Clin Orthop Relat Res (2013) 471:1727–1732
DOI 10.1007/s11999-012-2772-y

Clinical Orthopaedics and Related Research®
A Publication of The Association of Bone and Joint Surgeons®

CASE REPORT

Case Report: Osteoid Osteoma of the Acetabulum Treated With Arthroscopy-assisted Radiofrequency Ablation

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Received: 20 August 2012 / Accepted: 19 December 2012 / Published online: 12 January 2013

Abstract
Background Osteoid osteomas consist of a nidus surrounded by reactive sclerotic bone. The diagnosis typically is based on imaging and clinical presentation involving nocturnal pain. Removal of the lesion is essential and currently is performed mainly with image-guided, minimally invasive techniques. We describe a case involving an osteoid osteoma of the acetabular fossa, treated with arthroscopy-assisted radiofrequency ablation.
Case Description A 47-year-old woman presented with a 9-month history of right groin pain and limited motion. The CT and MR images showed synovitis around the ligamentum teres and a nidus of the acetabular fossa, surrounded by sclerotic bone and protruding from the inner part of the lamina quadrilateral. Synovectomy and debridement of the ligamentum teres were performed, followed by radiofrequency ablation of the osteoid osteoma under direct arthroscopic observation of the hip, avoiding resection of the normal bone around the nidus and preserving the integrity of the quadrilateral lamina and cartilage. The patient had complete pain relief the next day with minimal morbidity and rapid functional restoration. At the 22-month clinical followup, the patient was asymptomatic, and the CT and MR images obtained 1 year after surgery showed no pathologic signs or synovitis.
Literature Review Our case was the fifth such case to be treated with hip arthroscopy and the first of these to our knowledge to be treated with the arthroscopy-assisted radiofrequency ablation technique.
Purposes and Clinical Relevance Arthroscopy-assisted radiofrequency ablation is a combined treatment technique that may be used for intraarticular lesions of the hip that otherwise would require a difficult approach and jeopardize damage to cartilage and bone and also treat concomitant synovitis.

Introduction

An osteoid osteoma (OO) is a small, benign, osseous neoplasm characterized by a nidus with a maximum growth potential of 1.5 cm, surrounded by reactive sclerotic bone [32]. Osteoid osteomas represent 13% of all benign tumors [68] and typically are associated with nocturnal pain [22]. An OO most commonly occurs between the ages of 5 to 25 years with a male-to-female ratio of 3:1. The subcortical shaft and metaphysis of long bones are the most common lesion sites. The femur and tibia account for greater than 50%; however, lesion sites are ubiquitous [68]. This tumor is rare in the pelvis (range, 2.3%–3.0%) [7, 13].

An OO diagnosis can be confirmed with a combination of plain radiographs, technetium-99m (Tc-99m) bone scans, CT scans, and MR images. Plain radiographs can detect an oval, radiolucent, central nidus with a surrounding dense, reactive sclerosis mass, specifically for cortical

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Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

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lesions [31]. Detection is difficult for intramedullary lesions or locations on the spine, pelvis, hands, or feet [17]. Tc-99m bone scans are sensitive for detecting areas with increased activity of osteoblasts, allowing for localization of the lesion [8]. CT scans are the best imaging technique for observing the nidus in cortical and subperiosteal OOs, especially in complex anatomic sites (eg, the pelvis and spine) and when differentiating between several bone neoplasms [16]. MRI, specifically, dynamic gadolinium-enhanced MRI, is useful for diagnosing conditions located in atypical locations, such as trabecular and intraarticular osteomas [34, 67, 72].

An OO is characterized by local pain that is more frequent and severe at night. NSAIDS or salicylates are justifiable nonsurgical treatments [42]. For cases of severe pain with little to no response to pharmacologic treatment, an operative treatment is recommended. Removal is necessary for juxtaarticular and intraarticular lesions in young patients to prevent developmental complications, such as growth disturbances [25]. The CT-guided radiofrequency ablation (RFA) is a minimally invasive technique and considered the preferred treatment owing to a 91% success rate and low complications compared with an open surgical procedure [59]. This procedure is challenging, being near neurologic structures and juxtaarticular and intraarticular localizations [2, 53].

We describe the case of a patient with OO of the acetabulum treated by RFA performed under arthroscopic control to treat concomitant synovitis.

Case Report

A 47-year-old woman presented with a 9-month history of right groin and anterior thigh pain without injury. The pain intensified at night and was only partially alleviated by NSAIDs and analgesics. On physical examination, she limped with an antalgic gait and had limited ROM of her hip, with 0° to 100° flexion and 0° internal rotation. The pelvic, hip, and lumbar spine radiographs were normal. A CT scan showed an oval, lytic lesion with a 6-mm central nidus at the bottom of the acetabulum with expansion of the quadrilateral plate from the pelvis (Fig. 1). MR images showed an intraarticular lesion with substantial increased signal intensity of the cancellous bone around the acetabulum and concomitant increased signal intensity of the belly of the internal obturator muscle (Fig. 2).

RFA was performed during the arthroscopic procedure while the patient was under general anesthesia and in the supine position. Traction was maintained by a specialized extension room table, using an extra-wide and padded perineal post. An image intensifier was used to confirm the amount of traction, facilitate portal placement, and control

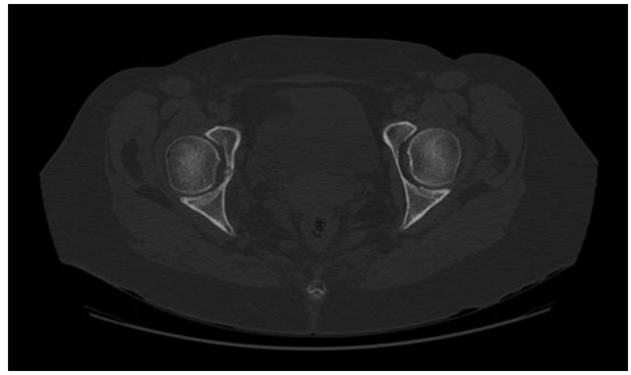

Fig. 1 The patient's CT scan shows an oval lesion at the bottom of the acetabulum of the right hip.

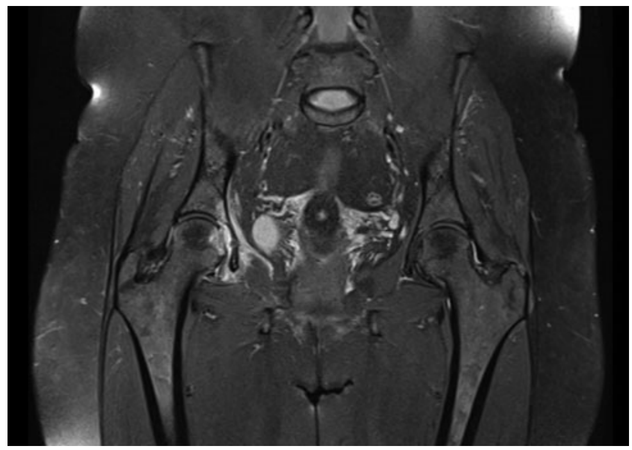

Fig. 2 A coronal MR image shows a high-intensity lesion in the acetabulum with synovitis and effusion.

the location of the electrode during the procedure (Fig. 3). The standard anterolateral and midanterior portals were established for use of the 70°-arthroscope. We observed no cartilage damage of the hip but severe synovial proliferation was noted around the ligamentum teres (Fig. 3A). Synovectomy and debridement of the ligamentum teres were performed (Fig. 3B). A rigid radiofrequency electrode with a diameter of 1 mm then was inserted through a cannula without normal saline inflow to reach the temperature (Fig. 3C). The lesion then was heated to 90°C for 7 minutes under arthroscopic and image intensifier control, avoiding a resection of the normal bone around the nidus and preserving the integrity of the quadrilateral lamina and cartilage (Fig. 3D). The surgical time was 85 minutes. A histologic examination was not performed.

The patient had complete pain relief the following day. Low molecular weight heparin and antiembolism stockings were used postoperatively for 15 days and 3 weeks, respectively. Weightbearing was partially limited by the use of two crutches for 2 weeks. At the 22-month followup, the patient had no pain, a normal gait, and normal ROM, and the CT scan (Fig. 4) and MR images at 1 year showed

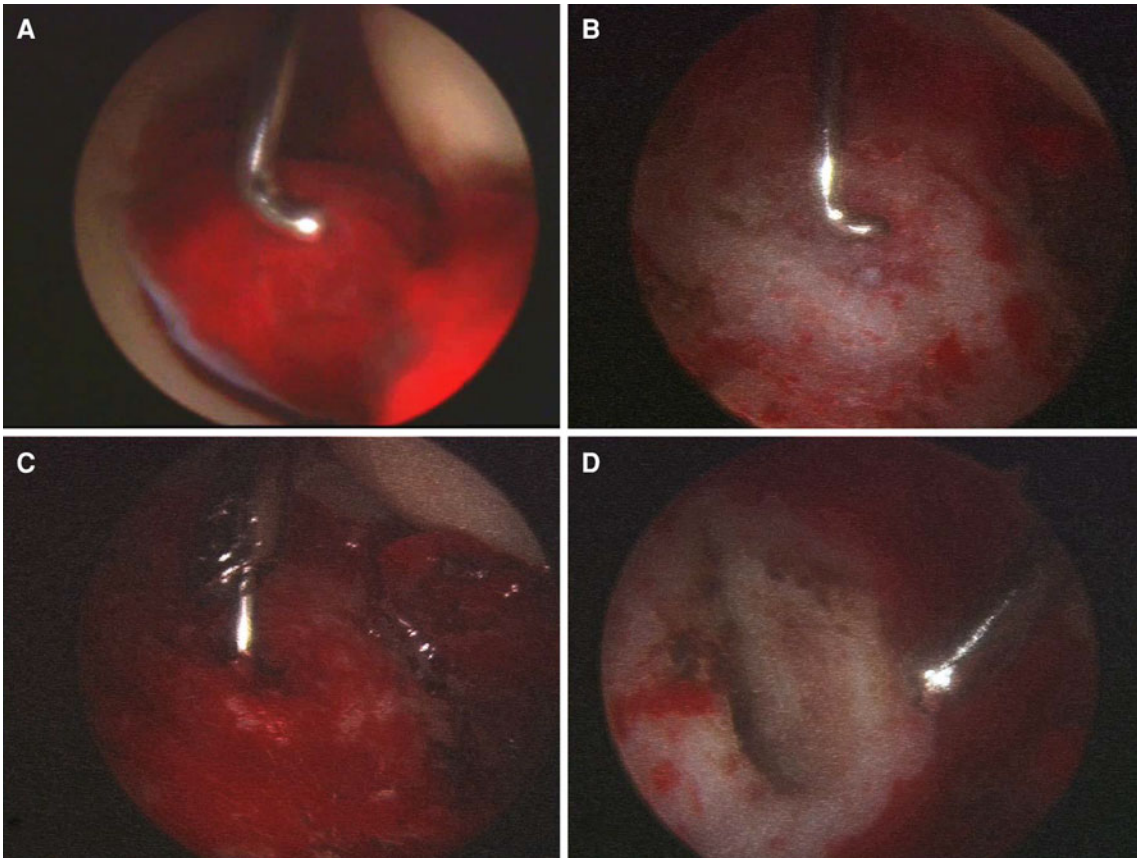

Fig. 3A–D These intraarticular views show (**A**) severe synovial proliferation around the ligamentum teres; (**B**) the center of the lesion, indicated by the probe after the synovectomy and débridement of the ligamentum teres were performed; (**C**) the lesion being heated to 90°C for 7 minutes using a rigid radiofrequency electrode with a diameter of 1 mm; and (**D**) the lesion after ablation of the nidus.

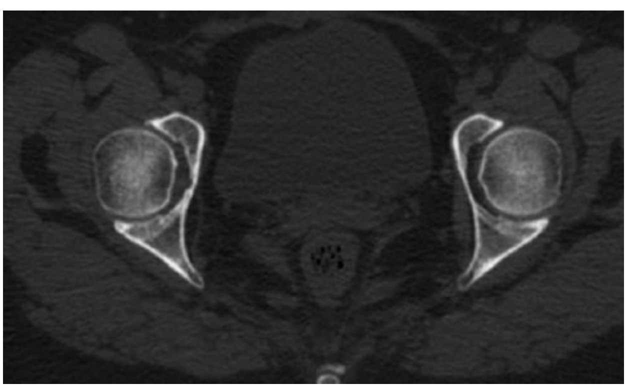

Fig. 4 The patient's 1-year postoperative CT scan shows removal of the osteoid osteoma.

no pathologic signs or synovitis. The patient agreed that information concerning this case could be published.

Discussion

Cortical bone (80%) is the most common lesion site for OO; intramedullary and trabecular sites are less common, and subperiosteal is rare [13, 68]. The acetabulum is an uncommon but painful location often associated with children [29]. There have been numerous reported cases of OO in the acetabulum [4, 9, 18, 20, 21, 28, 29, 36, 40, 41, 44, 48, 49, 52, 55, 56, 67]. Juxtaarticular and intraarticular localizations frequently are associated with a delayed diagnosis, as seen in our patient [24].

Cases of spontaneous healing of OO treated with NSAIDs have been reported [35, 42], but regression may be lengthy (up to 36 months) [30] and delayed treatment of intraarticular cases can damage the articulation [3, 15, 66] and cause early osteoarthritis [23, 54].

Numerous open surgical techniques involving removal of benign tumors in the pelvis have been described [12, 20, 51]. The rate of recurrence with surgical therapy ranges from 0% to 12% in published series [13, 58, 64, 70, 71]. Disadvantages of these approaches include activity restrictions if the tumor was in a weightbearing location [70], the need for plating in some patients [13, 64], donor site morbidity if grafting is used [71], and postoperative fracture [64].

Some authors suggest complete removal of the nidus is mandatory, leaving the thickened bone around the OO

[13, 68]. CT-guided percutaneous resection has been commonly used for the past decade, especially for difficult locations like the acetabulum [43, 56, 62]. Other percutaneous techniques have been proposed, such as laser thermal therapy, cryotherapy, and ethanol therapy [1, 2, 26, 27]. CT-guided RFA has become the preferred method owing to a low morbidity rate, minimal postoperative complications, minimal tissue exposure, rapid recovery, and no restriction of weightbearing activity [10, 14, 33, 50, 60, 69]. In addition, the healing rate is 76% to 100% [14, 53], with a major complication rate of 0% to 5% [2, 6, 45]. However, using CT-guided RFA, there are reports of articular cartilage damage in weightbearing joints; one patient experienced articular cartilage damage to the talus [47], and another had damage to the acetabulum [9]. Direct observation and femoral head distraction during the arthroscopy may decrease the risk of cartilaginous thermal damage.

Treatment of intraarticular hip lesions with CT-guided RFA is challenging, and caution is required in this situation [55]. We believe that a concerning interruption of subchondral bone continuity is unavoidable using percutaneous methods when reaching the central articular zone of the acetabulum because of the thin bone and the proximity to the joint.

Hip arthroscopy has become popular during the last decade with a widespread expanding list of indications, such as septic arthritis, loose body, labral tears, extraarticular lesions, and femoroacetabular impingement [5, 38, 39, 46, 57, 65]. However, this approach, like the others mentioned, has limitations. To minimize the risk of nerve injury [11, 19], it is necessary to not exceed 50 pounds and 90 minutes of continuous traction; otherwise, traction is temporarily released [61, 63]. In addition, not all areas of the acetabulum are easy to access; the inferior area of the acetabulum is almost inaccessible with arthroscopy, even when using a flexible probe. Synovitis is common with intraarticular tumor locations; it appears to depend on the release of cyclooxygenase-2 by osteoblasts of the nidus [37]. Synovectomy can be done during lesion removal, which may prevent cartilage damage, speed the healing process, and relieve pain immediately [15, 28, 44].

We found descriptions of four cases using arthroscopic excision of the OO of the acetabulum. Three were located in the acetabular fossa of adult patients [4, 18, 40]. In two patients [4, 40] the OO was located in the posterior area and the other [18] was in the posteroinferior area which was more difficult to reach. In the fourth patient (a 10-year-old boy) [44], the lesion was located under the triradiate cartilage. Our patient is the first to our knowledge treated with an arthroscopic-assisted RFA technique. No recurrences have been reported in these five cases.

We used arthroscopy for debridement and synovectomy to minimize the risk of damage to the articular cartilage with the use of percutaneous RFA and avoid disruption of the medial wall bone with the use of the arthroscopic burr, with no clinical recurrence at 22 months of followup.

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