

Giuseppe Milano  
Andrea Grasso  
Angel Calvo  
Roman Brzóska  
*Editors*



# Management of Failed Shoulder Surgery



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 Springer



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*To my father and my mother, fragile and brave persons,  
for their example of living (GM)*

*To my family, my Dad, my Mum and my wife. Thanks for  
always helping and supporting me (AG)*

*Dedicated to my four sons: Mar, Rocío, Angel and Alex (AC)*

*To my family, my co-workers and to the whole ESA team (RB)*

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## Preface

In recent years, as an effect of technological innovation of surgical instruments and devices, and also the increasing number of surgical techniques being proposed and validated in the literature, we have seen a considerable expansion of the surgical options for the treatment of shoulder disorders. Furthermore, advancing globalisation, the growth of web-based scientific dissemination and education, and the constant and systematic training and information activities carried out by scientific societies and the research world have all contributed to an overall improvement in the level of theoretical and practical knowledge in the field of shoulder surgery, with the result that there is now very little difference, in terms of quality and surgical efficiency, between the health systems of different countries. All this has contributed to an exponential increase in the number of shoulder repair, reconstruction and replacement surgeries performed every year in the world. Inevitably, this has brought an increase in the number of failures and complications, which have also become more complex to manage, especially in patients with repeated failures. For this reason, the various scientific societies with an interest in shoulder disorders have recently become inclined to examine more closely the problem of shoulder surgery complications and failures, from different perspectives: prevention, diagnosis and management. In particular, European Shoulder Associates (ESA), the ESSKA section devoted to shoulder disorders and surgery, decided that its first biennial meeting should focus on this important and highly topical issue. This meeting, entitled “Management of Failed Shoulder Surgery”, was held in Rome on 2–3 October 2015, and this book springs from that event.

We are particularly pleased and proud to have the task of presenting this monograph, which has the same title as the Rome congress, as it offers readers a valuable opportunity to explore aspects of a subject that is both complex and controversial. This is the first time in over a decade that a book has been published that deals exclusively and exhaustively with the management of failed shoulder surgeries, aiming to help us recognise these events, understand why they occur and find successful solutions.

The book is structured in the same way as the Rome meeting. There are five parts, each focusing on a specific area of shoulder surgery: glenohumeral instability surgery, sports injury surgery, standard anatomical shoulder replacement, reverse shoulder replacement and rotator cuff surgery. Each part is made up of chapters that analyse problems and solutions related to complications and failures specific to each surgical procedure. The parts also contain

case studies illustrating the diagnostic and therapeutic approach used by the authors to manage particularly complex cases.

All the speakers at the Rome congress agreed to take part in this book project, and all have provided a contribution, reviewed and updated, on the subject of their particular presentation. Our sincere thanks go to all of them. The enthusiastic support of all the authors has been crucial, helping us to produce volume of great scientific quality. We are confident that readers will appreciate the format the authors have chosen for their chapters, based mainly on a decision-making and problem-solving approach.

Finally, we thank ESSKA's Board for approving and supporting this initiative, and all those at Springer for their great professionalism, and also for the book's excellent quality in both graphic and editorial terms.

Rome, Italy  
Rome, Italy  
Zaragoza, Spain  
Bielsko-Biala, Poland

Giuseppe Milano  
Andrea Grasso  
Angel Calvo  
Roman Brzóška

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**Part I**

**Failed Shoulder Instability Repair**



# Shoulder Instability Repair: Why It Fails

# 1

Emilio Calvo, Gia Rodriguez-Vaquero,  
and David Haeni

## 1.1 Introduction

The glenohumeral (GH) joint is the least constrained joint in the body and allows a wide range of motion (ROM). On the other hand, it is more susceptible to high rates of instability. In the United States, the incidence of shoulder dislocations is 23 per 100,000 person-years, with the highest rates in adults in their 20s [1]. Anterior shoulder instability is the most frequent, and it is estimated that it affects 1.7% of the population. Current surgical techniques treating anterior shoulder instability are classified in soft tissue and bone augmentation procedures [2]. In the past, the open Bankart repair was considered the “gold standard,” obtaining satisfactory surgical results since its first description [3]. Concerns

regarding this technique were related to the extensive non-sparing subscapularis approach, immediate postoperative pain, loss of external rotation, and secondary osteoarthritis [4]. With the advent of new techniques and the development of new implants, the arthroscopic Bankart repair showed similar recurrence rates and functional outcomes than the open technique [5, 6]. Despite these results, reported recurrence rates after open or arthroscopic Bankart repair ranges between 5% and 15% [7, 8]. Bone augmentation procedures are usually preferred in young and active patients with recurrent shoulder dislocation in the presence of bone loss (Hill-Sachs lesions and/or bony Bankart) [9]. Recently, a prospective multicenter study found that the Latarjet procedure (open or arthroscopic) improves significantly shoulder function [10].

The main complication after surgical shoulder stabilization (whether open or arthroscopic) is recurrent instability. Revision instability surgery is usually a challenge, and patients with postoperative shoulder instability should be carefully evaluated not only to diagnose the failure but also to clearly identify the underlying causes that determined the outcome and to establish a successful therapeutic strategy [7, 8]. Careful preoperative evaluation is critical for the selection of the best treatment. The clinician must collect detailed information about the cause of the instability, the number and frequency of

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episodes, the degree of trauma necessary for recurrence, the arm position at the time of the initial injury, and the arm position that provokes symptoms [11].

Any patient with surgical treatment failure after shoulder stabilization can be classified in at least one of the following groups (Table 1.1). The first group is composed of patients in whom the problem was misdiagnosed, either because surgery was not indicated (i.e., voluntary instability), because the specific joint abnormalities to be corrected at surgery were not precisely identified, or because the direction of instability was not adequately understood (i.e., patients with multidirectional instability treated only for anterior instability). Patient-related risk factors may also increase the risk of postoperative recurrence and should be taken into account in the decision-making process in order to offer the best surgical treatment for every patient. Another group of subjects includes properly diagnosed patients in whom the treatment was inadequate, in terms of procedure selection or technical execution. Obviously, there could also be patients with combined misdiagnosis and inadequate treatment leading to surgical treatment failure. The last group includes those patients that were properly diagnosed, and in whom joint abnormalities were recognized and corrected with the optimal procedure, but who

suffered a new trauma causing postoperative dislocation or subluxation [12, 13].

### 1.1.1 Misdiagnosis

In order to properly address failed surgical treatment, it is essential first to clearly identify if surgery was indicated. Voluntary GH dislocation tends to occur in the young adult, and it is sometimes related to emotional and psychological problems. Huber et al. showed that voluntary subluxation in the childhood shows usually a favorable long-term outcome with conservative treatment and that is not associated with osteoarthritis [14]. Therefore, recurrent postoperative instability in this setting should be managed conservatively with physical therapy.

Once voluntary instability is ruled out, and considering that instability interferes with patient's activities, the most challenging issue is identifying which is the suitable surgical technique for each patient. For this purpose, it is crucial to recognize the direction of the instability, as well as the abnormalities responsible for recurrence to be addressed. Zabinski et al. [15] reported the comparative results of revision instability surgery in two groups of patients diagnosed of anterior and multidirectional instability, respectively. They found that persistent Bankart lesions were less common and the presence of hyperlaxity was almost constant in those diagnosed of multidirectional instability and concluded that while revision shoulder stabilization is a reliable procedure for patients who have recurrent anterior instability, it is unpredictable in patients who have multidirectional instability with surgical failure and reoperation occurring frequently.

Clinical history and meticulous physical examination allow identifying the direction of the instability, providing evidence about the possible causes of failure and potential associated lesions [16]. Physical examination should be performed always comparing the index shoulder to the contralateral side. The degree of instability (dislocation, subluxations, or apprehension) is also important information. The apprehension test is

**Table 1.1** Causes of failure of anterior shoulder stabilization

|  |
|--|
| Misdiagnosis   |
| – Surgical treatment not indicated                             |
| – Anatomical abnormalities not identified                      |
| – Direction of instability                                     |
| Patient-related risk factors                                   |
| – Age, sex   |
| – Number of dislocation  |
| – Type of sport  |
| – Concomitant/trigger disease: Epilepsy, Ehlers-Danlos disease |
| Surgery-related risk factors                                   |
| – Technical errors   |
| – Inadequate treatment   |
| – Implant failure: Anchor or graft related                     |
| Trauma after surgery   |
| Unknown causes   |

performed with the arm held at  $0^{\circ}$ – $90^{\circ}$ – $140^{\circ}$  abduction and is considered positive for anterior instability if the patient fears subluxation/dislocation or feels high discomfort during the maneuver. The sulcus sign is considered positive if during inferior traction of the shoulder held in neutral position a “sulcus” between acromion and humeral head is appreciated. A positive painful jerk test suggests postero-inferior labrum tear and a surgical repair should be discussed with the patient [17].

Examination under anesthesia before any revision surgery can be useful since it may overcome the clinical examination limitation due to patient’s apprehension. Mechanical symptoms, such as catching or locking, may suggest a displaced labral tear, a loose body, or a large osseous defect that is engaging. Instability that occurs in the midrange of motion or during the sleep may indicate an osseous defect. Decreased ROM may be secondary to postoperative stiffness, chondrolysis, GH osteoarthritis, or excessive tension of the capsulolabral ligamentous complex. Loss of strength could be related to rotator cuff tear or neurological injury. Accurate rotator cuff testing should be performed, especially with regard to subscapularis muscle function in patients with previous open surgery. Sachs et al. [18] found that 23% of the patients undergoing open Bankart repair had a deficient subscapularis function and only 57% of them obtained good or excellent results after revision surgery.

Conventional radiography (CR) represents the first level of investigation in postoperative shoulder instability and should include outlet view, “true” anteroposterior view, and the axillary view. With the axillary view, we can evaluate anterior or posterior humeral head subluxation and the state bone graft healing.

Magnetic resonance imaging (MRI) with intra-articular contrast medium (MR arthrography, MRA) can be used both in presurgical and postsurgical care for shoulder instability giving a good assessment of capsulolabral-ligamentous complex and to evaluate postoperative recurrence or complication. MRA identifies soft tissue injuries, rotator cuff tears, humeral avulsion of the glenohumeral ligament (HAGL) lesions, capsu-

lolar lesions, chondral lesions, and laxity or rupture of the joint capsule better than standard MRI [19]. MRA in abduction and external rotation (ABER) position is useful to identify patients with atraumatic multidirectional instability. The presence of a layer of contrast medium between the humeral head and the anteroinferior glenohumeral ligament (AIGHL) (crescent sign) combined with a triangular-shaped space between the humeral head, AIGHL, and glenoid (triangle sign) has a sensitivity of 86% and specificity of 94% in diagnosing MDI [20].

Computed tomography (CT) can be used for bone evaluation and in cases in which CR does not give enough information about devices positioning. CT arthrography (CTA) is a valid alternative to MRA when susceptibility artifacts are present.

### 1.1.2 Patient-Related Failure

Several studies have attempted to establish the prognostic factors that may increase the risk of postoperative recurrence following surgical stabilization. Young age and participation in risk activities were identified as major prognostic factors in all of them in addition to the presence of bone defects [21–25]. Age at the first dislocation and male gender have been strongly correlated with a significantly higher risk of recurrent instability after a first dislocation, approaching 80% [21, 26]. Coherently to that, young male patients are more prone to recurrence after primary stabilization [11]. In a study of over 5900 patients, those younger than 20 years had a 12.6% risk of postoperative dislocation and a 7.7% revision rate after primary stabilization, compared to 5.5% and 2.8%, respectively, in patients older than 29 years of age [14]. When compared to adults, young patients usually have higher activity level, more compliant tissue, and decreased muscle bulk. Ninety percent of patients with recurrent dislocations after arthroscopic repair are male [16, 17].

The number of dislocations before stabilization, in addition to the number of previous surgeries, negatively correlates with postsurgical

success [27]. Wasserstein et al. [26] found that patients with three or more dislocations had double the risk for revision surgery and ten times the risk of re-dislocating. Patients with more than one stabilization procedure trended toward lower functional outcomes and less overall satisfaction [28]. These results are likely related to progressive damage tissue.

Collision athletes and contact overhead athletes are more frequently subject to higher energy trauma that can lead to shoulder dislocation and other injuries. In addition, postoperative return to collision sports is associated to a higher risk of new trauma and re-dislocation. Cho et al. [29] and Rhee et al. [30] reported higher instability recurrence rate in active athletes (17.2%) after arthroscopic Bankart repair. Even higher rates are reported in patients who practice collision sports (25–28%). Uhorchak et al. [31] reported outcomes of open Bankart repair, and they found a recurrence of 12% in collision and contact sports athletes. Castagna et al. [32] analyzed the effectiveness of arthroscopic Bankart repair in adolescent athletes who practiced overhead or contact sports at competitive level and reported higher recurrence rate in very high-energy contact sports (rugby) and in high-energy contact sports associated with overhead position of the arm (water polo). Other authors associated contact sports with higher risk of recurrence, but it does not seem to be a contraindication for arthroscopic Bankart repair [33, 34].

Calvo et al. [21] evaluated prospectively 61 patients treated arthroscopically with Bankart repair for recurrent anterior shoulder instability. They developed a risk score for failure of arthroscopic Bankart repair based upon an analysis of the factors that may determine the outcomes (level of satisfaction and degree of stability). Age younger than 28 years, ligamentous laxity, the presence of a fracture of the glenoid rim involving more than 15% of the articular surface, and postoperative participation in contact or overhead sports were associated with a higher risk of recurrence and scored 1, 1.5, and 1 point, respectively. Those patients with a total score of two or more points had a relative risk of recurrence of 43% and should be treated by open surgery. Later, Balg

et al. [22] developed the instability severity index score (ISIS) to predict the success of arthroscopic Bankart repair. The ISIS score ranges from 0 to 10, with higher scores predicting a higher risk of recurrence after stabilization. Six risk factors are considered that can predict a higher recurrence rate: age at the surgery (over or below 20), degree and type of preoperative sport, hyperlaxity, and bone loss studied on CR.

Epileptic seizures can cause shoulder dislocation and instability, but these patients follow a characteristic pattern of instability with peculiar structural lesions. Bühler and Gerber [35] studied 34 shoulders in which initial dislocation had been caused by an epileptic seizure. Fifty percent of them had anterior instability and 50% posterior instability. They also found a higher recurrence rate for anterior instability comparing with posterior instability (47 versus 12%) after primary repair. Most of them were associated to poor control of epilepsy disease. Thangarajah et al. [36] followed up 49 patients with recurrent instability with epilepsy for 15 years: 73% of them showed anterior instability, 15% posterior, and 10% multidirectional instability. Eighty percent of all patients showed bone loss. They identified bone loss and persistent postoperative epileptic seizures as the principal factors for recurrent instability. Epileptic medical control and bone block procedure are associated with lower rate of recurrence.

### 1.1.3 Inadequate Treatment: Anatomic Abnormalities and Technique of Stabilization

Shoulder stabilization surgery should be tailored to the patient and to the specific abnormalities existing in the shoulder. In a cohort of 32 patients surgically revised for recurrent anterior dislocation of the shoulder after surgical repair, Rowe et al. [37] found that an abnormality that had not been adequately addressed and explaining the recurrence could be identified in more than 85% of the patients with postoperative shoulder instability. Moreover, Meeham and Petersen [12] proved in a similar investigation that in almost