



Morphometric Study of Supratrochlear Foramen And Presence of Translucency of Coronoid Olecranon Septum In Distal End of Humerus

***Sarita R Margam**

Assistant Professor, Department of Anatomy, Ashwini Rural Medical College, Hospital and Research Center, Kumbhari, Solapur, Maharashtra, India, * Corresponding author

Suresh P Bacchuwar

Professor, Department of Anatomy, Tagore Medical College and Hospital, Rathinamangalam, Chennai, India.

Priya S Pargunde

Assistant Professor, Department of Anatomy, JIU's Indian Institute of Medical Sciences and Research, Warudi, Badanapur, Jalna, Maharashtra, India,

ABSTRACT

Background: Lower end of humerus shows olecranon and coronoid fossae separated by a thin bony septum, sometimes it may deficient and shows foramen which is commonly referred as 'Supratrochlear foramen (STF)'. Presence of this foramen is clinically important during preoperative planning for intramedullary nailing in the treatment of supracondylar fractures of distal end of humerus.

Methods: We studied 120 humeri (55 Right sided and 65 Left sided) of unknown sex. Measurements were taken by using Vernier caliper. Translucency of coronoid olecranon septum (COS) was obtained by keeping the lower end of humerus against the X-ray lobby.

Results: 33 humeri (27.5%) showed the presence of STF. The STF was oval and round in shape in 16 humeri each. The mean length of the transverse diameter of STF was 7.34 mm and 5.94 mm on right and left sides respectively. The mean length of the vertical diameter of STF was 5.25 mm and 4.35 mm on right and left sides respectively. Most of the bones with no STF showed translucency of COS in 66.67%. Mean distance of STF from tip of medial epicondyle is 25.25 mm on right and 26.29 mm on left side.

Conclusion: Incidence of STF and translucency of COS are common on right side. The respective sides do not exhibit any statistically significant differences in other measured parameters. Present study gives knowledge of this anatomical variation of humerus which can be useful for anthropologists, orthopedic surgeons and radiologists in day to day clinical practice.

KEYWORDS

Supratrochlear, Translucency, Intramedullary nailing.

Introduction:

In the distal end of humerus, the coronoid fossa in front and the olecranon fossa behind is separated by a thin lamina of bone, the coronoid- olecranon septum (COS)¹. This bony septum (0.5 to 1mm in thickness) may show several perforations and in some bones it shows a clear foramen named as 'septal aperture' which is commonly referred as Supratrochlear foramen (STF). If this anatomical variation is wider, one can over-extend the elbow joint². It also has been designated by variety of names such as STF, Septal aperture, intercondylar foramen, olecranon foramen³.

According to Hirsh and Morton⁴, the thin bony plate is always present until the age of seven years, after which the bony septum becomes absorbed to form the STF. Generally, the shapes of STF are oval, round, triangular and some are with sieve like foramen. Some bones are with translucent septum. Presence of such STF may be due to absorption of this translucent septum. Mechanical interaction of humerus and ulna during articulation influence the formation of STF⁵.

According to the literature, the first finding of STF was reported by Meckel⁶ in 1825, since then it was described in various animals like dogs, hyena, cattle and other primates⁷. STF is always associated with narrow medullary canal, in that case, it is not easy to perform intramedullary fixation of the humerus in traumatic injuries and pathological fractures⁸. As the supracondylar fractures are common in paediatric age group, it requires proper nailing technique for stable configuration⁹.

Therefore, there is the need of prior anatomical knowledge of presence of such variations like STF in preoperative planning of operative procedures in distal end of humerus¹⁰.

Hence, prior knowledge of STF is essential to evade any faulty interpretations of X-rays. The present study focused to highlight the percentage of incidence of STF, translucency of COS, morphological and morphometrical features which may be useful for anthropologists, orthopedic surgeons and radiologists.

Materials and methods :

A total of 120 (55 right sided and 65 left sided) adult human dry humeri of unknown sex were collected from the Department of Anatomy, ARMCHRC, Kumbhari, Solapur, Maharashtra, India. The bones were selected free of any pathological changes. An incidence of STF on right and left side recorded. The foramina having regular margins were included in study. The vernier caliper was used to measure the maximum transverse and vertical diameters of STF. In absence of foramen, translucency of COS was noted by placing the distal end of the humerus against the X-ray lobby. In addition to this, shape of STF and its distance from the tip of medial epicondyle were also measured.

Results :

Out of 120 adult dry humeri of unknown sex, STF found in 33 humeri (27.5%) with an incidence of 16 (29.09%) on right side and 17(26.15%) on left side. The transverse and vertical diameters of STF on right side were 7.34 mm and 5.25 mm respectively. Similarly, on left side, transverse and vertical di-

ameters of STF were 5.94 mm and 4.35 mm respectively.

The shapes of STF were oval and round with the equal incidence of 16 (48.49%). The oval shape was common on right side with the incidence of 9(56.25%) while the round shape was common on left side with an incidence of 10 (58.82%).

Out of remaining 87 humeri, 58(66.67%) showed translucen-

cy of COS in 58 (66.67%). The translucency of COS was seen more on right side with the incidence of 36 (76.6%) as compared to an incidence on left side 22 (55%).

The distance of STF from tip of medical epicondyle was 25.25mm and 26.29mm on right and left sides respectively (Table no. 1).

Table no.1 : Incidence and measurements of different parameters of STF and incidence of translucency of COS in adult dry humeri

Sr No.	Paramteres		Right (N=55)	Left (N=65)
1.	Incidence of STF		29.09%	26.15%
2.	Transverse diameter of STF	Mean ± 3SD	7.34± 0.83mm	5.94± 0.9 mm
3.	Vertical diameter of STF	Mean ± 3SD	5.25± 0.5 mm	4.35± 0.54 mm
4.	Shapes of STF (Incidence in percentage)	Oval	9 (56.25%)	7 (41.18%)
		Round	6 (37.5%)	10 (58.82%)
		Irregular	1 (6.25%)	0 (00%)
5.	Distance of STF from the tip of medial epicondyle	Mean ± 3SD	25.25± 0.85 mm	26.29± 0.71 mm
6.	Incidence of translucent COS		36 (76.6%)	22 (55%)

The values of vertical and transverse diameters are expressed in Mean± 3SD; mm- millimeters.

Table no.2 : Comparison between present study and other authors studies

Sr No	Parameters		Singh S and Singh SP (1972)	Nayak et al (2009)	Krishnamurthy et al (2011)	Mahajan A (2011)	Present study (2015)
1	Incidence of STF (%)	Right	24%	44.51%	18%	22%	29.09%
		Left	31%	26.82%	28%	30%	26.15%
		Total	27.5%	34.38%	23%	48%	27.5%
2	Transverse diameter	Right	---	5.99 mm	5.26 mm	---	7.34 mm
		Left	---	6.55 mm	6.5 mm	---	5.94 mm
3	Vertical diameter	Right	---	3.81 mm	4 mm	---	5.25 mm
		Left	---	4.85mm	4.7 mm	---	4.35 mm
4	Shapes of STF	Oval	---	93.18%	---	70%	48.49%
		Round	---	5.30%	---	30%	48.49%
5	Distance of STF from the tip of medial epicondyle	Right	---	28mm	---	---	25.25 mm
		Left	---	26.1 mm	---	---	26.29 mm
6	Incidence of translucent COS	Right	70%	59.3%	40.2%	70%	76.6%
		Left	57%	55.2%	60.1%	54%	55%
		Toal	63.5%	56.7%	66.6%	62%	66.67%

Discussion :

The STF is a foramen of bony septum, which separates the olecranon and coronoid fossae at the distal end of the humerus. Its occurrence in adult varies from 6-47% in population of India⁸. Incidence of STF has been considered as an atavistic character as it is more commonly found in primates¹¹.

Present study is mainly focusing on the presence of STF and its morphological and morphometric analysis. Our study showed an incidence of STF as 27.5% which is exactly equal to the results reported by Shamer Singh and SP Singh¹². An incidence of STF is 29.09% and 26.15% on right and left sides respectively. Most of the researchers^{1,8,13 and 14}found higher incidence of STF on left side. But our results deviate from their results but are in correlation with study of Nayak et al¹⁵. This higher incidence of STF on right side can be explained by this – “ if the mechanical pressure of the olecranon process is considered the causative agent of the translucency of the septum finally leading to foramen, the latter should have been found more frequently on the right side”¹².

Transverse diameters of both right and left sides were found to be more than the vertical diameter. In present study, the STF was located at mean distance 25.25 mm and 26.29 mm on right and left side respectively. These results are similar to results found by Nayak et al¹⁵.

Translucency of COS was noted as 66.67%. It is more on the right side i.e. 76.6% and 55% on left side. This finding is similar to the study of Shamer Singh an SP Singh¹². Our study reveals that the incidence of STF and translucency of COS are more common on right side. The respective sides do not exhibit any statistical significant differences in other studied parameters.

A number of studies have been suggested that STF may be a hereditary phylogenetic trait associated with evolutionary significance¹⁶. The STF is attributed to atrophy of the bone after ossification, with impact of pressure during extension of forearm¹⁷. The possible reason for the presence of the STF in animals is the posture adapted by them during tearing of foods but in human its presence is debatable¹⁸. Other caus-

es of occurrence of STF may be osteoporosis, osteoarthritis or rheumatoid arthritis, but one hypothesis suggests that these are purely mechanically induced and acquired¹.

The distal portion of the medullary canal in humeri with STF was narrower and shorted than in humeri without foramen. Therefore, the knowledge of the presence of STF may be important for preoperative planning for the treatment of supracondylar fractures and perform antegrade medullary nailing rather than retrograde medullary nailing⁸.

X-ray is performed to detect bone cysts, tumors and other lytic lesions in day to day clinical practice¹³. STF is an area which is relatively radiolucent, is commonly seen as a type of 'pseudo-lesion' in any X-ray of upper limb and can be mistaken for an osteolytic or cystic lesion¹⁹. Hence, anatomical knowledge of STF may minimize wrong interpretation of X-rays by radiologists¹³.

Conclusion :

The presence of STF is an important variation in the distal end of humerus. Our study highlighted the percentage of incidence of STF and its morphological and morphometric analysis. An incidence is 27.5%. STF and translucent COS are more common on right side. Precise knowledge of STF may be beneficial for anthropologists, orthopedic surgeons and radiologists during their clinical diagnosis and surgical procedures.

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