ANATOMICAL RELATIONSHIPS OF THE SUPRASCAPULAR AND SPINOGLENOID NOTCHES AND THE SCAPULAR BONY LANDMARKS IN ADULT KENYANS: A DRY BONE STUDY

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ABSTRACT

Background: The suprascapular nerve, derived from the upper trunk of the brachial plexus passes through the suprascapular notch into the supraspinous fossa where it supplies the supraspinatus and then through the spinoglenoid notch to gain entry into the infraspinous fossa where it innervates the infraspinatus muscle. The nerve may be compressed at either of these two notches or injured in operations around the shoulder. Knowledge of the location of the nerve in these notches in relation to fixed bony landmarks around the shoulder is important in avoiding iatrogenic injury to the nerve or to locate it for release when it is compressed or for anaesthetic blockade.

Objective: To determine the distances between the suprascapular and spinoglenoid notches and fixed bony landmarks in the shoulder i.e the acromion, the supraglenoid tubercle, the posterior edge of the glenoid rim and the tip of the coracoid process.

Methods: The distances were measured using digital vernier callipers on dried unpaired adult scapulae that were grossly not deformed. The mean, minimum, maximum and standard deviation of the measurements was obtained.

Results: Average distance to the suprascapular notch from the supraglenoid tubercle, anterolateral edge of the acromion and the tip of the coracoid process were 31.2mm, 65.6mm and 45.7mm respectively. Average distance to the spinoglenoid from the posterior glenoid rim was 16.3mm.

Conclusion: Comparison with other populations shows variability in these distances. In order not to imperil the suprascapular nerve in the suprascapular incisure, a safe distance of less than 25.5mm from the supraglenoid tubercle should be observed. In the spinoglenoid notch, a safe distance of less than 13.1mm from the edge of the posterior glenoid rim should be maintained.

Key words: Suprascapular nerve, Suprascapular notch, Spinoglenoid notch, Acromion, Coracoid process

INTRODUCTION

The suprascapular nerve is a branch of the upper trunk of the brachial plexus, derived from C5 and C6 roots. Occasionally, it may have a contribution from the fourth cervical segment (1). Once it is given off by the upper trunk, it runs in the posterior triangle of the neck, deep to the trapezius and gains entry to the supraspinous fossa by passing through the suprascapular notch, where it supplies the supraspinatus. It then passes lateral to the base of the scapular spine in the spinoglenoid notch to enter the infraspinous fossa where it supplies the infraspinatus muscle (2). The nerve also gives articular and sensory branches to the shoulder and acromioclavicular joints (3). This course of the nerve has been found consistently, with rare variations reported (4).

The suprascapular nerve may be entrapped in the suprascapular notch by thickening or ossification of the transverse ligament (5,6) or when the suprascapular vessels run with the nerve under the transverse ligament (7). In other instances, the notch is closed off by a bony bridge, thereby converting it into a foramen, which may also cause compression of the nerve (8). It may be compressed in the spinoglenoid notch by ganglion cysts (9) or by the spinoglenoid ligament when present (10,11). The nerve may also be injured by penetrating instruments and suture anchors in operations around the shoulder like arthroscopic Bankart and rotator cuff repair (12,13), SLAP repair (14-16) or arthroscopic distal clavicular resection (Mumford procedure) with the anteromedial and Neviaser portals (17). It may also be injured in open procedures for fixation of scapular fractures (18) and the Latarjet procedure for recurrent dislocation (19,20).

A suprascapular nerve block may sometimes be done in patients with chronic painful conditions of the shoulder or for analgesia after shoulder surgery (3). Because of its consistent course through the suprascapular and spinoglenoid notches, knowledge of the relationship between these notches and fixed bony landmarks around the shoulder is essential. These relationships could act as guides for avoiding injury to the nerve at surgery or to locate the nerve for blockade with local anaesthetic or open decompression at the suprascapular or spinoglenoid notches.

This study sought to determine the distances between the suprascapular and spinoglenoid notches and the anterolateral border of the acromion, the tip of the coracoid process, the supraglenoid tubercle and the posterior edge of the glenoid rim in adult Kenyans. Some of these landmarks are palpable in the living and others visible at open or arthroscopic surgery.

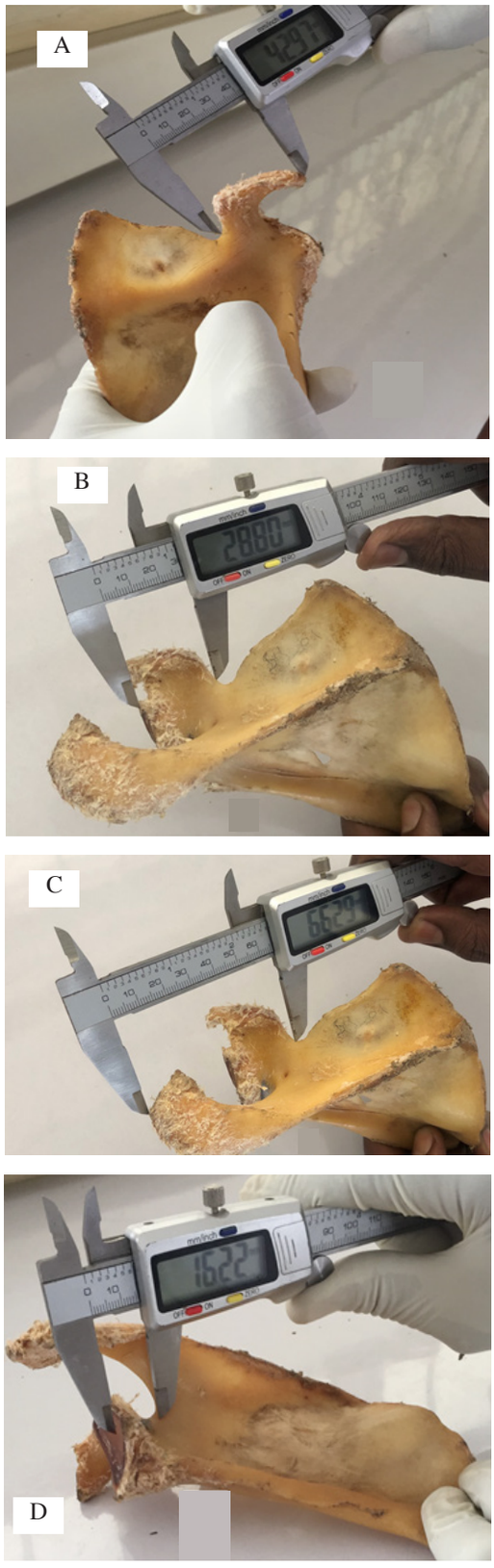
MATERIALS AND METHODS

Dried unpaired scapulae were obtained from the Departments of Human Anatomy, Egerton University and Kenyatta University, Kenya. Only adult skeletally mature specimens were used. Specimens that looked grossly deformed, those with previous fracture or surgery and those with post-mortem damage were excluded from the study. The distances from the following fixed bony landmarks to the suprascapular notch were measured using a digital vernier calliper: the supraglenoid tubercle, the tip of the coracoid process and the anterolateral edge of the acromion. The distance from the spinoglenoid notch to the posterior edge of the glenoid cavity was also measured. This was taken as the distance from the posterior glenoid rim to the lateral edge of the spine of the scapula. Figure 1 shows measurement of the distance to suprascapular notch from the tip of the coracoid process (A), the supraglenoid tubercle (B), the edge of the acromion (C) and measurement from the posterior edge of the glenoid rim to the spinoglenoid notch.

Each dimension was taken three times by one investigator and the average obtained. The data obtained was analysed using Numbers® version 5.1(Apple Inc). For comparisons, a p value of <0.05 was taken as being significant.

Figure 1

Measurement of distance to suprascapular notch from tip of coracoid(A), supraglenoid tubercle (B) edge of acromion (C) and distance from posterior edge of glenoid to spinoglenoid notch (D)



RESULTS

A total of 30 scapulae were obtained. Fourteen were from the left side, while 16 were from the right side. Table 1 shows the results obtained. There was no significant difference in the measurements between the right and left sides.

Table 1
Results obtained

	Distance (mm) to suspracapular notch from			Distance (mm) to spino-glenoid notch from
Side	Supraglenoid tubercle	Tip of coracoid	Anterolateral edge of acromion	Posterior edge of glenoid
All (30)	31.2±2.6 (25.5-35.0)	45.7±3.7 (37.4-52.6)	64.6±4.5 (55.6-72.7)	16.3±2.0 (13.1-21.1)
Right (16)	31.9±3.0 (26.0-35.0)	46.6±3.9 (37.4-52.6)	65.3±4.7 (58.9-72.7)	16.7±2.1 (13.9-21.1)
Left (14)	30.5±2.1 (25.5-33.0)	44.7±3.3 (37.8-49.3)	64.0±4.4 (55.6-70.0)	16.0±1.9 (13.1-20.1)
p value	0.74	0.71	0.69	0.56

Table 2 shows a comparison of the results obtained with results from other studies.

Table 2
Comparison with other studies

Author	Population	Study type	Distance from supraglenoid tubercle to suprascapular notch (mm)	Distance from posterior edge of glenoid to spinoglenoid notch (mm)	Distance from anterolateral edge of acromion to suprascapular notch (mm)
Sinkeet *et al* (21)	Kenyan	Dry bone study	28.74±3.8 (16-36)	15.86±2.2 (14-20)	
Philip *et al* (22)	Indian	Dry bone study	28.10±3.4	16.37±2.7	
Sharma *et al* (24)	Indian	Dry bone study	29.98 (21.70-39.25)		
Gumina *et al* (23)	Italian	Dry bone study	31.0 (21-41) 33.5±2.9 (26-41)-M 30.48±2.6 (24-38)-F	17(11-25) 18.1±1.9 (11-23)-M 17.7±1.5 (14-21)-F	
Terra *et al* (25)	Brazilian	Cadaveric			61.0(57-68)
Current study	Kenyan	Dry bone study	31.2±2.6 (25.5-35.0)	16.3±2.0 (13.1-21.1)	65.6±4.5 (55.6-72.7)

DISCUSSION

This study has detailed the distances between the suprascapular and spinoglenoid notches and fixed bony landmarks of the scapula. In the current study, the average distance between the supraglenoid tubercle and suprascapular notch was found to be 31.2mm (3.1cm) with a range of 25.5mm-35.0mm. This was more than the values obtained by Sinkeet *et al* (21), in a previous study on Kenyan specimens, who obtained a mean of 28.74mm with a range of 16-36mm. In studies on Indian specimens, Philip *et al* (22) and Sharma *et al* (24) obtained mean distances of 28.1mm and 29.98mm respectively. These are less than those obtained in the current study and could be due to ethnic differences. The mean obtained in the current study is similar to that obtained by Gumina *et al (23)* in a study using Italian cadavers, who found a mean distance of 31.0mm with a range of 21-41mm. Average distance from the posterior glenoid rim to the spinoglenoid notch was found to be 16.3mm with a range of 13.1 to 21.1mm. These are generally similar to those found by other authors in different populations (21-24). From the results in this study, in order not to imperil the suprascapular nerve in the suprascapular incisure, a safe distance of less than 25.5mm from the supraglenoid tubercle should be observed. In the spinoglenoid notch, a safe distance of less than 13.1mm from the edge of the posterior glenoid rim should be maintained. It has been shown in studies that the suprascapular nerve may be endangered by suture anchors used in Bankart and SLAP repairs (12-16) and sometimes penetration by screws used to fix the coracoid to the deficient glenoid in the Latarjet procedure (19,20).

The mean distance from the anterolateral edge of the acromion to the suprascapular notch was found to be 64.6mm with a range of 55.6-72.7mm. Terra *et al* (25) reported a mean distance of 61.0mm with a range of 57-68mm in a study on Brazilian cadavers.Whilst this difference could be due to ethnic differences between the two populations, it could also be due to the small numbers used in their study. This distance is crucial especially when procedures in the superior aspect of the shoulder are anticipated. This could be placement of superior arthroscopic portals like the Neviaser portal or distal clavicular excision (17). This distance can also be used as a guide when doing open release of the compressed nerve at the suprascapular notch (26). It could also be used as an adjunct landmark for suprascapular nerve blockade (3).

There is a dearth of studies that have documented the distance between the tip of the coracoid process and the suprascapular notch. In the current study, this was found to be an average of 45.7mm with a range of 37.4 to 52.6mm. The authors believe that this distance is very important especially in operations that require a coracoid osteotomy like the Latarjet procedure. Though infrequent, displaced coracoid fractures sometimes require open reduction and internal fixation (27). In such instances, this distance must be borne in mind when dissecting over the coracoid to reach the fracture at its base, and ensuring that instruments, especially reduction clamps do not stray way too medially as the nerve is at risk of injury from the sharp instruments (28).

CONCLUSION

The current study has determined the distances between the suprascapular and spinoglenoid notches through which the suprascapular nerve passes and fixed bony landmarks in the scapula. Average distance to the suprascapular notch from the supraglenoid tubercle, anterolateral edge of the acromion and the tip of the coracoid process were 31.2mm, 65.6mm and 45.7mm respectively. Average distance to the spinoglenoid from the posterior glenoid rim was 16.3mm. These distances are important in locating and avoiding injury to the suprascapular nerve in procedures around the shoulder. In order not to imperil the suprascapular nerve in the suprascapular incisure, a safe distance of less than 25.5mm from the supraglenoid tubercle

should be observed. In the spinoglenoid notch, a safe distance of less than 13.1mm from the edge of the posterior glenoid rim should be maintained. Comparison with other populations shows ethnic variability in these distances.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare. No funding was received from any source for this study.

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