TECHNICAL NOTE

Posterior Shoulder Instability: The Augmented McLaughlin Procedure

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Abstract

Posterior shoulder dislocation, whilst uncommon, is frequently missed and often associated with a significant defect on the antero-medial aspect of the humeral head (the reverse Hill-Sachs lesion). Several techniques for stabilisation have been described, depending on the size of the lesion. We describe an additional technique for stabilising the shoulder following posterior dislocation by augmenting the reverse Hill-Sachs lesion with layers of extracellular matrix, thus further filling the defect.

Level of evidence: V

Keywords: All suture anchor, Extracellular matrix, McLaughlin procedure, Posterior dislocation, Reverse hill-sachs

Introduction

Posterior shoulder dislocation was first described almost 200 years ago by Sir Astley Cooper (1). Despite this and improved technology and imaging, the diagnosis of posterior dislocation may be missed in up to 79% of cases, hence, shoulder clinicians continue to see patients with chronic posterior shoulder dislocations (2). Management is challenging as these are often associated with bone loss and possible complications include persistent instability, avascular necrosis, degenerative changes and rotator cuff dysfunction. Treatment options include closed reduction and open reduction, which may be combined with capsular plication, subscapularis tendon transfer (McLaughlin procedure), lesser tuberosity transfer (Modified McLaughlin procedure), bone grafting and various arthroplasty options, including hemiarthroplasty, total anatomical and reverse shoulder replacement. The McLaughlin procedure and its modifications are generally utilised when the humeral bone loss is less than 50% of the articular surface, whereas bone grafting or arthroplasty are preferred in the presence of significant humeral bone defect (3). In this article we describe a further modification of the McLaughlin procedure, where, in addition to the subscapularis transfer, the humeral defect is filled and augmented with 2 layers of extracellular matrix patch using all suture anchors, with the aim of reducing risk of subsequent instability.

Technical Note

The procedure is performed with the patient in the beach-chair position, under general anesthesia combined with an interscalene nerve block. An image intensifier is also utilized to ensure adequate reduction of the dislocated humeral head.

Approach

A deltopectoral approach is used with a vertical incision from the tip of the coracoid and extending 4 to 5 cm. The cephalic vein is identified and taken laterally. There is usually a medial branch to the cephalic vein which is ligated. The interval between deltoid and pectoralis major in opened and maintained with a self-retaining retractor and a Hohman retractor over the top of the corocoid process. Release of the subdeltoid, subacromial,

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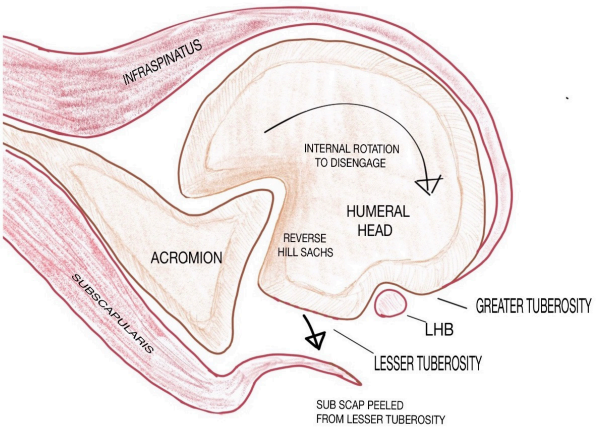

Figure 1. Axial view: The subscapularis is peeled from the lesser tuberosity. The long head of biceps (LHB) can be used to orientate the surgeon. Internal rotation may be needed to disengage the humeral head from the acromion.

and subcoracoid spaces optimises exposure to the subscapularis.

The conjoint tendon, superior and inferior border of the subscapularis muscle and the long head of the biceps tendon in the bicipital groove are identified. Sutures are placed in the subscapularis tendon to aid retraction.

A "subscapularis peel" technique is used to release subscapularis from the lesser tuberosity where the subscapularis and muscle insertion is removed directly from the lesser tuberosity beginning at the medial border of the bicipital groove using a sharp dissection [Figure 1] (4). As the humeral head is dislocated posteriorly, it may on occasions be difficult to find the subscapularis

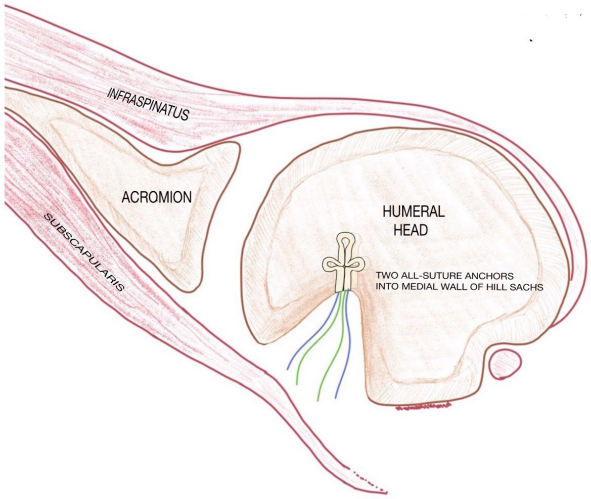

Figure 2. Axial view: Two Iconix, Stryker 2.3mm Double-stranded all suture Anchors are placed in the deepest part of the Hill-Sachs lesion, one superior, one inferior, 1.5-2cm apart. Note figure shows cross section through one anchor.

insertion into the lesser tuberosity. Identification of the long head of biceps and the bicipital groove should aid the navigation. The anterior joint capsule is also released in a similar fashion.

Humeral Head Reduction

The joint can now be visualised and an attempt is made to reduce the dislocated humeral head. This is aided by internal rotation of humeral head to disengage the humeral head defect from the glenoid rim and appropriate soft tissue release [Figure 1]. Following this, an elevator is placed into the joint to gently lever the head into glenoid and once the head is lateralised to the level of the glenoid, it is reduced by again gentle rotation.

Preparation of the defect & insertion of all-suture anchors

Once a satisfactory reduction is achieved the impression fracture (reverse Hill-Sachs lesion) is assessed. Our technique may be used for those defects which involve less that 40% of the humeral head. The defect's surface is prepared using a 4mm burr, enough to cause bleeding without decortication, thus avoiding weakening the bone. This technique uses two 2.3-mm double-stranded all-suture anchors (Iconix; Stryker) to repair the subscapularis into the defect and to build up and fill the defect with two layers of the extracellular matrix patch. The two anchors are inserted 1.5 to 2cm apart in the deepest part of the defect's groove, one superior and one inferior. The insertion technique involves first drilling the bone with a 2.3mm drill before inserting the anchor itself through the drill guide [Figures 2; 3].

Repair of subscapularis into the defect

The two strands from each anchor are then passed through the subscapularis tendon in a mattress manner either using a Mayo needle or Loop PDS. Knots are then made to repair and secure the subscapularis into the defect [Figures 4; 5]. It is important not to cut the anchor

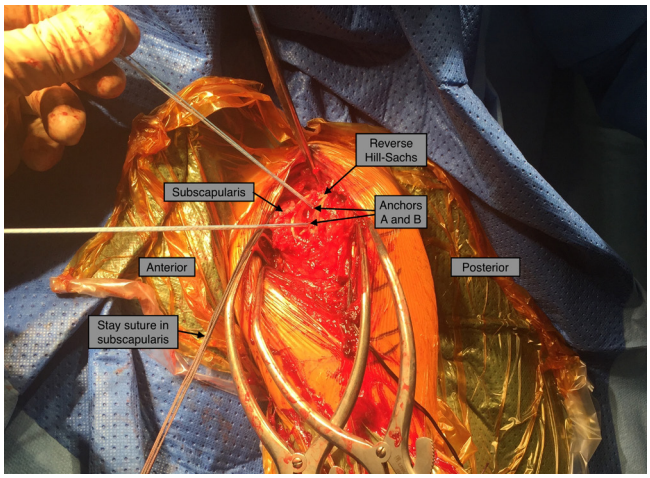

Figure 3. The anchors are placed in the deepest part of the defect. Note stay sutures have been placed in the retracted subscapularis tendon.

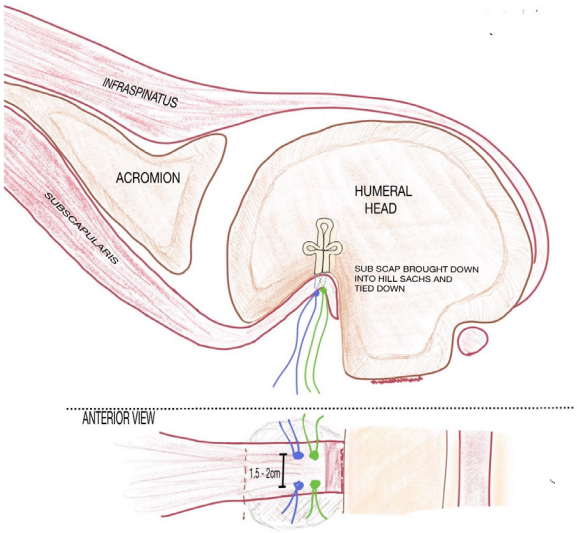

Figure 4. Axial and Anterior View: Each strand of each anchor is passed through the subscapularis tendon and the tendon is snugged down into the defect.

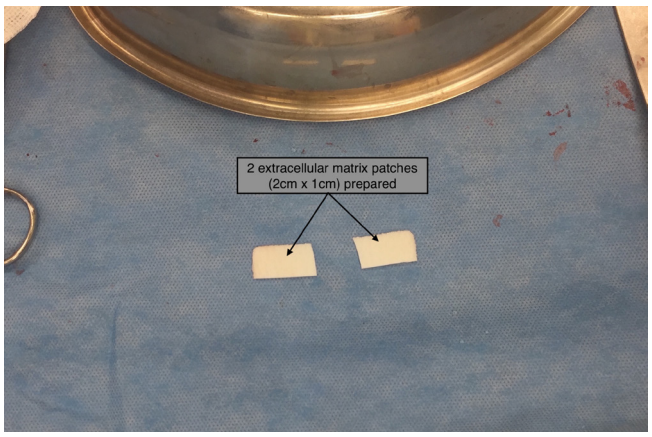

Figure 6. Two patches of ECM (2x1cm) are prepared.

suture limbs at this stage.

Augmentation of the defect using 2 layers of extracellular matrix

Following satisfactory relocation of the subscapularis into the Hill-Sachs defect, the defect repair is augmented with two layers of extracellular matrix (ECM) patch (DX Arthrex patch). Two ECM patches are prepared, each rectangular in shape with dimensions of 2cm by 1cm [Figure 6]. Two small holes are made in each patch 1.5cm apart (hole A superiorly and hole B inferiorly [Figures 7; 8]. All the suture limbs from superior anchor are passed through hole A of both patches and all suture limbs from the inferior anchor are passed through hole B of both patches. The two patch layers are now secured into the defect superficial to the repaired

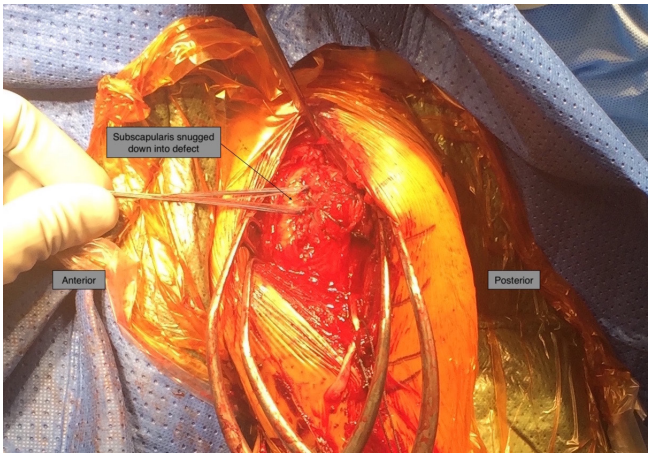

Figure 5. Subscapularis is snugged into the defect. Note that the stay sutures in subscapularis have been tied into the rotator cuff laterally.

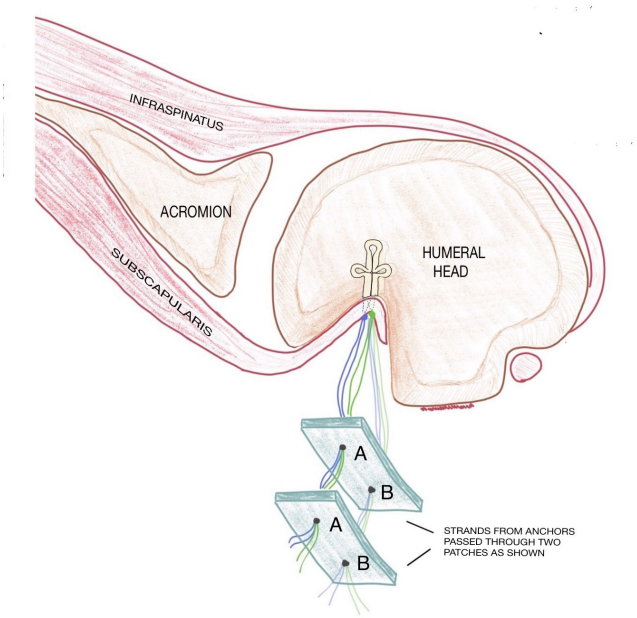

Figure 7. Two small holes are made 1.5cm apart in each ECM. Strands from the superior anchor are passed through holes A. Strands from the inferior anchor are passed through holes B.

subscapularis. This is performed by individually tying each of the suture limbs from hole A to suture limbs from hole B [Figures 9; 10]. The tied suture limbs are then shortened.

Discussion

Although posterior shoulder dislocations are rare, a significant proportion are missed on initial presentation and present with chronic dislocations with old, missed, locked or fixed dislocations (3). These are usually associated with an impression fracture of the anteromedial humeral head (reverse Hill-Sachs lesion)

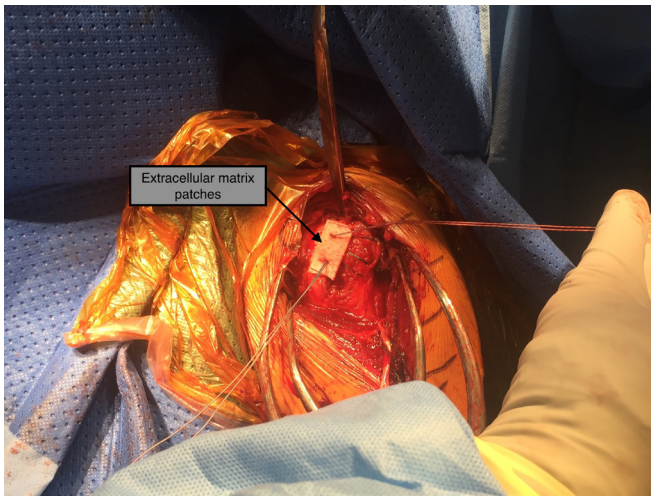

Figure 8. The patches are positioned over defect, superficial to subscapularis.

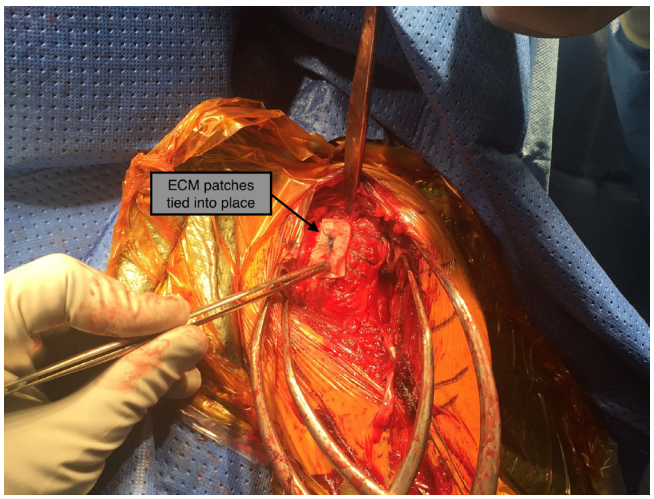

Figure 10. The anchor sutures are tied over the ECM, further filling the defect.

and in delayed presentations closed reduction is often unsuccessful. Management of these can present a challenge and depends upon shoulder stability and on the size of the defect in the humeral head (5).

It is generally accepted that chronic posterior shoulder dislocations with lesions involving less than 25% of the humeral head may be treated with open reduction plus or minus transfer of the upper part of subscapularis into the defect (McLaughlin procedure) depending on the stability of the humeral head.

For defects between 25 and 45-50%, open reduction may be accompanied by either the McLaughlin procedure or the modified McLaughlin procedure (3,6). This modification as described by Hughes and Neer, involves osteotomising with the attached subscapularis and then fixing it into the defect with screws (7). The potential advantage of this over the original McLaughlin procedure

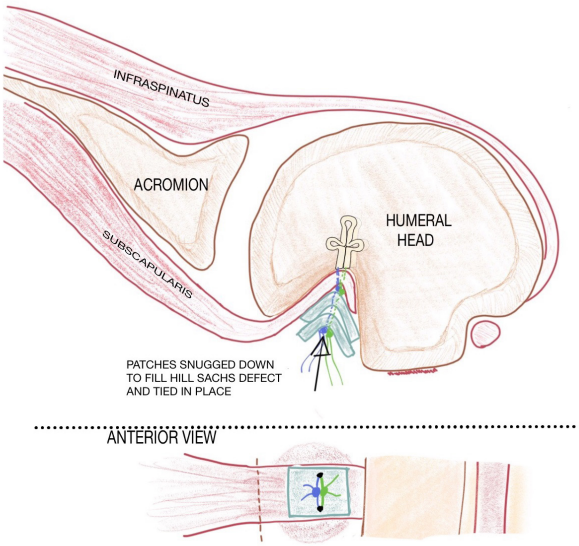

Figure 9. The patches are snugged down into the defect and the strands of the suture anchors are tied over the top of the patches. The suture ends are then shortened.

is that the bony lesser tuberosity may better fill the defect and, as there is contact between bony surfaces, healing may be more predictable.

Other options for defects of 25-50% include reconstruction with allograft, autograft or rotational osteotomy of the humerus (6). With allograft reconstruction, the defect is filled with a contoured bone graft which is in turn fixed with cancellous screws, with the added advantage of humeral head sphericity restoration (8). To perform a rotational osteotomy of the humerus, open reduction is followed by an osteotomy at the level of the surgical neck, the humeral shaft is internally rotated and the osteotomy is fixed with a plate, allowing immediate postoperative rehabilitation (9). Issues with this option include the risk of non-union and restriction of external rotation.

With lesions that involve more that 50% of the humeral head, arthroplasty may be needed. This may involve hemiarthroplasty, anatomic total shoulder arthroplasty (TSA) or reverse total shoulder arthroplasty (RSA). Hemiarthroplasty may be indicated in those cases where the glenoid is not damaged and the rotator cuff is intact (particularly in the younger age group). One may consider anatomic replacement where the glenoid articular surface is damaged but there is no compromise of the rotator cuff function. RSA offers the potential advantage of better stability as it is a semi-constrained implant. Additionally, RSA would be a better option in patients with significant glenoid erosions or if there is rotator cuff dysfunction (6).

In this article, we present another technique which may be utilized when the defect is less than 50% of the humeral head. Its advantage over the McLaughlin and modified McLaughlin procedures is that the two layers

of the extracellular matrix patch fill the defect more effectively than the subscapularis alone and there is no need to perform osteotomy of the lesser tuberosity. Furthermore, it does not involve insertion of any metalwork as all-suture anchors are used for the repair of subscapularis and securing of the patch. Similarly, it avoids the need for bone grafting and humeral rotational osteotomy. The drawbacks of the technique include that it would not be adequate for lesions which involve more than 50% of the humeral head. Additionally, it may be questioned whether the two layers of the extracellular matrix possess the adequate mechanical properties to reduce the risk of subsequent instability. In our opinion this can only be answered by further biomechanical and clinical studies. All we can state is that the patients who had this procedure all had regained their full range of motion without any instability at 6 months post surgery.

In addition, there may be concerns over the possible risk of an inflammatory response to the extracellular xenograft patch (10). In recent years, extracellular patches have gained popularity in repair of massive rotator cuff tears with patch augmentations and treatment of irreparable tears with superior capsule reconstruction (SCR) (11, 12). This renewed interest has led to improved processing of the more modern patches to extract the cells and DNA and therefore reduce the inflammatory response. With the latest patches, the inflammatory response does not appear to be a major issue (13). In a similar fashion, in recent years, all-suture anchors have attracted a lot of attention among surgeons particularly in management of instability surgery and rotator cuff repairs. Latest generations of these anchors are felt to possess pull-out strengths comparable to that of standard anchors, while avoiding large holes and the need for metal, PEEK or bio-composite material in bone (14).

In summary, this article presents another option for management of patients with chronic posterior dislocations and reverse-Hill-Sachs lesions that involve less than 50% of the humeral head while avoiding need for lesser tuberosity osteotomies, bone grafting and rotational humeral osteotomies.

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