

# Anterior Shoulder Ligamentoplasty as a Treatment for Multidirectional Shoulder Instability



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**Abstract:** Multidirectional shoulder instability represents an ongoing challenge for orthopaedic surgeons, and multiple techniques have been described to treat this condition. We present a modified anterior shoulder ligamentoplasty, in which we perform an inferior glenohumeral ligament (IHGL) anteroinferior and posteroinferior plication and, subsequently, an anterior reinforcement ligamentoplasty with an allograft through the subscapularis tendon, with humeral and glenoid fixation. This arthroscopic technique allows shoulder stability in the throwing position, as the humeral head is not uncovered in abduction, and external rotation by ascending the subscapularis tendon.

## Introduction

A multitude of treatment options are available for complex cases of multidirectional instability occurring in patients with traumatic or atraumatic instability and associated multidirectional hyperlaxity.<sup>1-5</sup>

Recurrent shoulder instability complicated by capsular insufficiency due to underlying soft-tissue disorders or multiple prior failed surgical procedures poses a challenging surgical problem.<sup>6</sup> Traditional capsulolabral soft-tissue reconstruction techniques are less effective in this setting, and bony procedures sacrifice normal anatomic relations.<sup>2</sup> Currently, there is an absence of high-level evidence supporting the effectiveness of these methods, and the best treatment option for these patients.<sup>7</sup>

Caspari et al.<sup>8</sup> and Lynch<sup>9</sup> modified the original technique described in 1948 by Gallie and Le Mesurier<sup>10</sup> and performed an inferior glenohumeral ligament (IHGL) replacement ligamentoplasty using fascia

lata allograft. However, the associated recurrence rate of this technique was 20%.

In 1990, Sánchez<sup>11</sup> developed a technique for reinforcement or replacement of the IGHL using a 4-mm Dacron plasty, which solved the problem of resorption associated with the fascia lata technique.

We present a modified arthroscopic technique based on the plasty described by Sánchez,<sup>11</sup> in which we pass the graft through the subscapularis tendon, allowing shoulder stability in the throwing position, as the humeral head is not uncovered in abduction, as well as in external rotation by ascending the subscapularis tendon. (Fig 1).

## Surgical Technique

Our surgical technique is demonstrated in [Video 1](#). The indications and contraindications are shown in [Table 1](#) and, the pearls and pitfalls are summarized in [Table 2](#).

The surgical procedure is performed with the patient under general and locoregional anesthesia (interscalene block) (Fig 2). The patient is placed in the beach chair position with the arm parallel to the body; no traction is used. We begin by placing D and E portals, according to Lafosse's nomenclature<sup>12</sup> (Fig 3). First, we perform a subacromial space inspection and, after that, we access the glenohumeral joint through the rotator interval.

## Inferior Glenohumeral Ligament Plication

The labrum and ligaments are explored, and a large inferior capsular recess is confirmed. A symmetric anteroinferior and posteroinferior plication is performed using two Iconix® 1.4 anchors (Stryker,

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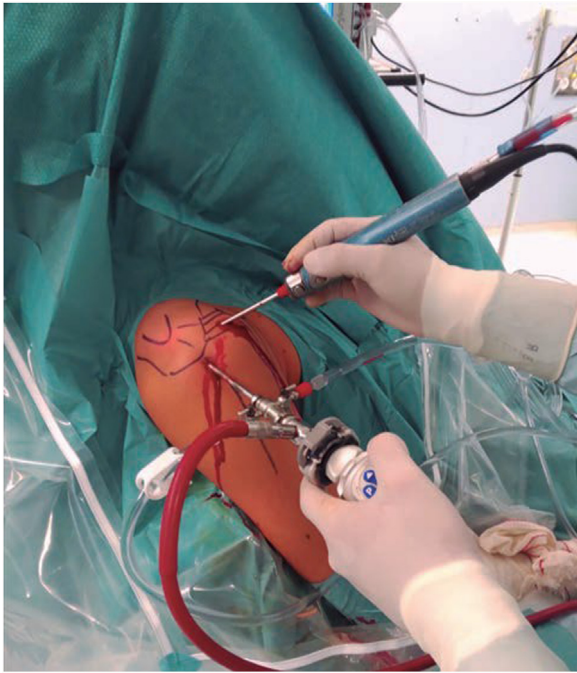
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**Fig 1.** Anterior shoulder ligamentoplasty as a treatment for multidirectional shoulder instability. Beach chair position, right shoulder.

Kalamazoo, MI). The anchorages are positioned at 5 and 7 o'clock, respectively, which are left unknotted. In this way, the intention is to retension the IGHL, both anteriorly and posteriorly, which will be knotted at the end of the ligamentoplasty (Fig 4).

**Humeral Tunnel**

The anterior humeral aspect is visualized through the anterior E portal. The arm position is kept neutral, without traction. We perform, under direct vision, an

inferior J portal, which will be used to perform the humeral tunnel. The space between the long head of the biceps, pectoralis major, and latissimus dorsi is dissected (Fig 5). Caution should be taken with the radial nerve that runs over the latissimus dorsi. The isometric point of fixation of the graft is located 1 cm medial to the bicipital groove and cranial to the latissimus dorsi. At this point, care must be taken with the “three sisters” on the underside of the subscapularis tendon, as the point of fixation of the graft is inferior to them, between the subscapularis and latissimus dorsi. Through a 2.3-mm Iconix anchor guide, a Beath pin is inserted superiorly toward the posterior angle of the acromion, avoiding possible axillary nerve injury in the humeral neck (Figs 6 and 7). The humeral cortex is drilled to a thickness of 7 mm and a depth of 25 mm and, a suture is left to subsequently transport the graft.

**Glenoid Tunnel**

Through the vision D portal, we dissect the conjoint tendon, and, medial to it, the glenoid is prepared for the reception of the graft. We use an M portal to have a good angle at the glenoid, given the scapular anteversion. At approximately 3 o'clock in the glenoid and 1 cm medial to the glenoid rim, we place a Beath pin, and through it, we drill a 7-mm diameter tunnel (Fig 8). The glenoid tunnel is continued until it exits the posterior glenoid, care must be taken not to damage the glenoid articular surface. We leave a transporter suture in the tunnel.

**Subscapularis Tendon Split**

Through the M portal (and similar to the Latarjet technique described by Dr. Lafosse)<sup>12</sup>, we perform the subscapularis split, which must be sufficiently wide in the medial area, so as not to restrict external rotation.

**Table 1.** Indications and Contraindications for Anterior Shoulder Ligamentoplasty as a Treatment for Multidirectional Shoulder Instability

Indications	Contraindications
<ul style="list-style-type: none"> <li>• Traumatic or atraumatic instability with associated multidirectional hyperlaxity, positive sulcus, and a large inferior recess</li> <li>• Recurrent shoulder dislocation with multidirectional hyperlaxity</li> <li>• Failure of other techniques with “poor tissue quality”</li> </ul>	<ul style="list-style-type: none"> <li>• Significant bone loss in the glenoid greater than 25%</li> </ul>

**Table 2.** Pearls and Pitfalls of Using Anterior Shoulder Ligamentoplasty as a Treatment for Multidirectional Shoulder Instability

Pearls	Pitfalls
<ul style="list-style-type: none"> <li>• Infiltrate local anesthetic with 1:200,000 adrenaline under the coracoid to reduce bleeding.</li> <li>• Use percutaneous portals to reduce turbulence.</li> <li>• Approach through the rotator interval with the superior view and anterior dissection</li> </ul>	<ul style="list-style-type: none"> <li>• Humeral or glenoid fracture during tunnel drilling</li> <li>• Radial nerve injury when we drill the humeral tunnel</li> <li>• Musculocutaneous nerve injury during medial dissection</li> <li>• Axillary nerve injury when we perform the subscapularis tendon split</li> <li>• Circumflex artery injury during humeral tunnel drilling, as it is performed just caudal to it</li> </ul>



**Fig 2.** Patient in the beach chair position; no traction used.

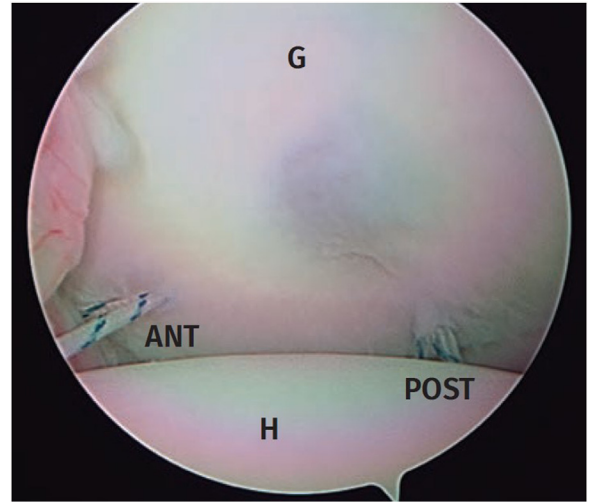
At this point, care must be taken with the axillary nerve on the anterior aspect of the subscapularis tendon when dissecting it medially. Through the split, the glenoid transporter suture is retrieved.

**Graft**

We use a tibialis anterior tendon allograft, with a length of 10 cm and a thickness of 7 mm. The graft is inserted into the humerus and fixed with a 7 × 23 mm interference screw (Stryker, Kalamazoo, MI) (Fig 9). After this, through the split, we insert the allograft into the glenoid socket and fix it with 7 × 23 mm interference fixation (Stryker, Kalamazoo, MI) (Fig 10). The graft replicates the IGHL, superiorly through the



**Fig 3.** Arthroscopic portals. Viewing portal D. Initial working portal E.



**Fig 4.** Beach chair position, left shoulder. View portal D. Placement of lower anchors. ANT, anterior anchor; G, glenoid; H, humeral head; POST, posterior anchor.

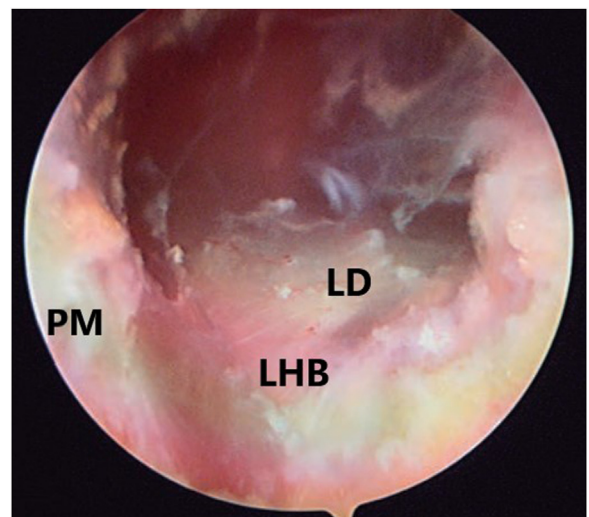
subscapularis tendon, and it is fixed at 45° of external rotation and 45° of abduction (Fig 11).

**Inferior Glenohumeral Ligament (IGHL) Plication**

Once the allograft is fixed, the glenoid anchor knots are tied (Fig 12), thus reducing the inferior capsular redundancy.

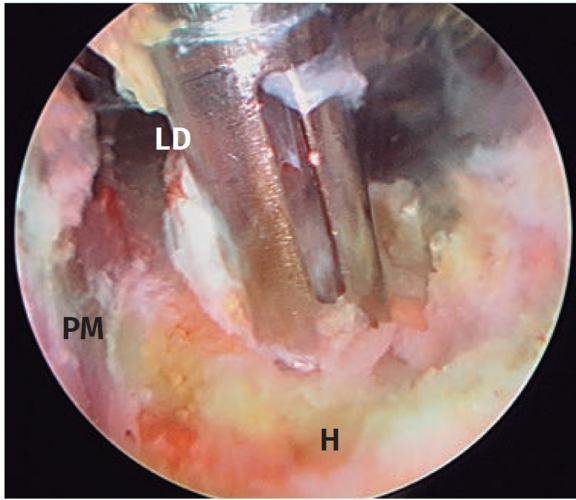
**Postoperative Management**

The patient must wear a sling for 2 weeks, which can be removed for eating and grooming. Two weeks after surgery, the rehabilitation is started. Passive and self-



**Fig 5.** View from portal E, left shoulder, beach chair position. The space where the humeral tunnel will be made is observed. LD, latissimus dorsi; LHB, long head of the biceps; PM, pectoralis major.



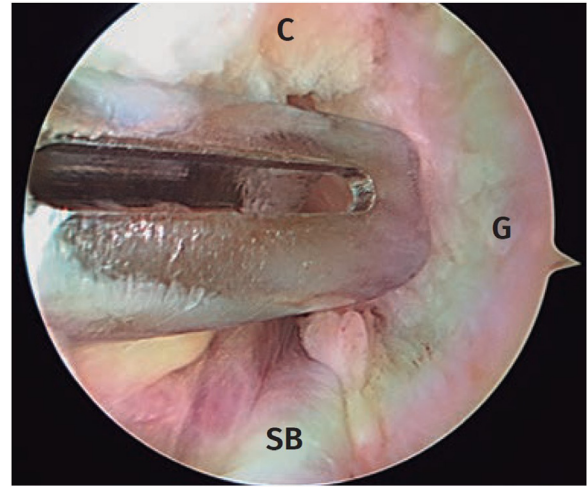


**Fig 6.** View from portal E, left shoulder. Placement of the guide to perform the humeral tunnel. H, humeral diaphysis; LD, latissimus dorsi; PM, pectoralis major.

assisted exercises are started after 15 days, active exercises after 4 weeks, and, stretching and muscle strengthening after 3 months.

### Discussion

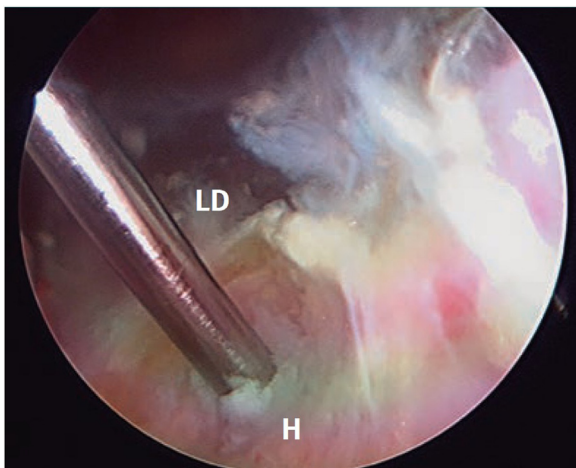
The “at-risk” position for shoulder instability is the throwing position in abduction and external rotation, in which the subscapularis tendon exposes the underside of the humeral head, leaving only the labrum and anteroinferior capsule to stabilize the joint. In patients with IGHL deficit and capsular hyperlaxity, a banal movement is enough to cause joint subluxation. Capsulolabral plication, and rotator interval closure techniques may not be sufficient due to the poor tissue quality in these patients, so ligamentoplasties play an



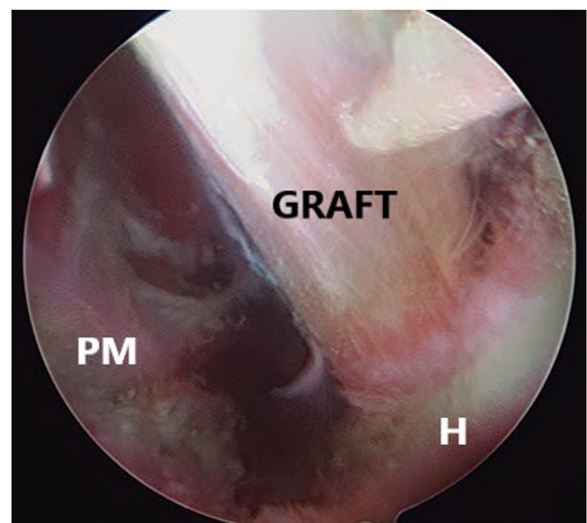
**Fig 8.** View from portal D, left shoulder, beach chair position. The guide is placed to drill the glenoid tunnel through portal M medial to the joint tendon. C, coracoid; G, glenoid; SB, subscapularis.

important reconstructive role. Boileau et al.<sup>13</sup> describes the Bristow arthroscopic technique, combining a Bankart repair with the transfer of the conjoint tendon cranial to the subscapularis tendon into the glenoid to descend the subscapularis tendon in “at-risk” positions.

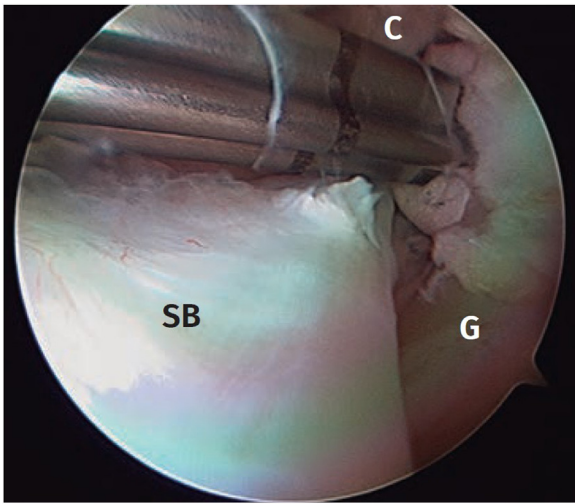
Anterior capsular reinforcement ligamentoplasty described by Sánchez<sup>11</sup> has shown excellent results, confirmed in the article by Cuellar et al.<sup>14</sup> Thus, we present this modification of their technique, combining inferior plication and anterior ligamentoplasty, using allograft, avoiding the need for coracoid osteotomy. By passing the graft through the subscapularis tendon, the IGHL is reconstructed, and a tenodesis effect is achieved enlarging the inferior brace in the abducted position.



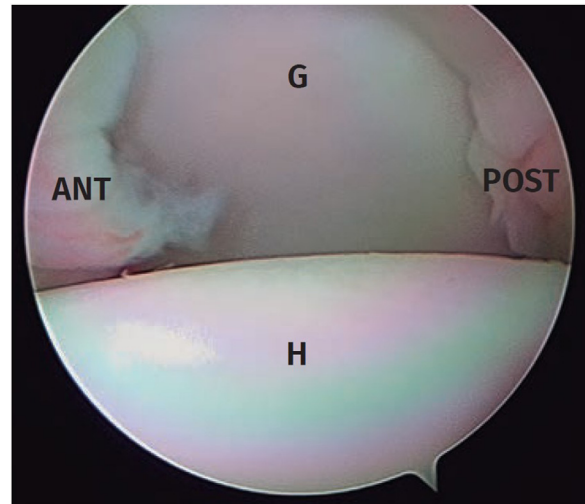
**Fig 7.** View from portal D, left shoulder. Beach pin in position. H, humeral diaphysis; LD, latissimus dorsi.



**Fig 9.** View from portal E, left shoulder, beach chair position. Introduction of the graft into the humeral tunnel. H, humeral diaphysis; PM, pectoralis major.



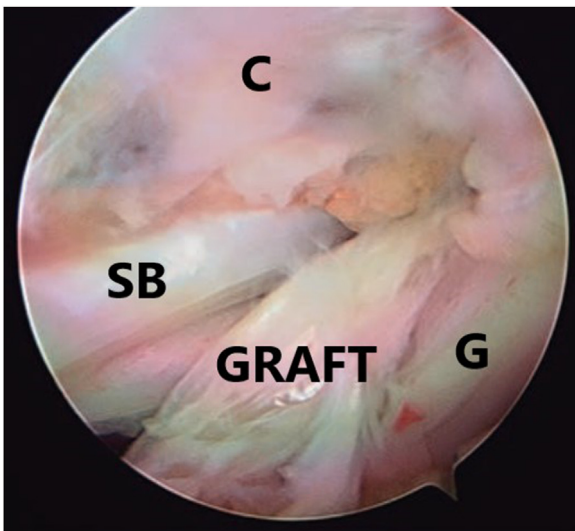
**Fig 10.** View from portal D, left shoulder, beach chair position. Introduction of the interference screw into the humeral tunnel through portal M. C, coracoid; G, glenoid; SB, subscapularis.



**Fig 12.** View from portal D, left shoulder, beach chair position. Shoulder centred after suturing the lower anchors. ANT, anteroinferior closure; G, glenoid; H, humeral head; POST, posteroinferior closure.

The main limitation of this technique is its high complexity. It is necessary to be an expert shoulder arthroscopist to be able to perform it reproducibly and safely.

The main advantage of this technique comes from passage of the graft through the subscapularis tendon, which allows shoulder stability in the throwing position, as the humeral head is not uncovered in abduction, and external rotation by ascending the subscapularis tendon. Another final advantage is the arthroscopic execution of the technique.



**Fig 11.** View from portal D, left shoulder, beach chair position. Graft in transscapular position. C, coracoid; G, glenoid; SB, subscapularis tendon.

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