Review of techniques and outcomes in arthroscopic shoulder stabilisation

Kapil Kumar & Tauras Valevicius

Recurrence instability of the shoulder is common, with an incidence of up to 90% following a primary traumatic anterior dislocation. Surgical attempts to address recurrent instability of the shoulder have evolved from initial anterior soft tissue repairs or bone block procedures. However, these procedures were associated with a high complication rate, with reduced external rotation and arthritis.

Bankart described reattachment of the glenoid labrum with sutures. This is the basis of most modern techniques.

Evolution of arthroscopic techniques

With the advent of arthroscopy and development of arthroscopic surgical techniques in knee surgery, arthroscopy was adopted by shoulder surgeons. Initial use was limited to using the arthroscope diagnostically to better understand shoulder instability. Therapeutic arthroscopic procedures developed with capsular stapling, labral reattachment with transosseous sutures and the use of rivets. Nevertheless, even in the hands of experienced surgeons, these procedures had a high failure rate. A survey of members of the Arthroscopy Association of North America in 1986 revealed the procedure with the highest complication rate was the anterior staple capsulorrhaphy of the shoulder.

Use of staples and transglenoid sutures were technically challenging and associated with high rates of iatrogenic injury to the articular surface and neurovascular structures.

Warren designed an absorbable fixation device, which reattached the capsule-labral complex to the anterior glenoid.

Figure 1: Suretac device. Printed with permission by DM Levy.
The advantages included avoiding metal around the join and that the implant was resorbed. It also avoided the need to drill the posterior glenoid. Although initial results were encouraging, it was associated with a high failure rate in the long term. Warner et al. found residual anchor material and a chronic indolent inflammatory reaction in some cases six months after surgery.

Suture anchors

The development of suture anchors acted as a catalyst to the development of arthroscopic shoulder stabilisation. Anchors offer a number of advantages including multiple points of fixation, no posterior glenoid penetration, and a pull out strength comparable to sutures. Arthroscopic stabilisation using suture anchors gives satisfactory results with recurrence rates between 5% and 8%. In a systematic review of long-term outcomes after Bankart shoulder stabilisation Harris et al. reported an 8.5% incidence of recurrent dislocation and 4% subluxations following arthroscopic surgery, although if apprehension was included, the recurrence rate was 24% in the arthroscopic group, compared to 18% in the open group. However, Kim et al. reported recurrence rates of around 10% after both arthroscopic and open surgery, including apprehension.

Anchor material

A variety of materials have been used for suture anchors. Metal anchors provide strong fixation, are relatively easy to insert, and are easily visualised on plain radiographs. However, they cause interference on CT or MRI scanning, and can also cause significant chondral damage if they become prominent or loose.

Some of these problems can be avoided by using bioabsorbable anchors. These are commonly made from polyglycolic acid (PGA) or poly-lactic acid (PLLA). Most modern bioabsorbable anchors have pull out strengths similar to metallic anchors. They are easy to revise, eventually resorb, and produce less artefact on an MRI scan. However, complications such as osteolysis, cyst formation, chondrolysis, synovitis and implant failures have been reported.

Biocomposite anchors combine traditional bioabsorbable polymer with osteoconductive calcium. As the absorbable polymer resorbs the osteoconductive calcium encourages bone to fill in. Barber et al. reported complete degradation of a biocomposite anchor used for rotator cuff repair at three years, with nearly complete or complete osteoconductivity in 50% cases.

Non-bioabsorbable and non-metallic materials have also been used in the manufacture of bone anchors. Polyetheretherketone (PEEK) is a chemically resistant crystalline thermoplastic. PEEK anchors are strong. They can be drilled out for revision. However, as they are radiolucent they can be difficult to localise if they dislodge and, for example, cause chondral damage.

Traditionally, labral fixation is performed using knotted sutures. Every fixation point is independent and the number of fixation points can be varied (Figure 2).

Boileau et al. reported that patients who had three or fewer anchors were at higher risk of recurrent instability.

Some in vitro studies suggest that horizontal mattress sutures reduce the loss of labral height. Double loaded suture anchors have more potential to reduce laxity in capsulolabral complex, although there is no evidence of clinical benefit. With knotted anchors there is the potential for knot laxity, knot impingement and cartilage damage. To avoid the issues with knots, knotless anchors were developed and are being used increasingly.

However, no clinical difference between knotted or knotless implants has been reported. Concerns about knot loosening, possible chondral injury from knot stack and failure of fixation remain.

Using bone anchors leads to concentrated point loading of the labrum at the fixation points. Osterman et al. have described the labral bridge technique.

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This technique aims to provide secure fixation with uniform pressure distribution of the entire labrum. With improvement in arthroscopic techniques, attempts have been made to restore the anatomical footprint of the joint capsule and labrum. Double row or double mattress techniques have been used to fix the labrum and capsule with good results. They are theoretically superior, although the techniques are more technically demanding.

Bone loss

Bone loss following traumatic instability of the shoulder has been reported in up to 90% of cases. These could be on the humeral side (Hill-Sachs lesion), on the glenoid or both (bipolar). Size and location of a Hill-Sachs defect and its relation to the Glenoid track has been shown to be a predictor of outcome in arthroscopic labral repair. Various techniques have been used to address humeral head bone loss including allograft, open or percutaneous disimpaction, resurfacing and hemiarthroplasty. One of the most commonly used techniques to address bone loss on humeral side is remplissage. This technique aims to convert the intra-articular bone defect extra-articular by posterior capsulotenodesis, including the infraspinatus tendon, to fill the Hill-Sachs lesion. However, remplissage can limit internal and/or external rotation of the shoulder by up to 11°, although in athletic population return to sports has been reported in up to 96% at seven months postoperatively.

Capsular procedures

The glenohumeral joint capsule can be affected by dislocation. Increased laxity of the capsule and joint volume are important factors contributing to the stability of the joint. In multidirectional instability with significant capsular stretching or laxity, anterior or posterior capsular plication can be performed with good results. Thermal or laser assisted capsule shrinkage (capsulorrhaphy) has been used. It has become less popular as there is a significant reoperation rate and high risk of chondrolysis. Use of rotator interval closure is also controversial. There is no biomechanical or clinical evidence to support its use. However, it is still used in patients with hyperlaxity, and some authors recommend it as a treatment of choice in non-traumatic anterior shoulder instability.

References

References can be found online at www.boa.ac.uk/publications/JTO or by scanning the QR Code.
References


