Ultrasonographic Axillary Nerve Mapping: A Novel Technique with Specific Landmarks to Prevent Iatrogenic Injury During Surgery

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Purpose

Iatrogenic axillary nerve injury is a serious complication of shoulder surgery, with debilitating functional consequences for the patient. Pre-operative visualisation and mapping of the axillary nerve with ultrasound may provide an effective means to reduce the risk of axillary nerve injury during surgery. This study aims to assess the viability of identifying and marking the axillary nerve, and to establish a reproducible and consistent technique for reducing the intra-operative risk of axillary nerve injury.

Method

Patients referred from primary care with shoulder pain for ultrasound (n=123)

Under 60 (n=92)

Over 60 or rotator cuff tear present (n=31)

Anatomical variability in axillary nerve course compared between the 2 groups

Subcutaneous tissue/fat

Fibres of Deltoid

Humerus

Posterior circumflex humeral artery

Axillary nerve identified as adjacent to posterior circumflex humeral artery

Distance marked from proximal visualised point of humeral head

Results

Approximately normal distribution shown in both groups

Next steps...

Pre-operative identification of axillary nerve course in the anaesthetic room using portable ultrasound device

Trial of marking axillary nerve using the described reproducible technique with identification of the posterior circumflex humeral artery

Analysis 1

Any difference between groups?

Unpaired t-test

<table>
<thead>
<tr>
<th>Patient group</th>
<th>N</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 60 years</td>
<td>92</td>
<td>4.26 ± 0.64</td>
</tr>
<tr>
<td>Over 60 years or cuff tear</td>
<td>31</td>
<td>4.11 ± 0.70</td>
</tr>
</tbody>
</table>

p = 0.30
No statistical difference between each group

Analysis 2

Relationship between patient age (+ rotator cuff tear) and axillary nerve distance

Pearson correlation

<table>
<thead>
<tr>
<th>Patient group</th>
<th>N</th>
<th>Correlation Coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All subjects</td>
<td>123</td>
<td>-0.08</td>
<td>0.36</td>
</tr>
<tr>
<td>Under 55 years</td>
<td>92</td>
<td>-0.05</td>
<td>0.67</td>
</tr>
</tbody>
</table>

No association between age and axillary nerve distance

Conclusion

Ultrasound visualisation and measurement of the axillary nerve is a quick, reproducible and cost-effective method with the potential to reduce the risk of iatrogenic axillary nerve injury during shoulder surgery. This preliminary study presents a technique for pre-operative axillary nerve mapping that is reproducible and consistent between operators.