



MORPHOMETRIC STUDY OF SUPRATROCHLEAR FORAMEN OF HUMERUS IN RAJASTHAN REGION

Anatomy

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ABSTRACT

Introduction: Supratrochlear Foramen (STF) of humerus is noticed in the distal end of the humerus and is a significant and relatively atypical anatomical variation. It is a perforation of the bony septum that separates the olecranon fossa and the coronoid fossa in the lower end of the humerus. The thickness of the bony septum determines its opacity or translucency. This translucent or opaque septum may have massive perforations, and in severe cases, it may be perforated to form a narrow orifice known as a 'supratrochlear orifice' or 'supratrochlear foramen'.

Material and Method : This study was conducted in Department of Anatomy, National Institute of Medical Science and Research Jaipur Rajasthan. Morphometric study was done in 70 dry humerus. Transverse Diameter, Vertical diameter, distance from medial and lateral epicondyles of supratrochlear foramen were measured using Digital vernier caliper, scale, Probe and divider. **Result and Conclusion:** Out of 70 bones studied, supratrochlear foramen was present in 19 bone so is present in 27% of bones. Most common noticed shape was oval (68.42%) followed by round and irregular shape (15.79%)., the average distribution of Width/transverse diameter \pm S.D is 5.98 ± 2.71 and he average distribution of Height/vertical diameter \pm S.D is 4.34 ± 1.87 . Acknowledging the variations in the prevalence rate of STF and its association with low-impact fractures of the distal end and narrow medullary canal of the humerus, it will be worth studying a wider population of living individuals using radiologic imaging techniques to enrich clinicians' understanding of STF, especially orthopaedic surgeons

KEYWORDS

INTRODUCTION

The supratrochlear foramen (STF) is a small hole in the humerus bone that separates the olecranon fossa and coronoid fossa. It's a common anatomical variation in humans, especially women, and is more likely to occur in the left humerus. Supratrochlear Foramen of humerus is noticed in the distal end of the humerus and is a significant and relatively atypical anatomical variation¹. The thickness of the bony septum determines its opacity or translucency². This translucent or opaque septum may have massive perforations, and in severe cases, it may be perforated to form a narrow orifice known as a 'supratrochlear orifice' or 'supratrochlear foramen'³.

This foramen is situated above the epiphyseal line in the intra-articular part of the olecranon fossa below the line of reflection of the synovial membrane which crosses the middle of the fossa. In the paediatric age group the incidence of supracondylar fracture is common. This is treated by intramedullary nailing which may be compromised by the presence of this foramen. Due to the high incidence of the STF of humerus noted in the Indian population & high incidence of traumatic injuries and pathological fractures in the lower end of the humerus, there has been increased incidence in intramedullary fixation of humerus because of its advantages. And it requires special attention during intramedullary humeral nailing procedures in the distal portion of humerus. Hence the present study describes the incidence, morphological features, and clinical importance of STF which is of greater importance to anthropologists, anatomist, orthopaedic surgeons and radiologists.

MATERIAL AND METHODS

This study was conducted in Department of Anatomy National Institute of Medical Science and Research Jaipur Rajasthan. Morphometric study was done in 70 dry humerus (Fig.1). Transverse Diameter (TD), Vertical diameter (VD), distance from medial and lateral epicondyles of supratrochlear foramen were measured using Digital vernier caliper, scale, Probe and divider (Fig.4). The shape is observed by visual method. Distance from medial aspect of medial condyle to the medial border of Supratrochlear foramen (MB) and distance from lateral aspect of lateral condyle to lateral border of foramen (Fig.3) is measured (LB). Statistical analysis was done using SPSS Microsoft Excel Software. Data MET is updated in Microsoft excel & analysis done using SPSS software.

RESULTS

In our study out of 19 dried humerus bones, the left humerus constituted slightly more (10, ie 52.63%). than right humerus (9, ie 43.37%). By visual method we observed the shapes of supratrochlear foramen of humerus bone. Various shapes identified were round, irregular or sieve-like shapes of supratrochlear foramens of humerus (Fig.2). Most common noticed shape was oval (68.42%) followed by round and irregular shape (15.79%). Out of 19 dried humerus bones, the left humerus constituted slightly more (10, ie 52.63%). than right humerus (9, ie 43.37%) in our study.

In all Humerus with STF, left predominance with most common shape was oval (60%) and followed by irregular (20%) and round or sieve (10%). Similar pattern was followed by right side as most common shape was oval (66.67%) except it following by round (22.22%) and irregular (11.11%). In studied humerus, the average distribution of Width/transverse diameter \pm S.D is 5.98 ± 2.71 and he average distribution of Height/vertical diameter \pm S.D is 4.34 ± 1.87 .

Out of total, 9 humerus ie. (47%) has distance from the medial aspect of the medial epicondyle to the medial border of the Supratrochlear foramen is 26.1-29.0 mm. In addition, most commonly distance from the lateral aspect of the lateral epicondyle to the lateral border of the Supratrochlear foramen is 23.1-26.0 mm (7, 36.84%).

The average distance from the lateral aspect of the lateral epicondyle to the lateral border of the Supratrochlear foramen \pm S.D was found 27.05 ± 2.67 mm.

In right humerus the mean distance of the foramina from the medial and lateral epicondyles measured 25.72 ± 2.52 mm and 28.13 ± 2.41 , mm respectively, which is more than distance in the left humerus. In left humerus, the distance (mean \pm SD) of the foramina from the medial and lateral epicondyles measured is 24.69 ± 3.19 mm and 26.08 ± 2.63 mm respectively. Although, the side wise comparison of humerus showed that there was no significant difference. (p value $> 0.05\%$).

DISCUSSION

In the present study we found Supratrochlear foramen in 19 Humerus out of 70 Humerus ie 27.14%. In Laishram MS et al. (2023) [1] study, the prevalence of STF was found to be 28.57%, and studies on STF in

the Indian population have reported a varying prevalence from 16.3% to 40.78% which is in agreement with the previous study report on eastern Indians. [5]

In our study out of 19 dried humerus bones, the left humerus constituted slightly more than right humerus. In the study the most common shape was oval (68.42%) followed by round and irregular shape (15.79%) which is in accordance with Laishram MS et al (2023)¹ who observed Oval shape in 59.66% followed by round and irregular shape and the triangular was the least common shape.

In right humerus the distance of the foramina from the medial and lateral epicondyles is more than distance in the left humerus. In left humerus, the distance of the foramina from the medial and lateral epicondyles measured is 24.69 ± 3.19 mm and 26.08 ± 2.63 mm respectively. Although, the side wise comparison of humerus showed that there was no significant difference. (p value > 0.05%).

We observed the overall distance of medial border of the Supratrochlear foramen (MB) and distance from the lateral aspect of the lateral epicondyle to the lateral border of the Supratrochlear foramen (LB) and found that most of humerus (47%) has distance from the medial aspect of the medial epicondyle to the medial border of the Supratrochlear foramen is 26.1-29.0 mm and the average distance from the medial aspect of the medial epicondyle to the medial border of the Supratrochlear foramen \pm S.D was found 25.18 ± 2.86 mm.

In right humerus the distance (mean \pm SD) of the foramina from the medial and lateral epicondyles measured 25.72 ± 2.52 mm and 28.13 ± 2.41 mm respectively which is more than distance in the left humerus of studied sample. In left humerus, the distance (mean \pm SD) of the foramina from the medial and lateral epicondyles measured is 24.69 ± 3.19 mm and 26.08 ± 2.63 mm respectively. Although, the side wise comparison of humerus showed that there was no significant difference. (p value > 0.05%).

In the Agarwal P et al. (2017) [3] study, the vertical diameter of supratrochlear foramen was 4.91 mm on the right side and 3.75 mm on left side, and the transverse diameter was 4.75 mm on the right side and 6.03 mm on left side which is in accordance with our study ie 4.34 ± 1.87 mm.

STF is found only in mammals and is inconstant in various species. Darwin mentions this foramen in humans as one of the characteristic that show man's close relationship to lower forms [11]. Anthropologists say that STF is more in ancient primitive people than recent civilization. According to Hrdlicka, the supratrochlear foramen is very frequent in primates other than man. 8 A number of hypotheses were proposed regarding cause of supratrochlear foramen; some say it may be an atavistic character. 9 Mechanical pressure caused during hyperextension can be one of the causes. 10 Large olecranon process was suggested by few. 11

CONCLUSION

The percentage of occurrence of Supratrochlear foramen is a crucial variation in the distal end of humerus. The incidence of STF is more common on left side than right side humerus. The present study can add data in to anthropology and anatomy text books regarding STF and it explains the knowledge of understanding anatomical variation of distal end of humerus. The anatomical knowledge of STF is beneficial for anthropologists, orthopaedic surgeons and radiologist in day to day clinical practice.

The study of the STF in the north western part of India is still a rarity. The present study sheds light on the prevalence of STF in Rajasthan. Most of the studies of STF in different parts are conducted on dry bones, and the prevalence rates vary in different regions and in different individuals.

Acknowledging the variations in the prevalence rate of STF and its association with low-impact fractures of the distal end and narrow medullary canal of the humerus, it will be worth studying a wider population of living individuals using radiologic imaging techniques to enrich clinicians' understanding of STF, especially orthopaedic surgeons



Fig-1- Dry Humerus



Fig 2- Different Shapes Of STF Round, Oval, Irregular, Sieve



Fig 3- Distance From Lateral Border Of STF To Lateral Aspect Of Lateral Epicondyle



Fig 4- Measurement Of Transverse Diameter Of STF

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