

STUDY OF SUPRATROCHLEAR FORAMEN OF HUMERUS

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ABSTRACT

Background: A thin bony plate between coronoid fossa and olecranon fossa of humerus sometimes perforated to form a foramen named as supratrochlear foramen (STF) or septal aperture. It was present between two epicondyles, also called as intercondylar foramen. It was formed after the age of 6 years following incomplete ossification, intralamellar space enlargement or gradual septal absorption. Individuals with STF may be able to hyperextend the elbow joint. STF is an important single factor which determines the route and mode of insertion of intramedullary nail during the management of supratrochlear fractures. The presence of STF may also result in erroneous interpretation of radiographs. STF is of great importance to anthropologists while claiming it as one of the points in satisfying relationship between human and lower animals.

Materials and Methods: the present study was conducted on 50 dried humeri (22 right side, 28 left side) of unknown sex, obtained from department of anatomy, mmc & ri, mysore. The side of bone, presence and shapes of STF were noted. Shape of STF was recorded as oval, round, triangular and sieve like.

Results: out of 50 humeri studied 14 (28%) showed STF. Out of which 10 (35.71%) on left side & 4 (18.18%) on right side. Out of which shape of STF was oval in 4 (28%), round in 5 (35.71%), triangular in 2 (7.14%) and sieve like in 3 (21.42%).

Conclusion: the anatomical knowledge of STF is beneficial for anthropologists helps while claiming it as one of the points in satisfying relationship between humans & lower animals. In supracondylar fractures of humerus, the surgeon must keep in mind that in humeri with STF it is better to perform an antegrade medullary nailing than a retrograde one; as there is higher chance of a secondary fracture due to extreme narrowness of the canal at the distal portion of humerus. STF appears radiolucent in radiographs and this may be misinterpreted as osteolytic or cystic lesion during radiological examination.

KEY WORDS: Supratrochlear Foramen, Anthropology, Intramedullary Nailing, Osteolytic Lesion.

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INTRODUCTION

A thin plate of compact bone known as supra-trochlear septum, which is lined by a synovial membrane, usually separates the olecranon fossa and coronoid fossa in the supra-trochlear

area of the distal part of the humerus. This bony septum is opaque or translucent and septum in some cases may become perforated to form a foramen called as supra-trochlear aper-ture, septal aperture, intercondylar foramen, or

epitrochlear foramen, but is most commonly referred to as supratrochlear foramen (STF) [1,2]. Hirsh (1927) described that the thin plate of bone between olecranon and Coronoid fossa is always present until the age of seven years, after which the bony septum occasionally becomes absorbed to form STF [3]. The supra-trochlear foramen was first described by meckel in 1825 as cited by kate and dubey [1]. Since then, it has been described in various animals like dogs, hyenas, cattle, and other primates [4]. It is of great interest to anthropologists who claim as it one of the points in establishing a relationship between humans and lower animals [5].

STF in the distal end of the humerus is always associated with a narrow intramedullary canal in its lower end. In the normal humerus the canal has the diameter of 6-8 mm but when such variation (STF) present, the intramedullary canal diameter is <4mm. Narrowing of the canal is more pronounced in the distal end of humerus above STF. Measurements of intramedullary canal are important in the treatment of supracondylar fractures and also in intramedullary nailing procedures [6]. Radiologists should be aware of the occurrence of this foramen because it may be misinterpreted as an osteolytic lesion [7].

The present study of the STF aims to highlight its incidence, morphological features and clinical importance which may be beneficial for anat-omists, anthropologists, orthopedic surgeons, and radiologists.

MATERIALS AND METHODS

Fig. 1: Distal end of humerus in human showing **OVAL & ROUND** shaped Supratrochlear foramina from anterior aspect.

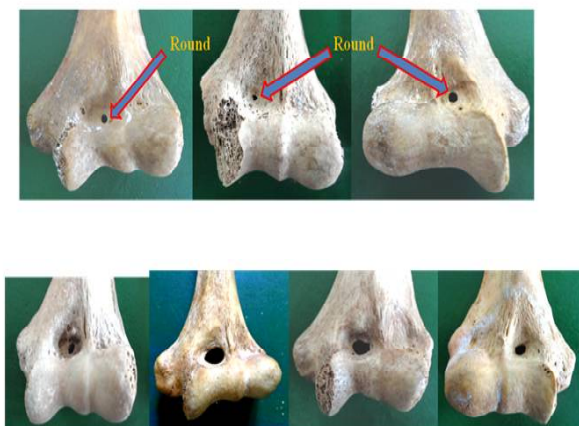


Fig. 2: Distal end of humerus in human showing **TRIANGULAR & SIEVE LIKE** Supratrochlear foramina from anterior aspect.

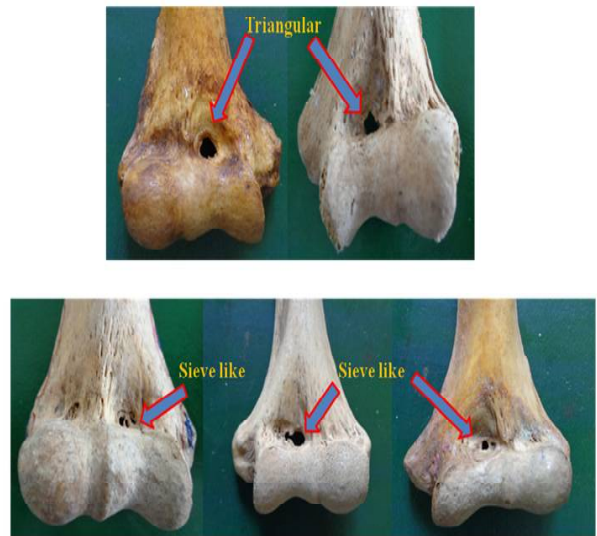


Fig. 3: A: Humerus without STF showing intramedullary canal, B: Humerus with STF showing Narrow medullary canal.



Fig. 4: Supra trochlear foramen on X-ray appearing as a radiolucent area.



The present study was conducted on 50 dried Humerii (22 right sided and 28 left sided) of unknown sex and age. The bones had taken from the department of anatomy, MMC & RI, Mysore, Karnataka, India. The presence of STF was noted. The shape of each foramen was noted and classified in to 4 types as oval, round, triangular & sieve like.

RESULTS

Table 1: Incidence of supratrochlear foramen.

Side	Number of humerii studied	Number of humerii with STF	% age of presence of STF
Right	22	4	18.18%
Left	28	10	35.71%
Total	50	14	28%

In the total 50 humerii (22 right sided & 28 left sided) studied 14 bones (28%), showed the presence of supratrochlear foramen of which 4 bones (18.18%) was of right side & 10 bones (35.71%) belong to left side. The incidence of supratrochlear foramen was more on left side than the right side as shown in Table 2.

Table 2: Incidence of different shapes of the supratrochlear foramen.

Shape of STF	Number of humerii with STF	Right sided	Left sided	%
Oval	4	1	3	28%
Round	5	1	4	35.71%
Triangular	2	1	1	7.14%
Sieve like	3	1	2	21.42%
Total	14	4	10	28%

Out of 50 humeri studied, STF was round, oval, triangular and sieve like in 5 (28%), 4 (35.7%), 2 (7.14%) and 3 (21.42%) cases respectively. The most common type of shape of STF is round followed by oval. The round and oval shapes were common on left side Table 2.

DISCUSSION

Though supra-trochlear foramen was reported by many authors, it was first described by meckel in 1825 [1]. Hirsh (1927) mentioned that the pressure of olecranon process may decrease the blood supply leading to septal aperture formation. In ancestors, the presence of foramen increases the degree of movements at elbow joint which had been an adoption to the

eventually disappear in modern man because of limited range of movement of elbow joint [3].

Supra trochlear foramen is not described in text-books of anatomy and orthopaedics [8, 9, and 11]. The knowledge of STF is important not only for its anthropological interest but for its clinical significance [5, 9]. Charles darwin described STF in humans as one of the characteristics linking origin of man's evolution to lower animals [9, 10].

In our study the STF was found in 14 bones (28%) which is nearer to the results of singhal s rao v et al [4], george k parakevas et al [2], jaswinder kauret al [11], oyedun oladayo et al [12]. But soubhagya nayak et al [13], surekha dilip et al [8], dhanalakshmi v et al [14] reported a higher incidence. Asha krishnamurthy et al [10], hima bindu et al [15], vekatesh gobi veerappan et al [6], varalakshmi et al [16], nizami duran et al [5] have reported a lower incidence. STF was more common on left side than right side which coincides with the findings of almost all the studies [2, 5, 6, 10-17]] except a study done by singhal S. Rao [4] in which STF is equal in both sides and soubhagya r nayak [13] in which STF is more on right side.

The shapes of the STF observed in our study were round 35.71%, oval 28%, triangular 7.14% and sieve like 21.42% (table -2), which is almost similar to those observed by oyedun oladayo [12], where as in other studies [5,6,7,8,9,13, 14,15, 16, 17] oval shape is more common than round shaped STF. Figure 1 shows round and oval shaped STF and Figure 2 shows triangular and sieve-like STF.

Incidence of presence or absence of STF in human populations varies significantly between ethnic groups as well as individuals of the same ethnic groups with similar habits and occupation [8]. Various populations showed different percentage of STF as shown in table- 5. Incidence of STF in indian population is different in different regions. It is present in eastern indians (27.4%), central indians (32%), south indians (28%), north indians (27.5%) as reviewed by singhal and rao (4, 7). Our study shows the same incidence of 28% that of south indians.

Due to high incidence of STF in the indian population it requires special attention during

intramedullary nailing procedures in the distal portion of humerus, because of presence of STF is associated with narrow intramedullary canal [6] as shown in Figure-3.

Table 3: Race-wise comparative data (in %) of septal aperture in humerus.

Sl no	Race	Percentage
1	Australians	46.5
2	Egyptians	43.9
3	Mexicans	38.7
4	Eskimos	19.8
5	American negroes	18.4
6	Japanese	18.1
7	Koreans	11
8	Italians	9.4
9	Germans	8.8
10	American whites	6.9
11	American indians	29.6
12	North indians	27.5
13	Central indians	32
14	Eastern indians	27.4
15	South indians	28
16	Present study	28

Clinical importance of STF: Common fracture in the distal end of humerus is supra condylar fracture which accounts for 75% of all injuries especially in paediatric age group usual mechanism is by hyperextension load on the elbow from falling on an outstretched arm. Different procedures are encountered in the route of pin entry while treating supra condylar fractures of humerus. The presence of STF in the lower end of humerus makes it more difficult to plan out such procedures pre- operatively. In humerus with STF antegrade intramedullary nailing procedure can be performed instead of retrograde procedure [2, 6]

In adults, stable fixation for complex supra-condylar fracture of humerus is often done with the placement of two plates on the posterior aspect of humeral pillars. In humerus with a wide STF, there will be difficulty in placing the plates to achieve stable reduction [9].

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

[10-17]. Such pseudolesions may lead to false positive diagnosis of an osteolytic or cystic lesion as shown in figure 4. Hence knowledge of STF may check wrong interpretation of x-rays by radiologists.

The STF is commoner in ancient primitive people than modern man, hence the presence of STF in humerus can be an invaluable tool to the anthropologists for dating specimens [9].

CONCLUSION

The knowledge of STF is beneficial for anthropologists, orthopedic surgeons & radiologists. Dating the specimens, STF is an important single factor which determines the route and mode of insertion of intramedullary nail during management of supracondylar fractures thereby helps in pre operative planning of distal humerus fracture. STF is an area which is radiolucent in radiographs and this may be misinterpreted as osteolytic or cystic lesion during radiological examination. So the radiologists need to be familiar with STF in order to avoid misdiagnosis during interpretation of plain radiographs and computed tomography scans of distal third of humerus.

Conflicts of Interests: None

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