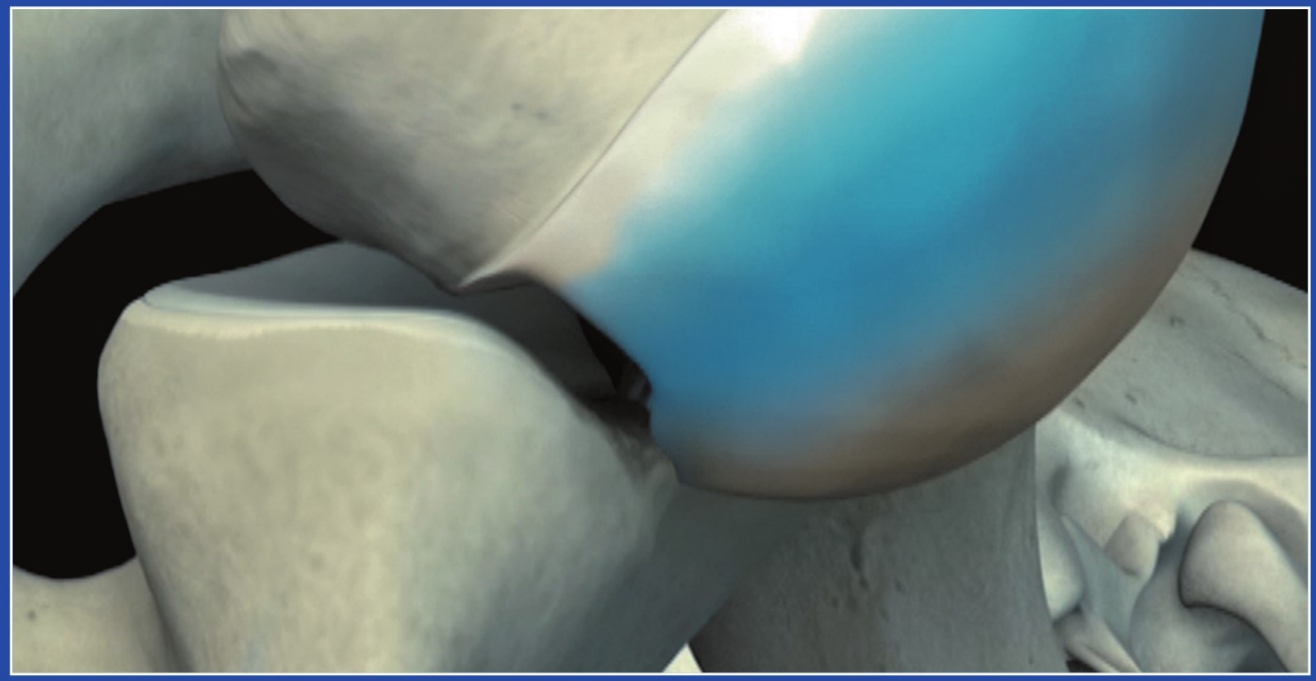
Giovanni Di Giacomo • Alberto Costantini
Andrea De Vita • Nicola de Gasperis

Shoulder Instability

Alternative Surgical Techniques



Forewords by
James C. Esch
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I dedicate this book to all my patients for their trust in me and the opportunities they have offered me over many years.

Giovanni Di Giacomo

To my mentors Giovanni, Alberto, and Andrea. To my parents, and to my wife, Virginia.

Nicola de Gasperis

To my mother Florinda, my father Gelsomino, and my brother Francesco.

Andrea De Vita

I would like to thank my family: Giusy, Andrea, Stefano, and my mother and father for their help and understanding.

Alberto Costantini

Foreword

Arthroscopic instability surgery has created a generation of surgeons who can repair an unstable shoulder by fixing a labrum to bone with suture anchors. Unfortunately, the failure rate ranges from 10% to 40%, especially in young active individuals. Engaging bone loss on both the humeral and glenoid sides as the arm is moved through a range of motion is often the reason for failure. This book offers surgical solutions to this often unappreciated bone loss. Giovanni Di Giacomo treats the reader to a beautifully illustrated, modern update of traditional procedures that address this difficult problem.

Each chapter is authored by experienced surgeons and provides a detailed understanding of the glenoid track as the large humeral ball with a defect moves on the smaller glenoid with bone loss. This is similar to a dented ping-pong ball moving on a golf tee that has a broken edge. Secure glenoid-rim bone-loss repair and fixation is detailed with a choice of using either the coracoid, iliac crest, or distal tibia allograft. Indications and options for humeral fixation range from filling the Hill-Sachs defect with bone to a resurfacing prosthesis. The renewed description of the traditional open surgical repair using, instead, a double-row capsular technique, is particularly interesting.

Shoulder Instability: Alternative Surgical Techniques is a welcome addition to the shoulder surgeon's armamentarium, contributing to awareness for recognizing and treating this difficult problem. Our patients will welcome better results.

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Foreword

The Italian School of Orthopedic Surgery has a long history related to addressing anterior shoulder instability (Putti, Delitala). For 20 years, Giovanni Di Giacomo has been an Italian pioneer of the new era of arthroscopic shoulder stabilization. His work is particularly dedicated to the difficult problem of treating athletes.

Arthroscopic treatment failure is observed in cases of severe bony defects, and it is often after such failure that the surgeon is faced with a difficult dilemma: should the glenoid-bone defect, the humeral defect, or both be treated? Giovanni Di Giacomo, Alberto Costantini, Andrea De Vita, and Nicola de Gasperis present an outstanding collection of surgical techniques by renowned surgeons addressing severe bony defects of the humerus and glenoid.

Di Giacomo and colleagues describe their precise technique of open Latarjet procedure, placing the coracoid with the patient in the lying position and fixing it with two screws and a new ingenious plate to distribute constraints and avoid coracoid nonunion or fracture. Matthew Provencher and colleagues propose two different techniques: the first is an intra-articular bone graft with the tricortical iliac crest contoured to re-establish glenoid cavity and width; the second, original and previously unpublished, uses an allograft of the distal lateral aspect of the tibia that, interestingly, matches the curvature and concavity of the native glenoid. Dario Petriccioli and colleagues propose a modified Eden-Hybbinette procedure using an autogenous tricortical iliac-crest bone graft to compensate for defects involving approximately 30% or more of the glenoid articular surface. Herbert Resch and colleagues propose their J-bone-graft technique to treat bony defects exceeding the width of the rim cortex. A wedge-shaped bone block is harvested from the iliac crest, carefully modelled, and fitted into a preformed crevice of the glenoid neck. Fixation is achieved by impaction, and no metallic screw is used. David Altchek and coworkers describe a beautiful technique with soft tissue repair only. This double-row capsulolabral repair eliminates the need to compensate for the bone defect.

Humeral defects have been analyzed since reports by Malgaigne in the 1830s and Hill and Sachs in the 1940s. Eiji Itoi and colleagues developed an intriguing approach to this defect and describe their new concept of the glenoid track with the purpose of evaluating the size of the Hill-Sachs lesion and glenoid. The glenoid track is a contact zone of the glenoid on the humeral head with the arm at the end range of motion. This approach makes it easier to understand when and how the engaging Hill-Sachs lesion can be considered a main cause of recurrent instability. Anthony Miniaci and Pradeep Kodali propose an original technique to address Hill-Sachs lesions by focal resurfacing of a humeral-head defect with a HemiCAP arthroplasty.

Each technique is meticulously described with the same spirit and plan of helping the orthopedic surgeon to perform it accurately and safely. For each step, the authors provide tips and tricks to facilitate the procedure, as well as possible complications and solutions to address them. Each chapter is richly illustrated with intraoperative color images of each step.

Di Giacomo brought together a talented group of shoulder specialists and must be commended for the exceptional quality of this textbook and congratulated for a job well done. This book will be valuable to all shoulder surgeons facing patients with recurrent anterior shoulder instability with bony defect.

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Preface

Shoulder arthroscopy is an instrument of undisputable success, but the intense use of the technique in recent years, in particular to correct shoulder instability, has revealed limitations that have become the focus of ongoing discussion.

Attention must be given to selecting the surgical patient and correctly interpreting anatomical lesions (bone loss, glenoid track, tissue quality), which seems to be taking us back to open techniques that, perhaps, we began to consider "old" too early.

With the aid of a pool of international experts, this book reviews some of these techniques, which represent a valid alternative to surgical arthroscopy and its failures. We trust it will encourage both younger and older surgeons to return, where necessary, to those procedures that must not be forgotten but, on the contrary, are crucial for the cultural and technical background of those who deal with shoulder pathologies.

Giovanni Di Giacomo

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Chapter 1 – Glenoid Track

Eiji Itoi, Noboyuki Yamamoto and Yasushi Omori

1.1 Classification of Shoulder Instability

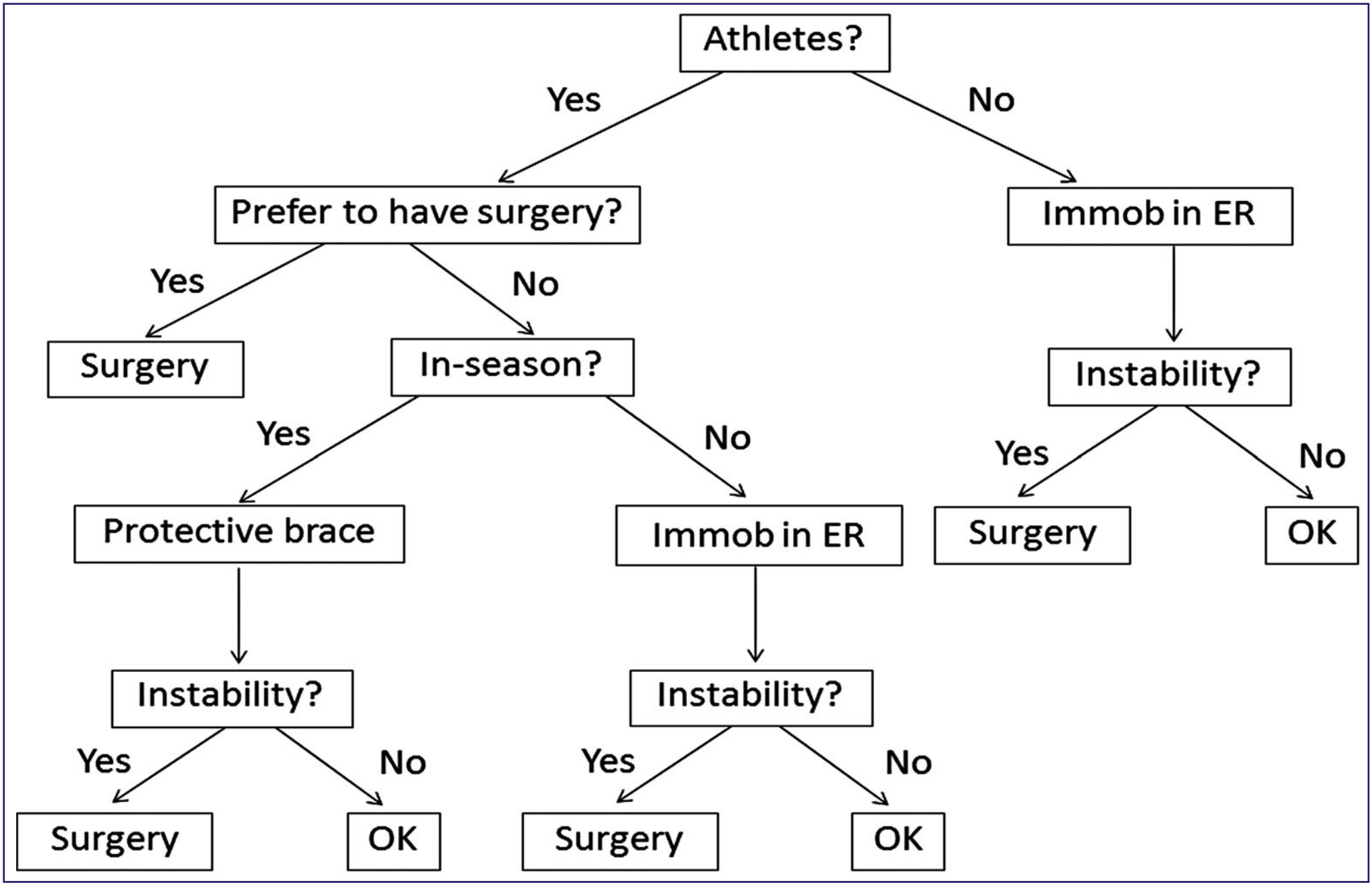
There are two distinct types of shoulder instability: 1) traumatic unilateral instability often with a Bankart lesion and usually requiring surgery (TUBS), and 2) atraumatic, multidirectional laxity, frequently bilateral, responds well to rehabilitation, however, should surgery be performed, an inferior capsular shift procedure is the treatment of choice (AMBRI) [1]. Whereas this classification does not include all types of instability, it does include the two most common types. Another classification that is important to understand is the one based on the position of the shoulder: midrange and end-range instability [2]. When the shoulder is in the mid-range of motion, all capsuloligamentous structures are lax and thus play no role as stabilizers. In this position, the shoulder is stabilized either by the negative intra-articular pressure (hanging-arm position without muscle contraction) or by the concavity-compression effect caused by the muscle contraction force against the glenoid concavity [3]. Any pathology that causes insufficiency in the mid-range stabilizers will cause mid-range instability. For example, if there is a large bony glenoid defect, the concavity-compression effect cannot be fully created, resulting in mid-range instability. Muscle imbalance, which makes it difficult to keep the humeral head centered in the glenoid socket, or enlarged joint volume with a thin joint capsule, which makes it difficult to keep the negative intra-articular pressure, also causes mid-range instability. On the other hand, when the shoulder is at the limit of motion, e.g., in abduction and maximum external rotation and maximum horizontal extension, the anteroinferior capsule becomes tight and plays a role as a stabilizer. This end-range stability deteriorates if there is disruption of the anteroinferior capsule, such as a Bankart lesion. A large Hill-Sachs lesion, which engages with the anterior rim of the glenoid at the end range of motion, is also related to end-range but not to mid-range instability. This concept is very important in order to properly understand the pathophysiology associated with bony defect of the glenoid and the humeral head.

1.2 Algorithm of Treatment

There are various treatment options for the first-time traumatic dislocation of the shoulder. Immobilization in internal rotation has been a standard treatment. However, the recurrence rate could not be reduced with increased rigidity or increased length of immobilization [4]. A new method of immobilization with the arm in external rotation is reported to be more effective in terms of reducing the recurrence rate [5]. There are a few randomized clinical trials reported with positive [6] and negative [7, 8] results. One explanation may be the brace. Some braces are not as efficient as others in keeping the arm in external rotation [9]. The ability of the brace to keep the arm in the intended position is critical. Nagaraj and colleagues used a cast to keep the immobilization position, which is probably the most secure means [6]. This may be the reason their results were superior. Other possible explanations are sample size or how soon the shoulders were immobilized after injury. This treatment, however, is not finalized. Immobilization position and period need to be further studied.

The more dislocation recurs, the more damage occurs in the shoulder joint. This is the reason some doctors recommend stabilization surgery after the initial dislocation [10–13]. However, the number needed to treat for surgical treatment is calculated to be 3.2 [14]. This means if all initial dislocations are treated surgically, two of three patients would undergo unnecessary surgery. In order to avoid this overtreatment, it may be wise to wait for the second dislocation to occur. According to the meta-analysis, there is no difference in recurrence or complication rates between those surgically treated after the initial dislocation and those surgically treated after the second or more dislocations [15]. On the other hand, patients, especially in-season athletes, wish to return to sports as soon as possible. For this purpose, various kinds of protective braces are available. The basic concept of these braces is to limit shoulder motion to prevent abduction and maximum external rotation (apprehension position). Recurrence rate with this protective brace is 38% [16]. Based upon these data, my treatment algorithm is as follows (Fig. 1.1). For

Fig. 1.1. Treatment algorithm. *Immob,* immobilization; *ER,* external rotation


Athletes?
Yes
No
Prefer to have surgery?
Immob in ER
Yes
No
Surgery
In-season?
Instability?
Yes
No
Yes
No
Protective brace
Immob in ER
Surgery
OK
Instability?
Instability?
Yes
No
Yes
No
Surgery
OK
Surgery
OK

in-season athletes, I recommend a protective brace and consider surgical stabilization if the shoulder is unstable after the season.

1.3 Hill-Sachs Lesion

Shoulders with primary or recurrent anterior dislocations often have bony lesions of the glenoid and the humeral head. Bony lesions of the glenoid are observed in 90% of shoulders with recurrent anterior dislocations [17]. A humeral-head lesion, a compression fracture created by the anterior rim of the glenoid when the humeral head is dislocated, is observed in 47–93% of shoulders after a first-time dislocation [18–21] and 77–93% of shoulders with recurrent dislocations [19, 20, 22–24]. The Hill-Sachs lesion is located between 0 mm and 24 mm from the top of the humeral head [25]. Below this level, the Hill-Sachs lesion overlaps with the bare area of humeral head. On the clock face with the bicipital groove as 12 o'clock, the Hill-Sachs lesion is pointing toward 7:58 on average (6:46 at the top and 8:56 at the bottom).

1.4 Surgical Indication for Hill-Sachs Lesion

As mentioned previously, a Hill-Sachs lesion may cause instability with the arm at the end range of motion. If the lesion is wider than the glenoid at the end range of motion, the anterior rim of the glenoid engages with the lesion and causes another dislocation at this position. On the other hand, as the lesion shifts away from the anterior rim of the glenoid in the mid-range of motion, there is no risk of engagement and dislocation. A Hill-Sachs lesion that is covered by the glenoid socket at the end range of motion is safe because there is no risk of dislocation (Fig. 1.2). However, the same lesion is

Fig. 1.2. Relative size of the Hill-Sachs lesion. This lesion (*arrowheads*) is entirely covered by the intact glenoid (*curved arrow*) at the end range of motion. There is no risk of engagement between the glenoid and the lesion