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SHOULDER AND ELBOW

Nerve injury associated with shoulder surgery

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Axillary;
Musculocutaneous;
Suprascapular;
Subscapular nerves

Summary
Although generally low, the risk of damage to nerves in the operative field during shoulder surgery still exists. These complications usually occur following surgery for anterior shoulder instability or joint replacement. The risk can be minimized by careful patient positioning, applying a detailed knowledge of shoulder anatomy to the approach and awareness of 'safe-zones'. Certain manoeuvres should be undertaken during the procedure to displace nerves from the operative field. If these measures are incorporated into routine practice, the risk of intraoperative nerve injury will be significantly reduced.

Introduction

Despite a better understanding of the application of shoulder anatomy surgery, there is still a significant intra-operative risk of nerve injury. The nerves in the immediate vicinity of the operative field (Figs. 1—4) which are most frequently damaged are the:

- Axillary
- Suprascapular
- Musculocutaneous
- Subscapular
- [other smaller branches of the brachial plexus]

The incidence of nerve injuries varies with the procedure, the approach utilized and the skill/experience of the surgeon. The reported incidence is 1—2% in patients undergoing rotator cuff surgery, 1—8% in patients undergoing surgery for anterior instability, and 1—4% in patients undergoing arthroplasty.[1,2,3,4] Unpredictable factors, such as anatomical variations and anomalies, influence the magnitude of risk. A three-dimensional knowledge of nerve anatomy is therefore essential in order to avoid injury to these structures.

Anatomy

The **axillary nerve**, composed of fibres from the **5th and 6th cervical nerve roots**, originates from the **posterior cord of the brachial plexus** at the level of the coracoid process, behind the conjoint tendon. It passes anterior to subscapularis and then courses towards its inferior border to enter the quadrilateral space. Here it maintains a close relationship to the inferior capsule, making it susceptible to damage. In the quadrilateral space it is accompanied by the posterior circumflex humeral artery and gives branches to the inferior aspect of the capsule. At posterior aspect of the humeral neck it divides into anterior and posterior trunks. The posterior trunk gives motor branches to teres minor and posterior deltoid, and cutaneous branches to the skin overlying the posterior deltoid before

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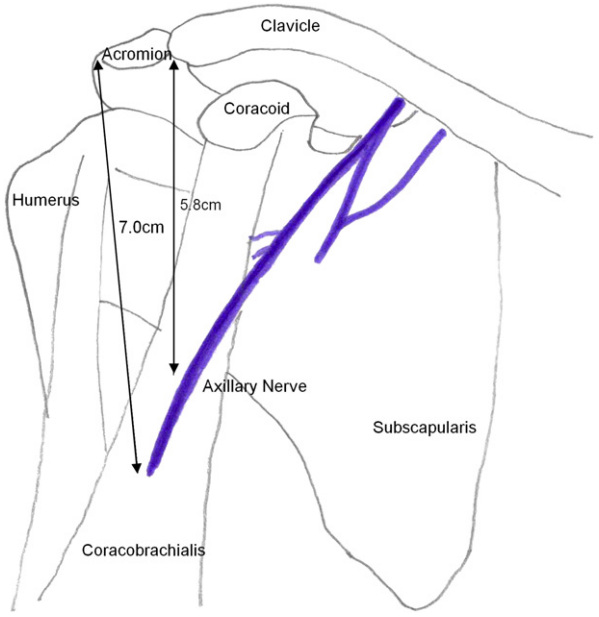

Figure 1 The Axillary nerve is located an average of 5.5 cm from the posterior corner of the acromion, 8 cm from the mid-portion of the acromion, 7 cm from the anterolateral corner of the acromion and 5.8 cm distal to the acromioclavicular joint. These distances tend to be even shorter in women and those with shorter arms.

terminating as the lateral brachial cutaneous nerve of the arm. The anterior branch continues to wind around the surgical neck of the humerus and extends to the anterior border of the deltoid, giving motor branches to the anterior and middle deltoid as well as a number of small cutaneous branches to the skin overlying the deltoid.

The **suprascapular nerve**, composed of fibres from the **5th and 6th cervical nerve roots** (with a variable contribution from the 4th cervical nerve root), originates from the **upper trunk of the brachial plexus**. It runs laterally, crossing the posterior triangle of the neck, parallel and deep to the omohyoid and trapezius muscles. It enters the supraspinatus fossa through the suprascapular notch, bridged by the thick transverse scapular ligament It then passes beneath the supraspinatus and curves around the lateral border of the scapular spine, the spinoglenoid notch, to enter the infraspinatus fossa. It gives off two motor branches to the supraspinatus muscle, then passes laterally within the fossa, providing sensory branches to the posterior capsule. In the infraspinatus fossa it gives off two motor branches to the infraspinatus muscle and some filaments to the shoulder joint and scapula.

The **musculocutaneous nerve**, composed of fibres of the **5th, 6th and 7**th **cervical nerve roots**, originates from the **lateral cord of the brachial plexus**, opposite the lower border of the pectoralis minor muscle. It penetrates the coracobrachialis muscle and passes obliquely between the biceps brachii and the brachialis to the lateral side of the arm. Just above the elbow it pierces the deep fascia lateral to the biceps tendon and continues into the forearm as the lateral antebrachial cutaneous nerve. Its gives motor branches to coracobrachialis, biceps brachii and brachailis. It also gives a small branch to the bone,

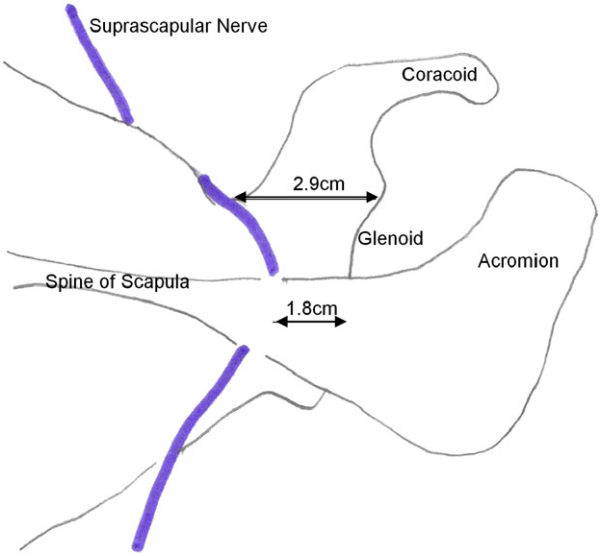

Figure 2 The suprascapular nerve lies on the undersurface of the supraspinatus and infraspinatus tendons, approximately 2.9 cm from the superior glenoid rim and 1.8 cm from the spine of the scapula. Therefore when dissecting the shoulder capsule on the inferior aspect of the rotator cuff, one should avoid dissection medial to the glenoid rim.

which enters the nutrient foramen with the accompanying artery.

The **subscapular nerves**, consisting of fibres from the **5th and 6th cervical nerve roots**, originates from the

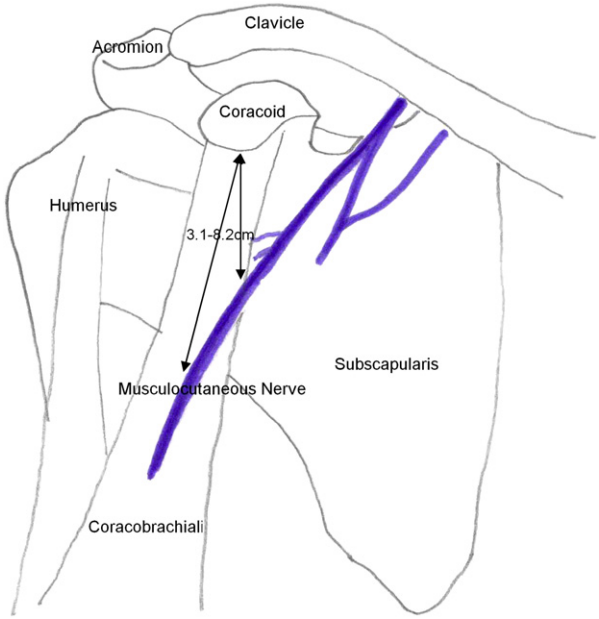

Figure 3 The musculocutaneous nerve is vulnerable in its proximal course where it lies on the subscapularis muscle. This is because the entry point of nerve into coracobrachialis is unpredictable and sometimes the nerve bifurcates. The distance between the coracoid and the entry point of the nerve into coracobrachialis muscle ranges from 3.1—8.2 cm.