

STUDY OF SUPRA TROCHLEAR FORAMEN AND ITS CLINICAL IMPLICATIONS

Gayatri Jayan ¹, Komala Nanjundaiah ^{*2}.

^{*1} 3rd year Undergraduate, M.S.Ramaiah Medical College, Bangalore, Karnataka, India.

² Associate Professor, Department of Anatomy, M.S.Ramaiah Medical College, Bangalore, Karnataka, India.

ABSTRACT

Introduction: Supra trochlear foramen is located on a thin bony septum that separates the anterior coronoid fossa and posterior olecranon fossa at the lower end of the humerus. Presence of this foramen makes it difficult for procedures such as inter medullary nailing of the humerus. The knowledge of this foramen is important for orthopaedicians for pre-operative planning of the treatment of supracondylar fracture of the humerus. It is also important for radiologists as it may be misinterpreted as an osteolytic lesion.

Materials and Methods: 114 dried humerus specimens were studied in the Department of Anatomy, M.S.Ramaiah Medical College, Bangalore. The shape of the foramen was noted. The vertical and transverse diameters were measured. The obtained data was tabulated and analysed.

Results: Out of 114 humeri studied, the supratrochlear foramen was found in 31 bones. The incidence of the foramen is 27%. The common shapes of the foramen seen were irregular, oval, triangular and round. The mean transverse diameter of STF is 6.13 mm and 6.61 mm, its vertical diameter is 4.24 mm and 4.34 mm on left and right sides respectively.

Conclusion: Presence or absence of supra trochlear foramen is important to clinicians during preoperative planning of surgeries. Knowledge of supratrochlear foramen is essential to avoid misinterpretation of radiographs.

KEY WORDS: Humerus, Supratrochlear foramen, Fractures.

Address for Correspondence: Dr. Komala Nanjundaiah, Associate Professor, Department of Anatomy, M.S.Ramaiah Medical College, MSRIT Post, Bangalore-560054, Karnataka, India.

E-Mail: komas2001@yahoo.com

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INTRODUCTION

A thin plate of bone at the lower end of humerus separates the olecranon fossa and the coronoid fossa. This plate may become perforated in some individuals to form the supra-trochlear foramen (STF). The STF can be oval, round, irregular and triangular in shape. The incidence of this foramen differs in different races. In cases of traumatic injuries involving

fractures of humerus, intramedullary fixation is the treatment of choice [1]. Hence detailed knowledge of this foramen as a variation is important for orthopaedicians to plan the procedures and avoid operative errors. The presence of this foramen is also important for radiologists for proper interpretation of X rays as it may be mistaken for an osteolytic lesion. Hence an anatomical study was conducted to

analyse the incidence, shape and dimensions of the supra-trochlear foramen.

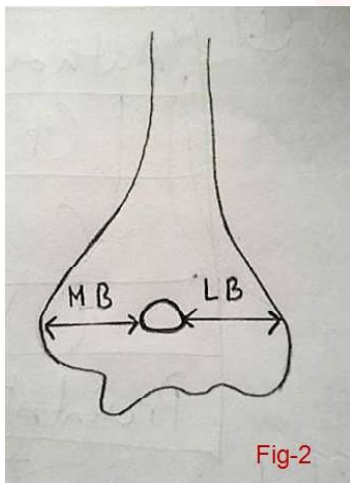
MATERIALS AND METHODS

A total of 114 (50 right and 64 left) dry human humeri of unknown gender and age from the department of anatomy of M.S.Ramaiah Medical College, Bangalore were included in the study. All the bones included in the study were free from any pathological changes and fractures. The presence of the STF was noted and its shape was observed. Digital vernier calipers was used to measure the transverse diameter (TD) and vertical diameter (VD) of STF (Fig-1), distance of STF from the medial epicondyle (MB) and lateral epicondyle (LB) (Fig-2). The data was analysed and tabulated.

Fig. 1: Transverse diameter (TD) and vertical diameter (VD) of STF.



Fig 2: Distance of STF from the medial epicondyle (MB) and lateral epicondyle (LB).



RESULTS

Out of 114 humeri studied, the supratrochlear foramen was found in 31 bones. Hence the incidence of the foramen is 27%.

Table 1: Incidence of supra-trochlear foramen, N - Total number of bones studied.

Side (N)	STF present	Percentage
Right (50)	13	26%
Left (64)	18	28%

The common shapes of the foramen were seen as irregular (Fig-3), oval (Fig-4), triangular and round (Fig-5).

Fig. 3: STF with Irregular shape.



Fig. 4: STF with Oval shape.



Fig. 5: STF with triangular/circular in shape.



Table 2: Shapes of supra-trochlear foramen.

Sl.No	Shape	Number	Percentage of cases
1	Irregular	13	41.90%
2	Oval	12	38.70%
3	Triangular	3	9.60%
4	Round	3	9.60%

Table 3: Diameter of the STF - Mean in mm.

	Transverse diameter	Vertical diameter
Left	6.13	4.24
Right	6.61	4.34

Table 4: Distance of STF from epicondyles.

	MB		LB	
	RIGHT	LEFT	RIGHT	LEFT
Mean in mm	23.45	23.78	24.32	24.99
Standard deviation	2.67	3.26	2.72	2.67

MB - Distance of the medial epicondyle from the medial aspect of the STF.

LB - Distance of the lateral epicondyle from the lateral aspect of the STF.

DISCUSSION

Oeydun et al has reported the global incidence of supratrochlear foramen as 4.2% in White Americans, 18.4% in American Negroes, 8.8% in Germans, 18.1% in Japanese, 21.7% in African Negroes, 43.9% in Egyptians and 9.4% in Italian populations. In a study done on Nigerian population the incidence of STF is 27.7%. [2]. Incidence of the supra-trochlear foramen as per Indian studies ranges from 19 to 35% (Table-5).

Table 5: Incidence of STF in humeri of Indian population.

Authors	Total number of humeri studied	Incidence of STF in percentages	
		Right humeri	Left humeri
Arunkumar 2015 [3]	355	19.68	23.35
Varalakshmi 2014 [6]	85	21.95	29.54
Surekha Dilip Jadav	222	34.51	34.86
Soubhagya R Nayak 2009 [5]	384	44.51	26.81
Sharmila Banu 2012 [4]	121	26.53	33.33
Present study	114	26	28.12

Table 6: Shapes of the supra-trochlear foramen.

Authors	Oval	Round	Triangular
Mallikarjun & adibatti	80%	20%	-
Suba	82%	18%	-
Arunkumar 2015 [3]	93.42%	2.63%	3.94%
Soubhagya r nayak 2009 [5]	93%	5%	1.50%
Present study	Oval- 38.74% Irregular-41.5%	9.60%	9.60%

Oval/irregular shape of STF is commonly seen. Transverse diameter ranges from 4 mm to 7 mm. The vertical diameter ranges from 3 to 5 mm [3-6]. Transverse diameter of STF is more as compared to the vertical diameter. In paediatric age group, supracondylar fractures are most commonly encountered in the distal end of humerus. Treatment of these fractures involves

intermedullary nailing. Paraskevas found out that the distal part of the medullary canal in humeri (less than 4mm) with STF was narrower and shorter at the entry point of a retrograde nail than in a humeri without STF [7]. Hence presence of STF in the lower end of humerus is an important aspect to be considered while planning for the orthopedic procedures preoperatively. Occurrence of supratrochlear foramen can be due to incomplete ossification, mechanical pressure from olecranon process during hyperextension, atrophy of bone etc [3,8,9]. Some believe that it is formed by resorption from the anterior surface of the septum. STF is present in animals [3,5]. This is one of the link between man and lower animals as told by Charles Darwin. Presence of STF was more in ancient people when compared to modern man. Hence the presence of STF can be an invaluable tool to anthropologists for dating specimens.

CONCLUSION

The present study showed 27% incidence of the supratrochlear foramen being more predominant on the left side. Oval/Irregular shape of the foramen was more commonly found. The anatomical knowledge of this foramen is beneficial for orthopaedicians and anthropologists. On the X ray, the STF presents a radiolucent area simulating an osteolytic lesion. Hence knowledge about the occurrence of STF may prevent misinterpretation of radiographs. The present study is done with dry bones. The study can be further correlated with the radiographic findings.

Conflicts of Interests: None

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