En bloc arthroscopic resection of osteoid osteoma in the hip: a report of four patients and literature review

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INTRODUCTION

Arthroscopic procedures have recently gained importance in orthopaedic practice, and the advantages are now well established in the hip. Hip arthroscopy is being performed more frequently because it allows precise diagnosis and a direct approach; has low morbidity; does not require dislocation of the joint, which reduces the risk of vascular damage to the femoral head; requires shorter hospitalization time and allows faster rehabilitation.[1–5]

The indications for hip arthroscopy also are expanding mainly because of improvements in diagnostic means, surgical instruments and the expertise of the surgeons.[1–5] Arthroscopic resection of osteoid osteomas in the hip previously has been described in two independent case reports with good results.[1,2]

The aim of this paper was to describe the technique for arthroscopic en bloc resection of an osteoid osteoma in the hip and to report four patients treated with this technique.

PATIENTS

Between July 2005 and March 2008, four patients underwent arthroscopic resection of osteoid osteoma. The mean age was 27.2 years at the time of the procedure (standard-deviation [SD]: 13.4 years), and all the patients were men.

The preoperative protocol consisted of clinical evaluation, radiographs and CT. The clinical assessment included the modified Harris Hip Score (HHS)[5] and Pain Facial Expression Scale (PFES).[6] The PFES varies from 1 to 6, in which the patient indicates the level of pain from standard facial expression drawings. A score of 6 represents the absence of pain and 1 the worst possible pain. Some patients brought in MRIs previously requested by other physicians. Clinical evaluation was repeated at 1, 3 and 6 months after surgery and every 6 months thereafter.

SURGICAL TECHNIQUE

After locating the tumor with the aid of CT, patients were placed supine for arthroscopy.[3] The need for articular traction depended on the location of the tumor. Traction was applied for acetabular lesions or those located in the femoral head. Tumors of the femoral neck were removed without the need for articular traction. In general, two portals were sufficient to approach the hip joint, and they were chosen based on the topography of the lesion.[3] In our patients, the anteroinferior and anterolateral portals were used. As soon as the probable site of the lesion had been identified by image intensification, arthroscopic debridement of the area was performed, which revealed either sclerotic bone or the tumor nidus. At this point, a Kirschner wire was introduced into the middle of the tumor under direct arthroscopic view. En bloc resection of the tumor was performed with cannulated trephines guided by the Kirschner wire. Those trephines had variable diameters to fit the size of the tumor and a millimeter scale to control the depth of the resection. The removed specimen was inspected and a radiograph obtained to assure complete removal of the tumor. In cases of incomplete removal, complete excision may be achieved with an arthroscopic burr.[1] This was not necessary in any of our patients. In all patients, the specimen was sent for histologic examination to confirm the diagnosis.

In patients in whom difficulties in locating the lesion were expected, the lesion was marked with a Kirschner wire in the radiology room just before surgery, with the aid of CT. En bloc resection of the lesion was performed after the wire was repositioned with arthroscopic assistance. The arthroscopic view allowed us to protect the intra-articular structures.

RESULTS

All patients had groin pain for an average of 22.7 months (standard-deviation of 8.6 years). The mean preoperative modified HHS[7] and PFES[8] were 56.6 (SD = 18.2) and 1.75 (SD = 0.5) points, respectively. Complete remission of the symptoms was achieved in all patients after resection, and maximal scores for pain and function were registered. Mean follow-up time was 21.5 months (range, 3–35 months). All patients were discharged from the hospital within 24 hours after the procedure.

Table 1 details the demographic aspects, pain and functional scores of all patients, as well as the follow-up times.

CASE REPORTS

Patient 1

A 20-year-old man presented with a 22-month history of hip pain. He reported no previous trauma or surgeries. Nonsteroidal anti-inflammatory drugs (NSAID) relieved his pain. He complained of pain during stair climbing, getting

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TABLE 1. List of patients

Patient	Age (years)	Sex	Duration of symptoms (months)	HHS-preoperative	PFES-preoperative	Follow-up (months)	HHS-postoperative	PFES-postoperative
1	20	M	22	30.8	1	35	100	6
2	47	M	33	62.7	2	33	100	6
3	18	M	12	73.7	2	15	100	6
4	24	M	24	59.4	2	3	100	6
Mean (SD)	27.25 (13.4)	—	22.75 (8.61)	56.65 (18.28)	1.75 (0.5)	21.5 (15.26)	100 (0)	6 (0)

HHS, Harris Hip Score modified by Byrd; postoperative, measured at last follow-up; M, Male; m, months; PFES, Pain Facial Expression Scale; SD, Standard-deviation; y, years.

in and out the car, while exercising and rising from a low chair. Blood tests were within the reference values.

Physical examination suggested intra-articular pain, but there was also pain during palpation of muscle structures in the hip. Functional scores are listed on Table 1. Radiographs showed no evidence of the lesion. Scintigraphy, CT and MRI arthrogram demonstrated a lesion in the anteromedial aspect of the femoral neck suggestive of an osteoid osteoma (Figure 1).

Arthroscopic resection of the tumor was performed with the aid of a bone trephine (Figure 2). Histologic examination of the surgical specimen confirmed the diagnosis. Pain subsided after surgery. The patient remained symptom-free and had no signs of recurrence 35 months after surgery.

Patient 2

A 47-year-old man complained of anterior hip pain with insidious onset 30 months earlier. He reported that his symptoms worsened when exercising, and he had relief with rest. There was no history of trauma or fever. He had undergone several evaluations in other hospitals with no conclusions. The patient presented with groin and buttock pain elicited by physical activities, which was recurrent at night. Blood tests were normal.

Physical examination was similar to that found in patient 1, and functional scores are listed on Table 1. Radiographs showed sclerotic bone in the acetabular fossa (Figure 3). Other images showed evidence of osteoid osteoma associated with a labral lesion (Figure 4).

At arthroscopy, we were able to remove the tumor en bloc. A chondral lesion associated with labral tear and synovitis also was diagnosed and treated. Histologic study of the surgical specimen confirmed the diagnosis. Immediately after the procedure, there was complete relief of the pain, and at 33 months after surgery he had no signs of recurrence.

Patient 3

An 18-year-old man complained of hip pain for 1 year after table tennis practice. He reported worsening of the symptoms 2 months before surgery when he engaged in athletics. Relief of pain was reported with NSAID use. Radiographs were normal. A magnetic resonance arthrogram (MRA) was obtained in another hospital, and a labral tear was diagnosed.

Our evaluation revealed characteristics of intra-articular pain. Functional scores are listed in Table 1. The complaint of pain that worsened at night and after exercises and was relieved with NSAIDS was an important hint for the diagnosis. The clinical presentation was considered inconsistent with an isolated labral tear, and we suspected osteoid osteoma as a diagnosis, which was confirmed by CT.

En bloc resection of the femoral neck tumor was performed with trephine under direct arthroscopic view. The diagnosis was confirmed by histology. The patient was asymptomatic and resumed physical activity after 15 months.

Patient 4

A 24-year-old man complained of anterior right hip pain that he had for 24 months. NSAIDs relieved the symptoms temporarily. He did not have symptoms of pain during hip palpation or mobilization. There were no records of fever, previous surgery or trauma in the hip, and the blood tests were normal. Functional and pain scores are listed in Table 1.

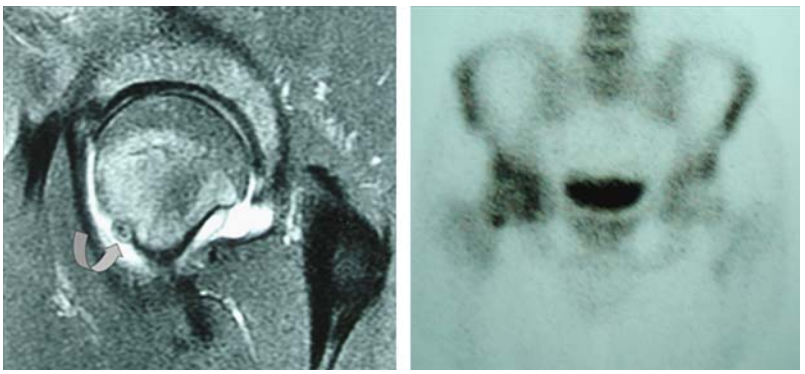

FIGURE 1. Patient 1. MRI and scintigraphy images of the right hip were consistent with osteoid osteoma in the anteromedial aspect of the femoral neck.

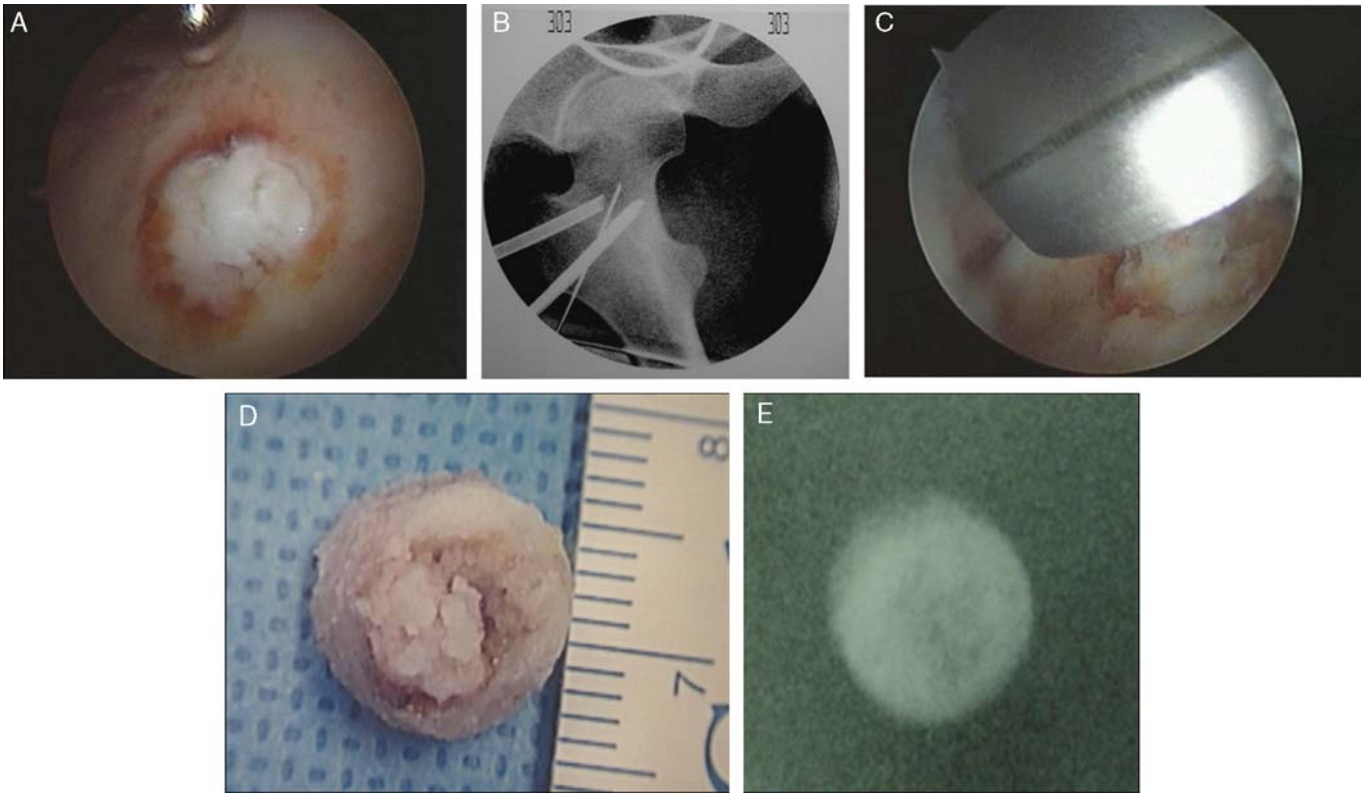

FIGURE 2. Patient 1. (A) Arthroscopic view of the tumor after debridement. (B) Fluoroscopy image of the arthroscopic triangulation. (C) En bloc removal of the lesion with a trephine graduated in millimeters. (D) Macroscopic inspection of the tumor. (E) Radiograph of the specimen.

No lesions were noted on the radiographs. The patient had CT and MRA that revealed a lesion in the anterior aspect of the acetabulum, which was consistent with osteoid osteoma (Figure 5).

The lesion was marked with a Kirschner wire placed with the aid of CT (Figure 6). En bloc resection of the tumor was performed with a circular trephine under arthroscopic view (Figure 7).

The diagnosis was confirmed by histology study. After the procedure, the patient resumed his previous activities and was asymptomatic at 3 months follow-up.

DISCUSSION

Osteoid osteomas, first described by Jaffe in 1935,[7] are painful lesions of the bone that comprise 10–12% of all benign bone tumors. However, only 1–3% are located in the pelvis.[8] Mostly males are affected, and 80% of the patients are between 5–24 years of age.[9,10] It is a small benign tumor that causes episodes of intense pain. The size differentiates it from osteoblastoma, which is always larger than 2 cm.[8,11] In general, pain is continuous despite physical activities; it is more intense during rest, especially at night, and is relieved with NSAID and salicylates. An intense and chronic inflammatory response of the surrounding tissues with periosteal reaction, bone sclerosis and synovitis is caused by local secretion of prostaglandins by the tumor, which subsides spontaneously after removal of the nidus.[10,12] The main sites for occurrence are the femur, the proximal tibia and the spine.[8,10]

FIGURE 3. Patient 2. Sclerotic lesion in the acetabular fossa raised the suspicion of a bone tumor as a diagnosis.

The diagnosis of an osteoid osteoma often is easily confirmed because its symptoms are well defined, and the lesion is easy to see on scintigraphy, radiographs and CT. However, the diagnosis and treatment of periarticular lesions are challenging.[8–10] In the hip, such lesions are rare; we found 30 osteoid osteomas in the acetabulum reported in the literature (Table 2).

Various options for the treatment of this tumor have been described. Medical treatment is seldom reported and is reserved for patients in whom the lesion is unapproachable or its removal should incur in unacceptable morbidity.[29] Other treatments include open curettage of the lesion,[30] open en bloc removal,[12,21–26,31] percutaneous removal guided by CT[9,18,19] and percutaneous ablation with radiofrequency,[14,15,32–35] laser,[36] or ethanol.[37]

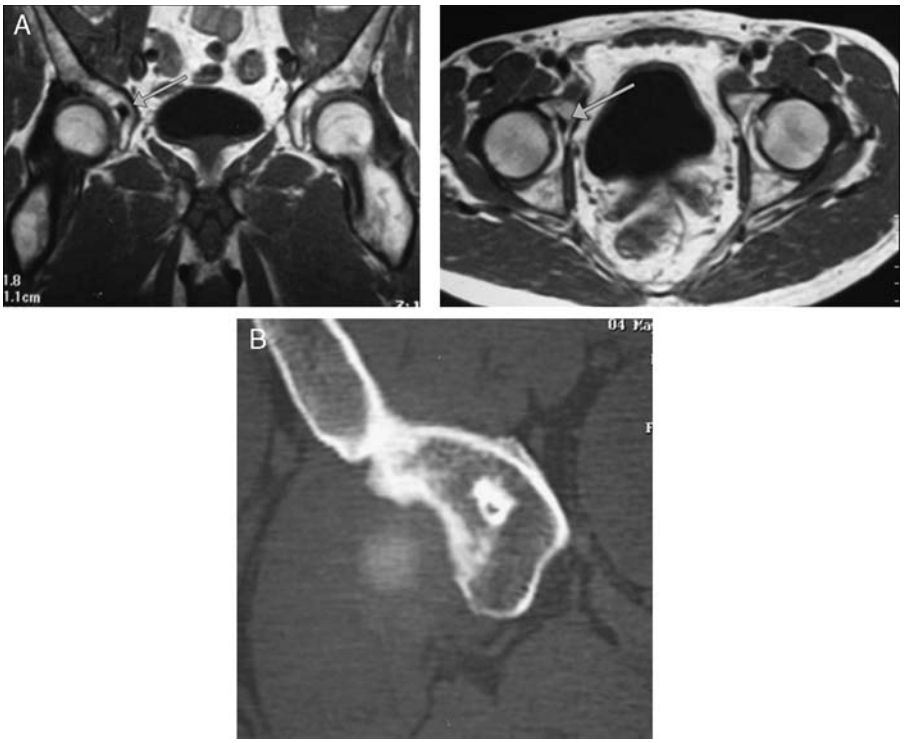

FIGURE 4. Patient 2. Tomography (A) and MRI (B) images confirmed the suspicions of the osteoid osteoma in the right acetabulum.

Open en bloc excision is considered to be the most efficient way to obtain complete removal of osteoid osteomas.[12,14,15,18,19,21–26,31–35] However, it can be related to greater morbidity, due to larger incisions or larger amounts of bone removal, increasing the risk for fractures in diaphyseal sites.[32] At the femoral neck, resections may be performed through the Smith-Petersen approach.[31] At the acetabulum, resection may be performed without dislocation through the Ludloff approach[12] or intra-pelvic approach,[21] with trochanteric osteotomy for access to the lateral aspect of the acetabulum,[25] or with dislocation of the joint through an anterior approach.[22–24,26]

The percutaneous en bloc resection guided by CT is considered a good option to treat these lesions for it is a minimally invasive procedure.[38] However, it does not a allow direct view of the tumor, which in acetabular lesions often causes some destruction of the articular cartilage.[2,19] Besides there is increased risk for neurological and vascular damage.[39]

Radiofrequency ablation of the tumor in various anatomical sites has achieved rates of success varying from 88–100% depending on the series.[14,33–35] Few reports have mentioned the application of this technique in the hip though, accounting for the treatment of only three acetabular lesions.[14,15] Additionally, this technique does not usually allow histological analysis of the tumor.

All three previously reported cases of arthroscopic removal of osteoid osteomas in the hip consisted of a biopsy followed

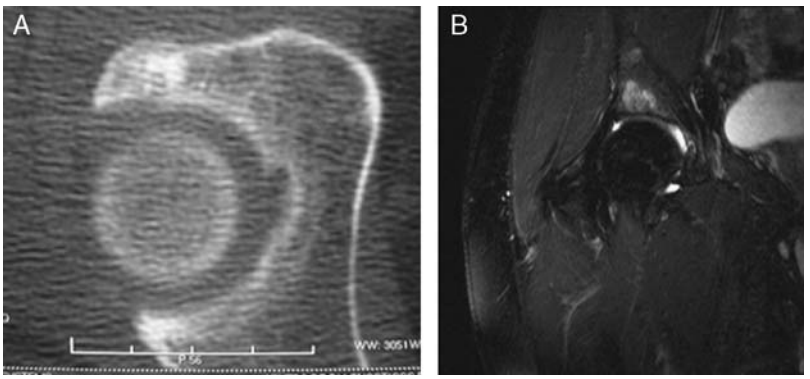

FIGURE 5. Patient 4. (A) CT showing lesion in the anterior wall of the acetabulum consistent with osteoid osteoma: sclerotic lesion (hyperdense) with a central nidus (hypodense). (B) T2-weighted MRI coronal slice showing an image of diffuse increased signal in the acetabular wall suggestive of the lesion.

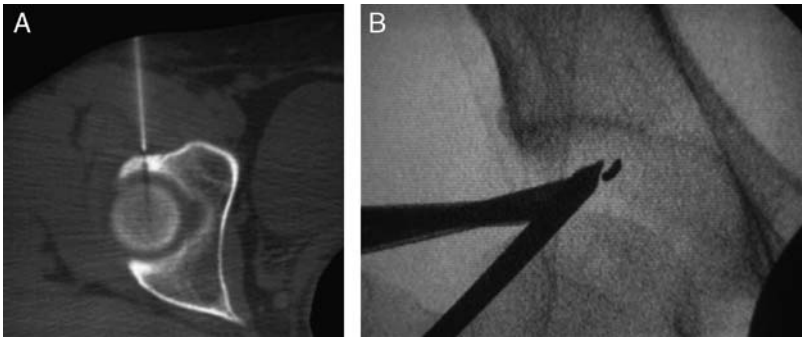

FIGURE 6. Patient 4. (A) CT-scan axial slice shows the Kirschner wire marking the region next to the lesion. (B) Fluoroscopy shows arthroscopic triangulation on the previously marked topography.

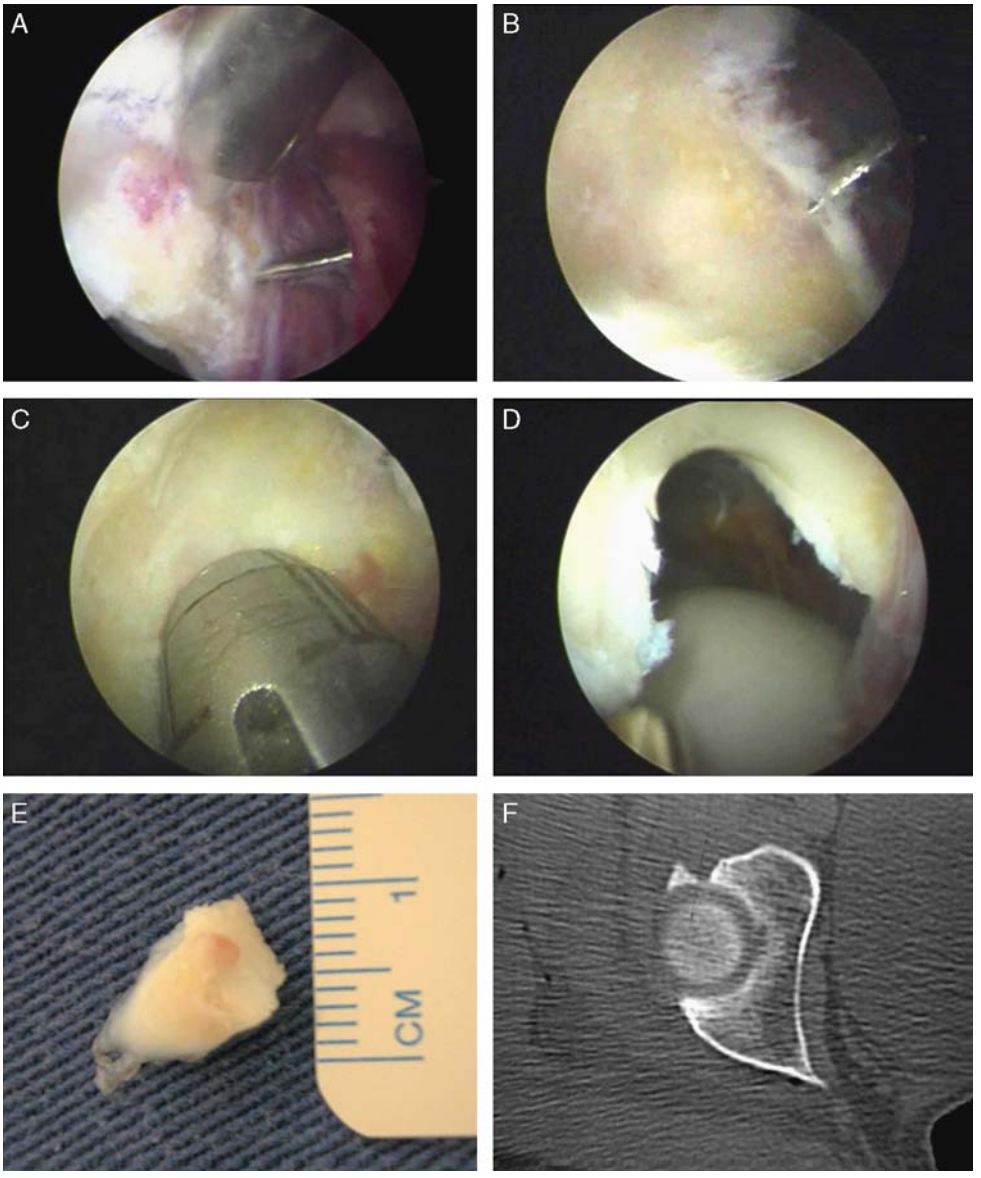

FIGURE 7. Patient 4. (A) Site of the lesion and of the Kirschner wire in the external surface of the wall of the acetabulum. (B) After debridement, sclerotic bone area is observed. (C) Trephine graduated in millimeters is placed over the lesion. (D) Arthroscopic view after resection shows the intact femoral head on the background. (E) Specimen removed with less than 1 cm. (F) Postoperative CT showing complete removal of the lesion.

TABLE 2. Review of acetabular osteoid osteomas reported, treatments performed and complications

Author	Publication/year	Patients	Treatment	Complications
Souza *et al.*	Current study	2	Arthroscopic, en bloc removal	None
Mounach *et al.*[13]	Reumatol Int, 2008	1	Percutaneous, guided by CT-scan	None
Papagelopoulos *et al.*[14]	J Int Med Res, 2006	2	Radiofrequency	None
Weits and van der Werf[15]	JBT-BTR, 2006	1	Radiofrequency	None
Haddad *et al.*[16]	Rev Chir Orthop, 2004	3	Radiofrequency	None
Alvarez *et al.*[1]	Arthroscopy, 2001	1	Arthroscopic	1 Pudendal nerve neurapraxia
Mott *et al.*[17]	Am J Orth, 2001	2	Open, en bloc removal	2 LFCN neurapraxia
Khapchik *et al.*[2]	Arthoscopy, 2001	1	Arthroscopic	None
Guyot-Drouot *et al.*[18]	Joint Bone Spine, 2000	1	Percutaneous, guided by CT-scan	''No serious complications''
Parlier-Cuau *et al.*[19]	Clin Orthop Relat Res, 1999	3	Percutaneous, guided by CT-scan	None
Miller *et al.*[20]	Orthopedics, 1997	1	Open, en bloc removal	None
Cohen and Rzetelny[21]	Clin Orthop Relat Res, 1994	1	Open, en bloc removal	None
Takaoka *et al.*[22]	Clin Orthop Relat Res, 1994	1	Open, en bloc removal	None
Karray *et al.*[23]	Int Orthop, 1993	1	Open, en bloc removal	None
Gille *et al.*[24]	J Pediatr Orthop, 1990	2	Open, en bloc removal	None
Bettelli *et al.*[8]	Clin Orthop, 1989	2	Open, intra-lesional excision	Limb shortening (2.5 cm)
Ninomiya *et al.*[25]	Acta Orthop Scand, 1989	2	Open, en bloc removal	None
Callaghan *et al.*[12]	Clin Orthop Relat Res, 1988	2	Open, en bloc removal	None
Carcopino *et al.*[26]	Chir Pediatr, 1986	1	Open, en bloc removal	None
Morin and Carlioz[27]	Rev Chir Orthop, 1986	1	Open, en bloc removal	Persistent deformity of the femur
Dejour *et al.*[28]	Rev Chir Orthop, 1975	1	Open, en bloc removal	?

Paper signaled with (?) was not available for full review of the complications.
LCFN, lateral femoral cutaneous nerve.

by resection using electrical devices and burr blades.[1,2] In the present series, we performed en bloc removal of the tumors (two in the acetabulum and two in the proximal femur) with the aid of a trephine. In one patient, the lesion was previously marked with a Kirschner wire guided by CT, followed by arthroscopic resection (Figure 6). When acetabular tumors were present, arthroscopy had an additional advantage of allowing resection under direct inspection with articular distraction, protecting the femoral head from potential iatrogenic harm from the trephine (Figure 7). This technique also avoided dislocation of the hip. Femoral neck tumors could be treated in a minimally invasive fashion, with direct visualization and with en bloc resection, avoiding the need for larger incisions. Additionally, in two patients concomitant intra-articular lesions were treated in the same procedure.

Previous studies reported no recurrences after arthroscopic resection of osteoid osteomas of the hip. In one study, temporary numbness in the area of the pudendal nerve was observed in a patient, with complete recovery after 4 weeks.[1,2] In our series no complications or recurrences to date have been noted. If one suspects incomplete removal of the tumor, additional resection may be performed with an arthroscopic burr.[1] This has not been necessary in our patients because we obtained complete removal of the tumors in all four. Overall, complication rates reported in hip arthroscopy vary from 0.5–6.4%.[40] Most are transient and have a low morbidity.[3,4,40,41] En bloc resections of tumors on the femoral neck may potentially increase the risk for stress fractures.[19] In fact, osteoid osteomas are by definition small tumors (less than 2 cm) and usually just a small portion of the neck needs to be resected using the en block technique. In an experimental study, Mardones *et al.*[41] showed that resection of up to 30% of the anterolateral quadrant of the head-neck junction did not significantly alter the load-bearing capacity of the proximal part of the femur. Even so, in our patients partial weight-bearing and crutches were implemented for 1 month after surgery.

This study has several limitations. We report on a small series of patients with a relatively rare condition who were treated with a novel technique that merged two established approaches: hip arthroscopy and en block tumor resection. This is not an outcome study, and we have very short follow-up for some of our patients. However, our patients showed full recovery, and the histology confirmed complete removal of the tumors; we cannot predict the success rate for this procedure in a larger population or compare it to other techniques such as radiofrequency ablation. To report our outcomes we have used the modified HHS,[5] which is a score that has not yet been validated for this technique. However, this is the most commonly used score in hip arthroscopy studies.[4,5,42] Moreover, this score has shown to have greater responsiveness than the Hip Outcome Score, which is a validated score for hip arthroscopy (Briggs *et al.* Presented at the 2009 AANA Annual Meeting). The strengths of this study are that all the data were prospectively collected, the patients were operated by the same surgeon using a common approach and we were able to obtain histologic confirmation in all patients.

En bloc arthroscopic resection of osteoid osteoma has repeated the success of the traditional open procedure in this series, without the potential morbidity related to more extensive approaches.

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