Technical Note

Arthroscopic Modified McLaughlin Procedure and Posterior Labral Repair in the Lateral Decubitus Position

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Abstract: Traumatic posterior shoulder dislocations are commonly associated with a posterior labral tear and an impaction fracture involving the anterior humeral head referred to as a reverse Hill-Sachs lesion (RHSL). This humeral defect can engage on the posterior glenoid rim during shoulder cross-body adduction combined with shoulder elevation and may require surgical intervention. Depending on the size of the RHSL relative to the articular arc of the humeral head, traditional open surgical options including transfer of the subscapularis tendon alone, subscapularis transfer with the attached lesser tuberosity into the humeral impaction injury, or reconstruction using allograft for more severe defects have been described. We present an all-arthroscopic technique performed in the lateral decubitus position involving concomitant repair of the posterior labral tear and transfer of the subscapularis tendon (reverse remplissage or arthroscopic modified McLaughlin procedure) into a moderately sized RHSL.

Posterior shoulder dislocation represents a relatively uncommon injury, comprising approximately 2% to 10% of all glenohumeral instability cases.[1,2] It is commonly associated with a posterior capsulolabral injury, posterior glenoid osseous lesion, and posterior capsular attenuation.[2] Additionally, a reverse Hill-Sachs lesion (RHSL), represented by an impaction of the anteromedial humeral head, can be seen in 30% to 90% of cases.[3] This defect frequently involves 10% to 30% of the articular surface of the humeral head and may require intervention apart from a posterior labral repair alone.[4] Failure to address the entire spectrum of pathology may result in persistent pain, recurrent dislocations, progressive joint damage, and osteoarthritis.[5] A recent systematic review concluded that when all concomitant pathologies are addressed, patients can expect a low rate of instability recurrence, satisfactory range of motion, and favorable patient-reported outcome measures after surgical treatment.[6] Several options for open procedures (e.g., McLaughlin procedure) have been described to address an RHSL noted concomitant to the posterior capsulolabral defect.[7-9] More recently, arthroscopic approaches have shown similarly favorable results.[1,2,4,10-12] In this report, we present an all-arthroscopic technique performed in the lateral decubitus position in which the subscapularis tendon undergoes tenodesis into the RHSL, in addition to repair of the posterior capsulolabral tissue.

Surgical Technique

Our technique is shown in Video 1. Pearls and pitfalls of this procedure are given in Table 1, and advantages and disadvantages of using an arthroscopic approach are presented in Table 2.

Patient Positioning

After administration of regional and general anesthesia, the patient is placed into the lateral decubitus position and secured with a bean bag with appropriate padding of the bony prominences (Fig 1). The lateral decubitus position is preferred for multiple reasons (Table 3). The operating table is rotated 45° away from the anesthesia area. An examination under anesthesia is routinely performed to assess for the directions of glenohumeral laxity. The operative shoulder is then prepared and draped in the standard sterile manner. The patient's arm is placed into a position of 45° of abduction with longitudinal traction. The anatomic

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Received April 20, 2024; accepted June 12, 2024.

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2212-6287/24659
https://doi.org/10.1016/j.eats.2024.103178

Table 1. Pearls and Pitfalls of Procedure

Pearls
Regarding portal placement, the AS portal is posterior to the biceps tendon and in line with the glenohumeral joint and the AI portal is at or slightly superior to the upper border of the subscapularis to allow suture anchor placement and suture passage.
Both glenoid and humeral anchors should be placed before knot tying to allow the humeral head to remain mobile.
A 70° arthroscope should be used when addressing the anterior humeral defect and subscapularis.
Cautery and a motorized shaver should be used to carefully release the rotator interval, expose the interval between the deltoid and subscapularis, and debride soft tissue on the articular side of the subscapularis.
A motorized shaver and burr should be used to debride the glenoid and humeral defect to achieve a bleeding bone bed to facilitate healing.
Pitfalls
Failure to identify significant bone loss on both glenoid (>20%) and humerus (>40% of articular surface)
Improper placement of arthroscopic portals (i.e., placement of AI portal too superior or lateral, making passage of sutures difficult, or malpositioned AS portal, leading to poor visualization of reverse Hill-Sachs lesion)
Inadequate debridement of rotator interval or soft tissue surrounding subscapularis tendon, leading to poor visualization and suture passage through subscapularis tendon
Iatrogenic axillary nerve injury when releasing posteroinferior capsulolabral tissue or debriding anterior to subscapularis

AI, anteroinferior; AS, anterosuperior.

landmarks and portals are drawn onto the skin, including the posterior, anteroinferior (AI), anterosuperior (AS), and posterolateral portals (Fig 2).

Surgical Approach

A standard posterior portal is created, typically 1.5 cm inferior and 1.5 cm medial to the posterolateral acromion. A 30° arthroscope is introduced, and a diagnostic arthroscopy is performed with attention to the posterior capsulolabral complex (Fig 3), glenoid, and humeral head to evaluate for the presence of an RHSL. An outside-in technique is used with a spinal needle to localize the AI and AS portals. The AI portal is created at the upper border of the subscapularis tendon, and the AS portal arises posterior to the biceps tendon and in the plane of the glenohumeral joint. A threaded 8.5 × 90-mm cannula (Smith & Nephew, Andover, MA) is inserted into the AS portal (Fig 4). The AS portal is created using an outside-in technique, and a switching stick is inserted. The arthroscope is then placed through the AS viewing portal, and a standard posterior portal is created under direct visualization. A soft-tissue elevator is inserted to elevate the capsulolabral tissue from the glenoid neck. The posterior glenoid rim is decorticated with a motorized shaver to allow for bony bleeding. Through a percutaneous posterolateral portal, an anchor drill guide is introduced and sequential 2.3-mm bio-composite suture anchors (Osteoraptor; Smith & Nephew) are placed, starting at the 6-o'clock position. The sutures are passed through the capsulolabral tissue with a suture-shuttling device (Fig 5). In general, 3 or 4 suture anchors are placed for the posterior labral repair. The sutures are left untied to allow for mobilization of the humeral head during preparation of the RHSL. Attention is now turned to the anterior humeral head. To accomplish this, a 70° arthroscope is introduced through the posterior portal. The rotator interval, as well as the interval between the deltoid and subscapularis, is carefully resected to allow for visualization of the articular and bursal sides of the subscapularis (Fig 6). A motorized shaver is introduced from the AI portal to debride the RHSL, creating a bleeding bone bed (Fig 7). Two 2.3-mm double-loaded bio-composite suture anchors (Osteoraptor) are inserted into the RHSL at the articular margin (Fig 8). By use of a soft-tissue penetrator, the 4 limbs of suture are passed through the subscapularis tendon in a horizontal mattress configuration (Fig 9). We then retrieve 1 suture limb from each anchor and tie the suture limbs together. The 2 remaining limbs are pulled to slide the knot down to the bursal surface of the subscapularis in a pulley fashion (Fig 10). The 2 remaining limbs are tied to

Table 2. Advantages and Disadvantages of Arthroscopic Approach

Advantages
An arthroscopic approach limits the incision size and is less invasive.
This approach uses common arthroscopic instruments and portals that are familiar to most arthroscopic surgeons.
A thorough shoulder examination can be performed, and concomitant glenohumeral and extra-articular shoulder pathology (e.g., rotator cuff tear) can be addressed.
Visualization is improved, especially during meticulous dissection of soft tissue near neurovascular structures (e.g., axillary nerve).
Disadvantages
This approach can be technically demanding.
This approach is limited to patients with minimal glenoid-sided (<20%) and moderate humeral-sided (20%-40%) bone loss.
Theoretically, external rotation may be restricted owing to humeral constraints after subscapularis tenodesis.

secure the tenodesis. This pulley-type construct creates excellent compression of the subscapularis tendon into the RHSL. The 30° arthroscope is again placed into the AS portal. The sutures from the previously inserted glenoid anchors are sequentially retrieved and tied, beginning from the inferior-most anchor. An effort should be made to shift an adequate soft-tissue bumper over the face of the glenoid to create a stout tissue bumper (Fig 11). The posterior portal is closed intra-articularly with a No. 0 PDS suture (Ethicon, Somerville, NJ) with side-to-side closure. The arthroscopic incisions are closed with No. 3-0 Monocryl sutures (Ethicon).

Postoperative Rehabilitation

The patient is immobilized in slight abduction and external rotation using an abduction sling for 6 weeks. At 3 weeks postoperatively, the patient begins supine, passive motion exercises in the scapular plane. At 6 weeks, the patient begins active and active-assisted motion exercises with forward elevation in the scapular plane, as well as internal and external rotation with the arm at the side. At 12 weeks, the patient begins active motion in all planes and sport-specific training with isometric strengthening. At 6 months postoperatively, the patient can return to full unrestricted activity.

Table 3. Advantages and Disadvantages of Lateral Decubitus Position

Advantages
Traction increases the glenohumeral and subcoracoid working space.
The patient's head and the operating table are out of the way and do not restrict the surgeon from achieving anatomic access to the shoulder.
Cerebral perfusion is improved, and there is a decreased risk of autonomic dysfunction (e.g., hypotension).
Cautery bubbles move laterally and out of view.
Disadvantages
The positioning and orientation of the anatomy are nonanatomic.
The position may need to change in cases of emergent intubation and/or conversion to an open procedure.
The anterior portal requires reaching over the arm, which may be challenging with larger patient body habitus.

Fig 1. Right shoulder with patient in lateral decubitus position and bony prominences well padded.

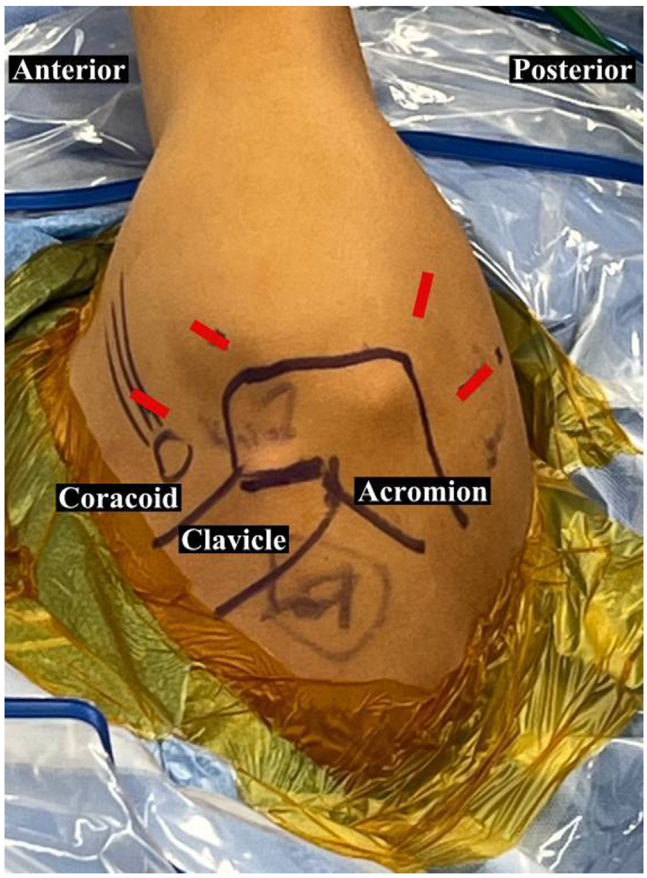

Fig 2. Marking of surface landmarks and intended portals (red) on surface of right shoulder.

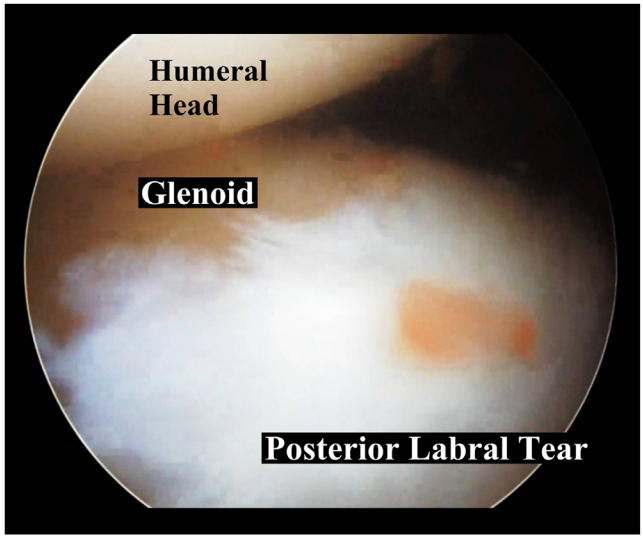

Fig 3. Posterior labral tear and humeral head viewed from standard posterior portal using 30° arthroscope in right shoulder.

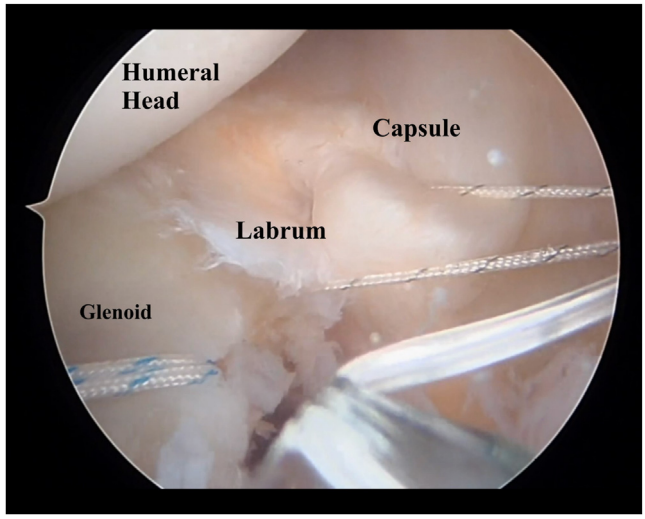

Fig 5. Anchor insertion percutaneously and suture passage for posterior capsulolabral repair while viewing from anterosuperior portal using 30° arthroscope in right shoulder.

Discussion

We present an arthroscopic technique for addressing recurrent posterior glenohumeral instability with posterior labral injury and a moderate RHSL from the decubitus position. The posterior capsulolabral repair is accomplished with standard suture anchors, and the RHSL is addressed with tenodesis of the subscapularis tendon. The lateral decubitus position facilitates adequate distraction of the glenohumeral joint to allow for improved visualization to address both the posterior labral tear and RHSL using standard arthroscopic instruments and portals.

Although posterior shoulder instability comprises only about 2% to 10% of shoulder dislocations, it represents up to 24% of all surgically treated instability patients in the young, active population.[1,2,13] A recent review noted that concomitant bony or soft-tissue injuries were present in 65% of patients, whereas other studies have found that a posterior labral lesion and RHSL were present in up to 58% and 86% of cases, respectively.[7,14] In particular, an engaging RHSL can be problematic because its presence has been associated with recurrent posterior shoulder instability.[3] The 3 significant predictors of engagement are defect size (alpha angle), defect localization (beta angle), and

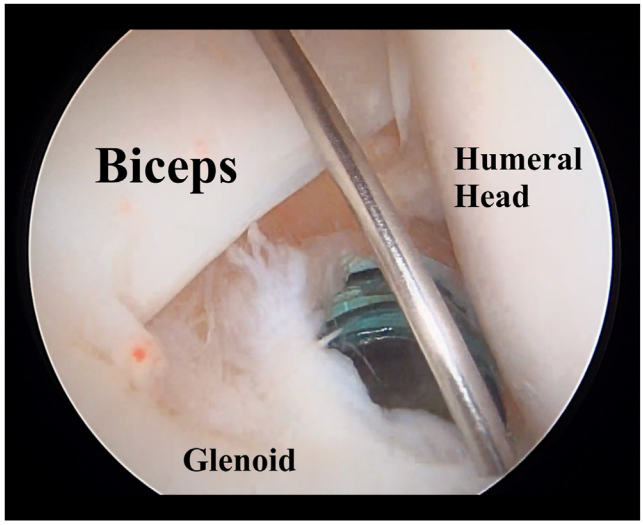

Fig 4. Anteroinferior portal cannula placement within rotator interval and anterosuperior portal needle localization just posterior to long head of biceps tendon in right shoulder.

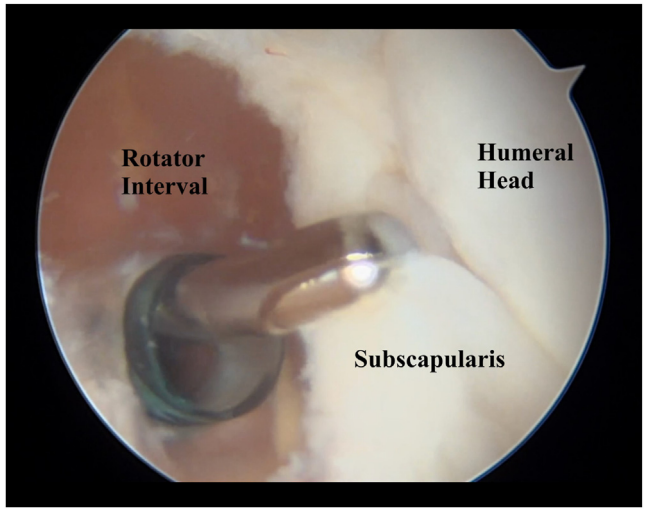

Fig 6. Debridement of rotator interval tissue and surrounding capsule through anteroinferior portal while viewing from posterior portal using 70° arthroscope in right shoulder.

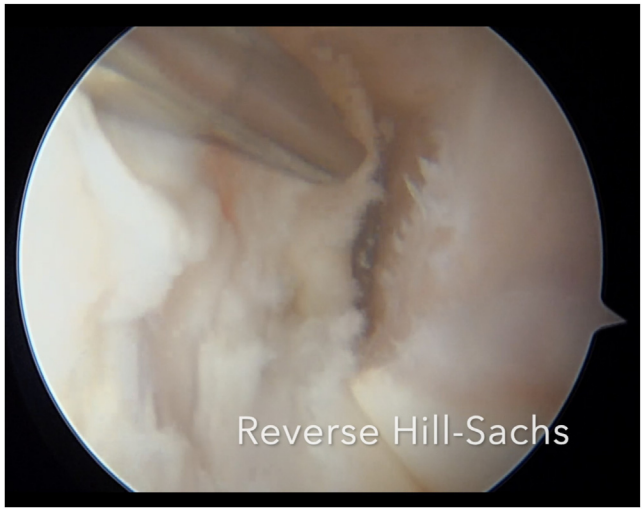

Fig 7. Visualization of reverse Hill-Sachs lesion using 70° arthroscope from posterior portal in right shoulder.

position of the posterior defect margin (gamma angle).[3] Conservative treatment has been shown to be an effective option in relatively older patients with a well-centered joint and a low gamma angle.[15] In patients with more substantial defects, the RHSL can be corrected surgically either through anatomic or nonanatomic means. In anatomic procedures, the goal is to restore the anatomy of the humeral head with either allograft or disimpaction of the impression fracture, whereas nonanatomic procedures involve transfer of the lesser tuberosity with the attached subscapularis tendon or transfer of the subscapularis tendon alone.[5] The classic open McLaughlin procedure (detachment of the subscapularis tendon and transfer into the defect) and the modified McLaughlin procedure (lesser tuberosity osteotomy) have been described to address the RHSL.[8,9] Buda et al.[16] has shown that both approaches lead to satisfactory clinical results and a low redislocation rate. More recently, several reports have described an arthroscopic modified McLaughlin procedure with transfer of the subscapularis tendon completed in the beach-chair position.[2,4,5] Kelly and Field[12] previously described fixation of the subscapularis tendon using a rip-stop construct. On the basis of our experience, the pulley-type construct (Fig 10) is our preferred method to allow for compression of the subscapularis into the RHSL. This surgical technique is a reproducible means for addressing bipolar pathology in recurrent posterior shoulder instability.

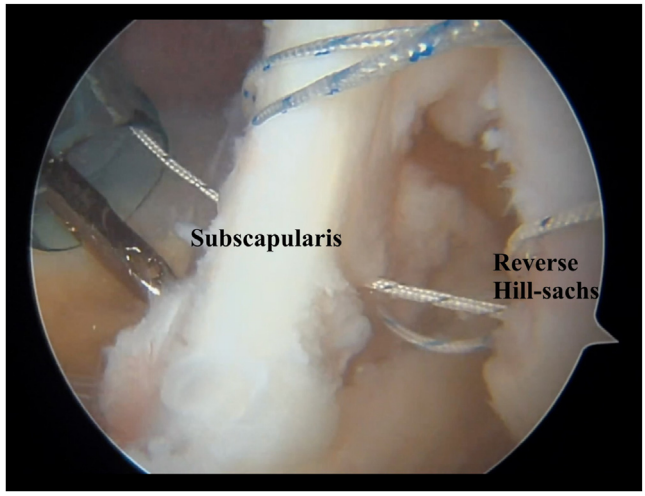

Fig 9. Passage of sutures through subscapularis tendon via anteroinferior cannula in right shoulder. The passed sutures are then shuttled out of the glenohumeral joint through the anterosuperior cannula.

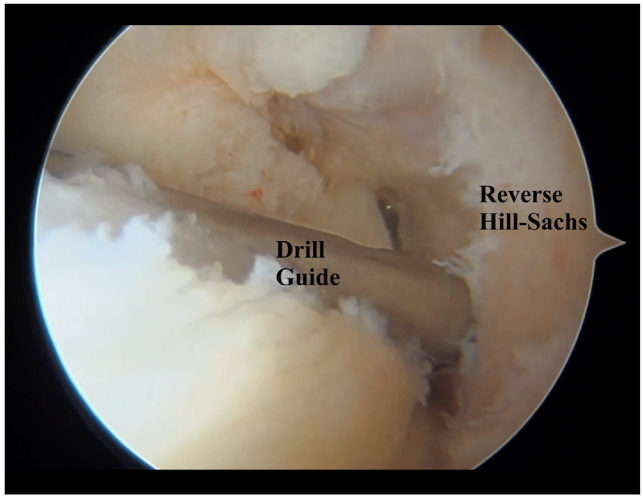

Fig 8. Placement of bio-composite anchors into reverse Hill-Sachs defect at articular margin working through anteroinferior cannula and viewing from posterior with 70° arthroscope in right shoulder.

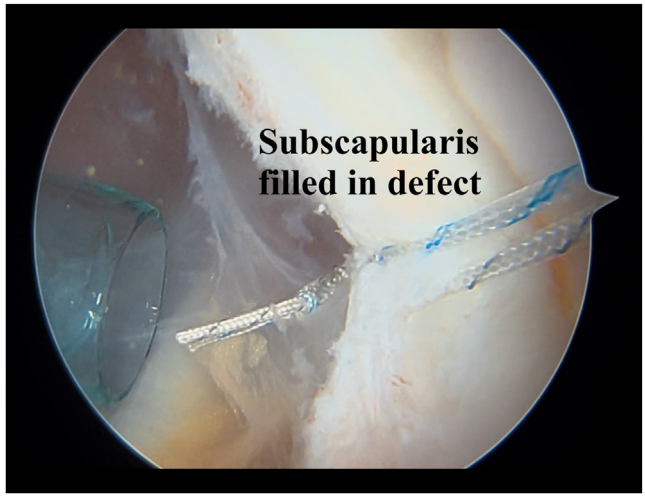

Fig 10. Suture tying for subscapularis tenodesis through anteroinferior cannula in right shoulder.

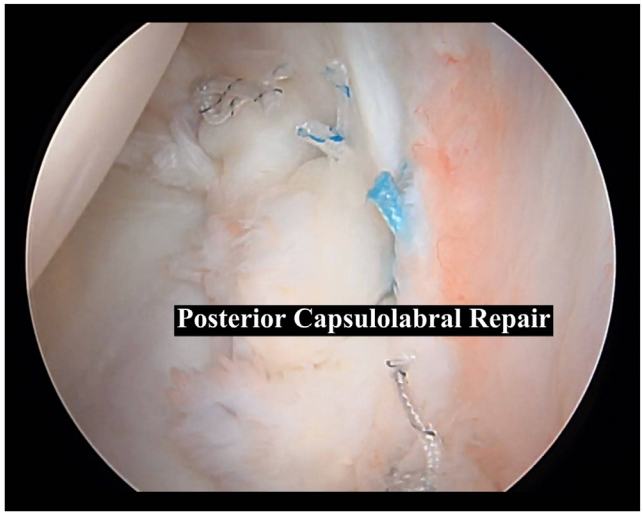

Fig 11. Knot tying for capsulolabral sutures and completion of posterior labral repair through posterior cannula and viewing through anterosuperior portal using 30° arthroscope in right shoulder.

Disclosures

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: K.I.G. reports a consulting or advisory relationship with Stryker Orthopaedics and Smith & Nephew and owns equity or stocks in Stryker Orthopaedics. The other authors (T-F.A.C., E.T.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding

This study was supported by the Montefiore Medical Center Department of Orthopaedic Surgery Seed Grant #0008.

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