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## Original article

# Arthroscopically assisted reduction of acute acromioclavicular joint dislocation using a single double-button device: Medium-term clinical and radiological outcomes

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## ARTICLE INFO

### Article history:

Received 24 September 2016

Accepted 8 November 2017

### Keywords:

Acromioclavicular joint  
Dislocation  
Medium term  
Long-term  
Double-button  
Arthroscopy

## ABSTRACT

**Introduction:** Double-button devices for endoscopic management of acute acromioclavicular joint dislocation (ACJD) provide satisfactory short-term functional and radiological results. However, little exists in the literature regarding the long- and medium-term results of these implants, especially regarding the evolution of the acromioclavicular joint (ACJ).

**Hypothesis:** Satisfactory and steady long- and medium-term outcomes can be achieved in patients with acute ACJD undergoing endoscopically assisted ACJ repair using a single double-button device.

**Material and method:** A retrospective single-center study was conducted in patients with acute Rockwood III and IV ACJD treated endoscopically with a single double-button device from October 2008 to October 2010, allowing a minimum 5-year follow-up. Functional evaluation used Constant and Quick-DASH scores. Clinical evidence of dislocation recurrence was combined with bilateral Zanca views to assess coracoclavicular distance. Acromioclavicular osteoarthritis was evaluated on the Paxinos test and Zanca views.

**Results:** Nineteen of the 25 operated patients were seen at a mean  $76.9 \pm 8.5$  months' follow-up. Mean age was  $34.4 \pm 8.3$  years. Mean Constant and Quick-DASH scores were  $96.2 \pm 5.1$  and  $0.9 \pm 1.6$  points, respectively. Four patients had a recurrence of their initial dislocation, 3 of whom had positive Paxinos test, whereas the 15 patients without recurrence had a negative test ( $p = 0.004$ ). Five patients had radiological evidence of ACJ osteoarthritis: all 4 patients with recurrence and 1 without ( $p = 0.001$ ).

**Conclusion:** Long- and medium-term radioclinical outcome of endoscopically assisted management of acute ACJD using a single double-button device seems to be satisfactory and steady over time. Recurrence of the initial dislocation appears to be related to onset of degenerative ACJ arthropathy.

**Level of evidence:** Therapeutic type IV-Retrospective case series.

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## 1. Introduction

Acromioclavicular joint dislocation (ACJD) has an incidence of 1.8/10,000 new cases per year [1], accounting for 9% of all shoulder traumas [2]. It mainly concerns young males with high functional demand and follows a direct impact on the shoulder, usually during sport or in a road accident.

The Rockwood classification distinguishes 6 grades of acute lesion severity and is the most widely used system guiding treatment decision-making [3]. In general, low-grade dislocation (I and II) is managed functionally and high-grade dislocation (IV, V and VI) surgically. Despite numerous studies, there is no current consensus on the management of grade III lesions: some authors recommend surgery and others non-operative treatment [4–6]. For more than 8 years, we have systematically managed grade III-V ACJD using the TightRope double-button device (Arthrex Inc., Naples, FL, USA) under endoscopy.

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The technique has many advantages: minimally invasive approach, possibility of diagnosing and treating any concomitant traumatic lesions (e.g., rotator cuff tear or labral lesions), no systematic secondary removal of material, satisfactory dislocation correction with anatomically positioned ligament healing, and generally excellent short-term functional results and consequent high satisfaction ratings [7–12]. There are, however, scant reports of medium- and long-term outcome, and the long-term evolution of the joint remains unclear.

The present study therefore sought to assess medium- and long-term functional and radiological results in patients with grade III–V ACJD treated endoscopically with a double-button device, and to assess the radiological and clinical evolution of the AC joint. In the light of the known short-term results and the fact that ligament healing is usually achieved by 6 weeks, the study hypothesis was that satisfactory results would be maintained over time.

## 2. Material and methods

### 2.1. Patients

A single-center retrospective study included all patients operated on in our department between October 2008 and October 2010, with as inclusion criteria: Rockwood grade III–V ACJD, treated endoscopically by TightRope double-button (Arthrex Inc., Naples, FL, USA), with a minimum 5 years' follow-up. Grade III lesion was defined as reducible displacement toward the distal clavicle. Grades IV and V were defined as displacements that were not reducible due to the end of the clavicle passing through the deltoid-trapezius muscles; grade IV involved predominantly posterior displacement through the trapezius, and grade V predominantly superior displacement, as in grade III, but with the clavicle lying subcutaneously. Patients aged <18 or >60 years, with associated lesions requiring complementary procedures, or with >30 days' interval before surgery were excluded.

### 2.2. Surgical technique

All patients were operated on by the same senior surgeon, experienced in shoulder arthroscopy (PB). The patient was put in the beach-chair position, under general anesthesia. A posterior arthroscope portal was performed first, to enable exploration of the shoulder joint and assessment of any associated lesions. The instrument portal was performed using a needle at the rotator interval. The subscapular bursa was resected using a radiofrequency probe down to the medial edge of the foot of the coracoid process, providing satisfactory visualization of the whole inferior side of the coracoid process. A longitudinal incision was made perpendicularly to the distal quarter of the clavicle, beginning laterally 2 cm from the AC joint-line and continuing medially for 2 cm. The inferior part of the guide (AC TightRope Constant Guide, Arthrex Inc., Naples, FL, USA) was then introduced via the anterior portal and positioned under the bottom of the coracoid process, as close as possible to the foot and centered mediolaterally; the superior part was applied to the superior side of the lateral quarter of the clavicle, 3 cm from the AC joint, and centered anteroposteriorly. Under fluoroscopic and endoscopic control, a guide-wire was first positioned, followed by a 4-mm cannulated drill bit to complete the clavicular and coracoid tunnels. The coracoid button was then introduced using a suture-pass over the inferior side of the coracoid base, under endoscopic control (Fig. 1). The clavicular button was positioned on the superior side of the clavicle, under visual control. Reduction was achieved by external maneuvers, with an assistant exerting vertical pressure downward on the clavicle shaft while lifting the shoulder in abduction. Once satisfactory reduction was

confirmed on fluoroscopy and endoscopy, the surgeon fixed the TightRope device.

Discharge was on the day of surgery or the following day. The limb was immobilized in an elbow-to-body sling for 6 weeks. Passive and pendular mobilization was initiated on day 10, by a physiotherapist, with assisted active mobilization as of day 45. Patients had systematic clinical and radiological follow-up on days 10, 45 and 90.

### 2.3. Clinical and functional assessment

Data were collected by an independent observer (SPI), respecting the 1964 Declaration of Helsinki and methodological standard MR-003, with declaration to the CNIL data protection commission. Demographic data comprised: age at trauma, gender, dominant limb, type and level of sport, and occupation. The type of accident (i.e., sport or road accident) and circumstances (work accident or not), intra- and postoperative complications and time to return to sport and work were also recorded. Clinical assessment used Constant score [13] and the Quick-DASH questionnaire [14]. Pain was assessed on a 0–10 visual analog scale (VAS). The patient's perception of function was assessed by the subjective shoulder value (SSV). The Paxinos test was used to determine any symptomatology specific to the AC joint [15]: the examiner stood behind the patient, with his or her hand on the patient's shoulder, with the thumb under the posterolateral edge of the acromion and the index finger on the clavicle shaft, then pushed the acromion anterosuperiorly with the thumb and pushed the clavicle downward with the index finger. The test was considered positive if the patient experienced pain at the AC joint during the maneuver.

### 2.4. Radiology assessment

Radiologic assessment was conducted preoperatively, immediately postoperatively and at last follow-up. It comprised a bilateral Zanca view (Fig. 2) [16]. Coracoclavicular distance was measured at each consultation (Fig. 3), as was its ratio with respect to the healthy limb. Signs of degenerative AC arthropathy were screened for on the radiographs of the last consultation, using the Kellgren–Lawrence classification (Fig. 4) [17]. For more precise assessment of AC cartilage and ligament stock, shoulder MRI was systematically prescribed at last follow-up (Fig. 5).

### 2.5. Statistical analysis

Demographic, functional and radiological data were presented as means with standard deviations, and compared between patients according to recurrence. The Shapiro–Wilk test was used on all data and excluded their normal distribution; non-parametric tests were subsequently performed. Proportions were compared on Fisher exact test, and quantitative data (Constant, Quick-DASH, SSV and pain scores) on Mann–Whitney test. The significance threshold was set at  $p < 0.05$ . Analysis used SPSS software, version 22.0 (IBM, Armonk, NY, USA).

## 3. Results

### 3.1. Demographic data

Six of the 25 patients were lost to follow-up (impossible to contact, or refusing to participate). Thus 19 patients (16 male, 3 female) were assessed clinically and radiologically, with a mean  $76.9 \pm 8.5$  months' follow-up (range: 66–90 months). There were 15 grade III and 4 grade IV ACJDs, with no grade V. Mean age at trauma was  $34.4 \pm 8.3$  years (range: 20–52 years). The dominant side was involved in 14 cases. There were 12 amateur and 2 competitive

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