Surgical Hip Dislocation for the Treatment of Synovial Chondromatosis Associated with a Cam Deformity

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ABSTRACT
Synovial chondromatosis is a rare benign disease of the synovial tissue that can cause joint damage if not properly treated. On the other hand, cam deformity causes friction between the acetabular rim and the femoral neck-head junction, which can lead to chondrolabral damage and, in its natural progression, result in osteoarthritis. The treatment of synovial chondromatosis of the hip is controversial, involving open surgery or arthroscopy, but it should include complete removal of loose bodies and synovectomy to prevent recurrences. In contrast, a cam lesion can often be managed with arthroscopy. We present a clinical case where both conditions were associated and treated with controlled hip dislocation. The choice of controlled dislocation allows for a comprehensive view of the joint and has been successfully used in cases of synovial chondromatosis associated with cam lesions.
Keywords: Synovial chondromatosis; femoroacetabular impingement; surgical hip dislocation; hip arthroscopy.
Level of Evidence: IV

Luxación controlada de cadera en el tratamiento de la condromatosis sinovial asociada a una lesión tipo cam

RESUMEN
La condromatosis sinovial es una rara enfermedad benigna del tejido sinovial que puede causar daño articular si no se trata adecuadamente. Mientras que la lesión tipo cam provoca una fricción entre el borde acetabular y la unión cuello-cabeza femoral que puede generar un daño condrolabral y, en su evolución natural, llegar a la artrosis. El tratamiento de la condromatosis sinovial de cadera es controvertido, entre la cirugía abierta o artroscópica, pero debe incluir la extracción completa de los cuerpos libres y la sinovectomía para evitar recurrencias. Por el contrario, la lesión tipo cam puede manejarse con artroscopia en la mayoría de los casos. Presentamos un caso clínico en el que se asocian ambas patologías y que fue tratado mediante luxación controlada de cadera. La elección de la luxación controlada permite una visión completa de la articulación y se ha utilizado con éxito en casos de condromatosis sinovial asociada a la lesión tipo cam.
Palabras clave: Condromatosis sinovial; fricción femoroacetabular; luxación quirúrgica de cadera; artroscopia de cadera.
Nivel de Evidencia: IV

INTRODUCTION

Synovial chondromatosis (SC) is a rare, benign, proliferative disease of synovial tissue. It is characterized by synovial tissue metaplasia, which results in the formation of cartilaginous bodies, which tend to ossify over time by endochondral ossification and can become free bodies, causing joint injury and osteoarthritis if not detected early.[1,2] SC occurs in structures with synovial lining, such as synovial joints, tendon sheaths, and bursae, although it most commonly affects weight-bearing diarthrodial joints, with the hip being the second most affected joint after the knee. The etiopathogenesis of SC is not clear, and it can be divided into primary or idiopathic and secondary. The most common clinical manifestations are coxalgia, stiffness and mechanical symptoms; and the method of choice for early diagnosis is magnetic resonance imaging.[1,3]

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The treatment of hip SC is controversial, but it should include total excision of the free bodies as well as synovectomy to reduce the risk of recurrence.[4,5] Therapeutic options may be arthroscopy or open surgery, with or without hip dislocation; the average overall recurrence is 19%.[2,6,7] Hip arthroscopy results in less morbidity, but has limitations in access to some areas of the joint, while controlled dislocation poses greater surgical risk and slower rehabilitation, but allows a complete view of the joint.[4,8-11]

Femoroacetabular impingement occurs due to abnormal contact between the proximal femur and the acetabulum.[12] Cam deformity occurs at the expense of the proximal femur, at the intersection of the femoral neck and femoral head, and is diagnosed by imaging showing an alpha angle >55°, although this value is still debated. Cam deformity can cause coxalgia in young adults by impingement on the acetabular rim during physiologic movements. This can lead to chondrolabral damage which, left to natural evolution, can end in osteoarthritis.[14,15] In two case reports, hip SC has been associated as a possible secondary cause of cam deformity, although the evidence is insufficient.[16,17] The treatment chosen for these cases was controlled hip dislocation which was effective in treating the SC and the cam deformity in a single surgical procedure.

The purpose of this technical note is to describe the surgical technique of controlled hip dislocation for cases with one or more conditions requiring a 360° view of the hip, such as SC associated with a cam lesion.

CLINICAL CASE

A 21-year-old man consulted for right coxalgia, with no relevant medical history. Five years earlier, he had started with insidious pain and, gradually, joint stiffness had appeared. He had received conservative treatment, without a clear diagnosis.

The patient reported limitations in daily activities due to pain; the visual analog pain scale score was 9/10 and the range of motion was limited. During the physical examination, he had pain on 90° flexion, a positive FADIR test, and limited rotations. The preoperative modified Harris hip score was 47.

Radiographs showed multiple intraarticular radiopaque round images of different sizes, a cam deformity in the anterior-superior region and absence of degenerative signs. MRI revealed numerous free bodies throughout the joint cavity, as well as edema in the trochanteric and lateral neck areas. The cartilage was found to be intact. The ossified free bodies were located with more precision using computed tomography, and the alpha angle obtained was 64° in the anterosuperior region.[13] It was decided to perform a controlled hip dislocation, as described by Ganz et al., to remove the free bodies, perform a wide synovectomy and resect the cam deformity in the same surgical procedure.[18]

Technical considerations

The patient is placed in the lateral decubitus position. A lateral hip approach of 12-15 cm in length is performed between the anterior third and posterior two thirds of the greater trochanter, with a one-third proximal extension and a two-thirds distal extension. Once the fascia is reached, it is incised and, with internal rotation of the hip, a retractor is placed under the posterior insertion of the gluteus medius and another under the vastus lateralis to expose the greater trochanter. The site of the trochanteric osteotomy is marked, going from the anterior region to the most posterior insertion of the gluteus medius to the origin of the vastus lateralis, in a straight line, approximately 1.5 cm thick. This is performed with an oscillating saw or osteotome and, during this procedure, the sciatic nerve must be protected. Then, the gluteus medius-trochanter-lateral vastus complex is mobilized anteriorly and, with the limb in flexion and external rotation, the joint capsule is exposed in its anterior, inferior and posterosuperior portions. It is critical to protect the insertions of the external rotators during osteotomy, capsulotomy, and limb mobilization to reduce the risk of femoral head bone necrosis. The medial femoral circumflex artery is protected by the obturator externus muscle, and an anastomosis of the medial femoral circumflex artery and the inferior gluteal artery runs along the superior border of the piriformis muscle.[19]

A z-shaped capsulotomy is performed, although it can also be done in an inverted T-shape, and care must be taken not to cross the lesser trochanter in its inferior extension so as not to damage branches of the medial femoral circumflex artery. Before dislocation, it is necessary to divide the ligamentum teres with a tenotome and then, with flexion, adduction and external rotation, the femoral head can be dislocated without causing excessive tension or twisting of the vessels supplying it posteriorly. Once dislocated, the joint can be carefully examined

in 360° to evaluate the state of the labrum, the cartilage and, in our case, the location of the free bodies, the state of the synovial tissue and the cam deformity. First, all the free bodies are removed and a modified complete synovectomy is performed, debriding all the synovial tissue with an electroscalpel, except for the posterosuperior region where the entrance of the retinacular vessels, branches of the medial femoral circumflex artery, is located.[4] It is important to remember to debride the synovial lining of the capsule. Then, the osteochondroplasty of the cam deformity is performed with an osteotome and then with a 5 mm burr until the normal neck-head junction is restored. It is recommended that the resection be thoroughly controlled in order to avoid excessive resection with the consequent risk of stress fracture of the femoral neck. It is important to verify that there are no free bodies adhering to the acetabular background or synovial tissue that has not been debrided. The wound is then irrigated, in our case, with saline solution. Once both conditions have been treated, the hip is gently reduced with traction, flexion and internal rotation and the hip is taken through a full range of motion to search for signs of friction. Capsular closure is performed with absorbable suture #1, without generating excessive tension to avoid collapse of the capsular vessels. The greater trochanter is fixed with two 4.5 mm cortical screws. Histological examination confirmed the diagnosis of SC (Video).

To avoid heterotopic calcifications, celecoxib 200 mg is administered daily for two weeks after surgery, together with a 30-day antiplatelet regimen of aspirin 100 mg daily. Mobilization begins on the first postoperative day, and six weeks of partial weight bearing with crutches is recommended. Active abduction is prohibited during this time to protect the trochanter fixation. After six weeks, gradually increase weight-bearing to full weight-bearing at ten to twelve weeks.

Postoperative evolution

One year after surgery, the patient suffered some pain on days of high activity, but the visual analog scale score improved significantly: 0/10 at rest and 2/10 with activity. In addition, he regained his functional capacity and the modified Harris hip score improved to 94. Postoperative radiography shows no signs of bone necrosis.

FINAL CONSIDERATIONS

Surgical hip dislocation aims to achieve a complete view of the joint, and Ganz et al. described this technique with the necessary precautions to maintain the main blood supply to the femoral head and thus minimize the risk of necrosis. To avoid necrosis, it is necessary to preserve the irrigation that comes mainly from the medial femoral circumflex artery and enters the joint through the posterior muscular plane, with special care for the obturator externus muscle. During surgery, the moments of greatest danger to vascularization are trochanteric osteotomy, capsulotomy, dislocation, synovectomy and capsular closure, which have been detailed above. This technique can be used for multiple purposes, such as the treatment of femoral head fractures, epiphysiolysis, femoroacetabular impingement, and tumor, infectious and osteochondral lesions.[20] The advantages of surgical hip dislocation when there is a combination of SC and a cam deformity are that this procedure allows us to visualize the entire joint to extract the free bodies in all the locations that are detected and, in the case of extraarticular involvement, it can also be accessed.[10]It also allows us to perform a complete synovectomy while preserving the retinacular vessels and leaving no residual diseased synovial tissue, and with the cam deformity exposed, we can ream the deformity with the appropriate care to avoid excessive resection. Furthermore, it is possible to confirm whether the cartilage and labrum are intact, and if a lesion is discovered, it can be repaired in the same procedure. The rate of complications with this technique is low, the most common being wound infection and lack of consolidation of the trochanteric osteotomy, while the most feared is necrosis, which can be prevented with the aforementioned surgical care.[7,10] An alternative to surgical dislocation is arthroscopy, which causes less morbidity, provides a faster recovery and does not pose the risk of bone necrosis. Good outcomes have been reported for the treatment of hip SC, with complete removal of the free bodies, synovectomy, and low complication rates.[8] Hip arthroscopy became the gold standard procedure for the surgical management of cam deformities, and surgical dislocation was relegated to cases with posterior region or circumferential cam deformities.[21] However, arthroscopy restricts access to the posteroinferior region, and SC treatment can be challenging when there are numerous free bodies and substantial synovial involvement that is difficult to approach. Moreover, complications such as iatrogenic chondrolabral injury, neurovascular injury, and traction neuropraxia are possible. It is essential to thoroughly examine the preoperative imaging to

determine the location of the free bodies as well as the presence of degenerative signs and associated lesions. In our case, we opted for surgical dislocation since the length of clinical evolution (5 years) along with the synovial involvement seen in the images led us to believe that numerous free bodies would have adhered to the synovium as a result of the synovitis. Furthermore, with the proper irrigation care, modified complete synovectomy can be better controlled and thus prevent the recurrence of SC. Regarding recurrence, the risk is higher when only the free bodies are removed without resecting the inflamed synovium, which is the seat of cartilaginous metaplasia. In a systematic review, the arthroscopic technique had a recurrence rate of 7.1%, whereas Comba et al. had no recurrences.[8,22] No recurrences have been found with surgical dislocation and the complication rate is very low in recent studies.[3,10] However, as this is a rare disease, there are no studies of high scientific quality available to be able to draw solid conclusions in this regard.

In two studies, the association of hip SC and cam deformity was reported, and the latter was attributed to SC.[16,17] Such hypothesis could be due to the fact that synovial metaplasia occurs mainly in the transition zone between cartilage and synovium where the nodule becomes ossified, or to free body adhesion and, in both cases, the femoral neck-head relationship would be altered. The cam deformity, on the other hand, could be regarded as the primary cause, originating during the developmental stage and not causing symptoms until the onset of clinical SC, or as osteophytes due to an osteoarthritic process caused by damage to the underlying SC. At present, there is insufficient evidence to support this theory, but the treatment we have established serves as a model, since our case had similar characteristics and the results were satisfactory. In addition, it is important to include SC within the differential diagnoses of infrequent coxalgia and a high index of suspicion is necessary to reach an accurate diagnosis and be able to offer timely treatment.

CONCLUSIONS

SC of the hip is a rare disease of the synovial tissue that leads to progressive joint damage. It is possibly related to a cam deformity; therefore, treatment should address both conditions. Surgical hip dislocation is a viable option because it allows for the visualization of the entire joint, allowing for the treatment of both the SC and the cam deformity in a single surgical procedure with minimal chances of residual disease and a low rate of complications that can be minimized by taking precise precautions during the procedure.

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