Original Communication

STUDY OF INTERCONDYLOID FORAMEN OF HUMERUS

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RESUMEN

Una delgada lámina ósea entre el olécranon y la fosa coronoides es a veces perforada para formar un agujero denominado foramen supratroclear (STF). Dado que el agujero se encuentra entre el epicóndilo lateral y el medial, también se llama el agujero intercondiloidea. Este agujero fue más frecuente en los huesos prehistóricos. El agujero se ha estudiado en detalle en 214 húmeros secos (131 lado derecho y 83 lado izquierdo) de sexo y edad desconocidos. De 214 huesos, el agujero estaba presente en 67 húmeros (48 lado derecho y 19 lado izquierdo) que muestra una incidencia del 31,3%. El diámetro transversal medio fue de 6,5 mm a la derecha y 5,8 mm a la izquierda. El diámetro vertical promedio fue de 4,4 mm a la derecha y 3,9 mm en el lado izquierdo. La distancia media del STF desde la punta del epicóndilo fue de 24,4mm a la derecha y de 24,5 mm en el lado izquierdo. Algunos de los huesos mostraron translucidez del tabique óseo (49,3% y 35,9% a la derecha e izquierda, respectivamente). En las radiografías simples, el agujero puede simular una lesión osteolítica. El conocimiento anatómico de STF puede ser beneficioso para los antropólogos, los cirujanos ortopedistas, los radiólogos y en la práctica clínica diaria.

***Palabras clave**: agujero supratroclear, húmero, epicóndilo medial.*

ABSTRACT

A thin bony plate between the olecranon and coronoid fossa is sometimes perforated to form a foramen named the supratrochlear foramen (STF). Since the foramen lies between the lateral and the medial epicondyle, it is also called the intercondyloid foramen. This foramen was more common in prehistoric bones. The foramen was studied in detail in 214 dried humeri (131 right side and 83 left side) of unknown sex and age. Out of 214 bones the foramen was present in 67 humeri (48 right side and 19 left side) showing the incidence as 31.3%. The mean transverse diameter was 6.5mm on the right and 5.8mm on the left. The mean vertical diameter was 4.4mm on the right and 3.9mm on the left side. The mean distance of the STF from the tip of the medial epicondyle was 24.4mm on the right and 24.5mm on the left side. Some of the bones showed translucency of the bony septum (49.3% and 35.9% on right and left respectively). On plain radiographs, the foramen may mimic as an osteolytic lesion. The anatomical knowledge of STF may be beneficial for anthropologists, orthopedic surgeons and radiologists in day-to-day clinical practice.

***Key words**: Supratrochlear foramen, septum, humerus, medial epicondyle.*

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Received: 24 November, 2010. **Revised**: 12 December, 2010. **Accepted**: 28 December, 2010.

INTRODUCTION

A thin bony plate between the olecranon and coronoid fossa is sometimes perforated to form a foramen named the supratrochlear foramen (STF). Since the foramen lies between the lateral and the medial epicondyle, it is also called the septal aperture (Bryce, 1915). This foramen was more common in prehistoric bones. It was first reported by Meckel in 1825 (Kate, 1970). It was reported commonly in dogs, hyenas, cattle and other primates (Haziroglu and Ozer, 1990). Their posture during tearing of foods may explain the reasons for having the STF. In dogs the foramen connects the olecranon fossa and radial fossa and hence bicondylar fracture is more common. According to Hirsh (1927), in humans the thin bony septum is present until the age of seven, after which the septum occasionally becomes absorbed to form the STF (Morton and Crysler, 1945). Perforation of the olecranon fossa allows a greater arc of movement at the elbow and when the forearm is fully extended the olecranon may pass into it.

The aim of this study was to analyse the morphology and measure the dimensions of STF and also to calculate its incidence, which may be beneficial to orthopaedic surgeons.

Figure 1. The supratrochlear foramen of humerus is demonstrated

Data	Transverse diameter (mm)		Vertical diameter (mm)		Distance between STF and Medial Epicondyle (mm)	
Side	Right	Left	Right	Left	Right	Left
Mean	6.50	5.82	4.48	3.98	24.4	24.5
S.D	2.26	2.07	1.86	1.68	2.89	2.50
Range	2.20 - 10.4	3.30-10.3	2.00-8.10	2.10-7.60	19.5- 28.9	19.4- 28.1
t	1.15		1.01		0.752	

Table 1. Statistical data of supratrochlear foramen of humerus.

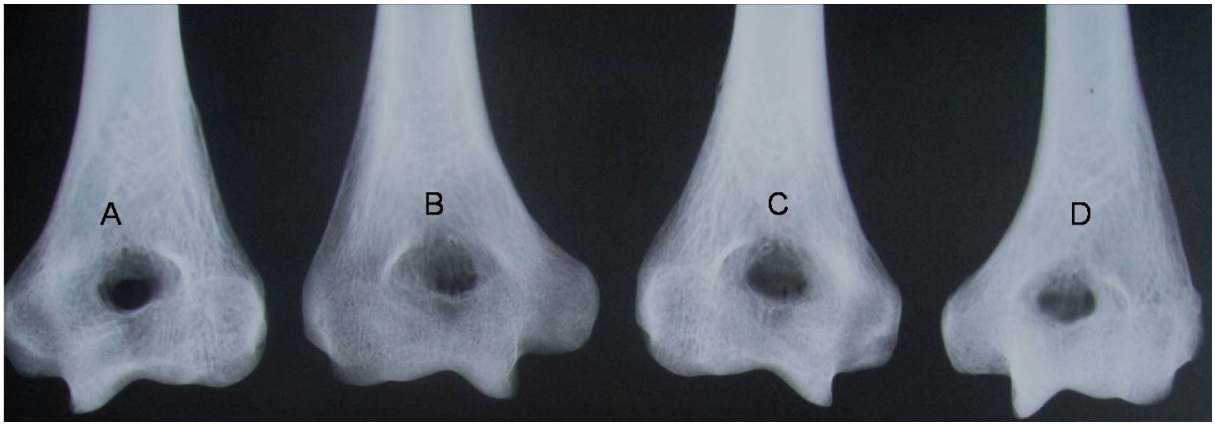

Figure 2. X-ray of humerus showing A- Supratrochlear foramen, B- 2 minute opening, C- Sieve like pattern, D- Translucency of septum

MATERIALS AND METHODS

The foramen was studied in detail in 214 dried humeri (131 right and 83 left sides) of unknown sex and age collected from the bone library of Department of Anatomy, Chettinad Hospital and Research Institute, Tamilnadu, India. The presence of the STF was noted and its shape was observed (Fig. 1). The transverse diameter and the vertical diameter of the STF and the distance of the STF from the medial epicondyle were measured using a digital vernier caliper. Side differences of transverse diameter, vertical diameter and distance from the medial epicondyle of the STF were compared using the unpaired Student's t test; the level of significance was set at $P< 0.05$ (Table1). X-rays of humeri with STF and translucency of septum were taken and compared with normals (Fig. 2).

Figure 3. Arrows showing the humerus with minute opening and sieve like pattern of foramina

RESULTS

Out of 214 bones the STF was present in 67 humeri showing an incidence of 31.3%. STF was present in 48 out of 131 right side (36.6%) and 19 out of 83 left side (22.8%) humeri. The mean transverse diameter was 6.5mm on the right and 5.8mm on the left. The mean vertical diameter was 4.4mm on the right and 3.9mm on the left side. The mean distance of the STF from the tip of the medial epicondyle was 24.4mm on the right and 24.5mm on the left side. The differences between sides were not significant (Table.1). The STF was oval shaped in 55 humeri (82%) and round shaped in 12 humeri (18%). Our study also revealed two bones in which one presented with two small openings and the other bone had a sieve like pattern of foramina (Fig. 3). The translucency of septum was observed in 41 right and 23 left humeri with an incidence of 49.3% and 35.9% respectively.

DISCUSSION

The STF was studied in detail by authors including Chatterjee in 1968, Singh and Singh in 1972, Singhal and Rao in 2007 and Soubhagya et al in 2009. The incidence of STF in Indian population ranges from 28% to 34.4% (Kate and Dubey, 1970). The incidence of STF was highest (58%) in Arkansas Indians and lowest (4.2%) in white Americans (Akabori, 1934). The STF is attributed to atrophy of the bone after ossification, with impact of pressure during extension of forearm (Lamb, 1890). The possible reason for the presence of the STF in animals is the posture adapted by them during tearing of foods. Presence of translucency of septum was more common. Hence following the translucency of septum, the foramen may initially be small, following which, a sieve like pattern may develop, which coalesce to form a STF of large size. The present study revealed a mean distance of about 24.4mm on the right and 24.5mm on the left side between the STF and the tip of the medial epicondyle. Incidence of translucency of septum and STF was high on the right side.

Supracondylar fracture is more common in paediatric age group and for stable configuration proper pinning technique is required (Akpinar et al, 2003). The medullary canal width at the entry point of a retrograde intramedullary nail was statistically smaller in humeri with a STF than in humeri without it. Furthermore, the medullary canal of the humeri with a foramen ends more proximally than the canal in humeri without a foramen. In cases of fracture of humerus with a STF, the surgeon must keep in mind that it is better to perform an antegrade medullary nailing than a retrograde one, as there is higher chance of a secondary fracture, due to the extreme narrowness of the canal at the distal portion of humeri with the STF (Paraskevas et al, 2010). On plain X-rays STF appears radiolucent and so may lead to a misdiagnosis of an osteolytic or cystic lesion (De Wilde et al, 2004).

Our study highlights the higher incidence of translucency of septum and STF. The results of our study show that STF was high on the right side with the oval shape being more common. The right and left side did not exhibit statistically significant differences. Prior anatomical knowledge of STF will be useful for radiologists and orthopaedic surgeons.

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