



“A MORPHOMETRIC STUDY OF SUPRATROCHLEAR FORAMEN OF HUMERUS IN NORTH INDIAN POPULATION”

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ABSTRACT

The olecranon and coronoid fossa at the distal end of humerus are usually separated by a thin bony septum lined by synovial membrane in life. In some individuals this bony septum may become perforated to form an opening called supratrochlear foramen (STF) or septal aperture of humerus. The presence of STF was studied in 110 dry adult humeri of unknown sex from the department of Anatomy. The presence & shapes of the STF were established by visual observations. The supracondylar foramen is seen in 27.3% of total humeri. The round shaped STF is more common than oval and it is mostly seen on the left sided humerii.

KEYWORDS : Humerus, Supratrochlear foramen and septal aperture.

Introduction:

A thin plate of bone separates the olecranon & the coronoid fossa which may become perforated in some cases to give rise to a foramen known as “septal aperture” or “supratrochlear foramen” (STF) as described first by Meckel in 1825.¹ A thin plate of bone between the olecranon & coronoid fossa is always present until the age of seven years, after which the bony septum occasionally becomes absorbed to form the STF.² Individuals with this anatomic variation may be able to overextend the elbow joint.³ 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.⁴ The present study on north Indian population is an attempt to highlight the incidence, morphological features and clinical importance of STF which may be beneficial to anthropologists, orthopaedic surgeons and radiologists.

Material and Methods:

This present study was conducted in the Department of Anatomy, World College of Medical Sciences, Jhajjar during the period from November 2016 to March 2017. 110 (55 left and 55 right) dried humerus (Out of which 85 were procured from the first year students while 25 were from the departmental collection) bones free from pathological changes and of unknown sex obtained from Department of Anatomy. The incidence and shape of STF was noted on the left and right side humerii and only those foramen having regular margins were considered. Digital vernier caliper was used to measure the maximum transverse and vertical diameter of STF. In bones where STF was absent, translucency of septum was noted by observing the lower end of humerus under X-ray lobby.

Fig. 1: Photograph of humeri showing STF s of round and oval shape.



Results and Discussion:

Out of 110 humerii studied, only 30 humerii (27.3%) showed the presence of STF out of which STF was present in 18 left sided (32.7%) and 12 right sided (21.8%) humerii (Table I). The STF was absent in 80 humeri (72.7%) among which 38 humeri (69.1%) showed the translucency of septum and 42 humeri (76.3%) showed the Opaque septum. The translucency of septum was observed on 18 right humeri (32.7%) and 20 left humeri (36.3%). The Opaque septum was observed on 20 right humeri (36.3%) and 22 left humeri (40.0%)

(Table 2). Most common shape of STF was round in 19 out of 30 humeri with STF, followed by oval in 11 humeri. No triangular or sieve like shape was observed.

Table 1: Presence of supratrochlear foramen (STF) in humerus irrespective of sex and age:

Side of Humeri	Total No. of Humeri	Presence of STF	Percentage (%)
Right	55	12	21.8
Left	55	18	32.7
Total	110	30	27.3

Table 2: Frequency of supratrochlear foramen and translucent septum:

Parameter	Right side	Left side	Grand Total
Foramen	12(21.8%)	18(32.7%)	30(27.3%)
Translucent septum	18(32.7%)	20(36.3%)	38(69.1%)
Opaque septum	20(36.3%)	22(40.0%)	42(76.3%)
Total	50(45.4%)	60(54.5%)	110(100%)

Table 3: Shape of Supratrochlear Foramen (STF):

Shape of STF	Right side STF (n= 12)	Left side STF (n= 18)
Oval	3	8
Round	9	10
Triangular	0	0
Sieve	0	0

Table 4: Morphometric measurements as T.D. and V.D:

Parameter	Right (Mean ± S.D)	Left (Mean ± S.D)	P- value
Transverse diameter	5.16±1.169mm	5.20±2.14mm	0.42
Vertical diameter	3.77±0.62mm	3.87±1.40mm	0.73

In the present study, the mean vertical diameter (V.D) for STF was observed to be 3.77±0.62mm (range 2.65-4.69mm) on the right side and 3.87±1.40mm (range 1.5-5.10mm) on the left side. Transverse diameter (T.D) was found to be 5.16±1.169mm (range 2.81-6.15mm) on the right side and 5.20±2.14mm (range 1.51-8.27mm) on the left side. (Table:4). The side differences of the diameters were not statistically significant.

Table 5: Comparative data of supratrochlear foramen in human races:

RACES	INCIDENCE (%)
Americans (Benfer & Mc kern, 1966)	6.9
Egyptians (Orztuk et al. 2000)	7.9
Ainus (Akabori, 1934)	8.8
Japanese (Akabori, 1934)	18.1
North Indians (Singh & Singh, 1972)	27.5
South Indians (Singhal & Rao, 2007)	28

Eastern Indians (Chatterjee, 1968)	27.4
Central Indians (Kate & Dubey, 1970)	32
South Africans (Nodu et al, 2012)	32.5
South Indians (Arunkumar K R et. al., 2015)	21.4
Present study (2017)	27.3

The supratrochlear foramen is a neglected entity in both anatomy and orthopedic textbooks.⁵ The knowledge of STF is important not only for its anthropological interest but for its clinical significance. Some authors opine that the presence of STF is an atavistic character because it is frequently found in primates.⁶ STF has been reported in animals like dogs, horse, hyena and cattle.⁷ Charles Darwin described STF in humans as one of the characteristics linking origin of man's evolution to lower animals.⁸ Desmoulin's⁹ claimed the presence of STF as racial anomaly. The incidence of STF varies in different races (Table 5).

In our study the STF was found in 30 bones (27.3%) which is nearer to the results of Kumar et al⁵, Diwan et al¹⁰, Mahajan et al¹¹ and Patel et al¹². But Jadhav et al¹³ reported a higher incidence of STF (40.78%) in their study. STF was more common on left side than right side which coincides with the findings of Kaur et al¹⁴. The shapes of the STF observed in our study were oval (36.6%), round (63.3%), triangular (0%), which is almost similar to those observed by Diwan et al¹⁰ However Jadhav et al¹³ reported a sieve like appearance of STF in 3.22% of bones in their study.

Translucent septum was observed in 38 (69.1%) cases in the present study which is less when compared with the reports of Soubhagya Nayak et al¹⁵ (56.7%), Patel et al¹² (52.5%), Veerappan V et al¹⁷ (50%), Anupama Mahajan¹¹ (62%) and more as reported by Jadhav Mayuri¹⁷. The current study showed translucent septum chiefly on the right side (32.7%) than the left side (36.3%). This finding is in accordance with the reports of Vasantbhai¹⁹ (50% on the right side) and Veerappan et al¹⁶ (55.8% on the right side) whereas it is contradictory to those reported by Bhanu et al¹⁵ and Krishnamurthy et al¹⁹. Opaque septum was recorded more on left side (40%) as compared to right side (36.3%) and this fact differs from other studies^{20,21}.

In the current study, the vertical diameter for STF was observed as 3.77±0.62 mm on the right side and 3.87±1.40 mm on the left side. Transverse diameter was found to be 5.16±1.169mm on the right side and 5.20±2.14mm on the left side. The mean TD of STF on the left side is observed to be slightly larger than on the right side, as is also reported by Ozturk et al²² and Erdogmus S et al²². The transverse diameters of both sides were observed to be more than the vertical diameter which is similar with the studies of Nayak et al²⁴ and Bhanu and Shankar¹⁵.

Supratrochlear fracture of humerus accounts for 75% of the total of pediatric age group injuries. Its treatment requires an adequate route of pin entry¹². The presence of STF at the lower end of humerus may cause hindrance in planning out intramedullary humeral nailing procedure in the distal end of humerus, thus establishing the need to have a better anatomical understanding of lower end of humerus¹². Antegrade intramedullary nailing procedure is preferred over the retrograde procedure in such cases of humerus with STF. In day to day clinical practice, bone cysts and other lytic conditions can be seen with the aid of plain radiographs. STF appears as a relative radiolucent area in X-rays and thus may be mistaken as osteolytic or cystic lesion mimicking the 'pseudolesion'²¹. Thus prior anatomical knowledge is must to avoid such false interpretation by radiologists.

Conclusion:

These findings suggest that the round shaped STF is more common than oval and it is mostly seen on the left sided humeri. This study will be helpful for anthropologists, surgeons, orthopaedicians and radiologists.

References:

1. Kate BR, Dubey PN, "A note on the septal apertures in the humerus of central Indians",

- Eastern Anthropologist, 33, pp. 270-284, 1970.
2. Hirsh SI. (1927) cited in Morton SH & Crysler WE. Osteochondritis dissecans of the supratrochlear septum. J Bone Joint Surg, 1945; 27-A: 12-24.
3. De Wilde V, De Maeseneer M, Lenchik L, Van Roy P, Beeckman P, Osteaux M. Normal osseous variants presenting as cystic or lucent areas on radiography & CT imaging: a pictorial overview. Eur J Radiol. 2004; 51:77-84.
4. Akpinar F, Aydinlioglu A, Tosun N, Dogan A, Tuncay I, Unal O. A morphometric study on the humerus for intramedullary fixation. Tohoku J Exp Med. 2003; 199:35-42.
5. Kumar Ajay, Sharma Anu, Singh Poonam. A Study of Supratrochlear Foramen of Humerus with its Clinical Implications. The Clinical Researcher. 2010; 2(2):58-60.
6. Hardlicka A. The humerus septal apertures. Anthropologie, X (Prague) 1932; 34-96.
7. Haziroglu RM, Ozer M. A supratrochlear foramen in the humerus of cattle. Anat Histol Embryol. 1990; 19:106-108.
8. Sunday OO, Olusegun OS, Oluwabunmi BM. The Supratrochlear Foramen of the Humerus: Implications for intramedullary nailing in distal Humerus. Journal of Biology, Agriculture and Healthcare. 2014; 4(7):136-139.
9. Desmoulin's (1826). Cited by Comas J. In manual of physical Anthropology. Thomas C. USA. 1960:421.
10. Diwan RK, Rani A, Anita R, Chopra J, Srivastava AK, Sharma PK, Verma RK, Pankaj AK. Incidence of Supratrochlear Foramen of Humerus in North Indian Population. Biomedical Research 2013; 24(1):142-145.
11. Mahajan A, Batra APS, Seema, Khurana BS. Supratrochlear foramen; study of humerus in North Indians. Professional Med J Mar 2011; 18(1):128-132.
12. Patel SV, Sutarika LK, Nayak TV, Kanjiya DP, Patel BM, Aterkar SH. Morphometric study of supratrochlear foramen of humerus. International Journal of Biomedical and Advance Research. 2013; 04(2):89-92.
13. Jadhav M, Tawte A, Pawar P, Mane S. Anatomical study of Supratrochlear foramen of Humerus. J Res Med Den Sci 2013; 1(2):33-35.
14. Jaswinder Kaur, Zora Singh. Supratrochlear Foramen of Humerus – A Morphometric Study. Indian Journal of Basic & Applied Medical Research; June 2013; Issue-7, Vol.-2, P.651-654.
15. Bhanu PS, Sankar KD. Anatomical note of supratrochlear foramen of humerus in south coastal population of Andhra Pradesh. Narayana Medical Journal, 2012; 1(2):28-34.
16. Veerappan V, Ananthi S, Kannan NG et al. Anatomical and radiological study of supratrochlear foramen of humerus. World J Pharm Pharm Sci, 2013; 2(1):313-20.
17. Mayuri J, Apama T, Pradeep P et al. Anatomical study of Supratrochlear foramen of Humerus. Journal of Research in Medical and Dental Science 2013; 1(2):33-35.
18. Vasantbhai PS. Morphometric Study of Supratrochlear Foramen of Humerus. International Journal of Biomedical and Advance Research, 2013; 4(2):89-92.
19. Krishnamurthy A, Yelicharla AR, Takkalapalli A. Supratrochlear foramen of humerus - a morphometric study. Int J Biol Med Res, 2011; 2(3):829-31.
20. Kumar A, Sharma A, Singh P. A study of supratrochlear foramen of Humerus with its clinical implications. The Clinical Researcher. 2010; 02(02):58-60.
21. Singhal S, Rao V. Supratrochlear foramen of the humerus. Anat Sci Int. 2007; 82:105-7.
22. Ozturk A, Kutlu C, Bayraktar B et al. The supratrochlear foramen in the humerus (Anatomical Study) stTpFak. Mecmus, 2000; 63:72-76.
23. Erdogmus S, Guler M, Eroglu S, Duran N. The Importance of the Supratrochlear Foramen of the Humerus in Humans: An Anatomical Study. Med Sci Monit, 2014; 20:2643-2650.
24. Nayak SR, Das S, Krishnamurthy A et al. Supratrochlear foramen of the humerus: An anatomicoradiological study with clinical implications. Ups J Med Sci, 2009; 114(2):90-94.