The Risk of Vascular Injury to the Femoral Head When Using the Posterolateral Arthroscopy Portal: Cadaveric Investigation

Patrick S. Sussmann, M.D., Matthias Zumstein, M.D., Frederik Hahn, M.D., and Claudio Dora, M.D.

Purpose: The aim was to clarify the relationship between the posterolateral arthroscopy portal to the hip joint and the deep branch of the medial femoral circumflex artery (MFCA) and its terminal divisions. **Methods:** In 7 fresh fixated human cadavers, the deep femoral arteries were injected with latex. In all specimens, the standard anterior, anterolateral, and posterolateral arthroscopy portals to the central compartment of the hip were established in a standardized procedure as done in our operating room. Subsequently, all specimens underwent surgical dissection to identify the tract of the posterolateral portal, the course of the deep branch of the MFCA, and its terminal divisions. The distance between the portal tract and the deep branch of the MFCA was measured at its shortest point. **Results:** None of the specimens revealed injury to the deep branch of the MFCA and its terminal divisions; however, 1 specimen did not reveal filling of the MFCA, and did not allow for accurate measurement. For the remaining 6 specimens, the mean distance of the portal tract to the vessels at the closest point was 10.16 mm (standard deviation, 4.4 mm; range, 5 to 15 mm). In all specimens, the greater trochanter seemed to prevent closer contact between the vessel and the portal tract. **Conclusions:** As long as the shape of the posterior aspect of the greater trochanter has not been changed by previous surgery, the posterolateral portal to the hip joint can be performed safely with respect to the vital blood supply to the femoral head, because the MFCA is protected by the overhang of the posterior aspect of the greater trochanter, giving a minimum of 3 mm and an average 10 mm of clearance. **Clinical Relevance:** At the level of the piriformis muscle, the posterolateral portal has a minimum of 3 mm and an average of 10 mm of clearance to the deep branch of the MFCA. As long as the shape of the posterior aspect of the greater trochanter has not been changed, and the skin penetration remains close to this bony margin with direction of the portal toward the joint space, this portal can be performed safely with respect to the vital blood supply to the femoral head. **Key Words:** Arthroscopy—Avascular necrosis—Blood supply—Complication—Hip—Portal.

Arthroscopic treatment of prearthritic hip pathologies has gained attention over the past years. With appropriate techniques, hip arthroscopy has been described as a low-risk procedure, with an overall complication rate of 1.4%.[1] With an injury rate of 0.6%,[1] nerve and vessel injuries are still rare, and most often affect the lateral femoral cutaneous nerve.[2,3] Fortunately, avascular necrosis of the femoral head is not among the reported lists of complications with joint entry in hip arthroscopy.[1,4-6] Nevertheless, at the level of the piriformis muscle, the posterolateral portal has a worrisome close relationship to the deep branch (ramus profundus) of the medial femoral circumflex artery (MFCA), which provides the main blood supply to the femoral head.[7] Vessel injuries at the time of portal placement have been reported as portal bleeding,[5] and topographic reports have focused on the relationship of the anterior portal to the ascending and terminal branches of the lateral femoral circumflex

From the Department of Orthopaedics, University of Zürich, Zürich, Switzerland, and the Department of Orthopaedics and Traumatology, Inselspital Bern, Bern, Switzerland.

The authors report no conflicts of interest.

Address correspondence and reprint requests to Patrick S. Sussmann, M.D., Department of Orthopaedics, University of Zürich, Balgrist, Forchstrasse 340, 8008 Zürich, Switzerland. E-mail: sussmannp@gmx.net

0749-8063/07/2310-6487$32.00/0
doi:10.1016/j.arthro.2007.05.014

artery.[2,3] However, injuries to these vessels bear no risk of avascular necrosis of the femoral head.[7] Topographic description of the posterolateral portal has focused on the relationship to the sciatic nerve, whereas the relationship to the MFCA remains unknown.[2,3] We felt that clarification of this relationship is important if prearthritic hip pathologies are approached by a posterolateral arthroscopy portal. Therefore, the aim of this study was to examine the anatomic relationship between the deep branch of the MFCA and the posterolateral portal to the hip.

METHODS

The deep femoral arteries of 7 fresh human cadavers were injected with latex according to the technique used by Gautier[7] and fixed according to the technique described by Thiel.[8] None of the specimens had previous surgery to the hip joint, nor did we observe any deformities of the hip during later dissection in any of the specimens.

For the arthroscopic procedure, the specimens were positioned on a traction operating table in the supine position with the operated extremity in 10° of internal rotation, 10° of flexion and neutral abduction. The operating table was tilted 10° away from the surgeon.[9] Twenty-five to fifty pounds of axial traction were applied until appearance of the vacuum phenomenon[10] under fluoroscopic control in order to gain appropriate distraction for needle placement and entry of the hip joint.[11] All portals were established using a well-described technique.[10] First, the anterolateral portal was established under fluoroscopic control, penetrating the skin anterior to the tip of the greater trochanter and penetrating the gluteus medius muscle.[10] After introduction of a 70° optic into the central compartment, the anterior portal was established by penetrating the skin 6 cm distal to the anterior superior iliac spine and the sartorius and rectus femoris muscle in a 45° cephalad and 30° toward midline angle[10] under arthroscopic control. The arthroscope was then changed to the anterior portal, and the posterolateral portal was established under arthroscopic visualization of the posterior triangle as an intra-articular landmark. The external landmark for placement of this portal was the posterior superior border of the greater trochanter, penetrating the posterior border of the gluteus medius and minimus proximal to the piriformis tendon.[10] As anteversion of the femoral neck was compensated for by internal rotation of the foot and tilting the table 10° away from the surgeon, the needle was aimed almost parallel to the floor for joint entry. Careful attention was paid to avoid the labrum with placement of all 3 portals.[12] All cannulas were placed over a flexible guide wire.

Subsequently, all specimens underwent surgical dissection to identify the tract of the posterolateral portal and to expose the course of the MFCA and its deep branch. To this end, the greater trochanter was osteotomized. The exposed course of the MFCA and the portal tract were documented by photography. The distance between the portal tract and the deep branch of the MFCA was measured in millimetres at its shortest point utilizing a standard ruler, which always was at the level of the piriformis tendon.

RESULTS

The posterolateral arthroscopy portal could be established in all 7 specimens with the above described technique; however, 1 specimen did not reveal filling of the deep branch of the MFCA, and did not allow for accurate measurement of the distance.

In 6 specimens, the tract of the posterolateral portal and the course of the MFCA could be visualized after dissection.

The portion where the deep branch of the MFCA crosses anterior to the superior gemelli muscle and distal to the piriformis tendon, just before the vessel's terminal division into its superior retinacular branches

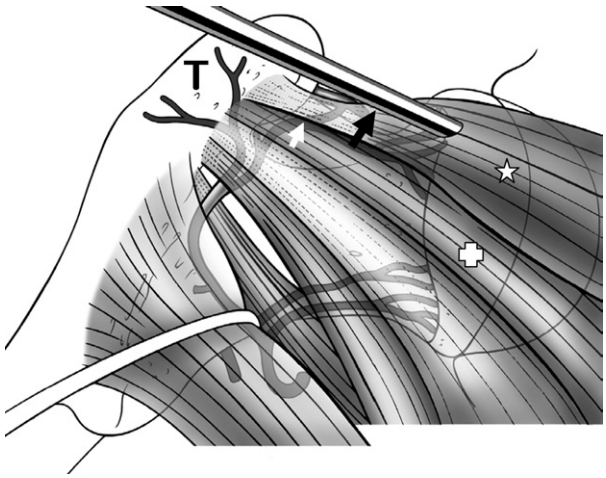

FIGURE 1. Graphic demonstrating the relation ship between the posterolateral portal (*black arrow*) to the hip and the course of the deep branch of the MFCA (*white arrow*). The portion where the deep branch of the MFCA crosses anterior to the superior gemelli muscle (cross), just before the vessel's terminal division into its superior retinacular branches, was the region where the posterolateral portal came closest to this vessel at the level of the piriformis tendon (star). Posterior border of the greater trochanter (T).