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CASE REPORT

Percutaneous CT-Guided Treatment of Osteochondritis Dissecans of the Sacroiliac Joint

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Abstract Osteochondritis dissecans (OCD) is a joint disorder that affects the articular cartilage and subchondral bone, most commonly at the knee. OCD of the sacroiliac joint is extremely rare. Management of OCD remains controversial, and surgery is often needed, especially when conservative treatment fails. We present a rare case of OCD involving the left sacroiliac joint successfully treated by percutaneous computed tomography—guided retrograde drilling and debridement.

Keywords CT guidance · Imaging · Osteochondritis dissecans · Percutaneous treatment · Sacroiliac joint

Introduction

Osteochondritis dissecans (OCD) is a pathologic process that affects the articular cartilage and subchondral bone of joints, with an incidence of 15–60 per 100,000 in the general population [1, 2]. The knee joint, especially the lateral aspect of the medial femoral condyle, is most frequently involved (approximately 75% of cases), followed by the ankle and the elbow [3]. OCD of the sacroiliac (SI) joint is rare; only a few cases have been reported in the literature [4–6].

More than a century after König termed the disorder "osteochondritis dissecans" in 1888 [7], its etiology and management are still debated, and surgery is often required, particularly when conservative treatment fails [1, 8]. Recently, percutaneous image-guided retrograde (extra-articular) drilling techniques have been proven to be feasible, safe, and effective in the treatment of OCD [9, 10].

We present an uncommon case of OCD involving the left SI joint. To our knowledge, this is the first case of OCD of the SI joint successfully treated by percutaneous computed tomography (CT)-guided retrograde drilling and debridement.

Case Report

A 42-year-old otherwise healthy man was referred to our institution for the treatment of a left SI joint disorder. He presented with a 14 month history of pain in the left buttock, which occurred after he fell from his height onto his buttocks. The pain was located around the left posterior superior iliac spine and radiated into the groin, the posterior thigh, and sometimes the posterior calf. It limited the patient's walking perimeter, was aggravated by sitting, and persisted at night. The symptoms had not responded to steroidal and nonsteroidal anti-inflammatory drugs, rest, and physical therapy.

At physical examination, the patient manifested an antalgic gait. Point tenderness was noted on palpation of the left SI joint, approximately 5 cm below the posterior

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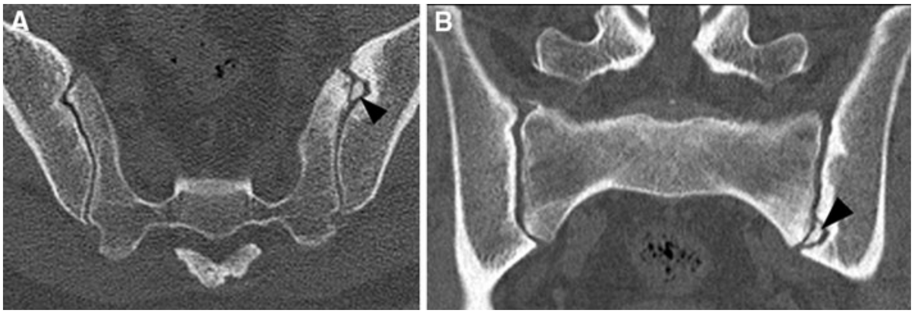

Fig. 1 Axial (**A**) and coronal-reformatted (**B**) unenhanced CT images of the pelvis display a well-circumscribed osteochondral lesion (*arrowhead*) of the anterior portion of left SI joint. The osteochondral fragment originates from the left iliac bone and measures 7.5 × 4 × 10 mm. It is surrounded by peripheral osteosclerosis. No periosteal reaction is seen

superior iliac spine. The Gillet test (a motion palpation test described elsewhere [11]) was positive on the left side. Gaenslen and posterior shear tests (pain provocation tests also described elsewhere [11]) were both painful. Passive and active left hip movements were within normal range. Motor and sensory examinations of the left lower limb were unremarkable.

All imaging studies were performed at another institution. An anteroposterior pelvic radiograph (not shown) was interpreted as normal. Lumbosacral spine magnetic resonance (MR) imaging (not shown) demonstrated an ill-defined bone marrow edema of the anterior portion of left SI joint. An associated osteochondral lesion was suspected but hard to assess. There was no joint effusion, and the right SI joint was normal. Multidetector computed tomography (CT) of the pelvis (Fig. 1) confirmed, that an osteochondral fragment had detached from the left iliac bone. This lesion measured 7.5 × 4 mm in the axial plane and 10 mm craniocaudally. It was surrounded by peripheral osteosclerosis. There was no bony erosion or periosteal reaction. Furthermore, increased tracer uptake in the sacral aspect of the anterior portion of left SI joint was noted on technetium-99 m single-photon emission computed tomography—CT hybrid imaging (Fig. 2). However, there was no abnormal tracer accumulation in the osteochondral fragment. All these findings were consistent with the diagnosis of left SI joint OCD. The differential diagnosis also considered an osteoid osteoma or a Brodie abscess, but these were thought to be far less likely.

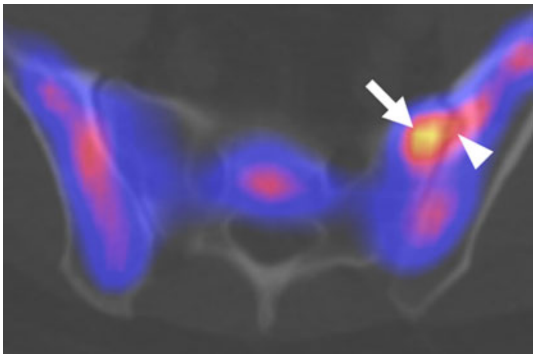

Fig. 2 Axial fused single-photon emission computed tomography—CT image of the pelvis after intravenous administration of 736 MBq of technetium-99 m—dicarboxy-propane-diphosphonate demonstrates increased tracer uptake in the sacral aspect (*arrow*) of the anterior portion of left SI joint. There is no abnormal tracer accumulation in the osteochondral lesion (*arrowhead*) detached from the left iliac bone

Because of the patient's persistent symptoms, and after discussing treatment options in a multidisciplinary meeting, a percutaneous CT-guided treatment (Fig. 3 and Supplementary Material) was scheduled after obtaining the patient's written informed consent. The intervention was performed under general anesthesia, and a single dose (2 g) of intravenous cefazolin was administered 30 min before the procedure. With the patient positioned prone on an eight-slice multidetector CT scanner (LightSpeed Ultra; GE Healthcare, Waukesha, WI), the entire procedure was carried out under CT fluoroscopy (SmartStep; GE Healthcare) guidance. First, under strict aseptic conditions, a 3 cm skin incision was made, and access to the lesion of the anterior portion of the left SI joint was gained through a dorsolateral approach using a 1.25 mm Kirschner wire mounted on a cordless motorized drill (TRS Modular Driver; Synthes, Bettlach, Switzerland). The wire was drilled through the left iliac bone until it reached the osteochondral lesion. Then a previously cannulated 11-mm-diameter laparoscopic bladeless trocar (Endopath Xcel; Ethicon Endo-Surgery, Guaynabo, Puerto Rico) was inserted on the Kirschner wire and advanced to the contact with the outer cortex of left iliac bone, to protect the surrounding soft tissues (Fig. 3A). A cannulated drill bit was subsequently mounted on the Kirschner wire in a coaxial fashion, and the left iliac bone was bored until contact was obtained with the osteochondral fragment (Fig. 3B). The retrieved material was sent for histopathologic examination and was consistent with the diagnosis of OCD (Fig. 4). The sacral aspect of the anterior portion of left SI joint was then also drilled in order to promote joint arthrodesis. Because the differential

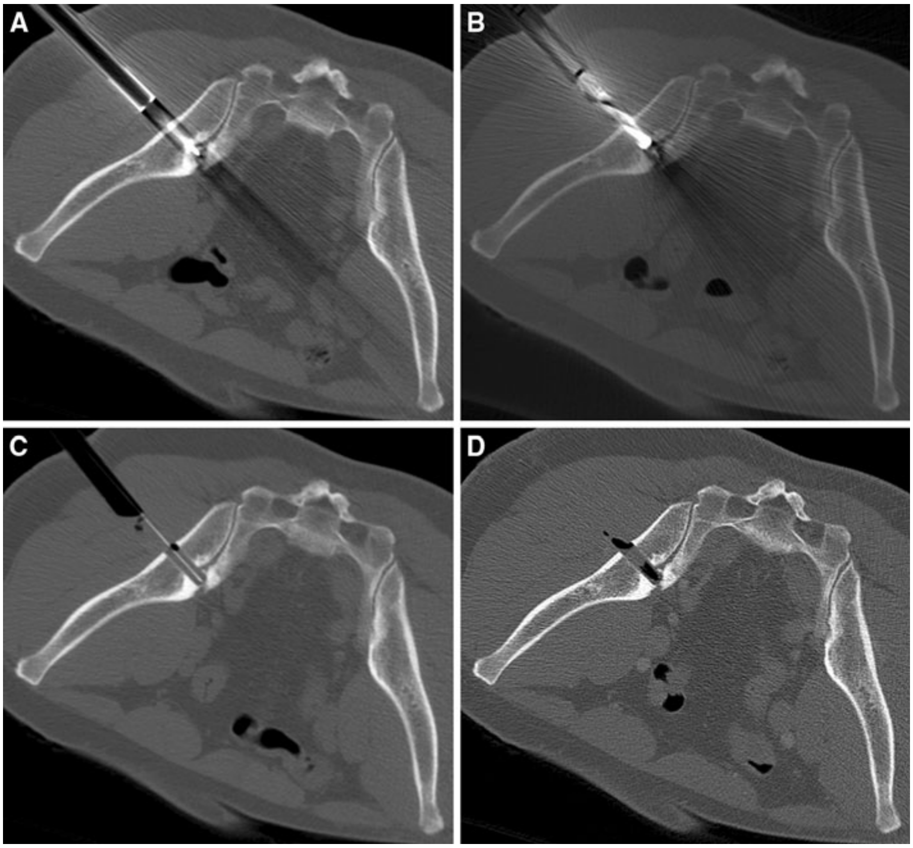

Fig. 3 Periprocedural axial unenhanced pelvic CT fluoroscopy images. **A** First, a Kirschner wire is drilled through the left iliac bone with a dorsolateral approach until reaching the osteochondral lesion. A laparoscopic bladeless trocar is then inserted on the wire and advanced to the contact with the outer cortex of left iliac bone, in order to protect the surrounding soft tissues. **B** A cannulated drill bit is subsequently mounted on the Kirschner wire in coaxial fashion, and the left iliac bone is bored until contact is achieved with the osteochondral fragment. **C** A RF ablation cannula is then inserted through the laparoscopic trocar, and the probe tip is positioned in the region of the former osteochondral lesion. **D** Finally, an absorbable hemostatic plug is placed through the laparoscopic trocar into the drilled bone canal to prevent prolonged bleeding

diagnosis of osteoid osteoma could not be completely excluded before the procedure, radiofrequency (RF) ablation was performed after suction of blood and debris. A 20 gauge RF cannula bearing a 5 mm curved tip (RFK; Cosman Medical, Burlington, MA) was inserted through the laparoscopic trocar and connected to the RF generator (RFG-3C; Radionics, Burlington, MA). After controlling the accurate position of the RF probe tip by CT fluoroscopy (Fig. 3C), the ablation was achieved by gradually increasing the tip temperature to 80°C and maintaining it for 4 min. Finally, an absorbable hemostatic plug (Tabotamp; Ethicon, Neuchâtel, Switzerland) was inserted into the drilled bone canal (Fig. 3D) to prevent prolonged bleeding. The skin was then stitched and a dry dressing applied. The whole procedure, from skin incision to wound closure, lasted about 60 min, and the radiation dose was approximately 8.8 mSv (dose–length product = 465 mGy cm).

Follow-up pelvic CT scans were obtained immediately and 6 h after the procedure to control a small hematoma in the left gluteus medius muscle. The next day, the patient was allowed to bear full weight on his left lower limb according to pain, and he left the hospital. At 3 months, the pain was greatly reduced (visual analog scale score decreased from 7 to 2), but slight discomfort persisted in the left groin. These symptoms completely disappeared within the next few weeks. At 6 months, the patient was asymptomatic, and follow-up pelvic MR imaging revealed minimal residual bone marrow edema and arthrodesis of the anterior portion of left SI joint (Fig. 5). More than a year after the intervention, the patient is still free of symptoms.

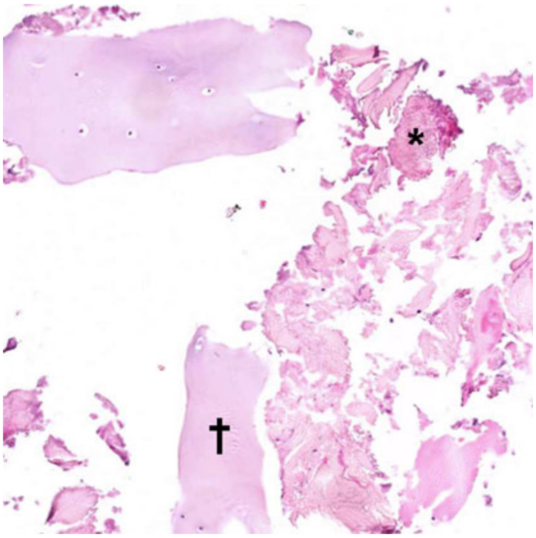

Fig. 4 Photomicrograph of the retrieved osteochondral specimen reveals avascular hyaline cartilage (*dagger*) and necrotic subchondral bony trabeculae (*asterisk*). No osteoid matrix or anastomosing bony trabeculae with osteoblastic rimming are observed. There are no inflammatory cells. Hematoxylin and eosin; original magnification, ×50

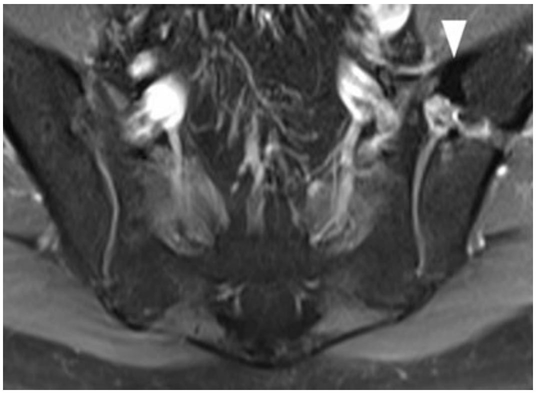

Fig. 5 Follow-up axial gadolinium-enhanced fat-suppressed T1-weighted (TR/TE = 425/9) turbo spin echo MR image of the pelvis shows fusion (*arrowhead*) of the anterior portion of left SI joint. Minimal residual bone marrow edema is noted in the sacral aspect of the SI joint. The drilled left iliac bone canal is still visible

Discussion

OCD (also called osteochondrosis) is a pathologic process that primarily affects the subchondral bone of joints, and may secondarily involve the articular cartilage. More than 150 years after Paré described the first case of loose bodies retrieval and König coined the controversial term "osteochondritis dissecans" [7], its etiology remains unclear [1, 8, 12]. Trauma in specific and susceptible locations plays a major role, and about 40% of patients with OCD of the knee have a history of trauma [1, 8]. However, the pathogenesis seems multifactorial and ischemic; accessory centers of ossification as well as genetic theories have been proposed [1, 8, 12]. The overall incidence of OCD varies between 15 and 60 cases per 100,000 in the general population [1, 2]. A male predominance exists, with a male–female ratio of 2:1 to 4:1 [1, 8]. The juvenile form of the disease affects children (with open physes) between 5 and 15 years, whereas the adult form involves patients (with closed physes) from 16 to 50 years [8]. The knee is the most frequently affected joint (approximately 75% of cases), with the lateral aspect of the medial femoral condyle being involved in about 80% of cases [3]. The ankle (particularly the talar dome) and the elbow (specifically the humeral capitellum) are also commonly affected [12]. Bilateral lesions may be found in 5 to 30% of cases [3, 8, 12].

Cases of OCD of the hip (mainly the femoral head but also the acetabular roof) [12, 13], the shoulder (the humeral head and glenoid fossa) [12, 13], and the wrist [12, 14] joints have less often been reported in the literature. To our knowledge, OCD of the SI joint is extremely rare, and only a few cases have been published so far, in German and French [4–6].

The diagnosis of OCD is challenging because symptoms are often vague and nonspecific, and depend on the stage of the disease [1, 8, 12]. Patients may present with variable pain, swelling, and catching and/or locking of joints, and the physical findings tend to be inconclusive. At the SI joint, the diagnosis is even more difficult and may be considered as one of exclusion [4, 5]. Indeed, inflammatory or infectious disorders must be first excluded [4, 5, 11].

OCD is rather a radiological diagnosis. Conventional radiographs typically display a well-circumscribed area of sclerotic subchondral bone separated from the epiphysis by a radiolucent line [3]. CT is helpful to precisely delineate the osteochondral lesions [3]. Bone scintigraphy and MR imaging have been used to evaluate the healing potential of the defects [3, 15]. Furthermore, MR imaging has proven to be useful to differentiate between stable and unstable lesions and to direct clinical management [1, 3, 15].

The treatment of OCD is still debated and depends on the patient's age, the affected joint and its degree of involvement, and the experience of the orthopedic surgeon [1, 8, 15]. Conservative treatment should be emphasized in young patients with open physes, while a more aggressive approach is recommended in older symptomatic patients because 30 to 50% of stable OCD lesions fail to progress toward healing [8, 15]. Treatment options include intra- or extra-articular drilling, mosaicplasty, fixation, autologous chondrocyte transplantation, or debridement [10, 15]. At the knee, treatment should promote revascularization of subchondral bone and restoration of articular surfaces congruity by fragment replacement, with or without bone grafting [12]. Lesions of the ankle and elbow are usually treated with debridement and subchondral curettage or drilling [12]. Recently, image-guided extra-articular drilling techniques proved to be clinically effective in selected patients [10]. The main advantages of minimally invasive procedures are decrease in total rehabilitation time, decrease in length and cost of hospitalization, and avoidance of open surgery with its associated risk of infection [9, 10, 16].

In our case, failure of conservative treatment prompted intervention. Because of the complex anatomy of the SI joint and its close relationship to vital soft tissues, arthroscopy or open arthrotomy could not be safely and effectively performed [17, 18]. Thus, a percutaneous CT-guided procedure was planned. Given the current relative lack of instrumentation for MR- guided interventions [10], CT guidance was preferred. Moreover, CT-guided interventions on the SI joints have already been shown to be technically feasible, safe, and effective in the treatment of sacral disruptions and nonunions [16, 17]. CT is also far more accessible in clinical practice, and metal artifacts are a minor issue, even with low-dose CT imaging [16]. Finally, although radiation dose may be a concern in children, this is a minor one with CT fluoroscopy guidance in adults.

In conclusion, a high index of suspicion is needed for the diagnosis of OCD of the SI joint in patients with long-lasting SI joint pain of unknown origin. The case presented here demonstrates that percutaneous CT-guided treatment of OCD of the SI joint may be technically feasible, safe, and effective. However, further studies with large numbers of patients are needed to consider this technique as a valid alternative when conservative treatment fails.

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Conflict of interest The authors declare that they have no conflict of interest.

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