A study of anthropometric measurements of the human scapula in Maharashtra, India

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Abstract

Introduction: The scapula (shoulder blade) is a triangular flat bone that lies on the posterolateral aspect of the thorax, overlying the 2nd to 7th ribs. The present study aimed to study the anthropometric measurements of the human scapula in Maharashtra, India. 50 intact and dry scapulae sourced from the bone banks of Medical colleges in Maharashtra were studied. The age and gender of the bones was not known. The measurements of bony dimensions of the scapula included the glenoid, coracoids process, acromion process, spine, and the body. Angles of the scapula and the various shapes of the suprascapular notch were also categorized. This anthropometric study of Scapula is helpful for referral of normal variation in many surgical procedures and in the radiological assessment related to shoulder especially the suprascapular notch.

Key Words: Anthropometric Measurements, Human Scapula.

INTRODUCTION

The scapula (shoulder blade) is a triangular flat bone that lies on the posterolateral aspect of the thorax, overlying the 2nd to 7th ribs. The convex posterior surface of the scapula is unevenly divided by the spine of the scapula into a small supraspinous fossa and a much larger infraspinous fossa. The concave costal surface of the scapula has a large subscapular fossa. The triangular body (blade) of the scapula is thin and translucent superior and inferior to the scapular spine. 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. The knowledge of various dimensions of the scapula may be helpful in open reduction and internal fixation of significantly displaced scapular fractures. It is important for the orthopaedician to resurface the glenoid cavity during total shoulder arthroplasty. The knowledge dimensions of the glenoid fossa helpful in the making of prosthesis. The dimensions are of importance in the pathomechanics of rotator cuff disease and recurrent shoulder dislocations. The acromion is believed to be the primary causative factor in the pathogenesis of impingement syndrome, leading to possible rotator cuff disease. The syndrome evolves mostly under the acromion but also rarely under the coracoid process. There are very few papers in forensic literature in which scapular dimensions have been used for estimation of living stature. The study of dimensions of suprascapular notch will help the orthopaedicians to correlate suprascapular nerve entrapment syndrome with a specific type of suprascapular notch. Suprascapular nerve entrapment is an acquired neuropathy secondary to compression of the nerve in the bony suprascapular notch. The nerve may be entrapped at suprascapular notch, secondary to narrowed neck, by cyst (ganglion), repetitive strain (volley ball...
players), thick transverse scapular ligament, fracture of superolateral area of scapula, or at spinoglenoid notch by space occupying lesion such as ganglion or tumor. Bilateral cases have been reported in weight lifters. The size of the SSN plays a role in the predisposition for suprascapular nerve entrapment. A small notch gave a greater chance of a nerve impingement than a large one. The SSN type, apart from the anatomical interest, may have some clinical significance for suprascapular nerve entrapment. The size and shape of the SSN may be a factor in suprascapular nerve entrapment because narrow SSNs have been found in patients with this syndrome.

MATERIAL AND METHODS
50 intact and dry scapulae sourced from the bone banks of Medical Colleges in Maharashtra, India were studied. The age and gender of the bones was not known. Adult, intact scapulae with clear features were included into study while broken or defective scapulae. Out of total 50; 26 were of right side and 24 of the left side. A sliding digital Vernier caliper and measuring scale were used for taking linear measurements

- **Length of scapula**: Distance between superior angle to inferior angle of scapula
- **Breadth scapula**: Maximum transverse diameter of scapula at level of spine meet with medial border
- **Maximum scapular spine length**: Distance between medial border of scapula to lateral border of acromion
- **Superior inferior glenoid diameter**: distance from inferior point on glenoid margin to most prominent point of supraglenoid tubercle
- **Anteroposterior glenoid diameter**: Maximum breadth of articualr margin of the glenoid cavity perpendicular to height of glenoid cavity
- **Acromion length**: distance between tip and midpoint of posterior border of acromion process
- **Acromion breadth**: Distance between lateral and medial borders at midpoint of the acromion process
- **Length of the coracoid process**: Distance from tip to base of coracoid process
- **Suprascapular notch tranverse diameter**: Horizontal measurements of corners of suprascapular notch on superior border of scapula
- **Supra-scapular notch depth**: measurements in the vertical plane from imaginary line between superior corners of the notch to deepest point of suprascapular notch.

Angular measurements like Superior Angle, Inferior angle, Lateral angle etc. were taken using goniometer and protractor by Standard method as described by Peter Ericson Lingamdenne et al. Each measurement was expressed in terms of Mean, Standard deviation, Minimum and Maximum calculated by Microsoft office Excel worksheet.

RESULT

Fig. 1 - (Various Types of Scapulae Type 1 to 6)
Types of Suprascapular notch as per Rengachary’s classification

Type I: Wide depression along superior border of scapula
Type II: Wide and blunt notch
Type III: Symmetrical ‘U’ shaped notch with parallel margins
Type IV: Small ‘V’ shaped notch
Type V: Partially ossified notch
Type VI: Complete foramen due to ossified suprascapular ligament

Representative photographs of various notch types in our study are shown in fig.1

Table 1: Distribution of various Measurements of scapular parameters (in mm)

<table>
<thead>
<tr>
<th>Various parameters of Scapula (mm)</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Scapula</td>
<td>137</td>
<td>13.67</td>
<td>89.42</td>
<td>160.4</td>
</tr>
<tr>
<td>Breadth of Scapula</td>
<td>99.32</td>
<td>10.11</td>
<td>57.28</td>
<td>121</td>
</tr>
<tr>
<td>Maximum spine length</td>
<td>123.02</td>
<td>11.29</td>
<td>89.05</td>
<td>151.3</td>
</tr>
<tr>
<td>Superior-Inferior glenoid diameter</td>
<td>36.83</td>
<td>3.18</td>
<td>29.2</td>
<td>43.91</td>
</tr>
<tr>
<td>Anterior Posterior glenoid diameter</td>
<td>25.08</td>
<td>2.53</td>
<td>19.7</td>
<td>32.61</td>
</tr>
<tr>
<td>Acromion length</td>
<td>42.91</td>
<td>4.87</td>
<td>27.62</td>
<td>50.82</td>
</tr>
<tr>
<td>Acromion breadth</td>
<td>23.22</td>
<td>2.91</td>
<td>18.84</td>
<td>33.72</td>
</tr>
<tr>
<td>CoracoidLength</td>
<td>40.01</td>
<td>4.05</td>
<td>30.11</td>
<td>51.35</td>
</tr>
<tr>
<td>Supra Scapular Notch Depth</td>
<td><strong>5.95</strong></td>
<td>3.17</td>
<td>0.3</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Table 2: Distribution of measurements of scapular angles (in Degrees)

<table>
<thead>
<tr>
<th>Various parameters of Scapula (deg)</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior Angle</td>
<td>92.2</td>
<td>2.33</td>
<td>82</td>
<td>99</td>
</tr>
<tr>
<td>Inferior angle</td>
<td>36.32</td>
<td>3.78</td>
<td>22</td>
<td>47</td>
</tr>
<tr>
<td>Lateral angle</td>
<td>54.21</td>
<td>3.55</td>
<td>42</td>
<td>66</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The size of the SSN plays a role in the predisposition for suprascapular nerve entrapment. The SSN type, apart from anatomical interest, may have some clinical significance for suprascapular nerve entrapment. The size and shape of the SSN may be a factor in suprascapular nerve entrapment because narrow SSNs have been found in patients with this syndrome. In the present study superior transverse diameter of suprascapular notch is mm and maximum depth 5.95 mm. Peter et al reported superior transverse diameter of suprascapular notch is 9.07 mm and maximum depth 5.47 mm. Peter et al reported scapula length 141.49 mm while Kavitha et al observed higher values of 145.1 mm. Lowest value of scapular length observed is 131.1 mm by Sitha et al in present study it was 137 mm. Sitha et al observed scapular width as 95.7 mm in Thais and Peter et al observed 98.69 mm whereas Kavitha et al reported scapular width as 105 mm which has higher than our observed value of 99.32 mm. Peter et al reported length of spine 123.35 mm which is similar to our finding 123.02 mm. Kavitha et al observed superior inferior glenoid diameter was 3 mm, Peter et al recorded 36.5 mm and present study showed 36.3 mm. Peter et al recorded length of glenoid by Peter et al 25.07 mm whereas in present study 25.08 mm. The length and width of acromion process is longer and broader Egyptians 52.81 mm and 32.05 mm respectively. In present study found 42.91 mm length and 23.22 mm width of acromion.
Peter et al reported coracoid length 39.04mm and Kavitha et al reported 41 mm which is very close to our finding of 40.01mm. Superior, Inferior and lateral angles were recorded as 92\textsuperscript{0}, 36.32\textsuperscript{0} and 54.21\textsuperscript{0}. Peter et al reported 91.70\textsuperscript{0}, 37.66\textsuperscript{0} and 55.10\textsuperscript{0}, superior, inferior and lateral angles respectively, these angles are helpful for biomechanism of shoulder joint movements.

**CONCLUSION**

This anthropometric study of Scapula of is helpful for referral of normal variation in many surgical procedures and in the radiological assessment related to shoulder specially the suprascapular notch. This anthropometric study of Scapula of Maharashtrian individuals shows similarity to South Indians and the determination and correlation of the morphometry of the scapula and the suprascapular notch is of great clinical significance.

**REFERENCES**


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Conflict of Interest: None Declared