Morphology Of Humeral Septal Aperture: An Osteological Study

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ABSTRACT

Background: The lower end of humerus shows olecranon and coronoid fossa separated by a thin bony septum. The deficiency in the bony septum forms a communication between both the fossae called septal aperture or commonly supratrochlear foramen (STF). The aim of present study is to know the incidence of septal aperture at the lower end of humerus.

Methods: This study is based on observations in 600 humeri (300 right side and 300 left side) obtained from Department of Anatomy, JJM Medical College, Davangere and Department of Anatomy, Subbaiah Institute of Medical Sciences, Shivamogga. Observation was made for the aperture status (presence of septal aperture, translucent septum & opaque septum) and its shape.

Results: The septal aperture was observed in 30.5% of humeri. The incidence was more common on left side (37%) as compared to right side (24%). The aperture were oval or round in shape, oval shape being more common. Translucency of bony septum was seen in 49.33% and opaque in 20.16% humeri.

Conclusion: The anatomical knowledge of septal aperture may be beneficial for orthopaedic surgeons in medullary nailing, to rule out pseudo lesion by radiologists and also significant for anthropologists for racial study.

Keywords: Humerus, septal aperture, supratrochlear foramen, translucent septum, opaque septum.

INTRODUCTION:

The bony septum separating coronoid and olecranon fossa of humerus if perforated results in a foramen called as septal aperture or supratrochlear foramen (STF), as described first by Meckel in 1825,¹ a thin bony plate is always present until the age of seven years between the coronoid and olecranon fossa after which it becomes absorbed occasionally to form a foramen.² The septal aperture in humerus has been described in various other animals like dogs, hyenas, cattle and primates.³ The incidence of septal aperture varies and it is racial dependent. The

knowledge of septal aperture is important for preoperative planning of intramedullary fixation in fractures of distal end of humerus due to narrow medullary canal.^{4,5} On plain radiographs the septal aperture may appear as osteolytic lesion. Anatomical knowledge of the septal aperture is essential during evaluation of any pathological lesions at distal end of humerus to prevent faulty interpretation of plain radiographs. The present study was undertaken to know the incidence, morphological features and clinical importance of septal aperture of humerus which may be beneficial to orthopaedic surgeons and radiologists.

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MATERIALS AND METHODS:

This study was conducted in 600 (300 right and 300 left) dried human humerus bones free from pathological changes and of unknown sex obtained from Department of Anatomy, J.J.M. Medical College, Davangere and Subbaiah Institute of Medical Sciences, Shivamogga. The incidence and shape of septal aperture was noted on the right and left side humeri. In bones where aperture was absent, translucency of septum was noted with help of transmitted light from behind and photographs were taken with digital camera.

OBSERVATIONS AND RESULTS:

Out of 600 humerii studied, only 183 humeri (30.5%) showed the presence of septal aperture in that septal aperture was seen in 72 (24%) right and 111 (37%) left humeri (Table 1, Fig.1A). The oval shaped septal aperture was found in 146 (79.78%) humeri and round in 37 (20.21%) humerii (Figure 1B, Table 2). In remaining 417 humerii, translucent bony septum seen in 296 (49.33%) and opaque bony septum in 121 (20.16%) humeri (Fig 1C and 1D, Table 1).

Table1. Showing incidence of septal aperture, translucent septum and opaque septum.

Side of bone	Number of ones	Presence of TF	Translucent septum	Opaque septum
Right	300	72 (24%)	155 (51.66%)	73 (24.33%)
Left	300	111 (37%)	141 (47%)	48 (16%)

Table 2. Showing Incidence of shape of septal aperture.

Side of bone	Number of bones	Oval	Round
Right	72	50 (69.44%)	22 (30.55%)
Left	111	96 (86.48%)	15 (13.51%)

Figure 1A-D. Photographs showing; 1A: Collection of humerii on which observation of septal aperture was done. 1B: Different shapes of septal aperture. 1C: Translucent septum observed with help of transmitted light from behind and 1D: Opaque septum

DISCUSSION:

The frequency of humeral septal aperture varies from 6% to 60% in different human populations and is racial dependent.⁶ The previous studies in worldwide population showed an incidence of 4.2% in White Americans,⁷ 18.1% in Japanese,⁸ 6.9% in Americans,⁹ 7.9% in Egyptians,⁶ 8.6 % in Turkish population,¹⁰ 32.5% in South Africans,¹¹ 34.4% in Indian population¹² and 58% in Arkansas Indians⁷ (Table 4). The previous studies in Indian population also showed an incidence of 27.4% in Eastern Indians,¹³ 32% in Central Indians,¹ 27.5% in North Indians,¹⁴ 28% in South Indians¹⁵ and 34.4% in overall Indians¹² (Table 3). In the present study the incidence of humeral septal aperture was found to be 30.5% slightly higher prevalence than previous studies and it is in correlation with the studies of Ndou R et al.¹¹, Kate BR and Dubey PN¹ and Manjappa et al.¹⁹ Humeral septal aperture is considered to be an atavistic character commonly seen in primates. It may be due to impact pressure on the bony septum in cases of hyper-flexion or hyper-extension of them elbow joint leading to its resorption where olecranon process and coronoid process of ulna would potentially make contact.² Presence of septal aperture make treatment of supracondylar fractures more difficult in intramedullary nailing due to narrow medullary canal. It may lead to increased local stress and significantly alter the pattern and stability of fractures.³

In our study translucent bony septum is 49.33%, lower compared to the previous studies. The opacity of bony septum is 20.16% in our present study which is slightly higher than previous studies and correlates with the study of Raghavendra K et al.¹⁸ and Manjappa et al.¹⁹

Table 3. Comparison of present study with previous studies

Author	Population studied	Incidence of septal aperture (%)
Chatterjee KP (1968)	Eastern Indians	27.4
Kate BR (1970)	Central Indians	32
Singh S (1972)	North Indians	27.5
Singhal S V (2007)	South Indians	28
Soubhagya R Nayak (2009)	Overall Indians	34.4
Manjappa et al (2014)	South Indians	31
Present study (2017)	South Indians	30.5

Table 4. Comparison of septal aperture race wise

Race	Incidence of septal aperture (%)
White Americans	4.2
Americans	6.9
Egyptians	7.9
Turkish	8.6
South Africans	32.5
Indians	34.4
Arkansas Indians	58
South Indians	31
Present study	30.5

CONCLUSION:

Our study highlighted the presence of STF is an important variation in the distal end of humerus. The percentage of septal aperture incidence and its morphological significance. The incidence is 30.5% and it is more common on left humeri than right humeri which agrees with previous others. This adds data to anthropology and anatomical variation of distal end of humerus, which is significant for anthropologists, orthopaedic surgeons and radiologists in habitual clinical practice.

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