ORIGINAL ARTICLE

Arthroscopic labral repair with all-suture anchors: a magnetic resonance imaging retrospective study with a 2.5-year follow-up

Federico Sacchetti[1,2], Martina Di Meglio[3,4], Nicola Mondanelli[3,4], Nicola Bianchi[1,2], Vanna Bottai[1,2], Federico Cartei[5,6], Fabio Cosseddu[1,2], Rodolfo Capanna[1,2], Stefano Giannotti[3,4]

[1]Department of Orthopaedic and Trauma Surgery, University of Pisa, [2]Department of Orthopaedic and Trauma Surgery, Azienda Ospedaliero Universitaria Pisana; Pisa, [3]Section of Orthopaedics and Traumatology, Department of Medicine, Surgery and Neurosciences, University of Siena, [4]Section of Orthopaedics and Traumatology, Azienda Ospedaliera Universitaria Senese; Siena, [5]Department of Radiology, University of Pisa, [6]Department of Radiology, Azienda Ospedaliero Universitaria Pisana; Pisa, Italy

ABSTRACT

Aim To evaluate radiological and clinical outcomes of a case series of patients affected by glenohumeral instability (Bankart lesion) or superior labrum tear from anterior to posterior (SLAP) lesions treated by arthroscopic repair using all-suture anchors.

Methods Patients were operated by a single surgeon at a single Institution. Exclusion criteria were chondral lesions of the glenoid, rotator cuff lesions, previous surgery at the index shoulder, or a bony Bankart lesion. Position and numbers of anchors used depended on the dimension and type of lesion. The DASH (Disability of the Arm, Shoulder and Hand) and Constant scores were used for subjective and clinical evaluation at follow-ups (FUs); also, at 1-year FU, MRI scan was obtained to evaluate bone reaction to the implanted devices.

Results Fifty-four patients were included. A mean of 2.7 devices per patient (145 in total) were implanted. Mean FU was 30 (range 12 – 48) months. No patient reported recurrent instability, nor hardware-related complications were registered. MRI analyses showed that 119 (82%) implants did not alter surrounding bone (grade 0), 26 (18%) implants were surrounded by bone oedema (grade 1), while no bone tunnel enlargement nor a bone cyst (grade 2 or 3, respectively) were registered.

Conclusion This study confirmed the efficacy and safety of a specific all-suture anchor system in the arthroscopic repair of the glenoid labrum for glenohumeral instability or a SLAP lesion. In the short- and mid-term period, these devices were associated with good clinical and radiological outcomes without clinical failures or reaction at bone-device interface.

Key words: Bankart lesion, bone-implant interface, hardware complication, shoulder, SLAP lesion

Corresponding author:
Nicola Mondanelli
Section of Orthopaedics,
Department of Medicine,
Surgery and Neurosciences,
University of Siena
Viale Mario Bracci 16, 53100 Siena, Italy
E-mail: nicola.mondanelli@unisi.it
Phone +39 0577 585675; fax +39 0577 233400;
Federico Sacchetti ORCID ID: https://orcid.org/ 0000-0003-1276-0624

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INTRODUCTION

In recent years, several improvements have been introduced in the techniques for glenoid labral arthroscopic repair in patients affected by recurrent glenohumeral instability (1,2). The main technological drive to these developments was the introduction of more suitable implants and surgical tools. However, it is still under debate which implant is to be considered as the gold standard for these repairs. Recently, some concerns have been posed on the repair with anchors, as several studies have underlined the relatively high rate of implant-related complications such as iatrogenic cartilage damages, formation of bone cysts and implant migrations (3–6).

Different anchoring systems that are not made of rigid materials have been studied to reduce rates of implant-related complications (1,2,4). All-suture devices have been proposed as a new anchoring system and they have been vastly used in surgical practice (1,6). However, there is a lack of information about clinical and especially radiological outcomes in patients treated with all-suture anchors (7).

The aim of this study was to evaluate the radiological and clinical outcome of a case series of patients affected by glenohumeral instability with Bankart lesion or by superior labrum tear from anterior to posterior (SLAP) lesions treated by arthroscopic repair using an all-suture anchor system.

PATIENTS AND METHODS

Patients and study design

All patients included into the study were treated with arthroscopic labral repair of a Bankart lesion, a SLAP lesion, or both, for shoulder instability at the Azienda Ospedaliera Universitaria Pisana – University of Pisa (Pisa, Italy) and Azienda Ospedaliera Universitaria Senese – University of Siena (Siena, Italy), between July 2016 and June 2019. All patients were operated by the same surgeon (SG) (he moved during the study period from a hospital to the other), and in all patients the same all-suture anchor system was used (Y-Knot PRO Flex, ConMed Inc, Utica, NY, USA). Exclusion criteria were the presence of cartilaginous or bone lesions of the scapular glenoid, rotator cuff lesions, history of previous surgery on the involved shoulder, and bony Bankart lesions.

All patients gave their written consent to the treatment and anonymous use of data and images for research and academic purposes. At our Institutions, no Ethical Committee nor Institutional Review Board approval are needed for retrospective studies.

Methods

Patients underwent surgery in the contralateral lateral decubitus position, with traction applied to the involved upper limb with 60°-70° of shoulder abduction and 15°-20° of anterior flexion. For each patient, standard posterior and standard antero-superior portals were used, plus appropriate supplementary portals as needed. After evaluation of the lesion and preparation of the tissues (scar tissue removal to favor bleeding and subsequent tissue healing), a 13-mm deep hole was drilled through a dedicated pointer with a drill bit. The all-suture anchors were positioned through the pointer, the suture pulled and so the sleeve was cinched up to compress against the bone creating an anchoring ball, then the sutures were passed into the soft tissues and a knot was tied (Figure 1). Position and numbers of anchors depended on the dimension and type of lesion. After surgery, patients were immobilized in a sling for 4 weeks allowing only passive motion of the involved shoulder. At 4 weeks post-operatively, physical therapy continued with active range of motion exercises and muscular strengthening exercises.

All patients were retrospectively evaluated subjectively and clinically, using the Disability of the Arm, Shoulder and Hand (DASH) score (0

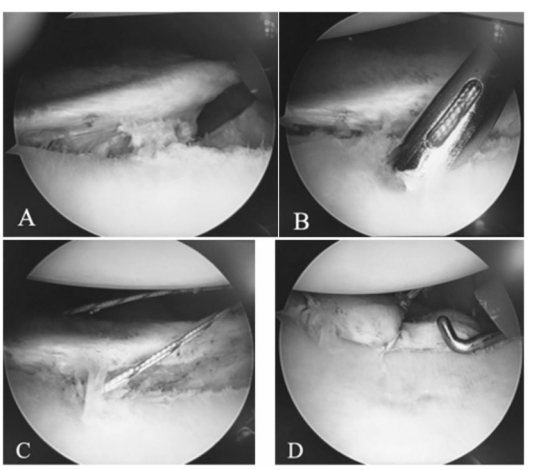

Figure 1. Arthroscopic labrum repair with all-suture anchor system. A) preparation of the torn labrum; B) insertion with the pointer of the all-suture anchor after having drilled the bone through the same guiding pointer; C) the suture is passed over the labrum and D) tied (Sacchetti F, 2019)

is best, 100 is worst) (8), and the Constant score (100 is the best, 0 is worst) (9) and grading (10). The DASH and Constant scores were administered to all patients before surgery, at six-months follow up (FU) and then annually; the final score was considered the one at the last available FU.

A magnetic resonance imaging (MRI) scan was obtained for all patients at 1-year FU (Figure 2). Sagittal T1-weighted, axial gradient-echo, oblique coronal and sagittal T2-weighted, coronal fat-suppressed images were acquired using a high-field (3 Tesla) scanner. Images were reviewed by a single radiologist (FC) with more than 10 years of experience in musculoskeletal radiology. The scoring system suggested by Willemot et al. (7) was used to assess the variation in the bone tissue near the anchors considering: normal bone aspect (grade 0), presence of local bone oedema (grade 1), enlargement of the bone tunnel of more than 3 mm (grade 2) or presence of a bone cyst (grade 3).

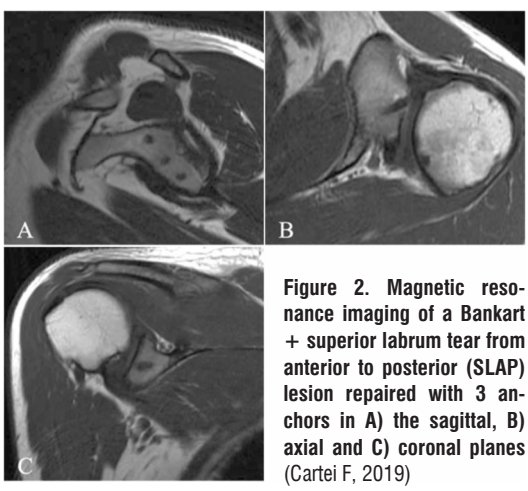

Figure 2. Magnetic resonance imaging of a Bankart + superior labrum tear from anterior to posterior (SLAP) lesion repaired with 3 anchors in A) the sagittal, B) axial and C) coronal planes (Cartei F, 2019)

RESULTS

Fifty-four patients fulfilled the inclusion criteria and were therefore included into the study. Thirty-two patients were male and 22 females, mean age at surgery was 26 (range 15–45) years. A mean of 2.7 devices per patient (145 in total) were implanted.

Mean subjective and clinical FU was 30 (range 12 – 48) months.

No patient reported recurrent instability nor hardware-related complications were registered. Mean DASH score was 15.3 points (range 5–25.8) and mean Constant score was 92.3 out of 100 (range 86–100); all patients but one graded excellent to the Constant grading with respect to the normal contralateral side.

The MRI scan was performed in all patients at 12 to 15 (mean 13) months from the surgery. MRI evaluation showed that 119 (82%) implants did not alter the surrounding bone (grade 0), 26 (18%) implants were surrounded by bone oedema (grade 1), no implant was surrounded by a bone tunnel enlargement bigger than 2 mm or by a bone cyst (grade 2 or 3, respectively) (Table 1).

Table 1. Bone reaction to glenoid implant on magnetic resonance imaging (MRI) based on Willemot et al. (7) grading system

Willemot et al. (7) MRI grading		No of cases (total 145 anchors in 54 patients)
Grade 0	No bone reaction	119
Grade 1	Bone oedema	26
Grade 2	Tunnel widening > 2 mm	0
Grade 3	Bone cyst	0

DISCUSSION

The main finding of this retrospective, single-surgeon study is the absence of hardware complications nor bone reaction to the anchors, confirming previous findings about the safety and efficacy of all-suture anchor systems in the arthroscopic treatment of shoulder instability. Willemot et al. (7) already showed excellent results out of 58 all-suture anchors in their original work. The present study was conducted on a 2.5-fold larger case series of patients and implanted devices as well, therefore with a stronger statistical power and significance. Also, a 3T-MRI scan was used in the present study, with theoretically better imaging than 1.5T-MRI scan used by Willemot et al. To our knowledge, to date no other studies in the English literature evaluated the bone-implant interface with MRI in all-suture devices in the glenoid, while only other studies exist, and it is about rotator cuff repair (11), with slightly worse results. Bone density plays a major role in implant stability (integration / loosening), and proximal humerus is less compact and dense than the glenoid, leading in our opinion to possible easier reaction to implants (intravasation of synovia fluid, micromotion of the anchors) than dense bone as in the glenoid.

This study has several limitations such as the retrospective nature of the analysis and lack of a blind evaluation of the clinical outcomes. Also, lack of a control group represents another important bias. However, radiological findings are not affected by such bias of the study. In this case se-

ries, bone reaction to implants was absent or low-grade on MRI in all cases, and clinical outcomes were satisfactory. The results of this study confirm the optimal biocompatibility with the host bone of all-suture devices in the short period, and excellent clinical results, as shown in recent review (12). The prevalence and number of bone reactions was predictable since the main drive to the development of the all-suture anchors devices was to reduce it, improving the biocompatibility of the anchoring systems. As for the main concern about all-suture anchors, their fixation strength, no clinical failures were registered in this series. Biomechanical studies have shown that the ultimate load to failure is higher in all-suture anchor constructs compared to standard metallic anchors (13,14). On the other hand, some animal models have shown the formation of bone cyst around the sutures that could lead to loosening and early failure of the construct (15). In this series, no clinical failure of the suture and no recurrence of instability were reported, and no anchor loosening was evident at MRI. This can also be explained by the small dimension of the holes (1.3 mm drill bit) needed to implant the all-suture anchors compared to the ones required to implant a traditional anchor (usually 2.5 to 3 mm drill bit). Less aggressive drillings reduce risk of glenoid fractures and anchor pull-out, and even in the case of anchors migration, the soft materials of the all-sutures devices limit the risk of secondary joints damages. The absence of recurrent and the excellent subjective and clinical outcomes assessed by DASH and Constant scores underline the efficacy of such all-suture anchors systems.

In conclusion, this study confirms the efficacy and safety of this specific all-suture anchor system in the arthroscopic repair of the glenoid labrum for glenohumeral instability or a SLAP lesion. In the short- and mid-term period, these devices are associated with good clinical and radiological outcomes (no recurrences, no reaction at bone-implant interface).

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TRANSPARENCY DECLARATION

Conflict of interest: None to declare.

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