

Research Article



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ANATOMICAL RESEARCH ASSESSING THE PREVALENCE OF THE SUPRATROCHLEAR FORAMEN OF THE HUMERUS IN HUMAN- AN IN VITRO STUDY

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ABSTRACT

Background: A little hole in the humerus located above the humerus trochlea is known as the supratrochlear foramen, and it was initially identified by Meckel in 1825. Understanding the supratrochlear foramen of the humerus is essential for managing supracondylar fractures, creating treatment plans, and identifying radiographic abnormalities.

Objective: To assess the prevalence of the supratrochlear foramen of humerus in the people.

Methods: In order to determine the prevalence of a supratrochlear foramen in humans, 120 dry humerus bones were analysed. The supratrochlear foramen of the humerus was one of the criteria evaluated in this investigation. We measured the dimensions of supratrochlear foramen using a digital vernier calliper. The observed supratrochlear foramen was also photographed in the present study.

Result: Upon inspection, 10 humerus showed evidence of the supratrochlear foramen. Only supratrochlear foramen of left side was visible. In 8.3% of all humerus examined, supratrochlear foramen was found to be highly prevalent. In four humerus, the supratrochlear foramen was seen to be circular in shape; in the other four humerus, it was oval in shape; and in two humerus, it was slit-shaped.

Conclusion: the current study's findings are essential for determining the frequency and occurrence of the supratrochlear foramen of the humerus and for contrasting it with previous research in the literature.

Keywords: Digital Vernier Calliper, Foramen, Humerus, Supratrochlear Foramen, Olecranon Fossa.

INTRODUCTION

The humerus is the longest and biggest bone in the upper limb. It contains a shaft and an enlarged end. The olecranon fossa is a deep depression located on the posterior surface of the condyle.¹ Olecranon fossa, which is situated just above the trochlea and into which the olecranon bone tip lodges as the elbow extends. The floor of the olecranon fossa is narrow and partly defective.²

In the supratrochlear region, coronoid fossa lines anteriorly and olecranon fossa posteriorly. A thin plate of solid bone separates the olecranon and coronoid fossa forming supratrochlear septum. The supratrochlear foramen is a tiny opening that is located above the humerus's trochlea. Meckel found and characterised the supratrochlear foramen of the humerus for the first time in 1825.^{3,4}

The aperture known as the supratrochlear foramen is created when the septum perforates, dividing the coronoid from the olecranon fossa. The phrase "septal aperture" refers to a round or oval-shaped bony hole in the septum that causes the olecranon bone and the coronoid fossa to separate.⁵

The supratrochlear foramen of the humerus is important to treating surgeons because it can modify the fracture pattern at a specific location, which further modifies how these fractures are managed.⁶ Understanding the presence of the

supratrochlear foramen in the humerus is essential for correct supracondylar fracture therapy as well as preoperative assessment and planning. To evaluate the anomalies on the radiographs, it is also essential to locate the supratrochlear foramen in the humerus.⁷ In order to assess the occurrence of the supratrochlear foramen of the humerus in humans, the current investigation was conducted.

MATERIALS AND METHODS

The goal of the current anatomical investigation was to assess the prevalence of the supratrochlear foramen of humerus in individuals. The Institute's Department of Anatomy donated the research bones. The research evaluated 120 dry humerus in pairs without taking gender into account as a study criterion. There were 120 dry humerus total; 60 were on the right side and the remaining 60 on the left. For the evaluated dry humerus bone, the age and gender were unknown.

The supratrochlear foramen of the humerus was evaluated for existence and prevalence in this study. The supratrochlear foramen's form was evaluated and depicted in the study as well. When an oval supratrochlear foramen was seen, measurements of the vertical and transverse diameters were taken. Additionally, the diameters of the slit-like and circular supratrochlear foramens were measured.

To measure the dimensions of supratrochlear foramen, a digital vernier calliper was employed. The observed supratrochlear foramen was also photographed in the present study. Using the vernier callipers, the distance was measured from the closest supratrochlear foramen margin to the tips of the lateral and medial epicondyles and lower trochlear margin. The average was then determined. Millimetres were used for all measurements.

After the collected data were tallied, conclusions were drawn. Multivariate statistical methods and logistic regression were used to statistically analyse the collected data.

RESULTS

The goal of the current anatomical investigation was to assess the prevalence of the supratrochlear foramen in humerus in individuals. The research evaluated 120 dry humerus in pairs without taking gender into account as a study criterion. There were 120 dry humerus total; 60 of them were on the right side and the remaining 60 on the left. For the evaluated dry humerus bone, the age and gender were unknown. Upon inspection, the supratrochlear foramen was visible in 10 humerus. Only the left side's supratrochlear foramen was visible. In 8.33% of all humerus examined, supratrochlear foramen was found to be prevalent. In four humerus bone, the supratrochlear foramen was seen to be circular in shape; in the other four humerus, it was oval in shape; and in two humerus, it was slit-shaped.

Table 1 summarises the findings of measuring the supratrochlear foramen's diameter in both transverse and vertical orientations. The transverse diameters of four oval shaped supratrochlear foramen were 3.2, 3.9, 3.3, and 3.6 mm, respectively. The vertical diameters were 2.3, 1.7, 1.9, and 1.9 mm. Four circular-shaped supratrochlear foramina documented in this investigation had transverse diameters of 1.8, 1.7 and 1.7 mm and vertical diameters of 1.5, 1.9, 1.8, and 1.6 mm, respectively. As indicated in Table 1, the transverse dimension of the two slit supratrochlear foramina was 0.9 mm, whereas the vertical diameters were 2.7 and 2.6 mm, respectively.

Upon assessing the average separation between the key points and the supratrochlear foramen, it was observed that the supratrochlear foramen's mean distance from the lower trochlear margin was 14.43 ± 1.64 mm. As indicated in Table 2, the average distance between the lateral epicondyle and the supratrochlear foramen was 26.94 ± 2.48 mm, whereas the medial epicondyle distance was 24.37 ± 3.17 mm. In the end of this literature, figure 1, 2 & 3 shows few variations of supratrochlear foramen of humerus.

DISCUSSION

Many anthropologists have noted that the supratrochlear foramen is an important anatomic feature that is crucial for establishing a link between humans and lower animals, as indicated by Kate BR et al⁸ in 1970. According to Anuradha M. et al⁹ in 2019, understanding the existence of the supratrochlear foramen in the humerus is also essential for planning the preoperative care of supracondylar fractures and for illustrating the anomalies on the radiographic interpretation.

Furthermore, according to Hirsh et al.¹⁰ in 1972, the septum is initially lined by the synovial membrane, remains intact until the child reaches the age of seven, and only then does a visible rupture appear.

No anatomical feature passes through the supratrochlear foramen, and according to Matthew AJ et al.¹¹ (2016), the most typical form seen in supratrochlear foramens is oval. The current study's findings indicate that the incidence of oval and circular-shaped supratrochlear foramens is similar, at 3.33% (n=4) instances each. In contrast to a 2016 research by Matthew AJ et al.¹¹ which indicated big foramina on the right side regardless of the form of the recorded foramen, all of the supratrochlear foramen in this investigation were found to be on the left side of the humerus.

According to De Wilde V et al¹² study in 2004 publication, radiolucency in the supratrochlear foramen of the humerus is frequently mistaken for cystic and osteolytic lesions due to its appearance on radiography. Additionally, because of

its connection to the tiny medullary canal, the supratrochlear foramen of the humerus is essential for determining the entrance location of the nails used in the medullary nailing method and can alter the fracture line. It was mentioned in the 2013 study conducted by Soni S et al.¹³ and Seth Hersh¹⁰ reported in 1927 that a bilateral supratrochlear foramen of the humerus was related with an increase in hyperextension in a kid subject. According to a 2006 study by Sahajpal DT et al.¹⁴ individuals with supratrochlear foramen of the humerus are more likely to have supracondylar fractures of the same bone, which might present with atypical fracture patterns and necessitate radiography before surgery. Literature has indicated that no humeral perforation occurs during embryonic development and that perforations invariably occur in maturity or adolescence; these findings are corroborated by Mays S et al¹⁵ in 2008 research.

The mean distance between the supratrochlear foramen and the lower trochlear margin was found to be 14.43±1.64 mm, based on an evaluation of the critical spots average distance from the foramen. The median distance between the lateral epicondyle and the supratrochlear foramen was 24.37±3.17 mm, whereas the mean distance between the two epicondyles was 26.94±2.48 mm. These findings were consistent with earlier research by Krishnamurthy A et al.¹⁶ in 2011 and Veerappan V et al.¹⁷ in 2013, which measured the supratrochlear foramen of the humerus's distance from significant anatomical landmarks.

CONCLUSION

In light of its limitations, the current study comes to the conclusion that these findings are critical for determining the frequency and occurrence of the supratrochlear foramen of the humerus and for facilitating comparisons with other studies in the literature. The unpaired dry humerus and the patients' unknown gender, age, and race were among the study's shortcomings.

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TABLES

S. No	Supratrochlear foramen shape	Transverse diameter	Vertical diameter
1.	Oval	3.2	2.3
2.	Oval	3.9	1.7
3.	Oval	3.3	1.9
4.	Oval	3.6	1.9
5.	Circular	1.8	1.5
6.	Circular	1.7	1.9
7.	Circular	1.5	1.8
8.	Circular	1.7	1.6
9.	Slit	0.9	2.7
10.	Slit	0.9	2.6

Table 1: Various shapes, transverse diameter, and vertical diameter of the supratrochlear foramen

S. No	Landmark	Left
1.	Lower trochlear margin	14.43±1.64
2.	Lateral epicondyle	26.94±2.48
3.	Medial epicondyle	24.37±3.17

Table 2: Average distance of the key points from the supratrochlear foramen



1

2

3

Figure 1, 2 & 3- Few variations of Supratrochlear Foramen of Humerus