

SUBSPECIALTY PROCEDURES

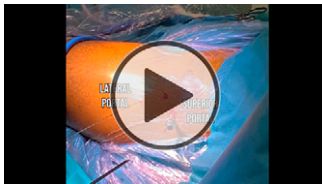
ARTHROSCOPIC REDUCTION AND FIXATION OF A PIPKIN TYPE-I FEMORAL HEAD FRACTURE

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Published outcomes of this procedure can be found at: *Acta Biomed.* 2021 Jul 26;92(S3): e2021016, *J Orthop Surg (Hong Kong)*. 2019 Sep-Dec;27(3): 2309499019881865, and *Orthop Surg.* 2022 Apr;14(4): 652-62

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Abstract

Background: This video article describes the technique for arthroscopic reduction and fixation of Pipkin type-I fractures.

Description: Surgery is performed with the patient in a supine position, with free lower limbs, on a radiolucent table. Arthroscopic superior and anterolateral portals are made similarly to the portals created to evaluate the peripheral compartment during an outside-in (ballooning) technique.¹ An additional medial portal is subsequently created in order to aid in reduction and screw placement. The medial portal is created in abduction and external rotation of the hip (i.e., the figure-4 position). The adductor tendon is identified, and the portal is then safely positioned posteriorly to its margin, approximately 4 to 5 cm distal to the inguinal fold, avoiding the saphenous vein (usually identified with an ultrasound scan). The fragment is mobilized, debrided, and then reduced with use of a microfracture awl or a large Kirschner wire (used as a joystick). Following reduction, temporary fixation is performed with use of long Kirschner wires under direct visualization and fluoroscopic guidance. If reduction is satisfactory, definitive fixation can be performed with use of 4.5-mm headless screws through the medial portal. All steps of fragment reduction and fixation are performed through the medial portal, with the patient in the figure-4 position. Once the screws are placed, a final dynamic arthroscopic and fluoroscopic check is performed.

Alternatives: In Pipkin type-I fractures, surgery is recommended when the femoral head fragment is large (exceeding 15% to 20% of the femoral head volume) and displaced (by >3 mm). In such cases, if untreated, spontaneous evolution to osteoarthritis may occur. For fragments smaller than 10% to 15% of the femoral head volume, arthroscopic removal is often the best choice². Several approaches (e.g., Smith-Petersen, modified Hueter, Kocher-Langenbeck, and surgical safe dislocation) have been proposed for reduction and fixation, with surgical safe dislocation being the most versatile because of the uniquely complete visualization of the femoral head³.

Disclosure: The Disclosure of Potential Conflicts of Interest forms are provided with the online version of the article (<http://links.lww.com/JBSEST/A446>).

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Rationale: The arthroscopic reduction and fixation technique for a non-comminuted Pipkin type-I fracture holds the intrinsic advantages of being less invasive than open surgery in terms of surgical exposure, and having less blood loss, infection risks, and wound complications. Arthroscopy allows direct visualization of the fragment and its reduction surface, along with removal of articular loose bodies and debridement. The surgical time is influenced by the surgeon's experience, but often is no longer than with an open procedure. In the few studies assessing the use of this technique, the rates of osteonecrosis and heterotopic ossification are lower than with open techniques. It is worth noting that the studies assessing the use of this procedure are limited both in number and quality; however, the results of these studies have been excellent. It must also be noted that patients undergoing arthroscopic fixation are mostly selected for this treatment because they have less severe injuries²⁻¹².

Expected Outcomes: Open reduction and fixation through one of a variety of approaches is the gold standard treatment for Pipkin fractures; however, it is a relatively invasive procedure, prone to increased risks of osteonecrosis of the femoral head and heterotopic ossification (from 4% to 78% of cases). In some cases, arthroscopic reduction and fixation can be as effective as open reduction, and carries with it the intrinsic advantages of a keyhole procedure. The reported 4.6% global complication rate following arthroscopic fixation demonstrates the potential advantages of this technique, with limits due to the low numbers of treated cases⁴.

Important Tips:

- The operating room should be carefully set up, especially regarding the positions of the C-arm and the arthroscopy tower, which should be double-checked before starting the procedure.
- The medial portal should be created after identification of the saphenous vein on an ultrasound scan. The anesthesiologist or a radiologist may mark the vein on the skin preoperatively, or the surgeon may extend the arthroscopic portal and perform a superficial dissection to avoid the vessel.
- Visualization after creation of the portals is usually suboptimal until the hematoma is completely removed. Patience must be maintained in this phase of the procedure.
- A microfracture awl or a large Kirschner wire can be utilized as a joystick to aid in reduction of the fragment, from either the usual portals or the medial portal. This aid can facilitate rotation of the fragment, which is a key step in the reduction phase.
- Definitive fixation can be achieved with use of 4.5-mm cannulated headless screws. Large cannulated headless screws have longer and larger Kirschner wires that can also aid in reduction when used as joysticks, reducing the risk of bending or breaking during screw insertion. Additionally, a 4.5-mm screwdriver is longer, allowing easier insertion, especially in patients with a larger thigh. The large diameter should not be a concern because the head is sunk in a non-weight-bearing area of the head.
- To avoid the risk of misplacement or loss of the screw during its insertion, make use of a cannulated guide handle for 4.5-mm screws, such as the guide utilized in a Latarjet arthroscopic procedure.
- To prevent screw loss into the joint, utilize a loop-knotted wire around the proximal part of the screw; this wire is cut at the end of the procedure.

Acronyms and Abbreviations:

- AAFF = arthroscopic-assisted fracture fixation
- HO = heterotopic ossification
- US = ultrasound/ultrasonography
- AP = anteroposterior
- CT = computed tomography
- ASIS = anterosuperior iliac spine

- GT = greater trochanter
- SP = Smith-Petersen
- IF = internal fixation
- K-wire = Kirschner wire

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