*Acta Orthop. Belg.*, 2012, **78**, 117-120

*TECHNICAL NOTE*

# Hill-Sachs reconstruction and repair using a synthetic scaffold

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**Dislocation of the shoulder joint is an unfortunate consequence of trauma to the shoulder girdle. It can occur in varying age groups with a complication of an impaction injury to the posterior aspect of the humeral head, termed a Hill-Sachs lesion. This can pose further problems leading to instability of the glenohumeral joint and recurrent dislocations. Varying surgical techniques have been developed to address this issue especially in young, active individuals. We describe another technique that can be used to treat Hill-Sachs lesions in patients with recurrent dislocations of the shoulder.**

**Keywords** : Hill Sachs lesion ; synthetic scaffold ; bony ingrowth.

## INTRODUCTION

Hill-Sachs lesion of the shoulder, associated exclusively with anterior shoulder dislocations, is a cortical depression in the posterior superior part of the head of the humerus. It results from forceful impaction of the humeral head against the antero-inferior glenoid rim following anterior dislocation of the shoulder. It is named after Harold Arthur Hill (1901-1973) and Maurice David Sachs (1909-1987), two prominent radiologists from San Francisco, USA. In 1940, the pair published a report of 119 cases of shoulder dislocations and showed that the defect resulted from direct compression of the humeral head (*8*).

Hill-Sachs lesions have been reported in as many as 93% of recurrent anterior dislocations (*5*). The presence of a Hill-Sachs lesion is an extremely specific sign of dislocation and can thus be used as an indicator that dislocation has occurred even if the joint has since regained its normal arrangement. The average depth of Hill-Sachs lesion has been reported as 4.1 mm (*6*). Large, engaging Hill-Sachs impaction fractures can contribute to shoulder instability and often cause painful clicking, catching or 'popping' of the joint. Defect correcting techniques described in the past involve the use of autografts harvested from either soft tissues or bone from the surrounding structures. This almost always leaves the patient with functional impairment at the harvesting site due to the loss or change in the biomechanics of the shoulder joint. Also, these procedures might be lengthy and involve extensive dissection of the joint with a significant risk of complications (*1,3,5,12*).

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*No benefits or funds were received in support of this study*

*Fig. 1.* – Picture of TRUFIT®, Bone Graft Substitute plug

The senior author (M.M) uses a synthetic scaffold (TRUFIT®, Bone Graft Substitute plug, Smith and Nephew, USA) for the repair of Hill Sachs lesion. This is composed of a composite scaffold produced from biodegradable materials including calcium sulphate, polylactide-glycolide (PLG) and polyglycolide (PGA) designed to resorb in 6 to 9 months,and has a porous microstructure to allow for cartilage and subchondral bony ingrowth (Fig. 1). They come in a cylindrical shape with four (5, 7, 9, 11 mm) different sizes designed to be press fitted to fill up the defects. All these plugs are 17 mm long so can be used to fill a significant size defect of size up to 12-14 mm deep.

## Operative technique

A new technique performed by the senior author was used to fill the defect (Fig. 2, 3) in the postero-superior part of the humeral head by using a TRUFIT plug. The patient was placed in a beach chair position and a minimal invasive technique was used to expose the anterior shoulder capsule through a delto-pectoral approach. The humeral head was exposed by making a T-shaped incision in the capsule. The defect on the posterior aspect of the humeral head was located by humeral rotation and palpation of the articular surface. A guide wire was drilled from the anterior aspect of the surgical neck to the center of the Hill-Sachs defect posteriorly. A drill sleeve (available in the set) for plug size 11 mm was passed over the wire. Size was pre-

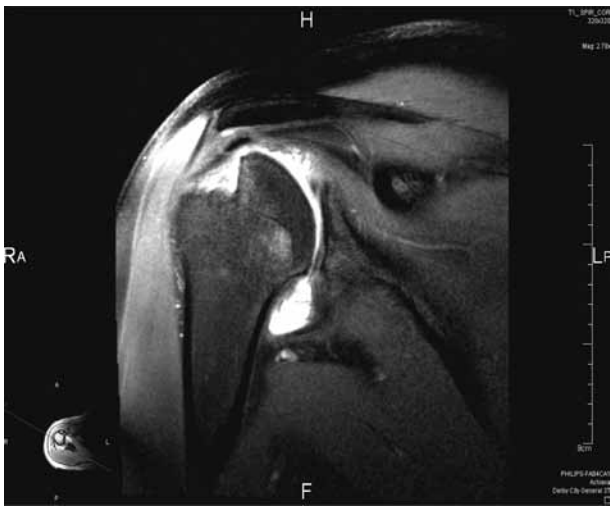


*Fig. 2.* – Pre-operative coronal MRI image showing defect at postero-superior humeral head.

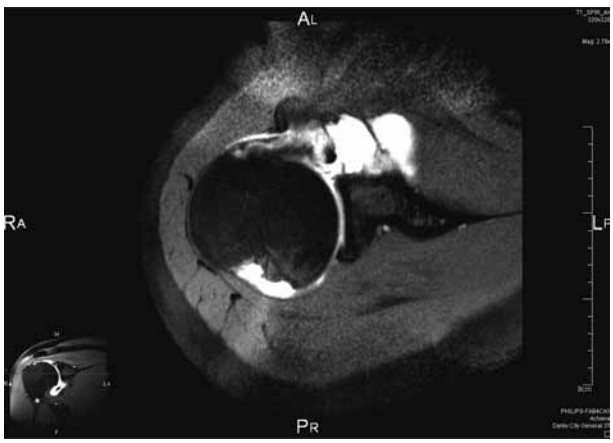


*Fig. 3.* — Pre-operative axial MRI image showing defect posteriorly on humeral head.

determined from MRI scans. A tunnel was then made by drilling from the antero-inferior position of the humeral head to come out through the centre of the Hill-Sachs lesion posteriorly. A size 11 mm TRUFIT plug was then railroaded through the tunnel in retrograde fashion, so that the articular surface side of the plug fills the defect flush with the surrounding articular cartilage. A second scaffold was used to fill up the defect created by the entry drill in the antero-inferior aspect of the humeral head in an anterograde fashion (Fig. 4).

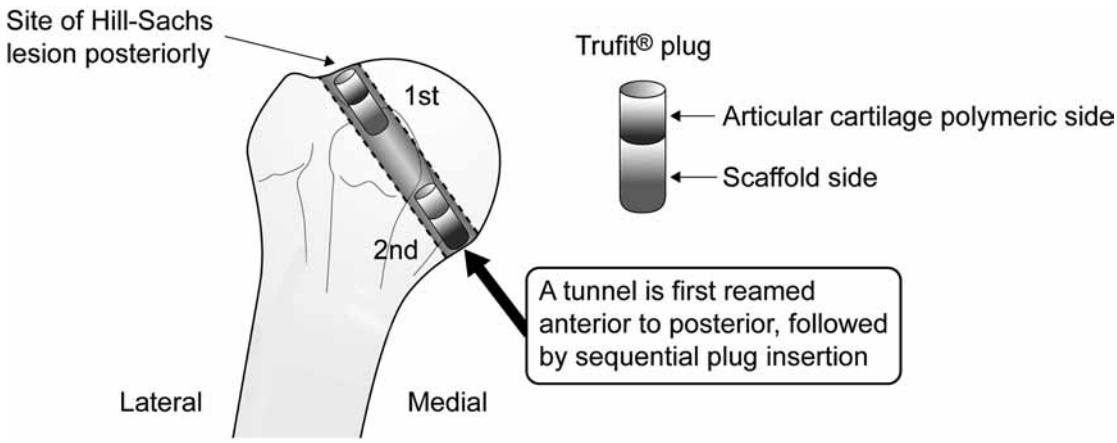


***Fig. 4.*** — Illustration showing surgical technique of insertion of TRUFIT plug into Hill-Sachs defect


***Fig. 5.*** — Post-operative coronal MRI image showing filled Hill-Sachs defect with TRUFIT plug at postero-superior humeral head.


***Fig. 6.*** — Post-operative coronal MRI image showing filled Hill-Sachs defect with TRUFIT plug at anterior entry point of humeral head.

The Bankart lesion was repaired using two Mitek anchors and the subscapularis muscle was repaired. Movements of the glenohumeral joint were checked in all directions revealing a stable joint and no suggestion of subluxation or dislocation especially in external rotation.

Following surgery, the patient was immobilised for 2 weeks in a neoprene poly-sling. A gentle rehabilitation programme was started in out-patient physiotherapy gradually building up strength of the shoulder girdle muscles. The patient regained full range of movement of his shoulder within 6 weeks. Patient was followed up in the clinic at 3 months, 6 months and 12 months with no further episode of subluxation or dislocation. Repeat MRI scan of the shoulder at 6 months following surgery showed evidence of full incorporation of the synthetic plug and filling up of the defect (Fig. 5 & 6).

## DISCUSSION

Based on size, a Hill-Sachs lesion has been classified into mild, moderate and severe defects (*11*). Mild defects are defined as 2 cm wide and 0.3 cm deep, moderate size defects are 4 cm wide and 0.5 cm deep followed by severe defects that are 4 cm wide and 1 cm deep. Another classification system divides the lesion into 3 grades based on surface involvement. Grade 1 lesions are cartilaginous, grade 2 has 'superficial bony scuffing' and grade 3 is known as 'hatchet fracture' (*7*).

In the young and active population, surgical repair is the preferred mode of treatment. It has been postulated that in patients with this defect, subluxation of the humeral head occurs when the lesion impinges on the anterior glenoid border on abduction and external rotation of the arm. Any further movement, in the same direction leads to dislocation of the glenohumeral articulation. Several techniques have been described in the past with regards to the surgical management of Hill-Sachs lesion. The techniques described aim at correcting the glenoid pathology, humeral head pathology or addressing both the problems simultaneously. Majority of treatment options deal with correcting the deformities involving the glenoid.

They all aim at either filling up the defect or realigning the area of the lesion to prevent it from impinging on the anterior glenoid border. Recurrence of symptoms following surgery have been reported to be as high as 20 percent (*3,4,9,12*).

A recently described technique advocated the elevation of depressed articular fragment by drilling up to a centimeter from the chondral surface and pushing the depressed fragment using bone tamps. The subchondral region was then supported by cancellous bone impaction grafting (*10*). Our technique incorporates the same principle with restoration of the humeral articular surface.

To our knowledge, there is no evidence in the literature describing the reconstruction and repair of a Hill-Sachs lesion using a synthetic scaffold with a minimally invasive approach. In our patient there was satisfactory incorporation of the impacted scaffold as seen on MRI scan 6 months following surgery. The clinical symptoms of the patient were significantly reduced. Further studies to assess long term outcomes are required. We believe that this procedure could be used as an alternative to treat Hill-Sachs lesions in young and active individuals.

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