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Supracondylar Humeral Process: An Osteological Study and its Clinical Implications

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Abstract

Introduction: In humans, a hook-like bony process called Supracondylar process is occasionally seen on the anteromedial surface of the humerus. It has also been referred as the supraepitrochlear, supracondyloid, epicondyloid, or supratrochlear spur. It is curved, directed downwards and forwards, and its pointed apex is sometimes connected to the medial border just above the medial epicondyle by fibrous band known as Struthers ligament. Supracondylar process represents the embryologic vestigial remnant of climbing animals and seen in many reptiles, most marsupials, cats, lemurs and American monkeys. *Aim:* To study the incidence of supracondylar process of humerus. *Materials and Methods:* 88 adult dry humeri were collected from the Department of Anatomy, Subbaiah Institute of Medical Sciences and were examined for any osseous projection from the distal part. *Results:* Out of 88 humeri, we found one humerus of left side with a bony projection from anteromedial surface of its distal shaft. The bone was then examined, studied, photographed and its dimensions were recorded using Vernier calipers. *Conclusion:* Knowledge of this variation is of great importance to anatomists and anthropologists because of the possible link to the origin and relation of human races and also to radiologists, orthopaedicians and surgeons due to its clinical implications.

Keywords: Supracondylar Process; Humerus; Struther's Ligament.

Introduction

Supracondylar process is a hook-like bony process which varies from 2 to 20 mm in length. It occasionally projects from the anteromedial surface of the shaft of the humerus, about 5 cm proximal to the medial epicondyle. It has also been referred as the supraepitrochlear, supracondyloid, epicondyloid, or supratrochlear spur. It is curved, directed downwards and forwards, and its pointed apex is sometimes connected to the medial border just above the medial epicondyle by fibrous band to which part of pronator teres is attached [1]. This fibrous band, known as ligament of Struthers, represents the lower head or third head of coracobrachialis. At times it maybe ossified [2].

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The supracondylar process of the humerus has been described by anatomists and anthropologists and is phylogenetically considered to be a remnant of the supracondylar foramen found in reptiles, marsupials, and some mammals [3,4]. The Supracondylar process of humerus has been mentioned in 16th century by Coiter as cited by Marquis et al. [5]. It was first noted in apes and monkeys by Tiedemann in 1822 who described it as pathological exostosis and later in human by Knox [6,7]. Supracondylar spur or process was first described by Struther in 1849 [8]. According to Kessel and Rang, the ligament actually represents lower part of tendon of a vestigial muscle latissimus condyloidieus, which is found in climbing animals and extends from latissimus dorsi to the medial epicondyle. It serves as an anchor for the pronator teres muscle. In the lower mammals, the osteo-fibrous tunnel formed by the humerus, the supracondylar process and Struthers' ligament protects the neurovascular bundle that extend to the forearm [9]. Its occurrence in humans is very rare, the reported incidence of SCP varies from 0.1% to 2.7% in different races [10].

Struthers' ligament passes over the median nerve and the brachial artery, and can cause compression

of these structures. The clinical symptoms associated with Supracondylar process are median nerve entrapment with or without brachial artery compression, ulnar nerve entrapment, and fracture of the process. The symptoms are exacerbated by pronation of forearm or by extension and pronation/supination of forearm. Nerve compression usually causes intense pain, paresthesia, sensory loss, and muscular weakness in the area of median nerve. In rare cases of localized brachial artery compression due to Supracondylar process, ischemic symptoms such as claudication and coldness, and reduced radial and ulnar pulses can be detected [11].

Hence knowledge of this variation is of great importance to anatomists and anthropologists because of the possible link to the origin and relation of human races and also to radiologists, orthopaedicians and surgeons due to its clinical implications.

Materials and Methods

Eighty eight adult dry humeri were collected from the Department of Anatomy, Subbaiah Institute of Medical Sciences and were examined for any osseous projection from the distal part.

Observations and Results

The Supracondylar process was projecting from distal one-third of shaft of humerus on anteromedial surface and was directed downwards, forwards, and medially. Dimensions of projection were recorded with vernier calipers and photographs were taken [Figure 1]. The following observations were recorded:

1. Length of Supracondylar process was 0.9 cm
2. Breadth at the base was 1.2 cm
3. It was located at 5.5 mm distance from medial epicondyle
4. It was at a distance of 4.8 mm from the nutrient foramen

The results were compared with other similar studies and are tabulated in Table 1. The incidence of supracondylar process was also compared with other races as shown in Table 2.

Fig. 1: Left humerus showing supracondylar process

Table 1: Comparison of the parameters of Supracondylar process with other studies

Study	No of humerus	Length of supracondylar spur in cm	Breadth of supracondylar spur in cm	Distance of the spur from the medial epicondyle in cm	Distance of the spur from the nutrient foramen in cm
Gupta et al [10]	380	0.3	1.1	6.5	-
Vandana R [11]	133	8	1.2	5.3	3.8
Dinesh K Patil et al [13]	60	0.91	-	5.43	-
Struther [18]		1.2 to 1.9	-	3.2 to 6.4	-
Shivleela et al [19]	-	1	-	6	-
Nag et al [20]	-	2.4	-	5.6	-
Prabhahita [21]	80	1.1	1.5	4.4	6.5
Present study	88	0.9	1.2	5.5.	4.5

Table 2: Incidence of supracondylar process in different races

Author	Incidence (%)	Population/race
Gruber (1865)	2.7	European race
Danforth (1924)	0.5	Mixed
Adachi (1928)	0.8	Mixed
Terry (1930)	1.16	European race
Terry (1930)	0.1	Negros
Hrdlicka (1923)	1	American Indians
Dellon (1986)	1.15	European race
Parkinson (1954)	0.4	Mixed
Natsis (2008)	1.3	Caucasians
Gupta et al (2008)	0.26	Indian
Prabhahita (2012)	1.24	Indian
Vandana R (2014)	0.76	South Indian population
Alka et al (2016)	0.78	Indian
Present study	1.25	Indian

Discussion

Skeletal data has been a central focus for race estimation in anthropology [1]. Morphological differences help to find the missing links between the different stages of evolution. The knowledge of variations is not only important to anatomists and anthropologists but also to radiologists, anesthetists and surgeons. One such variation is the "supracondylar" process.

The incidence of the supracondylar process of the humerus is very low and the percentage of incidence varies in different. According to Danforth, differences in racial incidence of particular variation are probably due to differential distribution of genes with reference to race. He also proposed the idea of somatic mutation as a general cause these small variations, at least in human material [12].

In our study, the incidence was 1.25% which was almost similar to previous studies. But the study on 60 dry humeri on Indian population by Dinesh K et al., showed incidence of about 8.3% [13]. The various parameters measured were also compared with different authors and were found to be almost similar.

The supracondylar process if present, is usually clinically silent, but can become symptomatic by presenting as a mass or may be associated with symptoms of median nerve compression and claudication of the brachial artery [14]. Ligament of Struthers, a fibrous band maybe present which extends from the supracondylar process to the medial epicondyle [1]. From embryological point of view, the Struthers ligament lies between the tendon of the latissimus dorsi and the coracobrachialis and corresponds to the lower part of the tendon of the vestigial latissimo-condyloideus, a muscle found in climbing mammals which extends from the tendon of insertion of the latissimus dorsi muscle to the medial epicondyle [9]. Rarely, this fibrous band may ossify forming a supracondylar foramen, a tunnel which transmits the median nerve and the brachial artery and sometimes a variant ulnar artery or the ulnar nerve [15,16].

In patients of pain and sensory disturbance of forearm and hand, knowledge about supracondylar spur should be used while diagnosing with radiological imaging procedures [17]. This variation should also be considered while doing venesection at the elbow.

Conclusion

Presence of supracondylar tubercle has an evolutionary significance. The supracondylar process is frequently misjudged as a pathological condition of the bone rather than as a normal anatomical variation. Though it is a very rare vestigial structure in humans, yet it is known to have racial variations.

Clinical symptoms may be associated with Supracondylar process like median nerve entrapment with or without brachial artery compression, ulnar nerve entrapment, and fracture of the process. Since it may not be palpable due to muscles covering it, radiographic investigations are suggested in cases with symptoms of median neuropathy. So the knowledge of the supracondylar process is equally important for clinicians so that it may not be overlooked and there may be misdiagnosis.

References

1. William PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Ferguson MWJ, (Ed). 39th ed. Edinburgh London: Churchill Livingstone; 2005.p.850.
2. Datta AK. Essentials of human Anatomy. In: Superior and inferior extremity. 3rd ed. Kolkatta: Current Books International; 2004.p.60.
3. Dwight T. A bony supracondyloid foramen in man. Am J Anat. 1904;3:221.
4. Kolb LW, Moore RD. Fracture of the supracondyloid process of the humerus. J Bone Joint Surg Am. 1967;49:532-8.
5. Marquis JW, Bruwer AJ, Keith HM Supracondyloid process of humerus. Proc Staff Meet Mayo Clin 1957;32:691-697.
6. Tiedmann F. Tabulae arterium corporis humani. Carlsruhae: Muller; 1822.
7. Knox R. On the occasional presence of the supracondylar process in the human humerus. Edinb Med Surg J 1841;56:125-28.
8. Struthers J. On a peculiarity of the humerus and humeral artery. Mon J Med Sci. 1848;28:264-7.
9. Kessel L, Rang M. Supracondylar spur of the humerus. J Bone Joint Surg Br. 1966;48(4):765-8.
10. Gupta RK, Mehta CD. A study of the incidence of supracondylar process of the humerus. J Anat Soc India 2008;57:111-115.
11. Vandana R, Patil SP. Study of supracondylar process of humerus. Int J Health Allied Sci 2014;3:134-6.
12. Danforth CH. The Heredity of Unilateral Variations in Man.Genetics. 1924;9:199.

13. Dinesh K Patel et al / A study of Supracondylar Spur: Clinical correlations with entrapment syndromes. IJBAR 2017;08(02).

14. Subasi M, Kesemenli C, Necmioqlu S, Kapukaya A, Demirtas M. Supracondylar process of the Humerus. Acta Orthop. Belg. 2002;68(1):72-75

15. Barnard LB, Mccoy SM. The supracondyloid process of the humerus, J Bone Joint Surg, 1946;28(4):845–50.

16. Mittal RL, Gupta BR. Median and ulnar-nerve palsy: an unusual presentation of the supracondylar process. Report of a case, J Bone Joint Surg Am, 1978;60(4): 557–58.

17. Ganesan Murugaperumal and Melani Rajendran S. Study on Struther's Ligament with Supracondylar Spur / Process and its Clinical Significance. IJAS 2012, 3(2):36-38.

18. Struthers, J. On some points in the abnormal anatomy of the arm. Brit. For. M. Chir. Rev. 1854;13:407-15.

19. Shivaleela C. Suresh B.S. Kumar G.V. and Lakshmiprabha S. Morphological Study of the Supracondylar Process of the Humerus and Its Clinical Implications. J Clin Diagn Res. 2014 Jan;8(1):1–3.

20. Alka Rashmi Nag, Shilpa Singh, Renu Prasad. Study of Supracondylar Spur of the Humerus in Jharkhand Population. IOSR-JDMS 2016;15(7)Ver. XII:79-81.

21 Prabahita Baruah,Choudhury PR, Talukdar KL.A study of supracondylar process of humerus. journal of evolution of medical and dental sciences 2012;1: 817-822.

22. Gruber, W.; Ein Nachtrag zur Kenntnis des Processus supracondyloideus (internus) humeri des Menschen. Arch. Anat. Physiol. Wissen. Med. 1865;267:367-76.

23. Adachi B. Das Arteriensystem der Japaner. Verlag der Kaiserliche- Japanische University zu Kyoto, Kenyusha Press, Tokyo. 1928.

24. Terry RJ. On the Racial Distribution of the Supracondyloid Variation. Am. J. Phys. Anthropol., 1930;14:459-62.

25. Hrdlicka, A. Incidence of the supracondyloid process in whites and other races. Am. J. Phys. Anthropol. 1923; 6:405-12.

26. Dellon, Lee. Musculotendinous variations about medial humeral epicondyle. Journal of Hand Surgery (Br), 1986;11B:175- 81.

27. Parkinson C. The supracondylar process. Radiology. 1954;62:556-558.

28. Natsis K. Supracondylar process of the humerus: study on 375 Caucasian subjects in Cologne, Germany. Clin Anat. 2008 Mar;21(2):138-41.