J Shoulder Elbow Surg (2016) 25, e139–e150

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

History of surgical intervention of anterior shoulder instability

David M. Levy, MD*, Brian J. Cole, MD, MBA, Bernard R. Bach Jr, MD

Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, USA

Background: Anterior glenohumeral instability most commonly affects younger patients and has shown high recurrence rates with nonoperative management. The treatment of anterior glenohumeral instability has undergone significant evolution over the 20th and 21 centuries.

Methods: This article presents a retrospective comprehensive review of the history of different operative techniques for shoulder stabilization.

Results: Bankart first described an anatomic suture repair of the inferior glenohumeral ligament and anteroinferior labrum in 1923. Multiple surgeons have since described anatomic and nonanatomic repairs, and many of the early principles of shoulder stabilization have remained even as the techniques have changed. Some methods, such as the Magnusson-Stack procedure, Putti-Platt procedure, arthroscopic stapling, and transosseous suture fixation, have been almost completely abandoned. Other strategies, such as the Bankart repair, capsular shift, and remplissage, have persisted for decades and have been adapted for arthroscopic use.

Discussion: The future of anterior shoulder stabilization will continue to evolve with even newer practices, such as the arthroscopic Latarjet transfer. Further research and clinical experience will dictate which future innovations are ultimately embraced.

Level of evidence: Review Article

Keywords: Anterior glenohumeral instability; dislocation; subluxation; shoulder stabilization; arthroscopic; Bankart

Because of its relative lack of bony limitations and extensive range of motion, the shoulder is the most commonly dislocated major joint in the body.[4,7,120] Anteroinferior instability of the humeral head is the most common pattern, accounting for over 90%.[40] Recurrence after the initial dislocation is common, and young age and activity level are the strongest risk factors.[56,60,132,134] The natural history of shoulder instability was perhaps most effectively illustrated by Hovelius et al[60] in a prospective study of 229 primary dislocations treated nonoperatively. After 25 years of follow-up, 72% of patients originally younger than 22 years had at least 1 recurrent episode of instability, as compared with 27% of patients older than 30 years. Other studies have reported recurrence rates in young athletes as high as 92% to 96%.[122,133,154] Furthermore, young patients who have recurrent dislocations are at greater risk of the development of moderate to severe arthropathies.[15,61] Nearly half of all anterior shoulder dislocations occur in persons aged 15 to 29 years,[160] so operative treatment is increasingly recommended to minimize the risks of recurrence and further complications. Level I evidence suggests that surgical

Institutional Beview Board approval is not required for review articles.

*Reprint requests: David M. Levy, MD, Rush University Medical Center, 1611 W Harrison St, Ste 300, Chicago, IL 60612, USA.

E-mail address: davidlevy42@gmail.com (D.M. Levy).

1058-2746/$ - see front matter © 2016 Journal of Shoulder and Elbow Surgery Board of Trustees.
http://dx.doi.org/10.1016/j.jse.2016.01.019

Table I History of anterior shoulder stabilization surgery

Open procedures
Open anatomic repair
Sutures (Bankart)
Staples
Soft-tissue reconstruction
Fascia lata autograft (Gallie)
Muscular transposition of subscapularis (Magnusson-Stack)
Shortening of subscapularis and anterior capsule (Putti-Platt)
Osseous glenoid reconstruction
Bristow
Latarjet
Iliac crest autograft (Eden-Hybbinette)
Distal tibia allograft
Corrective osteotomy
Proximal humerus (Weber)
Glenoid (Meyer-Burgdorff)
Open capsular imbrication
Laterally based inferior capsular shift (Neer and Foster)
Medially based inferior capsular shift (Altchek)
Vertical capsulotomy
Horizontal capsulotomy
Arthroscopic procedures
Arthroscopic anatomic repair
Staples
Transosseous sutures
Metallic rivet
Bioabsorbable tack
Suture anchors
Arthroscopic capsular imbrication
Thermal capsulorrhaphy
Split and shift
Multi-pleated capsular plication
Posteroinferior capsular plication
Rotator interval closure
Arthroscopic Latarjet
Targeted management of Hill-Sachs lesions
Humeral head or femoral head allograft
Disimpaction
Partial resurfacing arthroplasty
Hemiarthroplasty
Arthroscopic remplissage

stabilization may be indicated for young first-time dislocators.[13,47,67,75] This article describes the history of shoulder stabilization surgery, from its roots as an open procedure to recent arthroscopic innovations (Table I).

Open shoulder stabilization

Open anatomic repair

Bankart[4] first described the "essential lesion" of recurrent glenohumeral instability in 1923. Before his description, anterior dislocations had been largely attributed to excessive capsular laxity and weakness of the surrounding musculature. In addition to capsular plication techniques, Clairmont and Ehrlich[22] had popularized an operation in which a strip of deltoid was transferred to the inferior joint surface to act as a sling maintaining reduction. Bankart, however, felt that focus on capsular laxity and muscle weakness overlooked rupture of the glenohumeral ligament and labrum off the anterior glenoid. Using a technique previously described by Perthes[109] in 1906, Bankart reapproximated his eponymous lesion with silk suture from a subscapularis-splitting approach.

After Bankart's description, anatomic repair of the anterior labrum and inferior glenohumeral ligament (IGHL) remained the mainstay of stabilization surgery for decades. In 1956, similar to Bankart, Du Toit and Roux[29] split the subscapularis parallel with its fibers, but they used barbed staples for their fixation instead of suture. This was perceived as a simpler operation, but 10-year follow-up showed a 12% incidence of staple complications, including articular penetration and loosening with staple migration.[106] Over the 20th century, the surgical exposure evolved from one of subscapularis splitting to a tenotomy and peel-back method for improved visualization. Rowe et al[121] used this approach to drill holes through the anterior glenoid and tie down the avulsed labrum. They reported just a 3.5% recurrence rate in 145 patients.

In a later report, however, Rowe et al[123] found residual Bankart lesions in 84% of instability repairs that required revision. Appropriate anatomic landmarks and fixation methods were not yet fully understood, and an imperfectly anatomic repair failed to restore appropriate IGHL tension. In this context, surgeons began to explore nonanatomic alternatives.

Open soft-tissue reconstruction

By 1948, Gallie and Le Mesurier[36] had concluded that they could not securely fasten the anterior capsulolabral structures in perfect anatomic positioning. They instead devised a soft-tissue reconstruction using tensor fascia lata autograft and a series of drill holes through the scapula, coracoid process, and humerus. The fascia lata graft was passed from posterior to anterior through the scapula and then split to create soft-tissue struts extending to the coracoid and humerus. The authors reported only 7 recurrences in 175 patients, but this technique never achieved enough widespread use because of potential complications from drilling bone tunnels in such precarious locations. Numerous case reports and small series in the past 20 years have presented similar soft-tissue reconstructions using Achilles, hamstring, and tibialis anterior grafts,[2,96,150] but these are now restricted to salvage procedures.

Local soft-tissue transfers proved more popular than the remote autograft of Gallie and Le Mesurier.[36] Magnuson and Stack[89] harkened back to the muscle transfers of the early 20th century when they described their subscapularis muscle transposition in 1943. The Magnuson-Stack procedure transferred the subscapularis attachment from the lesser tuberosity to the greater tuberosity to increase tension across the anteroinferior