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Reliability of the posterolateral corner of the acromion as a landmark for the posterior arthroscopic portal of the shoulder

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Hypothesis: The present study aimed to evaluate the variability of the posterolateral corner of the acromion (PCA) position in relation to the glenohumeral joint, in a craniocaudal direction, to assess whether the universal use of a certain distance from that point will always lead to a consistent placement of the posterior arthroscopic portal of the shoulder.

Methods: The study used 140 dried scapulae (36 women and 34 men). Measurements included the glenoid height and the perpendicular distance between the PCA and the most superior point of the glenoid. The percentage of coverage of the glenoid by the acromion was defined as the ratio between the 2 measurements. The Student *t* test was used to examine for significant differences between the sexes and the Student paired *t* test between sides ($P < .05$).

Results: The average glenoid height was 3.37 ± 0.29 cm (range, 2.69-4.00 cm). The perpendicular distance between the PCA and the most superior point of the glenoid was 0.82 ± 0.69 cm (range, −0.35 to 2.27 cm). The percentage of coverage of the glenoid by the acromion was 24% ± 20% (range, −10% to 64%).

Conclusions: The position of the PCA in relation to the glenohumeral joint is quite variable. Therefore, the use of a universal distance from the PCA will not always lead to a consistent placement of the posterior arthroscopic portal of the shoulder. Future research is needed in this area to develop techniques to individualize placement of the posterior portal.

Level of evidence: Anatomy Study, Cadaver Materials.

Keywords: Shoulder arthroscopy; arthroscopic portals; anatomic landmarks; acromion; glenoid

Accurate and safe positioning of arthroscopic portals is crucial for the success of each arthroscopic procedure. Accurate portal placement allows the surgeon to clearly see the surgical zone and provides the work angle and the range of motion required. A slight portal malpositioning could compromise operative success. Burkhart et al[2]

Investigational Review Board approval was not required for this study.

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characteristically mentioned ''improper portal position can frustrate the arthroscopist for the entire duration of the case….'' The term ''safe arthroscopic portal positioning'' refers to the avoidance of iatrogenic injuries to periarticular neurovascular structures or intra-articular anatomic structures, which may lead to postoperative complications.

The posterior portal is the standard viewing portal for shoulder arthroscopy.[3,4,9] The entry point is usually traced using the posterolateral corner of the acromion (PCA) as a landmark, specifically 2 cm below and 1 cm medial to that point.[1] Other authors have suggested that using these landmarks may not lead to the ideal posterior portal placement and suggest using alternative measurements as guidelines.[2]

There are 2 basic prerequisites for using the PCA as a landmark for the posterior portal of the shoulder when measuring a universal certain distance from the landmark to the entry point. First, the PCA should be easily palpable, and second, it should have a constant anatomic relationship with the glenohumeral joint. Although there is no doubt about the subcutaneous location of the PCA, different guidelines from experienced arthroscopists, along with the great variability of the acromion geometry, motivated the present study.[5,6] The purpose of this study was to evaluate the position of the PCA in relation to the glenohumeral joint, in a craniocaudal direction. Our hypothesis is that the PCA does not have a constant anatomic relationship with the glenohumeral joint, and therefore, the universal use of a certain distance from that point will not always lead to a consistent placement of the posterior arthroscopic portal of the shoulder.

Materials and methods

The study used 140 paired dried scapulae, 70 right and 70 left. The bones came from 70 donors (36 females and 34 males), which were kept in the public ossuaries. The donors were a mean age of 68.5 ± 10.72 years (range, 46-96 years). Scapulae with evidence of fracture, postmortem damage, or arthritis, which would prevent accurate measurements, were excluded, together with the scapula from the other side of the skeleton.

Each scapula was secured in a jig, onto a table. Two measurements were performed, and the ratio between them was calculated (Fig. 1). The height of the glenoid fossa (AB) was defined as the distance between the most superior and the most inferior point of the glenoid fossa and was drawn on the bone. The PCA was chosen as the point where the lateral rim of the acromion presented an abrupt change of direction, from anteroposterior to medial (C). A triangular ruler was placed with 1 limb tangential to the glenoid height and another limb tangential to the PCA. The intersection point was noted (D), and the distance between that point and the most superior point of the glenoid (AD) was defined as the perpendicular distance between the PCA and the most superior point of the glenoid fossa. The percentage of coverage of the glenoid fossa by the acromion was defined as the ratio of the distance between the PCA and the most superior point of the glenoid, to the height of the glenoid (AD/AB).

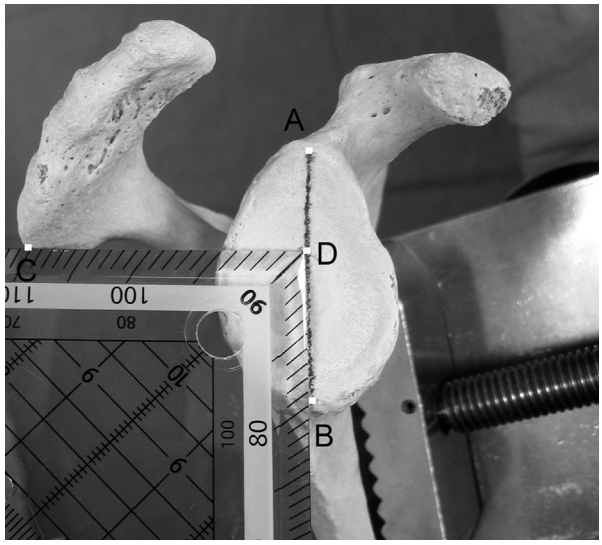

Figure 1 The distance between the most superior (*A*) and the most inferior point of the glenoid fossa (*B*) was defined as the height of the glenoid fossa (*AB*). The point where the lateral rim of the acromion presented an abrupt change of direction, from anteroposterior to medial, was chosen as the posterolateral corner of the acromion (*C*). A triangular ruler was placed, having 1 limb tangential to the glenoid height and another limb tangential to the posterolateral corner of the acromion. The intersection point was noted (*D*) and the distance between that point and the most superior point of the glenoid (*A*) was defined as the perpendicular distance between the posterolateral corner of the acromion and the most superior point of the glenoid fossa (*AD*). The ratio of the perpendicular distance between the posterolateral corner of the acromion and the most superior point of the glenoid (*AD*), to the height of the glenoid (*AB*) was defined as the percentage of coverage of the glenoid fossa by the acromion (*AD*/*AB*).

All bone measurements were done by the same investigator with a digital caliper with a resolution of 0.001 cm (Mitutoyo Company, Kanagawa, Japan). Each measurement was performed twice to calculate the intraobserver reliability, and the average of 2 measurements was recorded as a data point. Three of the authors (T.T., K.N., and G.P.) did both of the measurements independently and blinded in 20 scapulae, which were randomly chosen, to calculate the interobserver reliability. Measurements were rounded to 2 decimal places.

The intraobserver and interobserver reliability were assessed by the intraclass correlation coefficient (ICCs), 2-way mixed with absolute agreement and their 95% confidence intervals (CIs). All analyses were conducted using SPSS 19.9 software (SPSS Inc, Chicago, IL, USA). The Student *t* test was used to examine for significant differences between the sexes, and the Student paired *t* test was used for the 2 sides of the body. A *P* value of $<.05$ was considered statistically significant.

Results

The average height of the glenoid fossa was 3.37 ± 0.29 cm (range, 2.69-4.00 cm). It was significantly higher in men