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Original Research Article

SUPRATROCHLEAR FORAMEN OF HUMERUS IN TELANGANA STATE: A MORPHOMETRIC STUDY

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ABSTRACT

Introduction: The supratrochlear foramen (STF) of the humerus has been a neglected entity in standard anatomy and orthopaedics text books. The knowledge of the presence of STF in a humerus may be important for preoperative planning for treatment of supracondylar fractures. The presence of STF may also result in erroneous interpretation of radiographs.

Materials and Methods: The presence of STF was studied in 96 dry adult humeri of unknown sex from the department of Anatomy, Osmania Medical College, Hyderabad, Telangana. The presence & shapes of the STF were established by visual observations. The supracondylar foramen is seen in 18.7% of total humeri.

Results: It was present more frequently on the left side (23.6%) than on the right side (13.6%). The oval shape was more common.

Conclusion: The anatomical knowledge of STF is beneficial for anthropologists, orthopaedic surgeons & radiologists. In cases of humeral fractures of the supratrochlear foramen, the surgeon must keep in mind that it is better to perform an antegrade medullary nailing than a retrograde one; as there is higher chance of a secondary fracture, due to the extreme narrowness of the canal at the distal portion of humerus.

KEY WORDS: Humerus, Supratrochlear Foramen (STF), Transeverse Shape, Oval shape.

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INTRODUCTION

A thin, transparent plate of bone known as supratrochlear septum varying in thickness from 0.5mm to 1cm in thickness,which is lined in fresh state by the synovial membrane of elbow joint separates the olecranon and coronoid fossae. This septum may contain several perforations and in some cases may become perforated to form an aperture known as 'supratrochlear aperture' or 'supratrochlear foramen' [STF] [1]. According to Hirsh [2] the septum is always present until seven years of age after which it is occasionally absorbed to form STF. Individuals with this variation may be able to overextend the elbow joint [3]. Since then it has been described in various animals like cattle, rats, dogs and other primates [4,5].

This foramen is of great interest to anthropologists who claim it as one of the points in establishing relationship between man and lower animals. This study contributes to increase anatomical data and consistency in anthropology

and also for clinicians. The anatomical structure of the humerus may play an important role in the intramedullary fixation thereby stressing the need of prior anatomical knowledge & preoperative planning in the presence of variations like STF in the distal end of the humerus.

MATERIALS AND METHODS

STF was studied in 96 humeri (52 right sided and 44 left sided humeri) of unknown sex and age mostly of South Indians of Telangana region. These bones were obtained from the bone bank of Anatomy Department of Osmania Medical College, Hyderabad, Telengana State. The STF were morphologically and morphometrically analysed. The STF varied in different shapes such a round and oval (Fig. 1). The transverse and vertical diameter of STF was measured using vernier caliper. The incidence of the supra- trochlear foramen was found on the right & left side.

Fig. 1: Lower end of left humerus showing Supratrochlear foramen of different shapes.

Fig. 2: Lower end of right humerus showing Supratrochlear foramen of different shapes.

RESULTS

Out of 96 humeri studied (52 right sided and 44 left sided humeri), 18.7% of bones showed presence of STF(18 bones). The incidence of STF was greater on left side (23.6%) compared to right side (13.6%). A clear cut supratrochlear foramen was found in 18.7% of humeri. Septal apertures were more common on the left humeri than the right ones. (Table no-1).

Table 1: Incidence of supratrochlear foramen in 96 humeri.

Right side	Percentage	Left side	Percentage	Total	Percentage
6	13.60%	12	23.60%	18	18.70%

Oval shaped foramens were more common than round shaped ones. The mean lengths of transverse diameter were 4.6 and 6.2mm on right and left sides respectively. Similarly, the mean lengths of vertical diameter were 3.4 and 4.2mm on right and left sides respectively (Table 2).

Table 2: Showing range and mean value of transverse and vertical diameter of supratrochlear foramen in right and left humeri.

Side	Transverse Diameter		Vertilcal diameter	
	Range	Mean	Range	Mean
RIGHT	2-7mm	4.6mm	2-5mm	3.4mm
LEFT	3-9mm	6.2mm	2-6mm	4.2mm

Supratrochlear foramen appear in different shapes, most common being oval shape, followed by round and irregular (Table 3).

Table 3: Parameters of STF of humeri.

variables	Right (n=52)	Left (n=44)
Vertical diameter (mean)	3.4	4.2
Transverse diameter(mean)	4.6	6.2
Oval shape	2	6
Round shape	2	4
Irregular shape	2	2

Racial incidence of the septal aperture (Table 4)

Table 4: Comparative data (in %) of septal aperture in humerus, race-wise.

RACE	PERCENTAGE
Australians	46.5
Egyptians	43.9
Mexicans	38.7
Central Indians	32
American Indians	29.6
Eastern Indians	27.4
Eskimos	19.8
American Negroes	18.4
Japanese	18.1
Koreans	11
Italians	9.4
Germans	8.8
American whites	6.9
Present study (Telenganna State) South	18.7

DISCUSSION

STF is found only in mammals and is inconstant in various species. Darwin mentions this foramen in humans as one of the characteristic that show man's close relationship to lower forms. Anthropologists say that STF is more in ancient primitive people than recent civilization.Detailed look at literature showed that STF was first described by Meckel in 1825[6]. Recent studies by S.S. Singhal et al [7] and Anupama mahajan [8] showed an incidence of 28% and 26% respectively which is more than our study that is 18.7% in the present study. Translucent septum is seen in 66.6% which is in confirmity with the reports of Anupama mahajan (62%) and more as reported by Soubhagya Nayak et al (56.7%) [9]. Hirsh quotes examinations by martin which revealed the presence of STF in 58% of Arkanas Indians, 21.7% of African Negroes and 4.2% in White Americans. The same authority states that STF is more common in female and left side [2]. In the present study also the incidence of STF was greater on left side (23.6%) compared to right side (13.6%). A clear cut supratrochlear foramen was found in 18.7% of humeri.

The cause of STF has been debated by many authors, some authors considered it to be due to mechanical pressure during hyperextension or by large olecranon process. If mechanical pressure due to olecranonprocess was the causative factor then it would have been more common in males and on right side. Some opine that STF is formed by resorption from anterior surface of the septum. Others say it arises from impingement on humeral septum by coronoid and olecranon process [10]. Racial incidence of the septal aperture as shown in (Table -4) represents evolutionary aspects of the foramen in addition to its clinical significance [2,7,13].

The observation of the septal aperture was considered by Desmoulins [14] as the racial anomaly or atavistic. It was absent or rare on embryonal or infantile humeri& the youngest humeri out of the 436 examined by Akabori[15]. He found that the incidence was very low after the age of 60 years. No such correlation was found by Trotter[16]. but Hrdlicka [17]contraindicated & said that the intermittent pressure would cause the hyperaemia resulting in strengthening of the bone instead of becoming weak. Mechanical hypothesis say that it should be more in the old age which is not.

Clinical Significance: Supracondylar fractures account for 75% of all injuries in the paediatric age group [11]. Intramedullary humeral nailing is done to treat supracondylar fractures which become more difficult in presence of STF leading to secondary fractures. There is a lot of debate about route of pin entry in cases with STF because STF is always associated with narrow medullary canal at the distal end of humerus. Therefore, the knowledge of presence of STF may be important for preoperative planning for treatment of supracondylar fractures and perform antegrade medullary nailing rather than retrograde medullary nailing [12]. X-ray is performed to detect bone cysts, tumours and other lytic lesions in day to day clinical practice. On X-ray, STF presents as radiolucent areas simulating an osteolytic or cystic lesion. Such pseudolesions may lead to false positive diagnosis of an osteolytic or cystic lesion [3]. Hence knowledge of STF may check wrong interpretation of X-rays by radiologists. It represents evolutionary aspects of the foramen in addition to its surgical & orthopaedic significance. The presence of STF may also result in erroneous interpretation of radiographs. Due to the high incidence of STF in the Indian

population it requires special attention during intramedullary humeral nailing procedures in the distal portion of humerus.

CONCLUSION

This study focused on STF which is an important anatomical variation in the distal end of humerus. The incidence is 18.7% and more common on left side which agrees with the studies of other authors. The anatomical knowledge of STF is beneficial for anthropologists, orthopaedic surgeons and radiologists in day to day clinical practice.

Conflicts of Interests: None

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