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ORIGINAL ARTICLE

Recurrence after arthroscopic Bankart repair: Is quantitative radiological analysis of bone loss of any predictive value?

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KEYWORDS
Anterior shoulder instability;
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Summary
Introduction: Bone defects in the humeral head or antero-inferior edge of the glenoid cavity increase recurrence risk following arthroscopic Bankart repair. The present study sought to quantify such preoperative defects using a simple radiological technique and to determine a threshold for elevated risk of recurrence.
Materials and methods: A retrospective study conducted in two centers enrolled patients undergoing primary arthroscopic Bankart repair for isolated anterior shoulder instability in 2005. The principle assessment criterion was revision for recurrent instability. Quantitative radiology comprised: the ratio of notch depth to humeral head radius (D/R) on AP view in internal rotation; Gerber's X ratio between antero-inferior glenoid cavity edge defect length and maximum anteroposterior glenoid cavity diameter on arthro-CT scan; and the D1/D2 ratio between the glenoid joint surface diameters of the pathologic (D1) and healthy (D2) shoulders on Bernageau glenoid profile views. Seventy-seven patients were included, with a mean follow-up of 44 months (range, 36—54).
Results: Overall recurrence rate was 15.6%. Recurrence risk was significantly greater when the humeral notch length was more or equal to 20% of the humeral head diameter and the Gerber ratio more or equal to 40%. On Bernageau views, mean D1/D2 ratio was 4.2% (range, 0—23%) in patients without recurrence, versus 5.1% (range, 0—19) in those with recurrence ($P = 0.003$).

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Discussion: Beyond the above thresholds, bone defect as such contraindicates isolated arthroscopic stabilization. The D/R and Gerber ratios are simple and reproducible quantitative measurements can be taken in routine practice, enabling preoperative planning of complementary bone surgery as needed.
Level of evidence: Level IV; retrospective cohort study.

Introduction

Arthroscopic Bankart capsulorraphy has become widespread over the last decade thanks to the advent of absorbable anchors and ancillaries, improvements in arthroscopic knotting techniques and better anatomopathological understanding of the lesions. Recurrence rates now seem comparable to those reported for open Bankart procedures [1] although higher than for bone-block procedures [2], especially in case of bone defect of the humeral head (humeral notch or Hill-Sachs lesion) or antero-inferior glenoid cavity edge [3,4]. In 2007, a prospective study [5] determined predictive factors for recurrence: age less than 20 years, competitive sports, contact or forced overhead sport, shoulder hyperlaxity, and bone defect visible on plain AP radiograph. On the basis of these factors, a preoperative Instability Severity Index Score (ISIS) was drawn up to help surgeons to decide between stabilization either by bone-block (in case of ISIS > 6) or by isolated Bankart repair (ISIS < 3). A recent study [6] however reported that only the glenoid and not the humeral ISIS criterion proved reproducible in daily practice. Moreover, the ISIS analysis is purely qualitative; not being quantitative, it makes no contribution, for example, to preoperative planning of complementary filling procedures [7].

There are now many reports of bone lesion screening methods, but few of these measurement techniques provide threshold values, to get round the problems of image enlargement. In the case of humeral notching, one study [8,9] demonstrated that a ratio of notch depth to humeral head radius (D/R) exceeding 15% on AP view in medial rotation correlated with moderate to poor postoperative results in terms of Duplay-Walch score [10]. On the glenoid side, Bernageau et al. [11] recommended comparative glenoid profile views to assess glenoid defect with respect to the healthy contralateral shoulder: recurrence was on average associated with larger defects; however, no clinically relevant threshold was identified. In 2002, Gerber and Nyffeler [12] described an arthro-CT scan measurement of joint surface defect relative to theoretic total glenoid cavity area; in an anatomical study, they showed that resistance to dislocation was proportional to the ratio (X index) between antero-inferior glenoid defect length and maximum anteroposterior glenoid cavity diameter, diminishing by 30% when X = 0.5 and by 50% when X = 0.75.

The main objective of the present study was quantify preoperative glenohumeral bone defect using a simple radiological method, and to determine a threshold value for elevated risk of recurrence. The secondary objective was to analyze other recurrence risk factors in the series according to ISIS score.

Patients and methods

A retrospective study in two centers was conducted for a 1-year period from January 1st to December 31st, 2005. Patients meeting the inclusion and exclusion criteria were contacted.

Inclusion and exclusion criteria

The inclusion criteria were:

- isolated anterior shoulder instability;
- in patients not previously operated on for the affected shoulder;
- managed by arthroscopic Bankart repair and;
- with a complete radiology file.

The exclusion criteria were:

- multidirectional or posterior instability;
- recurrence of dislocation or subluxation caused by voluntary action;
- in a shoulder already previously operated on for instability and;
- associated rotator-cuff tear.

Preoperative radiological assessment

Preoperative radiology comprised:

- standard X-ray assessment: AP views in neutral and external rotation. The D/R ratio [8,9] was calculated from the AP view in internal rotation (Fig. 1), using templates of progressive diameters to solve the problems of radiographic enlargement;
- arthro-CT scan: sagittal slice through the glenoid cavity before the appearance of the humeral head, for calculation of Gerber's X index [11] (ratio of antero-inferior glenoid defect length to maximum anteroposterior glenoid diameter: Fig. 1);
- Bernageau's glenoid profile view [10], with the patient in upright posture, arm in abduction (Fig. 2). An exact glenoid profile requires that the line projecting the anterior edge of the superior part of the cavity should be continuous with the anterior line of the scapula; once this was checked visually, the radiograph was printed out. Only one view respects these criteria in this position, from which the D1/D2 ratio between glenoid joint