A Morphological Study of Suprascapular Notch and Incidence of Ossification of Superior Transverse Scapular Ligament in South Indian Dry Scapulae

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ABSTRACT

Introduction: The suprascapular notch is converted into suprascapular foramen by bridging of superior transverse scapular ligament (STSL) on its edges. The structures related to STSL are the suprascapular vessel which passes above and suprascapular nerve which passes below the ligament to reach the supraspinous fossa. The anterior coracoscapular ligament (ACSL) is present below the suprascapular ligament. Ossification of both STSL and ACSL leads to formation of double suprascapular foramen.

Aim: The aim of the present study is to know the incidence of suprascapular foramen and prevalence of different types of suprascapular notch in south Indian dry scapula.

Method and Result: 250 scapulae were examined in the present study. Out of which, 23 (9.2%) showed complete ossification and 13 (5.2%) showed partial ossification of STSL. Presence of both complete and partial foramen was observed in one of the right sided scapula.

Conclusion: The knowledge of variation in shape of suprascapular notch and ossification of both STSL and ACSL is of great concern for anatomist, neurosurgeon, radiologist and orthopaedician to understand the cause of suprascapular nerve entrapment syndrome and for better management of those cases.

Key Words: Suprascapular notch (SSN), Superior transverse scapular ligament (STSL), Anterior coracoscapular ligament (ACSL), Suprascapular nerve (SN), Suprascapular nerve entrapment syndrome

INTRODUCTION

The suprascapular notch is a depression on the superior border of the scapula just medial to the root of coracoid process. The notch is bridged by the superior transverse scapular ligament. Sometimes the suprascapular ligament is ossified to form a foramen that transmits the suprascapular nerve. The suprascapular nerve is the largest branch of upper trunk of brachial plexuses. It supplies both supraspinatus and infraspinatus muscles and gives articular branches to the shoulder and acromioclavicular joints¹.

Approximately 1–2% of all shoulder pain is caused by the suprascapular nerve entrapment syndrome². Kopell and Thompson was the first to describe the suprascapular nerve entrapment in 1959³. Many authors have identified that the morphological variation of the suprascapular notch and the ossification of the STSL is the cause of suprascapular nerve entrapment syndrome⁴,⁵,⁶,⁷. The ossification of the ligament is either partial or complete⁴. The size and shape of the notch may be a factor in suprascapular nerve entrapment because narrow suprascapular notch have been found in patients with this syndrome⁸,⁹,¹⁰,¹¹,¹². It is essential for clinical practice because various techniques are associated with the athroscopic decompression of the nerve¹³,¹⁴,¹⁵.
AIM OF THE STUDY

To study the incidence of completely ossified superior transverse scapular ligament forming suprascapular foramen in dry scapulae of Indian population.

1. To identify the different shapes of suprascapular notch.
2. To compare our results with previous authors.

MATERIAL AND METHODS

A total of 250 human scapulae obtained from the Department of Anatomy, Velammal medical college, Madurai and Govt. Sivagangai medical college, Sivagangai were analysed. Out of this, number of scapulae with completely ossified superior transverse scapular ligament and different shapes of suprascapular notch were identified, photographed and documented. The result of the present study is compared with the results of previous authors in Indian populations.

RESULTS

Out of 250 scapulae, 23 (9.2%) were identified to have complete ossification and 13 (5.2%) were identified to have partial ossification of superior transverse scapular ligament. One of the scapulae showed both complete and partial foramen in the same scapula was noted (Table 2). Six different shapes of the suprascapular notch were also observed (Table 1).

DISCUSSION

The incidence of complete ossification of suprascapular ligament according to Udayasree's study was 9.5% and 10% respectively. Whereas Jawed and Mistry recorded higher incidence and shiksha, polguj and Soni recorded a lower incidence. Hence the present study is in accordance with the study done by Udayasree and Usha.

According to Rengachary and Muralidhar and Usha kannan, the incidences of partial ossification of suprascapular ligament were 6%, 5.76% and 4% respectively. Hence the present study is in conformity to the above mentioned studies. However Soni in his study didn’t encounter a single scapula with partial ossification.

Double suprascapular foramen was reported only by four authors in the past. Hrdlica was the first to report this type of variation in 1942 followed by Wang in 2011, Polguj in 2012 and Serghei in 2016. In addition, Polguj proposed four hypothesis for formation of double foramen.

Hypothesis 1: ossification of superior transverse scapular ligament, anterior coracoscapular ligament

Hypothesis 2: ossification of bifid superior transverse scapular ligament

Hypothesis 3: partial ossification of trifid superior transverse scapular ligament

Hypothesis 4: ossification of bifid anterior coracoscapular ligament

Out of these four hypothesis, first one was highlighted to be the cause for double foramen by Polguj in his study. This type of variation may involve in compression of both nerve and vessels. In the present study, one scapula (0.4%) with double foramen was noted. But one foramen was partially ossified and the other was complete. Thus in the present study complete ossification of anterior coracoscapular ligament and partial ossification of superior transverse scapular ligament was noted.

Rengachary in his study of 211 cadaveric adult scapulae, had classified 6 basic type of suprascapular notch

Type 1: absence of notch
Type 2: V shaped notch
Type 3: U shaped notch
Type 4: small V shaped notch
Type 5: U shaped notch with partial ossification of suprascapular ligament
Type 6: complete ossification of suprascapular ligament

In the present study, all the above types of notch had been encountered expect type 4. Instead J shaped notch were observed in 13 (5.2%) scapulae.

The most common type of notch observed and in the present study was U shaped (53.2%) which was in accordance with the studies of previous authors. But in the present study two types of U shaped notch were observed that is a deep U which accounted for 37.2% and a shallow U for 16% of scapulae.

The incidence of absence of suprascapular notch in the present study was 21.2% which was in accordance with the studies conducted by Iqbal (18%), Muralidhar (21.15%) and Usha kannan (20%).

However, in the present study absence of the notch was observed and recorded on both sides which were similar to the study conducted by Raj kishore. He examined 112 scapulae and found absence of notch in 8.93% and 10.71% on right and left sides respectively. In the present study absence of notch was observed in 8% and 13.2% on right and left sides respectively.

Hence the present study is in accordance with the previous studies done by Muralidhar and Usha kannan.
CONCLUSIONS

Since the suprascapular notch is the most common site of both injury and compression of the suprascapular nerve, a thorough knowledge of this region is essential. This study would help the clinicians for better management of suprascapular nerve entrapment syndrome.

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REFERENCES

12. Vyas, Kintu K.; Rajput, Hina B.; Zanzrukiya, Kalpesh M.; Sut-tarwala, Ila; Sarvaiya, Bharat J.; Shroff, Bhavesh D. An osseous study of suprascapular notch and various dimensions of safe zone to prevent suprascapular nerve injury. Indian journal of applied basic medical sciences; jan2013, vol. 15 issue 20, p27
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Table 1: Shows the incidence of different shapes of the suprascapular notch on both sides.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Shape of the notch</th>
<th>Right</th>
<th>Left</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Deep U shaped</td>
<td>50</td>
<td>20</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>Shallow U shaped</td>
<td>17</td>
<td>6.8</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>V shaped</td>
<td>9</td>
<td>3.6</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>J shaped</td>
<td>7</td>
<td>2.8</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>No notch</td>
<td>20</td>
<td>8</td>
<td>33</td>
</tr>
</tbody>
</table>

Table 2: Shows incidence of both partial and complete ossification of suprascapular ligament on both sides.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Presence of foramen</th>
<th>Right</th>
<th>Left</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Partial foramen</td>
<td>6</td>
<td>2.4</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Complete foramen</td>
<td>12</td>
<td>4.8</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Complete + partial foramen</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3: Shows the comparative statement of different types of notch studied by different authors.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Author with year</th>
<th>U shaped notch</th>
<th>V shaped notch</th>
<th>J shaped notch</th>
<th>Ill-defined notch</th>
<th>No notch</th>
<th>Partial foramen</th>
<th>Complete foramen</th>
<th>Complete + Partial foramen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soni et al. (2012)</td>
<td>58%</td>
<td>7%</td>
<td>-</td>
<td>2%</td>
<td>11%</td>
<td>3%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Iqbal et al. (2010)</td>
<td>13.2%</td>
<td>20%</td>
<td>22%</td>
<td>26.8%</td>
<td>18%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Rengachary et al. (1979)</td>
<td>48%</td>
<td>31%</td>
<td>-</td>
<td>-</td>
<td>8%</td>
<td>6%</td>
<td>4%</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Dushyant et al. (2014)</td>
<td>45%</td>
<td>23.54%</td>
<td>-</td>
<td>12.28%</td>
<td>1.36%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Muralidhar et al. (2013)</td>
<td>59.61%</td>
<td>8.65%</td>
<td>-</td>
<td>-</td>
<td>21.15%</td>
<td>5.76%</td>
<td>1.92%</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Usha kannan et al. (2014)</td>
<td>52%</td>
<td>14%</td>
<td>-</td>
<td>-</td>
<td>20%</td>
<td>4%</td>
<td>10%</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>In present study (2017)</td>
<td>53.2%</td>
<td>5.6%</td>
<td>5.2%</td>
<td>21.2%</td>
<td>5.2%</td>
<td>9.2%</td>
<td>0.4%</td>
<td>-</td>
</tr>
</tbody>
</table>
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**Figure 1:** Absence of SSN.

**Figure 2:** Deep U shaped SSN.

**Figure 3:** Shallow U shaped SSN.

**Figure 4:** V shaped SSN.

**Figure 5:** J shaped SSN.

**Figure 6:** Partial ossification of STSL.

**Figure 7:** Complete ossification of STSL.

**Figure 8:** Complete and partial foramen.