



Original Research Article

Supratrochlear Foramen: An Anatomic and Clinico-Radiological Assessment

Berjina Farooq Naqshi¹, Adil Bashir Shah², Sangeeta Gupta³, Sunanda Raina⁴, Hayat Ahmad Khan⁵, Neena Gupta⁶, Nazia Hassan⁶

¹PG Scholar, ³Associate Professor, ⁴Professor and Head, ⁶Demonstrator,
Department of Anatomy GMC, Jammu, India
²PG Scholar, ⁵Senior Registrar,
Department of Orthopaedics GMC, Srinagar, India.

Corresponding Author: Adil Bashir Shah

Received: 02/12/2014

Revised: 25/12/2014

Accepted: 29/12/2014

ABSTRACT

Distal end of humerus bears a septum between coronoid and olecranon fossae which is deficient sometimes and forms a foramen called septal aperture or supratrochlear foramen (STF). Our study was conducted on 80 humeri bones (40 right side and 40 left side). The bones were fully ossified and dry. Vernier Calliper was used for taking various measurements. STF was seen in 27.5% bones. Septum was translucent in 22(55%) humeri on right side and 19(47.5%) on left side (Table 1). Oval and round shapes of STF were observed among which oval shape was found to be maximum (90.9%). The mean transverse diameter was 5.3mm on the right and 6.6mm on the left. The mean vertical diameter was 3.9mm on the right and 4.6mm on the left. The present study can provide more knowledge of STF which may be of great use for orthopaedicians, radiologists and anthropologists.

Key words: Supratrochlear foramen (STF), septal aperture, humerus.

INTRODUCTION

Supratrochlear septum is a thin plate of bone (0.5mm to 1 cm in thickness) separating the olecranon and coronoid fossae. In fresh state, it has a lining of synovial membrane. [1,2] This plate between olecranon and coronoid is present until 7 years of age after which it gets absorbed to form STF. [3] When this septum perforates it forms a foramen called supratrochlear foramen (STF). [4] The incidence of STF ranged from 6% to 60% in different races in humans. [5] Its percentage is higher in females. [3] These foramen are oval, triangular, round and sieve like in shape. [6]

STF has been discussed in animals like hyenas, cattle, dogs and primates. [7] Its knowledge being important helps in pre-operative planning of intramedullary fixation in fractures of distal humeral end due to narrow medullary cavity. [8-10] Knowledge about this foramen is beneficial for orthopaedicians, radiologists and anthropologists.

MATERIALS AND METHODS

The supratrochlear foramen was studied in detail in 80 (40 right side and 40 left side) human dried humeri of unknown sex and age. These bones were collected

from Department of Anatomy, Government Medical College, Jammu. The observed bones were free from any pathology. The presence of STF in bones (humeri) and its shape was observed. The transverse and vertical diameter of STF in humeri was measured using Vernier Calliper. Radiological assessment and photographs were taken.

RESULTS

Out of 80 adult dry humeri studied, 22 (27.5%) showed the presence of STF. (Fig 1a) In 10(25%) bones on the right side and in 12(30%) bones on the left side, STF was seen and it was showing left predominance. (Table 1) The STF was oval

in 20(90.9%) and round in shape in 2(9.09%) humeri. (Fig 3) Triangular STF was not observed stressing on the fact, that its number is less. (Table 2) The mean transverse diameter (Fig 1c) for STF was 6.6mm and 5.3mm on left and right sides, respectively. (Table 3) The mean vertical diameter (Fig 1c) for STF was 4.6mm and 3.9mm on left and right sides, respectively. (Table 3) Number of bones lacking foramen were 58 (72.5%). Most of the bones that had no STF, had translucent septum, 22 (55%) bones on right side and 19 (47.5%) bones on left side. (Fig 2a) (Table1) Opaque septum was found in 17 bones.(Fig 2b)



Fig 1a



Fig 1b



Fig 1c

Fig 1a:- Photograph showing distal humerus with STF.

Fig 1b: Radiograph of the distal end of humerus (AP view) showing STF as a radiolucent area mimicking lytic lesion.

Fig 1c: Photograph showing measurements of STF. Red line depicting vertical diameter and yellow line depicting transverse diameter.



Fig 2a



fig 2b

Fig 2a: Photograph showing distal humerus with translucency.

Fig 2b: Photograph showing distal end of humerus with opaque septum.



Fig.4: Radiographs of humeri with STF.

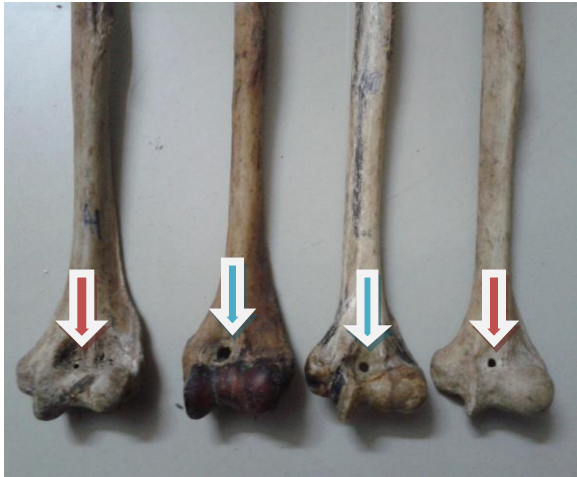


Fig. 3: Photograph of humeri with different types of foramen. (Oval - blue arrow and round - red arrow)

Table 1: Showing frequency of STF and translucent septum

Sides	Number of bones	Presence of STF	Translucency
Right	40	10(25%)	22(55%)
Left	40	12(30%)	19(47.5%)

Table 2: Showing shape of STF

Shape	Number	Percentage
Oval	20	90.9%
Round	2	9.09%
Triangular	-	-
Sieve shaped	-	-

Table 3: Showing different measurements of STF

Side	Transverse diameter(mm) Mean \pm S.D	Vertical diameter (mm) Mean \pm S.D
Right	5.3 \pm 2.37	3.9 \pm 1.32
Left	6.6 \pm 2.53	4.6 \pm 1.63

DISCUSSION

STF is a foramen in bony septum separating olecranon and coronoid fossa at distal humeral end. The STF, which was described for the first time by Meckel in

1825, [11] has been observed in many animal groups. Present study is focussed on STF with its morphology and morphometry in North Indian population of Jammu. Some previous studies revealed the incidence of supratrochlear foramen to be 28% (Singhal's study), [5] 26% (Anupama Mahajan's study) [12] and 25.8% (Varalakshmi's study). [13]

Our study on North Indian population of Jammu revealed the incidence of STF to be 27.5% which is very near to above mentioned studies. The incidence of STF is 25% on right side and 30% on left side which is similar to Varalakshmi's study [13] (21.9% on right side and 29.5% on left side) and Krishnamurthy's study [2] (18% on right side and 28% on left side). So, the incidence of STF on left side predominates. STF was absent in 72.5% of humeri. Among these 72.5%, some showed translucency at supratrochlear septum and some revealed opaque septum. Translucency of septum was seen in 22 (55%) bones on right side and 19 (47.5%) bones on left side and the values were near to study by Nayak [14] (59.3% on right and 55.2% on left) and Kumarasamy [15] (35.9% on right and 49.3% on left).

The STF of humerus, in spite of its importance, is a neglected area in Orthopaedics and Anatomy. Its incidence was not described clearly. The hypothesis behind the development of STF includes septal atrophy either after ossification or

mechanical process by impaction of bones during extension, though the exact etiology is still not clearly known. [7,16] Neurovascular bundles can land in compression due to the presence of STF. [17] Septal aperture was considered to be atavistic. [18] STF is more specifically present in mammals. This foramen is one of the characteristics that reveal man's closest relation with lower forms. Recent civilizations have less incidence of STF than ancient primitive people. [5,18-20] Incidence of the septal foramen in different races represents clinical importance of STF and its evolution. [3,5,19] (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	27.5

Common fracture in paediatric age group is supracondylar fracture and it requires a stable fixation usually by proper pinning procedure. [21] Presence of STF poses difficulty in planning proper surgery. Lot of debate has been there about the route of pinning. The narrow medullary canal in region of STF makes retrograde nailing more difficult and the chance of secondary fracture is increased in distal humeral end. The medullary canal with a foramen end more proximally than humeri without canals. [15] So antegrade route has been advised and is better than a retrograde method in people with STF. [10] STF being a radiolucent area on the X-ray resembles a cyst or any osteolytic lesion. Such an X-ray

increases the false positive result of cyst or osteolytic lesion and can lead to devastating results. [14] (Fig 1b, Fig.4) STF should always be included as a differential diagnosis while evaluating patient with a suspicious lytic lesion on the radiographs of distal humerus. Thus the morphology and morphometry of STF is very important to avoid such mistakes.

CONCLUSION

The present study laid stress on the study of STF which is an important variation of distal humeral end. Assessment of incidence of STF with its morphology and morphometry was done. Its incidence is 27.5% and is mostly seen in left humeri. The anatomical knowledge of the septal aperture is beneficial for Orthopaedicians, radiologists and anthropologists. Its awareness is important in orthopaedics for planning surgeries in supracondylar fractures. All necessary knowledge about STF should be provided to the radiologists to avoid any misdiagnosis.

REFERENCES

1. Kate BR, Dubey PN. A note on the septal apertures in the humerus of Central Indians. Eastern Anthropologists. 1970; 33:105-10.
2. Krishnamurthy A, Yelicharla AR, Takkalapalli A, Munishamappa V, Bovinndala B, Chandramohan M. Supratrochlear foramen of humerus- a morphometric study. Int J Biol Med Res.2011; 2(3):829-31.
3. Hirish IS. Cited in Morton SH and Crysler WE. Osteochondritis dissecans of the supratrochlear septum. J. Bone Joint Surg. 1945; 27-A: 12-24.
4. Ndou R, Smith P, Gemell R, Mohatla O. The supratrochlear foramen of the humerus in a South African dry bone sample. Clin. Anat. 2013; 26:870-4.

5. Singhal S, Rao V. Supratrochlear foramen of the humerus. *Anat. Sci. Int.* 2007; 82:105-7.
6. Mayuri J, Aparna T, Pradeep P, Smita M. Anatomical study of Supratrochlear foramen of humerus. *J Res Dent Sci.* 2013; 1(2):33-5.
7. Hazirolu RM, Ozer M. A supratrochlear foramen in the humerus of cattle. *Anat Histol Embryol.* 1990; 19(2):106-8.
8. Brauer CA, Lee BM, Bae DS, Waters PM, Kocher MS. A systematic review of medical and lateral entry pinning versus lateral entry pinning for supracondylar fractures of the humerus. *J. Pediatr Orthop.* 2007; 27(2):181-6.
9. Kour J, Zorasingh. Supratrochlear foramen of humerus- A morphometric study. *Indian J of Basic and Applied Med. Res.* 2013; 7(2):651-4.
10. Paraskevas GK, Papaziogas B, Tzaveas A, Giaglis G, Kitsoulis P, Natsis K. The supratrochlear foramen of the humerus and its relation to the medullary canal: a potential surgical application. *Med. Sci .Monit.* 2010; 16(4):119-23.
11. Meckel JH, Kate BR, Dubey PN. A note on the septal apertures in the humerus of Central Indians. *Eastern Anthropologist.* 1970; 33:2701-84.
12. Anupama Mahajan A, Batra APS, Seema, Khurana BS. Supratrochlear foramen; study of humerus in North Indians. *Professional Med J.* 2011; 18(1):128-32.
13. Varalakshmi KL, Shetty S, Sulthana Q. Study of Supratrochlear foramen of humerus and its clinical importance. *J Dent Med. Sci.* 2014; 13(7):68-70.
14. Nayak SR, Das S, Krishnamurthy A, Prabhu LV, Potu BK. Supratrochlear foramen of the humerus: An anatomical radiological study with clinical implications. *Ups. J. Med. Sci.* 2009; 114(2):90-4.
15. Kumarasamy SA, Subramanian M, Gnanasundaram V, Subramanian A, Ramalingam. Study of Intercondyloid foramen of humerus. *Rev Arg de Anat. Clin.* 2011; 3(1):32-6.
16. Langley-Hobbs SJ, Straw M. The feline humerus. A anatomical study with relevance to external skeletal fixator and intramedullary pin replacement. *Ret Comp Ortho Traumatol.* 2005; 18:1-6.
17. Varlam H, St Antole D, Chistol RO. Supratrochlear process and supratrochlear foramen of the humerus: a case report and review of the literature. *Morphologie.* 2005; 89:121-5.
18. Hardlicka A. The humerus septal apertures. *Anthroologie; X(Praque).* 1932: 34-96.
19. Akabori E. Septal apertures in the humerus in Japanese, Ainu and Koreans. *Am J Phy Anthropol,* 1934; 18:395-400.
20. Houshian S, Mehdi B, Larsen MS. The epidemiology of elbow fracture in children: analysis of 355 fractures with special references to supracondylar humerus fractures. *J. Orthop Sci.* 2001; 6:312-5.
21. Akpınar 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.

How to cite this article: Naqshi BF, Shah AB, Gupta S et. al. Supratrochlear foramen: an anatomic and clinico-radiological assessment. *Int J Health Sci Res.* 2015;5(1):146-150.
