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Anatomy Section

Superior Transverse Scapular Ligament Ossification and its Clinical Importance: An Osteological Study

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ABSTRACT

Introduction: Superior border of scapula is thin and presents the suprascapular notch. The superior transverse ligament bridges across the notch, which is attached laterally to the root of the coracoid process and medially to the limit of the notch. Notch is converted into foramen, through which passes the suprascapular nerve to the supraspinous fossa; the suprascapular vessels. The superior transverse ligament may be completely or incompletely ossified and it is one of the predisposing factors for suprascapular nerve entrapment neuropathy.

Aim: To study the ossification of superior transverse scapular ligament and its clinical importance.

Materials and Methods: The present osteological study was carried on 77 (34 right side and 43 left side) dry adult human scapulae of both sexes obtained during undergraduate teaching from October 2015 to September 2016. Scapulae with suprascapular foramen were studied. Superior transverse ligament was observed for complete or incomplete ossification.

Results: The incidence of the suprascapular foramen in the present study was 3.89% (2.59% completely ossified and 1.29% incompletely ossified superior transverse ligament).

Conclusion: Complete or incomplete ossified superior transverse scapular ligament may lead to narrowing of the suprascapular notch forming a foramen and thus give rise to suprascapular nerve entrapment syndrome. An awareness of suprascapular foramen is important to the anatomists, radiologists, neurosurgeons and orthopaedic surgeons. Existence of suprascapular foramen alters the surgical technique or arthroscopic decompression of the suprascapular nerve.

Keywords: Foramen, Neuropathy, Scapula, Suprascapular notch

INTRODUCTION

The scapula is one of the bones of shoulder girdle. It is a flat bone, triangular in shape and is situated in the postero-lateral part of the chest wall overlapping the second to seventh ribs. The scapula presents two surfaces-costal and dorsal, three borders-lateral, medial and superior, and three angles- lateral, inferior and superior, and three processes spine, acromion and coracoid [1]. The superior border is thin, sharp and is the shortest. It extends from superior angle to the root of coracoid process, where it presents a suprascapular notch. The superior transverse ligament bridges across the notch, which is attached laterally to the root of the coracoid process and medially to the limit of the notch. The superior transverse ligament is sometimes ossified. The foramen, thus formed, transmits the suprascapular nerve to the supraspinous fossa below the ligament, whereas the suprascapular vessels pass backwards above the ligament [1]. Calcification, partial or complete ossification and multiple bands are some of variations of superior transverse scapular ligament [2]. Incidence of complete ossification of superior transverse ligament varies with population [3]. The importance of this study lies in the diagnosis and treatment of suprascapular nerve entrapment neuropathy, as ossified superior transverse ligament is one of the predisposing factor [4]. The spino-glenoid notch and gleno-humeral joint related ganglion cysts or soft tissue masses, are other potential cause for nerve entrapment. In older patients, traction neuropathy may occur following excessive nerve excursion during overhead sports or as a result of massive, retracted rotator cuff tears [5]. The knowledge of ossification of superior transverse scapular ligament is important for clinicians as it is one of the risk factor involved in surgical decompression of suprascapular nerve. Therefore, the present study was conducted with an aim to study the ossification of superior transverse scapular ligament and its clinical importance.

MATERIALS AND METHODS

The present osteological study was conducted after obtaining institutional ethical committee permission on 77 (34 right side and 43 left side) dry adult human scapulae of both sexes obtained from the Department of Anatomy, during routine undergraduate teaching from October 2015-September 2016. Scapulae were carefully observed for the presence of suprascapular foramen and were selected for the study. Scapulae with damaged superior border were excluded from the study. Photographs of scapulae with different types of notches were taken with cannon 4 mega pixel camera. Superior transverse ligament was observed for complete or incomplete ossification.

RESULTS

In the present study, out of 77 dry scapulae, three scapulae showed the presence of suprascapular foramen. Two scapulae of left side showed completely ossified superior transverse ligament. One scapula right side showed incompletely ossified superior transverse ligament [Table/Fig-1,2].

[Table/Fig-1,2]: Suprascapular foramen in two left scapulae and one right scapula with completely and incompletely ossified superior transverse ligament respectively. (Images from left to right)

The incidence of the suprascapular foramen in the present study was 3.89% (2.59% completely ossified and 1.29% incompletely ossified superior transverse ligament). In the present study, incidence of Type I was 12.9%; Type II was 15.6, Type III was 67.5% and Type IV was 2.59%.

DISCUSSION

Variations in suprascapular notches have been noted and studied in different populations. Classification of notches was made by different authors. Accordingly, Rengachary SS et al., classified suprascapular notches into six types: Type I-entire superior border of scapula has wide depression from superior angle to base of coracoid process; Type II-wide and blunt, V-shaped notch; Type III-U shaped notch; Type IV-small V shaped notch; Type V-same as Type III with ossified medial part of ligament; Type VI-ligament is completely ossified and suprascapular foramen is formed [4]. The incidence of complete ossification of superior transverse ligament in Eskimos is 0.3% which is close to the results of present study [6]. In a study by Rajeev RD et al., incomplete ossification of superior transverse scapular ligament was 5.82% which is higher than present study [3]. The difference observed was due to difference in the region and population on which it was conducted. Incidence of ossification of superior transverse ligament in present study and its comparison against published literature is shown in [Table/Fig-3] [2-4,7].

Authors	Incidence of completely ossified superior transverse ligament	Incidence of incompletely ossified superior transverse ligament
Ticker JB et al., [2]	5%	18%
Rajeev RD et al., [3]	9.7%	5. 82%
Rengachary SS et al., [4]	-	3.7%-4%
Kalpana T et al., [7]	2%	-
Present study	2.59%	1.29%

[Table/Fig-3]: Comparison of incidence of ossification of superior transverse ligament with published literature [2-4,7].

In study by Ticker JB et al., incidence of U type was 77% and V type was 23% [2]. In a study by Bayramoglu A et al., and Duparc F et al., U type was 62.5%; 63.3% and V type was 25% and 36.7%, respectively [8,9].

Cohen SB et al., reported a familial case of calcification of superior transverse scapular ligament resulting in entrapment neuropathy of the suprascapular nerve in a 58-year-old man and his son [10]. Many researchers described the variable incidence of complete ossification of superior transverse scapular ligament which differs from population to population [10]. The main site of entrapment of the suprascapular nerve is at suprascapular notch [11]. Calcification, complete or incomplete ossification of superior transverse scapular ligament often leads to narrowing of the suprascapular notch which irritate or compress the suprascapular nerve and give rise to suprascapular nerve entrapment syndrome [12]. Rengachary SS et al., proposed the aetiopathology of the suprascapular nerve entrapment as the "sling effect". The nerve makes minimal transitional movements during motions of the arm. Hence, an angulated nerve can be pressed, during the action of the upper limb, against the sharp bony margin when travelling through the suprascapular foramen. The repeated kinking irritates the nerve and induces microtrauma that might result in this neuropathy [4]. Patients with suprascapular nerve entrapment syndrome usually presents with pain radiating across scapula, dull shoulder ache, limitation of shoulder joint movements and on examination, it would be associated with wasting of supraspinatus and infraspinatus muscles [13,14]. Injury to the suprascapular nerve may result in significant rotator cuff dysfunction. Patient is examined thoroughly by imaging and electrodiagnostic studies. Initial treatment should be non-surgical with physical activity modification and Physiotherapy. In case of failure of non-surgical measures it requires early surgical interventions like open suprascapular and or spinoglenoid notch decompression.

LIMITATION

It was carried out on dry scapulae without clinical history. Hence detailed clinical, radiological and cadaveric studies can be done.

CONCLUSION

The incidence of suprascapular foramen was 3.89% (2.59% completely ossified and 1.29% incompletely ossified superior transverse ligament). Complete or incomplete ossified superior transverse scapular ligament may lead to narrowing of the suprascapular notch forming a foramen and thus give rise to suprascapular nerve entrapment syndrome. Knowledge of suprascapular foramen is important to the anatomists, radiologists, neurosurgeons and orthopaedic surgeons.

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