ORIGINAL
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SUPRATROCHLEAR FORAMEN;
STUDY OF HUMERUS IN NORTH INDIANS

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ABSTRACT... Introduction: The knowledge of the presence of STF in a humerus may be important for preoperative planning for treatment of supracondylar fractures. **Objectives:** Focused on the STF which is an important variation in the distal end of the humerus. **Material and Method:** The material consisted of 100 humeri of known sex taken from the Department of Anatomy, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar. 36 pairs of male humeri and 14 pairs of female humeri were taken. **Results:** The supracondylar foramen is seen in 26% of total humeri. It was present more in the females as compared to males and more frequently on the left side than on the right side. The translucent septum is found more frequently in the males than in females and more frequently on the right side than the left side. **Conclusions:** The anatomical knowledge of STF may be beneficial for anthropologists, orthopaedic surgeons, and radiologists in day-to-day clinical practice.

Key words: Humerus, supratrochlear, sex, variation.

INTRODUCTION

A thin plate of bone separates the olecranon and the coronoid fossa which may become perforated in some cases to give rise to a foramen known as 'septal aperture' or 'supratrochlear foramen' (STF)[1]. According to Hirsh[2] the thin plate of bone between the olecranon and coronoid fossa is always present until the age of seven years, after which the bony septum occasionally becomes absorbed to form the STF. Individuals with this anatomic variation may be able to overextend the elbow joint[3]. Patience and a detailed look at the literature show that the STF was first described by Meckel[4]. Since then it has been described in various animals like dogs, hyenas, cattle, and other primates[5,6].

MATERIAL AND METHODS

The material consisted of 100 humeri of known sex taken from the Department of Anatomy, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar. The bones which were freed of any pathological changes were used. 36 pairs of male humeri and 14 pairs of female humeri were taken. The incidence of the supratrochlear foramen was found on the right and left side. Only those apertures which were having the regular margins were considered.

RESULTS

A clear cut supratrochlear foramen was found in 26% of humeri. Its dimensions varied between 4-7.4 mm transversally and 2.7-4mm in vertical direction. Left cases showed the 30% and the right sided humeri showed it in 22% of cases. Female humeri showed positive preponderance over the males(39.3% : 20.8%).

Even sex wise the septal apertures were more common on the left humeri than the right ones. In males, right humeri had it in 16.7% of cases and left ones in 25% of cases while in the females right humeri had it in 35.7% of cases and left ones in 42.8% (Table I). Eight Cases had this on the both sides. Unilateral apertures were present in eight humeri on the left side and five on the right side (Table II). Translucency of the septum was however more common in the right humeri (70%) than in the left ones (54%). And males had predominance in this both on the right and left sides(Table III).

DISCUSSION

The observation of the septal aperture was considered by Desmoulins[7] as the racial anomaly or atavistic[6]. It was absent in Hare, Dog and some Lemurs[1]. It was absent or rare in embryonal or infantile humeri and the youngest humeri out of the 436 examined by Akabori[8] was a female

Table-I. Supratrochlear foramen in 100 humeri of 50 North Indian (36 males and 14 males)

Sex (No)	Right		Left		Total	
	No	%age	No	%age	No	%age
Male (36)	6	16.7	9	25	15	20.8
Female (14)	5	35.7	6	42.8	11	39.3
Total (50)	11	22	15	30	26	26.0

Table-II. Bilateral and unilateral supratrochlear foramen in 50 pairs of North Indian humeri

Sex	Present bilaterally	Right present Left absent	Left present Right absent	Absent bilaterally	Total
Male	4	3	6	23	36
Female	4	2	2	6	14
Total	8	5	8	29	50

Table-III. Frequency of supratrochlear foramen and translucent septum in 100 humeri of 50 North Indian (36 males and 14 males)

	Right Side			Left Side			Grand Total
	Male	Female	Total	Male	Female	Total	
Foramen	6 (16.7%)	5 (35.7%)	11 (22%)	9 (25%)	6 (42.8%)	15 (30%)	26 (26%)
Translucent septum	27 (75%)	8 (57.1%)	35 (70%)	21 (58.3%)	6 (42.8%)	27 (54%)	62 (62%)
Opaque septum	3 (8.33%)	1 (7.1%)	4 (8%)	6 (16.7%)	2 (14.3%)	8 (16%)	12 (12%)
Total	36	14	50	36	14	50	100

of 9 years old. He found that the incidence was very low after the age of 60 years. No such correlation was found by Trotter[9]. Some authors considered it to be due to the mechanical pressure during the hyperextension or by large olecranon process has been blamed by some workers to be responsible factor for producing these supratrochlear apertures, but Hrdlicka[6]contradicted and said that the intermittent pressure would cause the hyperemia 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. Incidence found was more in females as compared to the males[8,10] (Table IV).

Table-IV. Comparative data (in %) of septal aperture in humerus, sex-wise

Race	Male	Female
Central Indians	20.0	46.0
Japanese	12.6	43.1
Negro	11.8	34.5
White	5.0	17.0
Korean	7.0	15.0
Present Study	20.3	39.3

In the present study the frequency is almost double in females as compared with the males. It was found to be lower than found in the central India[1]. Septal aperture was found more in the left humerus which is in line with the findings of the other races (Table V). In the present study the bilateral aperture was found bilaterally in 8 as compared to the unilateral aperture found in 5 on right side and 8 on left side. From here it was concluded that unilateral septal aperture was more common than the bilateral ones. It was contradictory to the finding of Akabori[8].

Table-V. Comparative data (in %) of septal aperture in humerus, side-wise

Race	Right	Left
Central Indians	28	35
Eastern Indians	22	35
Japanese	25	27
Korean	06	13
Present Study	22	30

Translucent septum was found more in right humeri (70 %) than the left ones (54%) which is same as found by Chatterje[11] for the eastern Indians and was found more in the male humeri (75%) as compared to the female humeri (57.1%). Only 12% did not show any septal aperture or the translucent septum whereas the 88% humeri were having the either the aperture (26%) or the translucent septum (62%). If the mechanical pressure due to olecranon process is considered as the causative factor of this septum it would have been common in the right humeri and more common in males. Other causative factor was given by Mall[12] considering the inward curvature of the female elbow angle responsible for the higher incidence in females as compared to males. It was noted more common in primitive people as compared to the civilized ones. Its tendency can be considered to be phylogenetic as it is suppressed by the stronger limb or individual and is frequent in weaker limb or individual (female) or race.

CLINICAL IMPORTANCE

Racial incidence of the septal aperture is shown in (Table VI). It represents Evolutionary aspects of the foramen in addition to its surgical and orthopedic significance[13]. 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[14]. Due to the high incidence of the STF in the Indian population it requires special attention during intramedullary humeral nailing procedures in the distal portion of humerus. There is no clear opinion about the occurrence of the STF.

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

Race	%age
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	26.0

Some authors have opinion that the occurrence of the foramen is attributed to atrophy of the bone after ossification, with the impact of pressure in cases of the extension of the arm in straight-line direction[15]. The study had advocated the compression of neurovascular structures due to the presence of such variations[16].

Supracondylar fractures account for 75% of all injuries in the paediatric age group[17]. There is a lot of debate about the route of pin entry while treating supracondylar fractures of the humerus. The presence of the variations in the lower end of the humerus, e.g. STF, makes it more difficult to plan out such procedures preoperatively. Even intramedullary nailing cannot be possible in case these variations exist. Thus, a STF is always associated with a narrow medullary canal in the humerus. It has been opinioned that the STF is an area which is relatively radiolucent, is commonly seen as a type of 'pseudo-lesion' in any X-ray of the upper limb, and this can be mistaken for an osteolytic or cystic lesion[18].

Fig. Showing supratrochlear foramen of humerus

CONCLUSIONS

The present study focused on the STF which is an important variation in the distal end of the humerus. To the best of our knowledge no single piece of research had performed concomitant anatomical and radiological study on the humerus while describing STF. The anatomical knowledge of STF may be beneficial for anthropologists, orthopaedic surgeons, and radiologists in day-to-day clinical practice.

REFERENCES

1. Kate BR and Dubey PN. **A note on the septal apertures in the humerus in the humerus of Central Indians.** Eastern Anthropologist, 1970; 33: 105–10
2. Hirsh SI. (1927) cited in Morton SH and 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 and CT imaging: a pictorial overview.** Eur J Radiol, 2004; 51: 77–84.
4. Meckel JH, (1825), cited in, Kate, BR, Dubey, PN. **A note on the septal apertures in the humerus of Central Indians.** Eastern Anthropologist, 1970; 33:270–84.
5. Haziroglu RM and Ozer M. **A supratrochlear foramen in the humerus of cattle.** Anat Histol Embryol, 1990; 19: 106–8.
6. Hardlicka A. **The humerus septal apertures.** Anthropologie, X (Praque), 1932; P. 34-96.
7. Desmoulins (1826).Cited by Comas J (1960). **In manual of physical Anthropology.** P 421. USA, C. Thomas.
8. Akabori E. **Septal apertures in the humerus in Japanese, Ainu and Koreans.** Am J Phys Anthropol, 1934; 18: 395–400.
9. Trotter, M. **Septal aperture of humerus.** Am J Phy Anthrop, 1935; 19: 213-227.
10. Genovels S. **Estudio de loss restos oseos de Coixtahxuaca, Caxaca.** Miscellanea Paul Rivet, 1958; 1: 455-484.
11. Chatterjee KP. **The incidence of perforation of olecranon fossa in the humerus among Indians.** Eastern Anthropologist, 1968; 21: 270–84.
12. Mall (1905). Cited by Chatterjee (1968). **The incidence of perforation of olecranon fossa in the humerus among Indians.** Eastern Anthropologist, 1968; 21: 270–84.
13. Singhal S and Rao V. **Supratrochlear foramen of the humerus.** Anat Sci Int, 2007; 82: 105–7.
14. Nayak SR, Das S, Krishnamurthy A, Prabhu LV, Potu BK. **Supratrochlear foramen of the humerus: An anatomico-radiological study with clinical**

implications, 2009; 114(2): 90-94.

15. Lamb DS. **The olecranon perforation.** Am Anthropologist 1890; 3: 159–74.

16. Varlam H, St Antohe D, Chistol RO. **Supracondylar process and supratrochlear foramen of the humerus:** **a case report and a review of the literature.** Morphologie, 2005; 89: 121–5.

17. Houshian S, Mehdi B, Larsen MS. **The epidemiology of elbow fracture in children: analysis of 355 fractures with special reference to supracondylar humerus fractures.** J Orthop Sci, 2001; 6: 312–5.

Article received on: 18/03/2010 Accepted for Publication: 10/01/2011 Received after proof reading: 00/00/0000

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Article Citation:
Mahajan A, Batra APS, Seema, Khurana BS. Supratrochlear foramen; study of humerus in North Indians. Professional Med J Mar 2011;18(1):128-132.

Success isn't permanent, and failure isn't fatal.

Mike Ditka (1939 -)