# CLINICAL ARTICLE

# The position of the 'bare spot' – not central in the glenoid

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## Abstract

Dislocation of the glenohumeral joint is often associated with a bony lesion of the antero-inferior glenoid rim. This can be assessed at arthroscopy using the 'bare spot' – an area in the central glenoid where articular cartilage is comparatively thin.

The aim of this study was to assess the bare spot in a large number of cadavers. Fifty cadavers with no known history of bone or joint disease were examined. The bare spot was present in nearly 90% of shoulders and is centrally placed in the antero-posterior plane. However, the bare spot is significantly further away from the antero-inferior rim of the glenoid by 1.4 mm. The median distance from bare spot to the anterior rim is 13.2 mm, while the median distance to the antero-inferior rim is 14.6 mm.

Bone loss of the antero-inferior glenoid is associated with failure of soft tissue repairs after shoulder dislocation. These data will help in the arthroscopic assessment of the glenoid and in decision-making for surgery for glenohumeral instability.

## Introduction

Dislocation of the shoulder can be associated with either bone loss or compression at the antero-inferior glenoid margin.[1] This bony lesion can be assessed using radiographs, computed tomography (CT) and at arthroscopy.[2,3] During arthroscopic assessment, the thin area of articular cartilage in the centre of the glenoid[4,5] has been used to compare the amount of bone from this spot to the anterior and posterior glenoid margins.[6] It is of great importance to ensure that the calibrated arthroscopic probe is angled correctly to prevent erroneous measurement. Bone loss has been shown to increase the risk of further dislocation and of failure of arthroscopic soft tissue repair.[3]

Arthroscopic assessment has used the 'bare spot', representing an area of thinner articular cartilage, as a central reference point, for measurement of the bare spot to anterior and posterior glenoid lips. Burkhart *et al* have shown the bare spot to be a consistent finding both in cadavers and at arthroscopy of 'normal' shoulders.[6]

This work involved examination of 56 live patients, but only 10 cadaver glenoids. If bone loss from the anterior glenoid is identified, it is recommended that a bony procedure, such as the Latarjet or Cape Town modification of the Latarjet operation, be performed to restore the bony anatomy, the articular arc length and improve dynamic stability.[3,7] Aigner *et al* have shown that the inferior glenoid has variability in shape and they showed that the bare spot may not be centrally placed in the glenoid.[8]

The aim of this study was to determine the proportion of cadaver scapulae in which the bare spot was present and to identify the position of this bare spot in terms of the antero-inferior, anterior and posterior margins.

**Ensure that the calibrated arthroscopic probe is angled correctly to prevent erroneous measurement**

## Methods

Fifty cadavers were selected from the teaching laboratories of the Medical Faculty of the University of Stellenbosch's Department of Anatomy. None of the cadavers had a known history of shoulder or other joint pathology and all had died of a variety of medical conditions. In all cases the shoulder joint itself was in good condition and the glenoid surfaces had not been damaged or allowed to dry out. All the cadavers were embalmed and they were of various races reflecting the ethnic make-up of the population of the Western Cape.

After removal of deltoid, the shoulders were dissected open by dividing the complete rotator cuff and the capsule, and by releasing the insertion of pectoralis major. This gave easy access to the glenoid. The presence or absence of the bare spot was noted by visual inspection. When present, measurements were taken regarding the size and position of this landmark. Cartilage thickness was not measured because at arthroscopy it is the position of the bare spot that helps determine degree of bone loss. Positional measurements were made with a Whitworth micrometer accurate to 0.1 mm.

Where necessary, to accurately determine the edge of the glenoid, the labrum and insertion of the long head of biceps were removed. Measurements were made of the glenoid size in terms of the supero-inferior distance and the antero-posterior distance. The diameter of the bare spot was measured. Measurements from the bare spot to the anterior, posterior and the antero-inferior glenoid margins were made. The landmarks for the measurement of the antero-inferior margin were from a line drawn horizontally across the glenoid that was perpendicular to the longest axis of the supero-inferior maximum distance. A line at 45 degrees from this horizontal line, starting at the centre of the bare spot towards the antero-inferior rim was then measured; this antero-inferior rim distance was chosen as this is the area where bony lesions occur most commonly occur after anterior glenohumeral dislocation.

There were 50 cadavers available for this study. The median age was 47 years with a range from 27 to 92 and interquartile range from 39 to 55.5 years. There were 12 females and 38 males. The cadavers had been embalmed. The causes of death were predominantly respiratory (30/50) and cardiac (5/50) in nature. There was one case of Aids and the rest were a mixture of neurological, hepatic, abdominal and intestinal causes, with three given as natural causes. None had a history of trauma leading to their death and none had a discernable history of bone or joint disease, or of shoulder trauma. Repeated measurements were not possible as the cadavers were due for controlled disposal.

Measurements were taken with a micrometer by direct visualisation of the bare spot. Statistical analysis was performed (using Statistica version 6 software) and the Bonferroni test performed on the distances representing the position of the bare spot. Data were analysed for normality and non-parametric tests used where non-normal data were found.

## Results

Of the possible 100 scapulae in the 50 cadavers available for analysis, there were two in whom bony lesions were identified. Unusually one had a posterior bony lesion and the other had osteoarthritis with anterior, not posterior, bony wear. In only one case was there a rotator cuff tear of the superior portion of the cuff.

The two that had bony lesions were excluded from the positional analysis, giving 98 in total for positional measurements. The bare spot was visible in 88 out the 100 specimens (*Figure 1* of a bare spot and *Figure 2* of an absent bare spot). In one shoulder the spot was a C-shaped curve and not a complete circle; the centre of this curve was used for measurements. In another shoulder the spot was elliptical rather than circular; again the centre of the shape was used for measurements.

**Figure 1: The 'bare spot'**

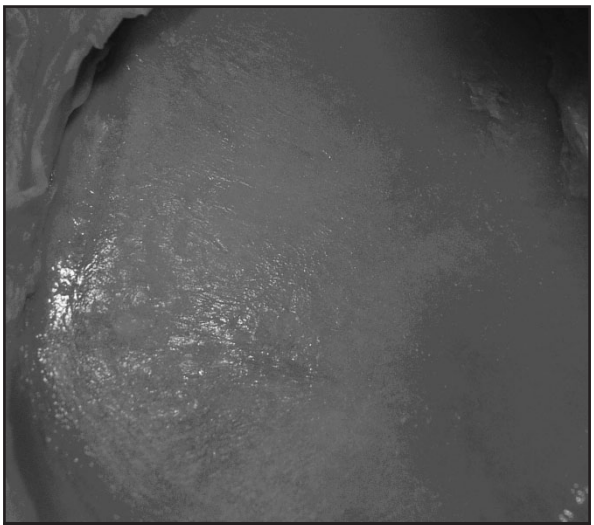

**Figure 2: A glenoid with no bare spot**

The data for glenoid dimensions are shown in *Table I*. The data were not normally distributed and hence non-parametric statistical tests were used. The distances from the bare spot to the anterior, posterior and antero-inferior glenoid margins are shown in *Table II*. Statistical analysis of the positional data used the Bonferroni test, comparing the bare spot to anterior, the bare spot to posterior and the bare spot to antero-inferior distances *(Table III)*. The bare spot is significantly further away from the antero-inferior glenoid rim than it is from the both the anterior and posterior glenoid rim. There is no significant difference between the bare spot to anterior glenoid rim and the bare spot to posterior glenoid rim, i.e. it is centrally placed in the antero-posterior plane.

The median diameter of the bare spot was 4.5 mm with a range from 2.4 mm to 9 mm and inter-quartile range from 3.35 mm to 6.1 mm. The diameter data are given in *Table IV*. Two spots were excluded as one was C-shaped and the other was elliptical.

## Discussion

The aim of this study was to document the presence and position of the bare spot of the glenoid surface in a greater number of cadaver shoulders than has been documented before.[6] We have been able to examine 100 shoulders in 50 cadavers who have no known history of shoulder trauma, or bone or joint disease. We have been able to examine a significant number of cadavers and have shown that the bare spot is present in about 90% of shoulders.

In two of the shoulders examined, however, there was evidence of a bony lesion; one appeared to be traumatic and the other degenerative. These shoulders did have a bare spot, but they could not be used for positional measurements.

In previous work on this subject, there was an examination of 67 shoulders in total, 10 of which were cadaver shoulders.[6] If the data are combined, the spot may be visible in 157 of 167 shoulders (about 92%). The importance of this study is that the bare spot must not be relied upon as the sole investigation to provide the surgeon with information about bone loss of the glenoid after glenohumeral dislocation. We recommend that pre-operative radiographs, that should include a Bernageau view, and that a pre-operative CT scan with sagittal reconstruction are performed.

**Table I: The antero-posterior and supero-inferior measurements of the glenoids**

| | Antero-posterior glenoid distance (mm) | Supero-inferior glenoid distance (mm) |
|---|---|---|
| Median | 25.9 | 34.9 |
| Minimum | 18.9 | 26.5 |
| Maximum | 35.6 | 42.9 |
| 1st quartile | 24.0 | 31.9 |
| 3rd quartile | 27.9 | 36.7 |

**Table II: The distances from the bare spot to the anterior, posterior and the antero-inferior glenoid margins**

| | Bare spot to anterior glenoid rim (mm) | Bare spot to posterior glenoid rim (mm) | Bare spot to antero-inferior glenoid rim (mm) |
|---|---|---|---|
| Median | 13.2 | 13.2 | 14.6 |
| Minimum | 8.0 | 6.6 | 10.4 |
| Maximum | 17.5 | 18.9 | 19.5 |
| 1st quartile | 12.1 | 11.6 | 13.4 |
| 3rd quartile | 14.8 | 14.8 | 15.9 |

**Table III: Statistical analysis of positional measurements using the Bonferroni test**

| | Bare spot to anterior glenoid | Bare spot to posterior glenoid | Bare spot to antero-inferior glenoid |
|---|---|---|---|
| Bare spot to anterior glenoid | N/A | 1.00 | <0.001 |
| Bare spot to posterior glenoid | 1.000 | N/A | <0.001 |
| Bare spot to antero-inferior glenoid | <0.001 | <0.001 | N/A |

**Table IV: The bare spot diameter**

| | Bare spot diameter (mm) |
|---|---|
| Median | 4.6 |
| Minimum | 2.4 |
| Maximum | 9.0 |
| 1st quartile | 3.4 |
| 3rd quartile | 6.1 |

**The bare spot is significantly further away from the antero-inferior glenoid rim than it is from the both the anterior and posterior glenoid rim**

If the bare spot is used to assess bone loss, it must be understood that it is not equidistant from the anterior glenoid and antero-inferior glenoid rims. We have shown that the antero-inferior glenoid rim is 1.4 mm further from the bare spot than is the anterior rim. These data are vital as the assumption that the bare spot is central will potentially lead to the under-treatment of patients who have undetected bone loss. Furthermore, it is important that the angle of the calibrated probe is carefully controlled as a change in angulation could affect measurement accuracy.

Our data agree with the study by Aigner *et al* who looked at only 20 specimens and who found that the bare spot is not necessarily centrally placed.[8] The bare spot is present in approximately 90% of shoulders but is not centrally placed; it is further from the antero-inferior glenoid rim by 1.4 mm. This information is vital if the bare spot is being used to assess bone loss in patients who are having surgery for glenohumeral dislocation.

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*This article was not submitted to an ethical committee for approval. The content of this article is the sole work of the authors. No benefits of any form have been derived from any commercial party related directly or indirectly to the subject of this article.*

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1. Conception of idea and design of experiment
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4. Actual writing of manuscript
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