Arthroscopic Treatment of Iatrogenic Slipped Capital Femoral Epiphysis Screw Impingement and Associated Hip Pathology

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Background: Screw impingement is an infrequently reported sequelae following in situ pinning of a slipped capital femoral epiphysis, but it may result in significant bony and chondrolabral degeneration. Hip arthroscopy may offer the advantage of screw removal in a minimally invasive manner under direct visualization, as well as providing the opportunity for management of concomitant hip pathology.

Indications: A healthy, active 27-year-old woman with right hip dysfunction secondary to screw impingement and concomitant chondrolabral pathology following previous in situ pinning of a slipped capital femoral epiphysis.

Technique Description: The patient elected to undergo arthroscopic removal of hardware, osteochondroplasty, and management of hip labrum pathology. After the screw was localized, a 2.8-mm pin was inserted down the cannulated center of the screw to prevent intraarticular displacement during removal. The screw and washer were removed intact, and femoroplasty was performed to remove the reactive bone and resolve the cam-type impingement. Acetabuloplasty was then performed to remove pincer-type impingement and provide an appropriate rim of bone for labral reconstruction. The pathologic labrum was then debrided and reconstructed with a semitendinosus allograft.

Results: There were no immediate complications following surgery. Surgical management led to resolution of the patient's mechanical symptoms and provided pain relief, which allowed return to prior baseline level of function.

Discussion/Conclusion: Symptomatic screws that impinge the osteochondral and soft tissue anatomy of the hip require removal. Historically, these screws have been removed by open, mini-open, or percutaneous techniques. This case demonstrates the advantages of arthroscopic removal, as it affords the surgeon the ability to perform a dynamic examination, safely remove the screw, and directly visualize and manage concomitant hip pathology that may not be otherwise be recognizable. Further studies will be required to determine the ability of this technique to more clearly illustrate long-term improvement in function and prevention of the development of osteoarthritis.

Keywords: hip arthroscopy; slipped capital femoral epiphysis; femoroacetabular impingement; hip labrum reconstruction; osteochondroplasty

VIDEO TRANSCRIPT

In this video we will discuss the management of iatrogenic screw impingement and concomitant chondrolabral pathology in a patient with right hip dysfunction following previous in situ pinning of a slipped capital femoral epiphysis (SCFE).

Here are our disclosures.

We will review the following items in this video.

This case example is a healthy, active 27-year-old woman who presented with progressive right hip pain, mechanical symptoms, and reduced range of motion that was functionally limiting and resistant to conservative management. Sixteen years prior she had undergone in situ pinning of a right SCFE, and afterwards experienced minimal symptoms until approximately 3 years prior to presentation. At the time of her presentation, the patient's right hip flexion and internal rotation was limited to 105 and 20 degrees, respectively. Her pain was recreated with hip flexion, adduction, and internal rotation. She otherwise demonstrated a non-antalgic gait, normal neurovascular examination, and had no focal tenderness to palpation.

Imaging is important in this case to evaluate the degree of hip arthritis present, identify the location and integrity of

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the retained hardware, and evaluate for bony morphology suggestive of residual femoroacetabular impingement, as well as any concomitant hip pathology. The current patient's imaging demonstrated preserved intra-articular space, mild cam-type morphology of the proximal femur, and acetabular crossover. A 6.5-mm, partially threaded, cannulated screw and washer was present with peri-hardware lucency noted, suspicious for toggling of the head of the screw. The head of this patient's screw was located quite medially at the anterior femoral head neck junction. During in situ pinning screw trajectory is typically started somewhat anteriorly to cross the physis perpendicularly and to achieve a central positioning of the screw within the femoral epiphysis. However, in moderate-to-severe SCFE, where the epiphysis is displaced more posteriorly, in situ screw placement perpendicular to the physis can produce a more prominent screw head that impinges upon the anterior acetabulum. A magnetic resonance arthrogram was acquired for evaluation of labral pathology, but proved to be of limited diagnostic value due to artifact from the screw. Most importantly, a dynamic fluoroscopic image with the patient's hip joint in flexion demonstrated screw abutment against the acetabulum.

The patient, limited in her quality of life by symptoms refractory to conservative management, elected to undergo arthroscopic removal of hardware, osteochondroplasty, and management of hip labrum pathology.

Contraindications to arthroscopic management are listed here, and include advanced hip joint arthritis and the presence of severe dysplasia.

Recommended patient positioning is supine on a table with a hip arthroscopy extension that facilitates traction through the operative extremity. The patient's feet are secured in traction boots, and a perineal post is placed between the legs. Standard hip arthroscopy portals are marked and created.

Direct evaluation of the intra-articular anatomy using a 70-degree arthroscope through an anterolateral portal revealed a macerated and completely deficient anterosuperior labrum that was too degenerated and incompetent to be amenable to repair. Full-thickness damage to the acetabular cartilage from the 12 o'clock to 3 o'clock position was noted, as was a groove in the bone in this region, which was ultimately found to be subjacent to the screw head with the leg held in hip flexion.

Here, the leg was brought up into hip flexion in order to identify the screw. The screw was found to be prominent at the anterior femoral head-neck junction, with a large, surrounding, reactive area of bone. The constellation of findings were suggestive of longstanding impingement and impaction from the retained screw. Reactive bone is removed to facilitate easier screw removal. Then, while viewing through a mid-anterior portal, a 2.8-mm pin was inserted through the anterolateral portal down the cannulated center of the screw to prevent intra-articular displacement during removal. The screw and washer were then removed intact using a screwdriver. Care must be taken to ensure the screwdriver is fully engaged to avoid stripping the screw.

Several options for removal exist in the case of a stripped screw. Mayers et al describe over reaming the screw with a coring reamer to facilitate removal.[6] Another described technique involves impacting a Steinmann pin into the cannulated portion of the screw to achieve an interference fit and using a T-handle chuck to remove the pin and screw.[7] Open removal remains as another option. Washers are commonly placed during in situ pinning of a SCFE and should be recognized preoperatively, as they may require separate removal with a grasper or suture, as demonstrated in this case. To facilitate safe removal and prevent intra-articular displacement, the 2.8-mm pin is left in place while a suture is passed through the washer to facilitate its removal.

Femoroplasty was performed to remove the reactive bone adjacent to the screw and resolve the cam-type impingement. Fluoroscopic images before and after femoroplasty are seen here. The proximal femur appears to be in slight varus alignment, related to the patient's prior SCFE, where there is posterior and inferior slippage of the proximal femoral epiphysis. Resolution of the cam-type impingement is confirmed.

The pathologic labrum was then debrided from the 11 o'clock to 5 o'clock position. Acetabuloplasty was then performed from the 12 o'clock to 3 o'clock region to remove pincer-type impingement and provide an appropriate rim of bone for labral reconstruction. An additional distal anterolateral portal was utilized for performing the labral reconstruction. A 1.4-mm Pivot NanoTack suture anchor (Stryker Corporation, Kalamazoo, Michigan) was placed just distal to the 4 o' clock position. Three knotless 1.8-mm FiberTak suture anchors (Arthrex, Naples, Florida) were then placed along the superior rim.

A semitendinosus allograft was then shuttled through the loops of the 3 superior anchors, and the graft was secured.

An additional 1.4-mm Pivot NanoTack suture anchor (Stryker Corporation) was placed at the 11 o' clock position to secure the labrum posteriorly.

The labral reconstruction was inspected. The reconstructed labrum was observed to provide a good suction seal to the femoral head.

While no clear consensus in the literature exists regarding open versus arthroscopic removal of impinging screws, this case demonstrates several advantages of arthroscopic management, as it affords the surgeon the ability to perform a dynamic examination, safely remove the offending screw, and directly visualize and manage concomitant pathology that may not be easily recognizable. Disadvantages specific to arthroscopic management are listed here and include the risk of screw breakage or failure of removal, risks associated with hip distraction, and the learning curve of hip arthroscopy.

In our patient's case, surgical management led to resolution of hardware-related and bony impingement. We were also able to successfully manage the concomitant chondrolabral pathology.

Potential complications that may be encountered are screw breakage or failure of removal, traction- or portal-related neurovascular injury, heterotopic ossification, and risk of fracture due to the bony void from screw removal.

Posotoperatively, chemoprophylaxis to prevent deep vein thrombosis and heterotopic ossification is provided to all our patients undergoing hip arthroscopy. Formal physical rehabilitation is also critical for achieving good outcomes following surgery. We restrict patients to 50% weight-bearing on the operative extremity for 4 weeks postoperatively if osteochondroplasty or labral repair or reconstruction is performed. Weight-bearing status was not modified due to screw removal. Physical therapy is typically initiated 1 to 3 days following surgery. Patients are functionally normalized in the following manner. Return to sports may be allowed after 14 weeks, provided the patient has completed the standard rehabilitation protocol.

Although this case demonstrates several advantages of arthroscopic management, no comparative literature exists regarding open versus arthroscopic removal of impinging screws. Several studies have been published demonstrating functional improvement following arthroscopic osteochondroplasty for SCFE-related femoroacetabular impingement. Basheer et al demonstrated approximately 20-point improvement in modified Harris hip (mHHS) and nonarthritic hip score following arthroscopic intervention.[2] Wiley et al reported improvements radiographically and functionally following surgery. In their series of 9 patients, the mean alpha angle improved from 75 to 46 degrees, and the mHHS improved from 63.6 preoperatively to 91.4 postoperatively.[9] While a goal of surgical intervention is to provide long-term improvement in function and prevent the development of osteoarthritis, further studies will be required to demonstrate these effects.

Our references are listed here.

From the Department of Orthopedics at the University of Virginia, we thank you.

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