International Journal of Anatomy and Research,
Int J Anat Res 2015, Vol 3(4):1624-28. ISSN 2321- 4287
DOI: http://dx.doi.org/10.16965/ijar.2015.267

Review Article

MORPHOMETRIC ANALYSIS OF SUPRASCAPULAR NOTCH: REVIEW OF LITERATURE

Gargi Soni *[1], Vivek Singh Malik [2], Ravindra Kumar Boddeti [3].

[*1] Head of Unit, Department of Anatomy, Faculty of Medical Sciences, IMS, Management & Science University, Malaysia.

[2] Associate Professor, Department of Anatomy, Pt. B. D. Sharma PGIMS, Rohtak, India.

[3] Sr. Lecturer, Department of Anatomy, Faculty of Medical Sciences, IMS, Management & Science University, Malaysia.

ABSTRACT

The suprascapular notch which is located on the lateral part of the superior border of the scapula, medial to the coracoid process, is bridged by the superior transverse scapular ligament. The notch serves as a passage for suprascapular nerve to pass to supraspinous fossa. Suprascapular nerve entrapment may be due to the variable morphology of the suprascapular notch or due to ossification of the superior transverse scapular ligament. Morphometric studies of suprascapular notch have been done in various populations. The aim of the present study is to review the morphometric studies of suprascapular notch, identify the most common type of notch and compare the morphometry in different populations.

KEY WORDS: Suprascapular notch, Entrapment, Morphometry, Scapula.

Address for Correspondence: Dr. Gargi Soni, Head of Unit, Department of Anatomy, Faculty of Medical Sciences, IMS, Management & Science University, Malaysia.
E-Mail: bhasingargi@rediffmail.com

Access this Article online

Quick Response code

DOI: 10.16965/ijar.2015.267

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 10 Sep 2015 Accepted: 02 Oct 2015
Peer Review: 10 Sep 2015 Published (O): 31 Dec 2015
Revised: None Published (P): 31 Dec 2015

INTRODUCTION

The suprascapular notch is situated in the lateral part of the superior border of the scapula, just adjacent to the base of the coracoid process. This notch is converted into a foramen by the superior transverse scapular ligament and serves as a passage for the suprascapular nerve which supplies motor branches to the supraspinatus, infraspinatus, and sensory branches to the rotator cuff muscles, and the ligamentous structures of the shoulder and acromioclavicular joint. The anatomical variation of the SSN, which includes the variation in shape, complete or partial ossification of the STSL, is recognized as one of the causes of suprascapular nerve entrapment. Koepell and Thompson (1959) were the first to describe the suprascapular nerve entrapment syndrome [1]. They reported that abduction or horizontal adduction of the shoulder exerted traction on the suprascapular nerve, which led to its compression against the superior transverse scapular ligament. SSN has been classified by various workers in different populations on the basis of parameters such as vertical length of the notch, transverse diameter of the notch and shape of the notch [2-6]. The three most commonly used classifications used by various workers are those proposed by Rengachary et al [6], Natsis et al [2] and Ticker et al [7].

Aim and objectives: The aim of the present study is to review the morphometric studies of suprascapular notch, identify the most common type of notch and compare it in different populations. The articles included in this review were based on the morphometric studies of suprascapular notch in various populations and the articles with more number of citations were included.

DISCUSSION

Anatomical variations of the suprascapular notch are important as possible predisposing factors for compression of the suprascapular nerve in this region, especially for individuals who were involved in violent overhead activities, such as volleyball players and baseball pitchers [8,9]. The knowledge of variations of the shape of SSN and incidence of ossification of STSL is also essential in various techniques associated with arthroscopic SN decompression [10-12].

The analysis of the literature revealed that various authors have used mainly three different classifications to study the morphometry of suprascapular notch.

Rengachary et al [6] observed six basic types of supracapular notch in 211 cadaveric adult scapulae: Type I (no notch): The entire superior border of the scapula showed a wide depression from the medial superior angle of the scapula to the base of the coracoid process (8%). Type II: This type showed a wide, blunted 'V'-shaped notch occupying nearly a third of the superior border of the scapula. The widest point in the notch was along the superior border of the scapula (31%). Type III: The notch was symmetrical and 'U'shaped with nearly parallel lateral margins. Type IV: The notch was very small and 'V'shaped. Frequently a shallow groove representing the bony impression by the suprascapular nerve was visible adjacent to the notch (3%). Type V: This type was very similar to Type III ('U' shaped), with partial ossification of the medial part of the ligament resulting in a notch with the minimal diameter along the superior border of the scapula. (6%).Type VI: The ligament was completely ossified; resulting in a bony foramen of variable size located just inferomedial to the base of the coracoid process (4%).

On the other hand, following examination of 423 scapulae, Natsis et al [2] proposed a classification: Type I – without a discrete notch, Type II – a notch with the longest transverse diameter, Type III – a notch with the longest vertical diameter, Type IV – a bony foramen Type V – a notch and a foramen.

The third classification was given by Ticker et al [7], he classified the suprascapular notch according to its shape, into two types, namely 'U' and 'V' types. The degree of ossification of the suprascapular ligament was evaluated separately. Iqbal et al [3] also classified the suprascapular notch on the basis of its shape into U, V and J types.

The classification given by Rengachary [6] was difficult to use when transition between these types is being found. The classification given by Natsis et al [2] seems to be simple and includes all the anatomical variations based on the vertical and transverse diameters of the SSN. The classification by Iqbal et al [3] though provides an easy method of distinction of SSN based on its shape (U, V, and J) without involving any measurements but some notches do not have any of the three mentioned shapes. As the other shapes of notch also observed are wide notch, shallow U and hockey stick shapes are not included in the classification given by Iqbal et al [3].

The most common type of notch reported by Rengachary [6] in American population was Type III (the notch was symmetrical and 'U'shaped with nearly parallel lateral margins) and the least common was Type IV - the notch was very small and 'V'shaped. The other authors who classified the suprascapular notch on the basis of Rengachary's classification were Sinkeet in Kenyan [5], Muralidhar et al [13] and Kanhan et al [14] in Indians also found the most common type of notch as Type III (Table 1). The least common type reported most of them was Type VI except Kanan et al [14] (IV and V).

The second type of classification used by various authors was by Natsis et al. [2] Natsis et al [2] in the Greek found an equal incidence of type II (a notch that was longest in its transverse diameter) and type III(a notch that was longest in its vertical diameter). The least common type

of notch reported by Natsis et al [2] was Type V .Based on the classification given by Natsis et al [2], Wang et al [4] in the Chinese, Soni et al [15] in the Indian and Mahdy A [16] in the Egyptian found Type II notch as the most common type of notch and type V as the least common type.

The third classification where the suprascapular notch was classified on the basis of shape according to the classification given by Ticker et al [7] and Iqbal et al [3] .The most common type of notch observed by Ticker et al [7], Soni G et al [15], Muralidhar et al [13] and Sutaria et al [17] was U shaped notch (in Indians), whereas in Kenyans hockey stick shaped and in Pakistanis J shaped notch was found to be most common.

Table 1: Shows the frequencies of various types of SSN in different populations using the classification given by Rengachary et al [6].

Study	Population(n)	Type 1	Type II	Type III	Type IV	Type V	Type VI
Rengachary et al 1979 [6]	American (211)	8%	31%	48%	3%	6%	4%
Sinkeet at al 2010 [5]	Kenyan (138)	22%	21%	29%	5%	18%	4%
Muralidhar et al 2013 [13]	Indian (104)	21.15%	8.65%	59.61%	28%	5.70%	1.93%
Albino et al 2013 [18]	Italian (500)	12.40%	19.80%	22.80%	31.10%	10.20%	3.60%
Kanan et al 2014 [14]	Indian (400)	20%	10%	52%	4%	4%	10%

Table 2: Shows the frequencies of various types of SSN in different populations using the classification given by Natsis et al [2].

Study	Population(n)	Type I	Type II	Type III	Type IV	Type V
Natsis et al 2007 [2]	Greek	8.30%	41.85%	41.85%	7.30%	0.70%
Wang et al 2011 [4]	chinese	28%	58.16%	28.23%	3%	none
Soni et al 2012 [15]	Indian (100)	5%	72%	20%	3%	none
Mahdy A et al 2013 [16]	Egyptian	6.06%	45.45%	43.93%	3.03%	1.50%
Sutaria et al 2013 [17]	Indian	6.06%	45.45%	43.93%	3.03%	1.50%

Table 3: Shows the frequencies of various types of SSN in different populations using the shape of the SSN.

Study	Pop(n)	U shaped	V shaped	J shaped
Ticker et al 1998 [7]	American	77%	23%	--------
Iqbal et al 2010 [3]	Pakistan	20%	13.20%	22%
Sinkeet et al 2010 [5]	Kenyan (138)	21%	5.18%	Hockey stick-22%
Soni et al 2012 [15]	Indian (100)	58%	7%	27%
Muralidhar et al 2013 [13]	Indian (104)	69.23%	26.92%	----
Sutaria et al 2013 [17]	Indian (314)	38%	7%	22%

Table 4: Shows the frequencies of absent SSN and the complete ossification of STSL ligament in different populations.

Study	Population(n)	Absent (%)	Complete ossification STSL (%)
Rengachary et al 1979 [6]	American (211)	8	4
Natsis et al 2007 [2]	Greek (423)	8.3	6
Sinkeet 2010 [5]	Kenyan (138)	23.91	4
Wang 2011 [4]	Chinese (295)		1.36
Albino et al 2013 [18]	Italian (500)	12.4	3.6
Polguj et al 2011 [19]	Polish (86)	6	7
Soni et al 2012 [15]	Indian (100)	2	3
Muralidhar et al 2013 [13]	Indian (104)	21.15	2
Kanan et al 2014 [14]	Indian (400)	20	40
Zahid A 2014 [20]	Pakistan (204)	-	1.96

The ossified STSL is a potential risk factor in the formation of suprascapular nerve entrapment. The frequency of completely ossified superior transverse scapular ligament varies in different populations (Table 4).

On analysis of results of various studies is observed that there is large variations in frequency of any type SSN in all populations. Even in the same population variation is not small. For example in Rengachary classification Type IV SSN has 28% frequency in one study [13] and 4% in another [14]. Similarly in Indian studies using Natsis classification there is large variation in frequency of different types of SSN.

For example type II SSN is 72% in one study [15] and 45.45% in another study [17] in Indian population. Same is true for Type III SSN which is reported 20% by Soni et al and 43.93% by Sutaria et al. It is observed that these classifications have elements of subjectivity. Therefore it is needed that morphometric studies wherein are performed wherein various dimensions of SSN as well as its area is measured. These studies need to be complemented by cadaveric studies so as to determine the effect of variations in attachment of superior transverse ligament on cross sectional area of of Suprascapular canal thus formed.

CONCLUSION

The most common type of notch in all the populations (American, Kenyan, Indian, Italian) where Rengachary's classification was used was type III. The most common type of notch in all the populations (chinese, Indian, Egyptian) where classification by Natsis et al was used was type II and type V was the least common. When the notch was classified according to shape the results varied, in Indians U shaped was most common, whereas in Kenyans hockey stick shaped and in Pakistanis J shaped notch was found to be most common.

The classification given by Natsis et al includes all anatomical variations of the suprascapular notch, is based on vertical and transverse diameters of the notch, is simple and therefore seems to be the best to classify the types of SSN.

We also emphasize on the need of cadaveric studies to complement the osteometric studies so as to determine the effect of variations in attachment of superior transverse ligament on cross sectional area of of Suprascapular canal thus formed.

Conflicts of Interests: None

REFERENCES

[1]. Kopell HP, Thompson WA. Pain and frozen shoulder. Surg Gynecol Obstet 1959;109:92-96.

[2]. Natsis K, Totlis T, Tsikaras P, Appell HJ, Skandalakis K. Proposal for classification of the suprascapular notch: a study on 423 dried scapulas. Clin. Anat. 2007;20:135-139.

[3]. Iqbal K, Iqbal R, Khan SG. Anatomical variations in shape of suprascapular notch of scapula. J. Morphol. Sci. 2010;27:1-2.

[4]. Wang HJ, Chen C, Wu LP, Pan CQ, Zhang WJ, Li YK. Variable Morphology of the Suprascapular Notch: An investigation and Quantitative Measurements in Chinese Population. Clin. Anat. 2011;24:47-55.

[5]. Sinkeet SR, Awori KO, Odula PO, Ogeng'o JA, Mwachaka PM. The Suprascapular notch: its Morphology and distance from the glenoid cavity in a Kenyan population. Folia Morphol. 2010;69:241-245.

[6]. Rengachary SS, Neff JP, Singer PA, Brackett CF. Suprascapular nerve entrapment neuropathy: A clinical, anatomical and comparative study. Part 1: Clinical study. Neurosurg. 1979;5:441-6.

[7]. Ticker JB, Djurasovic M, Strauch RJ, April EW, Pollock RG, Flatow EL et al. The incidence of ganglion cysts and variations in anatomy along the course of the suprascapular nerve. J. Shoulder Elbow Surg. 1998;7(5):472-8.

[8]. Holzgraefe M, Kukowski B, Eggert S. Prevalence of latent and manifest suprascapular neuropathy in high-performance volleyball players. Br J Sp Med. 1994;28:177–9. [PMC free article] [PubMed]

[9]. Bayramoglu A, Demiryurek D, Tuccar E, et al. Variations in anatomy at the suprascapular notch possibly causing suprascapular nerve entrapment: an anatomical study. Knee Surg Sport Trum Arthrosc.2003;11:393–8. [PubMed]

[10]. Barwood SA, Burkhart SS, Lo IK. Arthroscopic suprascapular nerve release at the suprascapular notch in a cadaveric model: an anatomic approach. Arthroscopy. 2007;23:221–225. doi: 10.1016/j.arthro.2006.11.011. [PubMed] [Cross Ref]

[11]. Bhatia DN, de Beer JF, van Rooyen KS, du Toit DF. Arthroscopic suprascapular nerve decompression at the suprascapular notch. Arthroscopy. 2006;22:1009–1013. doi: 10.1016/j.arthro.2006.05.012. [ubMed][Cross Ref]

[12]. Lafosse L, Tomasi A, Corbett S, Baier G, Willems K, Gobezie R. Arthroscopic release of suprascapular nerve entrapment at the suprascapular notch: technique and preliminary results. Arthroscopy. 2007;23:34–42. doi: 10.1016/j.arthro. 2006.10.003. [PubMed] [Cross Ref]

[13]. Muralidhar Reddy Sangam, Sattiraju Sri Sarada Devi, Karumanchi Krupadanam, Kolla Anasuya: A Study on the Morphology of the Suprascapular Notch and Its Distance from the Glenoid Cavity. J Clin Diagn Res. 2013;7(2):189-92.

[14]. Usha Kannan, N.S. Khannan, J. Anbalagan, Sudha Rao: Morphological study of suprascapular notch in Indian dry scapulae with specific reference to the incidence of completely ossified superior transeverse scapular ligament. J Clin Diagn Res. 2014 March;8(3):7-10.

[15]. Soni G, Malik VS, Shukla L, Chabbra S, Gaur N Morphometric analysis of the suprascapular notch. Internet J Biol Anthropol 2012;5:1.

[16]. Mahdy AA, Shehab AA Morphometric variations of the suprascapular notch as a potential cause of neuropathy: anatomical study. J Am Sci 2013;9:189–197.

[17]. Sutaria LK, Nayak TV, Patel SV, Jadav HR, Pensi CA Morphology and morphometric analysis of suprascapular notch. Int J Biomed Advance Res 2013;4:35–39.

[18]. Albino P, Carbone S, Candela V, Arceri V, Vestri AR, Gumina S Morphometry of the suprascapular notch: correlation with scapular dimensions and clinical relevance. BMC Musculoskeletal Disorders,2013;14:172.

[19]. Polguj M, Jêdrzejewski K, Podgórski M, Topol M. Morphometric study of the suprascapular notch: proposal of classification. Surg Radiol Anat. 2011 Nov;33(9):781-7.

[20].Zahid A, Khan Mw, Khan B. Ossified superior transverse scapular ligament, A morphological study on dried Pakistani scapulae. Biomedica. 2014;30:1-4.

How to cite this article:

Gargi Soni, Vivek Singh Malik, Ravindra Kumar Boddeti. MORPHOMETRIC ANALYSIS OF SUPRASCAPULAR NOTCH: REVIEW OF LITERATURE. Int J Anat Res 2015;3(4):1624-1628. **DOI:** 10.16965/ijar.2015.267