fate of neurovascular bundle in absence of ZFF along with the medical history of subjects.

The present study is not similar to the most of the existing studies. The comparisons made in the discussion were with non Indian studies as there was very less/nil number of studies we encountered in literature search. The variant anthropometric measurements were probably due to difference of skull anthropometry in different regions of the World. Similar studies are suggested to be conducted in the India in order to standardize the foresaid findings which will be helpful for different surgical procedures like Orbitozygomatic craniotomy, for nerve block, Malar reduction surgeries and in management of infraorbital tumors.

Table 2: Comparison of Present study findings with different existing studies

TYPE	AUTHOR								
	Present study		Ongeti et al[9]		Aksu etal[6]	Cajeron DM et al[8]		Marios Loukas et al[7]	Hwang SH et al[5]
	Right (%)	Left (%)	Right (%)	Left (%)	(%)	Right (%)	Left (%)	(%)	(%)
TYPE I	46	51	42	52	44	46	12	40	50.9
TYPE II	31	26	35	31	45	20	75	15	30
TYPE III	4	6	23	17	6.3	13	13	5	9
TYPE IV	1	1	--	--	4.4	0.5	0.5	1	0.9
TYPE V	Absent				1.3	Absent			

CONCLUSION

Frequency of ZFF and its distance from surrounding standard landmarks were varying from existing studies and knowledge on them is helpful for surgeons for various surgical procedures.

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