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Posterior shoulder instability managed by arthroscopic acromial pediculated bone-block. Technique

P. Métails^{a,*}, J. Grimberg^b, P. Clavert^c, J.-F. Kouvalchouk^d, F. Sirveaux^e, G. Nourissat^f, J. Garret^g, P. Mansat^h, A. Godenècheⁱ, the French Arthroscopy Society

^a Service de chirurgie du membre supérieur, hôpital privé La Châtaigneraie, 63110 Beaumont, France

^b IRCOS, 6, avenue Alphonse-XIII, 75016 Paris, France

^c Service de chirurgie du membre supérieur, avenue Baumann, 67400 Illkirch, France

^d Hôpital Foch, 40, rue Worth, 92151 Suresnes, France

^e Centre chirurgical Emile-Gallé, CHRU de Nancy, 49, rue Hermite, 54000 Nancy, France

^f UPMC Inserm UMRS938, clinique des Maussins, 67, rue de Romainville, 75019 Paris, France

^g Clinique du Parc, 155 ter, boulevard Stalingrad, 69006 Lyon, France

^h Département d'orthopédie-traumatologie, hôpital Riquet, CHRU-Purpan, place du Dr-Baylac, 31059 Toulouse, France

ⁱ Hôpital privé J.-Mermoz (Ramsay-GDS), centre orthopédique Santy, 69008 Lyon, France

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In posterior shoulder instability (recurrent dislocation, involuntary posterior subluxation or voluntary subluxation that has become involuntary), surgery may be considered in case of failure of functional treatment if there are no psychological contraindications. Acromial bone-block with pediculated deltoid flap, as described by Kouvalchouk, is an alternative to iliac bone-block, enabling triple shoulder locking by the blocking effect, the retention hammock provided by the deltoid flap and posterior capsule repair. Arthroscopy allows shoulder joint exploration and diagnosis of associated lesions, with opening and conservation of the posterior capsule; it greatly facilitates bone-block positioning and capsule reinsertion. The present report describes the procedure in detail.

Level of evidence: Technical note.

1. Introduction

In posterior shoulder instability (recurrent dislocation, involuntary posterior subluxation or voluntary subluxation that has become involuntary), the first-line option is functional treatment by adapted rehabilitation based on recentering the humeral head and on muscle reinforcement [1,2].

In case of failure of functional treatment, if there are no psychological contraindications, surgery may be considered to treat capsulolabral lesions, which may or may not be associated with bone lesions. The main procedures are capsulolabral reconstruction [3–5], filling reverse Hills-Sachs lesion [6,7], and iliac bone-block [8–13].

Acromial bone-block with pediculated deltoid flap, described by Kouvalchouk [14], is an alternative to iliac bone-block, presenting the same mechanical requirements as the coracoid bone-block

described by Latarjet and Patte and Debeyre [15–17] for anterior instability. It enables double shoulder locking by bone augmentation and a muscular hammock effect. The glenoid is reconstructed or augmented and the capsule is reinforced. Triple locking can be achieved by associating capsule reinsertion on the posterior edge of the glenoid.

With the advent of arthroscopic surgery, it seemed useful to suggest an improvement to this technique:

- minimal posterior approach, to dissect and harvest the bone-muscle graft;
- arthroscopy, to explore, open and conserve the posterior capsule;
- to facilitate bone-block positioning and capsule reinsertion.

The first arthroscopic acromial pediculated bone-blocks for posterior instability were performed as part of the 2016 symposium of the French Society of Arthroscopy (SFA).

The present study describes the procedure in detail.

* Corresponding author.

E-mail address: pierremetails@epaulemain.fr (P. Métails).

2. Technique

The SFA symposium demonstrated that posterior shoulder instability could be managed by bone-block stabilization, of which acromial pediculated bone-block is one variant.

2.1. Patient positioning

Surgery is performed under general anesthesia and locoregional anesthesia by interscalene nerve block, with the patient semi-seated (45°) with the shoulder off the table so as to leave the scapular belt free (Fig. 1). The arm can be positioned according to the surgeon's habits, on a simple support, with or without traction, or on an articulated arm. The sterile drapes are as in standard shoulder arthroscopy.

Bone relief is outlined: acromion and acromial spine, acromioclavicular joint and glenohumeral joint line projection.

2.2. Harvesting step

The harvesting step is basically as described by Kouvalchouk [14].

A 5 cm longitudinal incision is made over the joint line. After dissection of subcutaneous tissue, the superficial sides of the deltoid muscle and acromion are easily released. The bone-harvesting site is marked. Harvesting begins at the posterolateral angle of the acromion, taking a 2.5 cm long block. Harvesting may be shifted slightly medially, depending on acromion and shoulder morphology, but in that case the site is closer to the spine, with greater risk of fracture. Depth is about 1.5 cm and thickness about 0.5 cm, although this may be varied as the anterior and inferior acromial cortex has to be spared. Based on these marks, the deltoid flap is dissected and freed with a 2.5 cm width from the acromion toward the humeral insertion, with a height of 5 cm. It is essential to spare the deltoid insertion on the acromion.

Harvesting is cautious, using a saw and/or bone chisel, respecting an inferior tablet and the anterior cortex. The bicortical graft is mobilized to complete release of the deep side of the deltoid from the subacromial-subdeltoid bursa (Fig. 2).

2.3. Arthroscopy step

The posterior portal is classical, using the posterior incision made for the bone-block harvesting. After thorough exploration, an anterior optical portal is performed through the rotator interval.

Lesions causing posterior instability are identified. The posterior capsule is released from the posterior edge of the glenoid cavity and conserved. The bone surface is rasped, to be flat and regular and congruent with the acromial bone-block.



Fig. 1. Drawings of anatomic landmarks.



Fig. 2. Acromial bone-block and deltoid pedicle.



Fig. 3. Bone-block fixed to ancillary handle.

2.4. Positioning step

Arthroscopy facilitates positioning the bone-block, which is fixed onto the glenoid by 2 titanium screws (HCS 4.5, Synthes). An ancillary (Arthro-Latarjet, DepuyMitek, Raynham, MA) may be used, especially in the early learning curve, but is not essential.

The posterior portal serves to pass the bone-block and should be enlarged by simple soft-tissue dissection along the infraspinatus muscle fiber axis, by finger, forceps or dissection scissors.

Two K-wires are positioned in the bone-block, not penetrating beyond the cancellous side. The bone-block is drilled by a 3.2 mm cannulated bit and fixed to the double cannula by the 2 dedicated long screws of the ancillary. It can thus be easily mobilized (Fig. 3).

The bone-block is passed through the posterior plane under extra- and intra-articular control and positioned touching or slightly overlapping the glenoid. The height can be that of the lesions observed on arthroscopy, or the mid-third and inferior third of the glenoid. Once it has been well positioned, the 2 K-wires are pushed into the posterior glenoid cortex and fixed to the anterior cortex, without perforating it. Drilling uses the 3.2 mm cannulated bit and screwing is performed after measuring the length of the screws (HCS 4.5 Synthes), providing compression and locking, until the heads are sunk. Distal screwing is performed only in the second cortex and should not penetrate beyond (Fig. 4).

Screw-head position is checked with a finger or by the arthroscope introduced via the posterior portal until it touches the screwdriver to allow extra-articular visualization if the flap prevents an intra-articular view of the screws (Figs. 5–6).

2.5. Capsule reinsertion step

The arthroscope is introduced via the anterior portal, using the existing approaches. One or 2 anchors are positioned on the posterior side of the glenoid, slightly involving the cartilage surface, to



Fig. 4. Intra-articular view of acromial bone-block and deltoid pedicle.



Fig. 5. CT, sagittal slice.



Fig. 6. CT, horizontal slice.

allow capsuloplasty or capsule reconstruction by anchored sutures, following the usual arthroscopic technique.

2.6. Closure and postoperative care

We do not perform closure of the muscle plane, but suture the cutaneous and subcutaneous planes, without drainage. The patient

is immobilized on a cushion in 20° abduction and 0° external rotation for 3 weeks, then without abduction or any particular rotation for a further 3 weeks: i.e., 6 weeks in all. Early protected rehabilitation is initiated on the day after surgery, without exceeding the pain threshold or any passive or active internal rotation for the first 6 weeks.

3. Discussion

Posterior instability surgery depends on the patient (age, hyperlaxity, sports, occupation, history, etc.), the anatomic lesions (ligament, bone) and the surgeon's experience.

There are several treatment options: capsulolabral reconstruction [3–5], filling reverse Hills-Sachs lesion [6,7], glenoid osteotomy [18,19], posterior iliac bone-block [8–13], non-pediculated acromial bone-block harvested from the spine [20,21], or acromial pediculated bone-block [14,22,23].

Acromial bone-block with deltoid pedicle for posterior stabilization was first described in 1993 by Kouvalchouk [14]. It reorients the joint surface and prolongs or replaces the posterior glenoid edge, overlapping it or not [22]. Half of the cancellous thickness is harvested and the cancellous surface is in contact with the glenoid. There is only one surgical site, avoiding the morbidity associated with iliac harvesting [24]. The muscular pedicle may ensure vascularization, favoring bone healing and limiting bone lysis, although this is only a hypothesis.

The deltoid flap is intended to be the posterior equivalent of the conjoint tendon, actively promoting humeral head recentering. Adduction and internal rotation (backward dislocation) tenses the deltoid band, which thus acts as a retention hammock and reinforcement of the posterior capsule. Several studies have shown that the conjoint tendon hammock effect increases joint stability and is essential to anterior stabilization [25,26].

Triple locking is possible, by posterior capsulolabral reinsertion, and is recommended in case of hyperlaxity and associated posteroinferior instability [23]. If the notch exceeds 25% of the size of the humeral head, Kouvalchouk recommends an associated procedure [22].

There are only two articles, reporting clinical results in small cohorts:

- Kouvalchouk et al. [22]: 11 patients operated on, with 2 failures (1 psychiatric case and 1 with previous posterior Bankart procedure then glenoid osteotomy). Nine patients were stable at 5.5 years' follow-up;
- Sirveaux et al. [23]: 9 acromial pediculated bone-block procedures (mean 3.5 years' follow-up) compared to 9 iliac bone-block procedures (mean 13.5 years' follow-up). Duplay score and return to sport seemed better with acromial pediculated bone-block.

This technique, improved by arthroscopy, entails certain difficulties one needs to be aware of:

- bone harvesting should respect acromial architecture, to avoid graft fracture. Postoperative acromial fracture may occur, due to fatigue in the residual bone hinge if harvesting is excessive or too medial;
- the muscular flap should remain attached to the bone-block. Painstaking surgery easily ensures a fine pedicle;
- deltoid and infraspinatus dissection should protect and spare the axillary and suprascapular nerves [27–29];
- bone-block positioning on the posterior edge of the glenoid requires close attention. Lesions of the glenoid rim and posterior labrum should be analyzed and corrected. Screwing requires close attention. Glenoid retroversion should be anticipated, to

avoid intra-articular damage. The anterior cortex should not be pierced, so as not to injure the brachial plexus. Screw-heads should be sunk sufficiently to avoid inducing pain.

4. Conclusion

The present study is part of an exhaustive project by the French Society of Arthroscopy assessing management of posterior instability; the 2016 symposium showed the benefit of bone-block stabilization, of which acromial pediculated bone-block is one variant.

There are too few reported series for it to be possible to analyze the advantages of acromial pediculated bone-block, but published results suggest that the technique should be considered and that arthroscopy undoubtedly provides precious help and renewed attractiveness, reducing surgery time by facilitating bone-block positioning on the glenoid and capsulolabral reconstruction, and allowing exploration and treatment of associated pathologies.

Acromial pediculated bone-block meets the conditions for good-quality stabilization by triple locking: glenoplasty, hammock effect and capsulolabral reconstruction. It is an option for treating posterior instability of the shoulder.

Disclosure of interest

P.M.: occasional consultancy for DepuyMitek.

The authors J. Grimberg, P. Clavert, J.-F. Kouvalchouk, F. Sirveaux, G. Nourissat, J. Garret, P. Mansat, A. Godenèche have not supplied their declaration of competing interest.

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