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Operative Techniques in

Sports Medicine

Hip Arthroscopy: Technique and Anatomy

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The frequency of hip arthroscopies has been explosively increasing over the past years, leading to a tremendous improvement of its technique and understanding of the arthroscopic anatomy of the hip joint. This report presents established techniques for hip arthroscopy with and without traction for inspection of the central and peripheral compartment of the hip. Detailed steps for patient positioning, distraction and distension, portal placement, and a diagnostic round trip are included.
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For the past 2 decades, the need for less invasive, joint-preserving, operative techniques has led to a massive improvement of minimally invasive procedures not only of the knee and shoulder but also of arthroscopic surgery of the hip joint. Different centers in Europe,[1-20] the United States,[21-38] and Japan[39-41] have been contributing to the development and improvement of innovative techniques of hip arthroscopy. With its increasing frequency has grown the knowledge of the normal hip anatomy with the ability to differentiate between anatomic variations and pathologic conditions of the hip joint.

Based on the classification of the arthroscopic compartments of the hip joint, the following report presents the current diagnostic and operative technique of hip arthroscopy of both compartments with and without traction including a systematic mapping of the normal arthroscopic anatomy.

Arthroscopic Compartments of the Hip Joint

Placement of portals and maneuverability of the arthroscope and instruments within the hip joint is more difficult than in other joints. This is related to the following anatomic features: a thick soft-tissue mantle; close proximity of 2 major neurovascular bundles; a strong articular capsule; a relatively small intra-articular volume; permanent contact of the articular surfaces; and the sealing of the deep, central part of the joint by the acetabular labrum. Thus, if no traction is applied to the hip, only a small film of synovial fluid separates the articular surface of the femoral head from the lunate cartilage and acetabular labrum ("artificial space").

The anatomy of the acetabular labrum must be considered before accessing the hip joint. The labrum seals the joint space between the lunate cartilage and the femoral head. Even under complete muscle relaxation during anesthesia, the labrum maintains a vacuum force of about 120 to 200 N, which keeps the femoral head within the socket.[42-44] To overcome the vacuum force and passive resistance of the soft tissues, traction is needed to separate the head from the socket, to elevate the labrum from the head, and to allow the arthroscope and other instruments access to the narrow "artificial space" between the weight-bearing cartilage of the femoral head and acetabulum. However, if traction is applied, the joint capsule with the iliofemoral, ischiofemoral, and pubofemoral ligaments are tensioned and the joint space peripheral to the acetabular labrum decreases. Thus, to maintain the space of the peripheral hip joint cavity for better visibility and maneuverability during arthroscopy, traction should be avoided.

In consequence, Dorfmann and Boyer[11,13] divided the hip arthroscopically into 2 compartments separated by the labrum (Fig. 1). The first is the central compartment (CC) comprising the lunate cartilage, the acetabular fossa, the ligamentum teres, and the loaded articular surface of the femoral head. This part of the joint can be visualized almost exclusively with traction. The second is the peripheral compartment (PC) consisting of the unloaded cartilage of the femoral head, the femoral neck with the medial, anterior and posterolateral synovial folds (Weitbrecht's ligaments), and the articular capsule with its intrinsic ligaments including the zona orbicularis. This area can be better seen without traction.[45]

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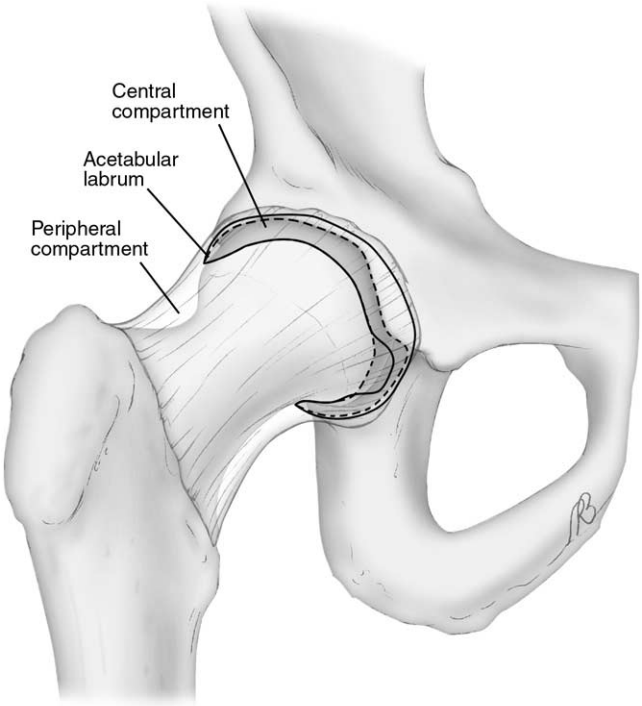

Figure 1 Arthroscopic compartments of the hip joint according to Dorfmann and Boyer.[11,13]

Operative Technique

Operating Room Setup

For the supine position, the surgeon, assistant, and scrub nurse with instrument table are on the ipsilateral side (Fig. 2). The image intensifier is placed on the opposite side. The arthroscopy unit with video monitor and image intensifier with monitor are placed toward the foot. If the patient is in the lateral position, the surgeon stands behind the patient.

Positioning

Hip arthroscopy with and without traction can be performed in the lateral[21,23] or supine position.[26,40,45] Some authors claim that there are advantages to the lateral position including better access to the posterolateral area[46,47] and better application of traction in line with the femoral neck.[48] However, in this author's studies in fresh cadaveric hips, joints showed no significant differences in distraction of the hip between the supine and the lateral position.[49] From the author's experience, the decision whether to use the supine or lateral position appears to be more a matter of individual training and habit of use. Because of the almost exclusive use of the anterolateral and anterior portals during hip arthroscopy without traction, the author prefers the supine position.[13,36,45,50]

The author usually combines the technique with traction and without traction. If distraction of the central compartment is not sufficient, only the peripheral compartment is operated without traction. The combination of both techniques is important to allow a complete diagnostic arthroscopic examination of the hip. However, this makes the positioning and draping technique demanding. As indicated earlier, traction is needed for hip arthroscopy of the CC, whereas free draping of the hip joint without traction is beneficial for hip arthroscopy of the PC. Because positioning for the traction part needs to be most accurate, the author starts with this part first. Exact placement of the counterpost is crucial to achieve optimal distraction of the hip and to avoid complications. This can be done only under nonsterile conditions.

Hip Arthroscopy With Traction

In the supine position, the patient is pulled distally onto the counterpost so that the medial side of the thigh presses against the post. This is important not only to avoid pressure to the perineum and pudendal nerve but also to increase the cantilever effect of the post on subsequent adduction of the leg (Fig. 3).[44] Both feet and ankles are well padded and fixed tightly into the traction boots to prevent damage to soft tissues around the ankle (eg, deep peroneal nerve) and not to lose distraction of the hip by slipping out of the boot. The contralateral hip is kept in abduction of about 20°, neutral rotation, and 0° of extension. Moderate traction only by manual lengthening of the extension bar of the extension table is then applied to the contralateral side first to increase the asymmetric, lateralized position of the counterpost and prevent tilting of the pelvis during traction of the ipsilateral side. The ipsilateral hip is then slightly flexed to 10° to 20° for relaxation of the strong anterior parts of the hip joint capsule. Strong traction by lengthening of the extension bar is then applied to the ipsilateral side. The leg is adducted to about 0° to 10° of abduction to increase the distraction force vector by a cantilever effect of the counterpost (Fig. 4).[44] Excessive internal or external rotation of the leg should be avoided not to bring the femoral or sciatic nerve bundles closer to the portal areas. The first anteroposterior radiograph is taken with the image intensifier (Fig. 5A). The hip is then distracted by pulling with the traction module until the joint vacuum is broken, which can be heard by a sudden "pop" of the hip and immediate lengthening of the leg. Another radiograph is taken to assess distraction of the hip joint (Fig. 5B). Traction is released until the hip is scrubbed and draped and portals to the central compartment are established. Sometimes distraction may be moderate only. In these cases, better separation can often be achieved once the vacuum seal is broken with the spinal needle. However, if adequate distraction cannot be achieved with a combination of traction, distension, and proper joint positioning, the surgeons needs to be prepared to abandon arthroscopy of the central compartment. Under these circumstances, he can still perform arthroscopy of the peripheral compartment without traction.

Hip Arthroscopy Without Traction

Traction is released and the foot is taken out of the traction boot and covered with a sterile hood. The traction bar and the counterpost are removed, and the leg rest extension is reattached to the extension table. The hip can be flexed, rotated, and ab-/adducted to the desired position (Fig. 6). Cadaver experiments and in vivo experience (H. Dorfmann, T. Boyer, personal communication, August 1998) have shown that free