

A STUDY ON PREVALENCE OF SUPRATROCHLEAR FORAMEN IN TAMIL NADU POPULATION

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ABSTRACT

Background: Supratrochlear foramen is located in the distal end of humerus over the bony septum separating the coronoid fossa from the olecranon fossa. A detailed and clear knowledge of supratrochlear foramen may be essential for management of fractures involving distal third of humerus. The aim was to study for the presence of supratrochlear foramen in the humeri. **Materials and Methods:** This descriptive study was conducted at Department of Anatomy, Government Medical College, Tiruvallur for a period of eleven months between September 2025 - July 2026. **Result:** The results were observed tabulated and interpreted. In 91.52% (54 /59) humeri, the supratrochlear foramen was present, in 6.77% (04 /59) humeri the supratrochlear septum was membranous and in about 01/59 (1.69%) specimen the supratrochlear septum was osseous on the right. In 96.15% (50/52) humeri, the supratrochlear foramen was present and in 3.85% (2/52) humeri, the supratrochlear septum was membranous on the left. The supratrochlear foramen was oval in 15.25% (09/59), round in 49.15% (29/59), irregular in 32.20% (19/59) and perforated in 3.39% (2/59) on right and oval in 5.77% (3/52), round in 75% (39/52) and irregular in 19.23% (10/52) on the left. The maximum vertical and transverse dimensions (mean+ SD) were 3.65+1.51 mm and 5.01+2.36 mm in the right and 4.66 + 1.22 mm and 4.07 + 1.48 mm in the left respectively. The existence of supratrochlear foramen was more medial than lateral. The distance measured from the inferior border of STF to inferior border of trochlea was the shortest than from the medial and lateral border of STF to tips of medial or lateral epicondyle respectively. **Conclusion:** During surgical intervention involving distal third of humerus with existence of STF, a precise surgical approach has to be planned so as to minimise damage to adjacent structures like brachial artery, median or ulnar nerve.

INTRODUCTION

The humerus is the largest and longest bone of the upper limb; it has a modified condyle at its distal end. The distal end appears wider transversely and consists of an articular and non- articular part. The articular part of distal humerus consists of a medial trochlea which articulates with trochlear notch of ulna and lateral capitulum articulates with the head of radius. There is a small hollow coronoid fossa above the trochlea in distal part of humerus which accommodates the anterior margin of the coronoid process of ulna during complete flexion of elbow. The floor of the coronoid fossa is separated posteriorly from olecranon fossa by a thin plate of compact bone lined by synovial membrane. This plate is called supratrochlear septum which sometimes may be partially deficient.^[1] This bony septum may be opaque, translucent or perforated. When perforated, it forms a

supratrochlear aperture.² This aperture was first described by Meckel in the year 1825 A.D. It may also be called as septal aperture, intercondylar, epitrochlear or olecranon foramen.^[2] Previous studies have shown that the proximal bone of upper limb, the humerus is usually not perforated in embryonal stage or may be even up to 7 years of life. Its development in adolescence or more frequently in adulthood may be due to incomplete ossification, interlamellar space enlargement and gradual septum absorption.^[3] Glanville E. V., suggested repeated mechanical and repetitive injury between the ulna and humerus during flexion and extension movements may also lead to genesis of supratrochlear foramen.^[4]

The T-Box (TBX) genes effect which played a crucial role in development of limbs and heart in foetal period may also influence the limbs in the postnatal period of life. 5

Aim: The aim of the study was, To find out the presence of supratrochlear foramen in the distal part

of humeri, its dimensions and for its variable distance from medial and lateral epicondyles of humeri and from the inferior border of trochlea.

MATERIALS AND METHODS

This cross sectional and descriptive study were conducted for a period of 11 months, between September 2025 to July 2026 in the Department of Anatomy, Government Medical College, Tiruvallur after complete approval from Institutional Ethics Committee for the research protocol.

The presence of supratrochlear foramen and its prevalence in the distal third of humeri were studied in total 111 number of humeri (right sided 59 and left sided 52) of unknown sex of Tamil Nadu population.

Inclusion criteria:

All completely intact adult humeri bones without gross distortion or abnormality were included in the study.

Exclusion criteria:

The adult humeri which showed pathological fractures or gross mutilation or any abnormality were excluded from the study.

Materials used: A total of 111 (right side -59 and left side- 52) dry adult humeri of unknown sex and age. Digital vernier caliper.

Parameters used: The supratrochlear foramen if present in humeri was morphologically and morphometrically analysed. The transverse diameter, vertical diameter, distance from medial border of STF to medial epicondyle, distance from lateral border of STF to lateral epicondyle and distance from inferior border of STF to inferior border of trochlea were measured. The shapes of supratrochlear foramen were also imaged. In bones where the foramen was not present, membranous or osseous supratrochlear septum were studied by passing a transmitted light from posterior to anterior. All the measurements were expressed in millimetres. With the observed measurements, the mean and standard deviation were calculated. SPSS version 20 was used for statistical analysis and results were inferred.

RESULTS



Figure 1: shapes of STF



Figure 2: parameters of STF

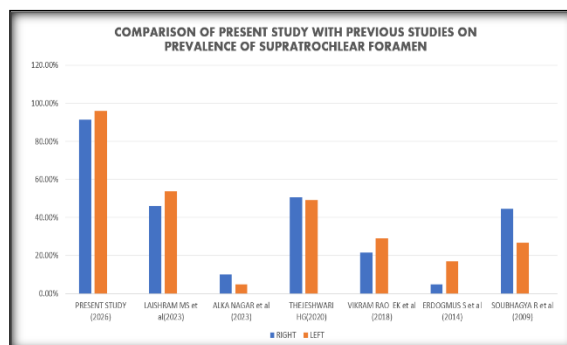


Figure 3: prevalence of STF

Table 1: Prevalence of supratrochlear foramen, membranous and osseous supratrochlear septum

Variables	Right	Left
Supratrochlear foramen	54 (91.52%)	50(96.15%)
Membranous supratrochlear septum	04 (6.77%)	02(3.85%)
Osseous supratrochlear septum	01 (1.69%)	---

In 91.52% (54 /59) dry humeri, the supratrochlear foramen was present on the right.

In 6.77% (04 /59) dry humeri, the supratrochlear septum was membranous and in 01/59 (1.69%) dry humeri, the supratrochlear septum was osseous on the right.

On the left in about 96.15% (50/52) dry humeri, the supratrochlear foramen was present and in 3.85% (2/52) dry humeri, the supratrochlear septum was membranous.

Table 2: Shape of the supratrochlear foramen

Shape Of Supratrochlear Foramen	Right (59)	Left(52)
Oval	09(15.25%)	03(5.77%)
Round	29 (49.15%)	39 (75%)
Irregular	19 (32.20%)	10 (19.23%)
Perforated	02(3.39%)	---

The supratrochlear foramen was oval in 15.25% (09/59) round in 49.15% (29/59) irregular in 32.20% (19/59) and perforated in 3.39% (2/59) on right and

oval in 5.77% (3/52) round in 75% (39/52) and irregular in 19.23% (10/52) on the left.

Table 3: measurement of vertical and transverse diameter of supratrochlear foramen

Distance	Right side		Left side		P value
	Mean	Sd	Mean	Sd	
Vertical diameter of supratrochlear foramen	3.65	1.51	4.66	1.22	< 0.001
Transverse diameter of supratrochlear foramen	5.01	2.36	4.07	1.48	0.013

The maximum vertical and transverse dimensions (mean+ SD) were 3.65+1.51 mm and 5.01+2.36 mm in the right and 4.66 + 1.22 mm and 4.07 + 1.48 mm in the left respectively.

Note: values are expressed in mean + standard deviation

Table 4: distance between STF to medial and lateral epicondyle and inferior border of trochlea

Distance in mm	Right side		Left side		P value
	MEAN	SD	MEAN	SD	
Distance between medial border of STF to medial epicondyle	25.3	2.60	25.4	2.46	0.836
Distance between lateral border of STF to lateral epicondyle	26.6	3.36	26.7	1.65	0.840
Distance between inferior border of STF to inferior border of trochlea	22.2	7.39	27.2	1.99	<0.001

The distance from medial, lateral and inferior margin of STF to tip of medial, lateral epicondyles and to inferior border of trochlea were measured respectively.

DISCUSSION

In the present study, a total of 111 unpaired adult humeri of unknown sex and age were studied.

The prevalence of supratrochlear foramen was found to be 91.52% on the right and 96.15% on the left. There was a higher prevalence on the left than on right.

The supratrochlear foramen exhibited different shapes in this study. It was observed that round shape (L>>R) was most common and irregular shape (R>>L) was less common in the study. The existence of a perforated foramen was the least common observation and was only 1.80% seen on the right.

The presence of membranous supratrochlear septum was 5.40% (R>>L) and osseous supratrochlear septum was 1.8%. The prevalence of membranous supratrochlear membrane was high than osseous septum in the present study.

This shows the occurrence of osseous septum was least common and present only on right.

The existence of supratrochlear foramen was more medial than lateral. The distance measured from the inferior border of STF to inferior border of trochlea was the shortest than from the medial and lateral border of STF to tips of medial or lateral epicondyle respectively.

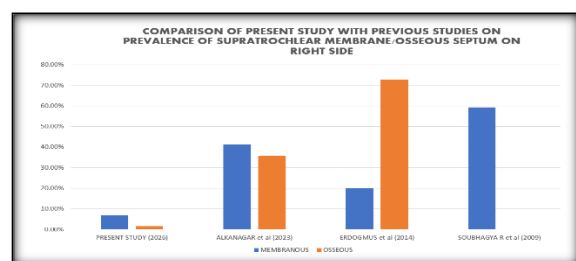


Figure 4: prevalence of supratrochlear membrane/ osseous septum on right side

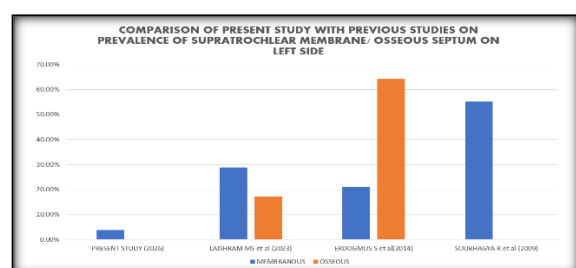


Figure 5: prevalence of supratrochlear membrane/ osseous septum on left side.

Table 5: comparison of present study with previous studies on prevalence of supratrochlear foramen

Authors	Right	Left
Present Study (2026)	54/59 (91.52%)	50/52(96.15%)
Laishram MS et al (2023)3	12/46 (46.15%)	14/45 (53.85%)
Alka Nagar et al (2023)5	20/110 (10%)	10/90 (5%)
Thejeshwari HG et al (2020)8	71 /125(50.7%)	69/175(49.2%)
Vikram Rao E.K et al (2018)7	13/60 (21.6%)	21/72 (29.17%)
Erdogmus S et al (2014) 2	4/83 (4.8%)	14/83(16.9%)
Soubhagya R et al (2009)6	73/132(44.5%)	59/132(26.8%)

Table 6: comparison of present study with previous studies on prevalence of supratrochlear membrane

Authors	Right		Left	
	Membranous septum	Osseous septum	Membranous septum	Osseous septum
Present study (2025)	04/54(6.77%)	1/54(1.69%)	02/52(3.85%)	-----

Alka Nagar et al (2023)5	45/110(41.2%)	39/110 (35.7%)	35/90(28.9%)	21/90(17.3%)
Erdogmus S et al (2014)2	17/34 (20%)	62/114 (72.9%)	17/34 (21%)	52/114(64.2%)
Soubhagya.R et al (2009)6	54/143 (59.3%)	--	89/143(55.2%)	--

Table 7: comparison of present study with previous studies on shape of supratrochlear foramen

Quoting authors	Variables			
	Oval	Round	Irregular	Perforated
Present study (2026)	12/111(10.81%)	68/111(61.26%)	29/111(26.13%)	02/11(18.18%)
Laishram MS et al (2023)3	12/26(46.15%)	05/26 (19.23%)	05/26 (19.23%)	-----
Alka Nagar et al (2023)5	14/40 (35%)	9/40(22.5%)	-----	-----
Thejeswari HG et al 20208	128/140(91.4%)	7/140 (5%)	-----	-----
Vikram Rao EK et al (2018)7	26/34(19.69%)	04/34(3.03%)	02/34(1.51%)	-----
ERDOGMUS s et al (2018)2	13/18 (72.2%)	2/18(11.1%)	-----	1/18 (5.5%)
Soubhagya R et al (2009)6	123/132 (93.18%)	7/132 (5.30%)	-----	-----

Table 8: comparison of present study with previous studies on dimensions of supratrochlear foramen

Quoting authors	Vertical diameter mean + sd		Transverse diameter mean + sd	
	Right	Left	Right	Left
Present study (2026)	3.65 + 1.51	4.66 + 1.22	5.01 + 2.36	4.07 + 1.48
Laishram ms et al (2023)3	4.1 + 1.88	5.4 + 2.44	5.6 + 2.67	6.1 + 2.61
Alka nagar et al (2023)5	3.82 + 1.21	3.61 + 1.31	5.52 + 1.82	5.85 + 1.48
Thejeswari hg et al 20208	4.80 + 2.30	3.8 + 0.99	5.9 + 2.1	6.6 + 1.47
Vikram rao ek et al (2018)7	5.4 + 1.52	5.3 + 2.00	8.1 + 1.8	7.25 + 2.78
Erdogmus s et al (2018)2	4.12 + 0.98	4.04 + 0.9	5.63 + 0.97	6.01 + 1.86
Soubhagya r et al (2009)6	3.81 + 0.97	4.85 + 1.64	5.99 + 1.47	6.55 + 2.47

The occurrences of STF in humans varies considerably globally. The presence of STF, may be a rare entity before 7 years of age. Its existence in adulthood/ adolescence may be due to an incomplete ossification or an interlamellar space enlargement or a gradual septal absorption.^[3] Soubhagya R. Nayak et al discusses, if the prevalence of STF is substantial, during any orthopaedic procedures of distal third of humerus like intramedullary nailing, a difficult procedure has to be anticipated and proper preoperative planning is mandated.^[6]

S.Erdogmus summarises, the existence of STF to innumerable of causes. Its origin could be due to a mechanical pressure during hyperextension or resorption from anterior surface of septum. It can also arise from impingement on humeral septum by coronoid and olecranon processes, hyperextension load on elbow in an outstretched arm, familial trait, atavistic character or a greater degree of hypermobility of upper limbs.^[2]

The supracondylar fractures are most common in paediatric age with a fall on outstretched arm. Fractures involving distal third of humerus are also common in early and late adulthood, especially the young males who involve in extreme sports like highspeed motor transportation or in elderly females with osteoporotic bones with injuries from fall. Any orthopaedic intervention involving distal third of humerus may be influenced by myriads of factors such as age group, treatment protocols, surgical guidelines, advancement in surgical techniques, implant designs as well as institutional preferences. With coincidental STF, many unique challenges and considerations have to be contemplated.

CONCLUSION

Surgical intervention involving distal third of humerus with existence of STF, a precise surgical approach has to be planned so as to minimise damage to adjacent structures - brachial artery, median or ulnar nerves. Intraoperatively, a cautious scrutiny of the implant site has to be made before the implant is placed so that the adjacent neurovascular structures are not impinged or damaged. Postoperatively, the fracture healing may also be affected if STF is present, as STF can influence blood supply to fractured site.

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