

## ACETABULAR OSTEOID OSTEOMA TREATED BY PERCUTANEOUS RADIO-FREQUENCY ABLATION: DELAYED ARTICULAR CARTILAGE DAMAGE

P.P. Bosschaert, F.C. Deprez<sup>1</sup>

The authors report the case of an osteoid osteoma of the acetabular roof in a 17-year-old sportsgirl successfully treated by radiofrequency ablation, with a mid-term evidence of cartilage loss. Extra-articular access and exact positioning of the needle electrode exclude direct operative chondral damage. Intense physical activity could be an aggravating factor for the chondropathy. It is difficult to determine whether the acetabular cartilage joint was damaged only by thermo-ablation or if it had also been weakened before by the O.O. The authors caution practitioners from using this technique for para-articular lesions, especially near weight-bearing joints.

**Key-word:** Osteoid osteoma – Articular cartilage damage – Radiofrequency – Thermo-ablation.

### Case report

A 17-year-old girl was referred to our institution for left hip chronic pain, with nocturnal episodes, pain which was partially alleviated by the use of salicylates. Clinical examination showed normal hip mobility, with pain during internal and external rotation movements. Slight left quadriceps femoris muscle hypotrophy was observed compared to the right side. Conventional radiographs revealed a subtle subchondral sclerosis of the acetabular roof. Bone scintigraphy indicated an increased radiotracer uptake on the left hip. Computed tomographic (CT) scan showed a small radiolucency with central calcification, named nidus, and surrounding reactive osteosclerosis, localized on the weight-bearing surface of the acetabulum (Fig. 1). Osteoid osteoma was diagnosed.

After informed consent, radiofrequency ablation (RFA) was performed under general anaesthesia and real-time CT guidance, in a sterile environment. The 14G penetration cannula (Bonopty; Radi Medical Systems, Uppsala, Sweden) was orientated on the nidus by an anterolateral way. The central trocar was removed and the nidus was drilled. The RF-probe, a Soloist Single Needle Electrode (RadioTherapeutics, Boston Scientific, Boston, USA), was advanced into the nidus (Fig. 2), and connected to the RF generator, an RF3000 Radiofrequency Ablation System (RadioTherapeutics, Boston Scientific). In this case, the electrode tip was heated for 8 minutes. Initial

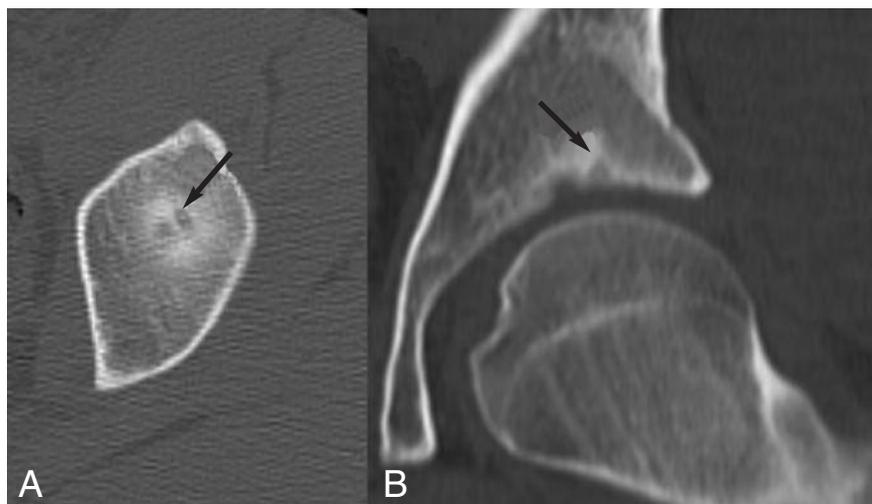


Fig. 1. — Axial (A) and coronal (B) CT imaging. Osteoid osteoma characterized by a small lacunar lesion with central calcification (nidus) and surrounding reactive osteosclerosis (arrow).

power was 2 watts, with an increase of 1 watt per minute until 5 watts was reached, when impedance increased and the current delivered to the needle electrode decreased indicating desiccation (Roll-Off). We stopped and waited approximately 60 seconds. We restarted at 70% of the highest set power. Roll-off indication was for a second time obtained 3 minutes later. The lesion was considered to be treated at this point.

The procedure was completed without any complications. The patient recovered quickly and was discharged in the evening. Total body weight-bearing was allowed. We recommended avoiding intensive phys-

ical activities for 6 weeks. Anti-inflammatory medications were administered as required for the initial three days.

Our patient didn't present any complaints for the first six months. She was able to take up intensive dance practice (13 hours per week) without experiencing any pain. A follow-up magnetic resonance imaging (MRI) performed at the end of the six months didn't reveal any abnormalities. There was a fat conversion on the location where osteosclerosis was seen on CT (Fig. 3) (1).

One year after treatment, the patient complained of occasional acute left hip pain related to intense physical exercise, which disappeared quickly with rest. MRI then revealed development of a subchondral cystic structure at the acetabular roof (Fig. 4). No intra-articular joint effusion was seen. A CT-arthrography of the joint demonstrated a focal 4 mm<sup>2</sup> acetabular cartilage loss near

From: 1. Department of Radiology, Clinique St-Pierre, Ottignies, Belgium.

Address for correspondence: Dr P. Bosschaert, Department of Radiology, Clinique St-Pierre, Avenue Reine Fabiola 9, 1340 Ottignies, Belgium.

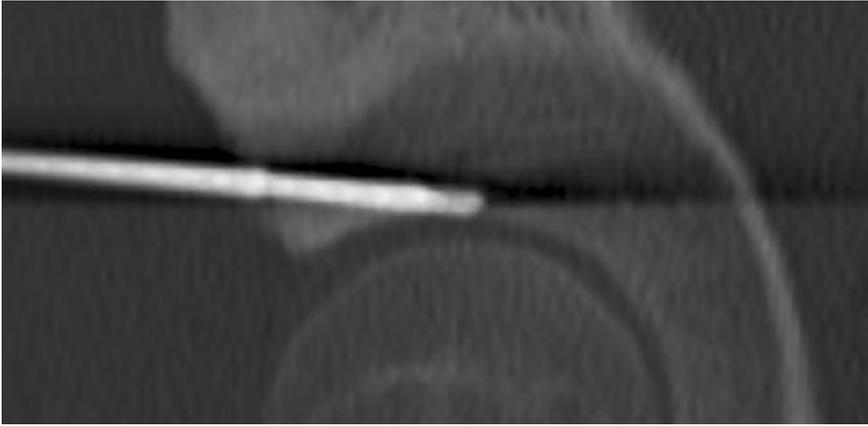


Fig. 2. — Sagittal CT imaging. Optimal RF-probe position in the osteoid osteoma by extra-articular antero-lateral way.

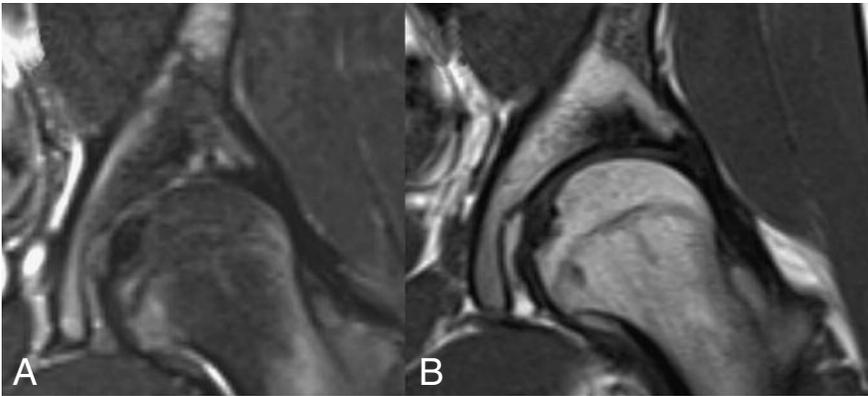


Fig. 3. — Coronal MRI imaging. (A) T2-weighted and (B) T1-weighted images reveal a fat conversion of bone marrow without oedema.

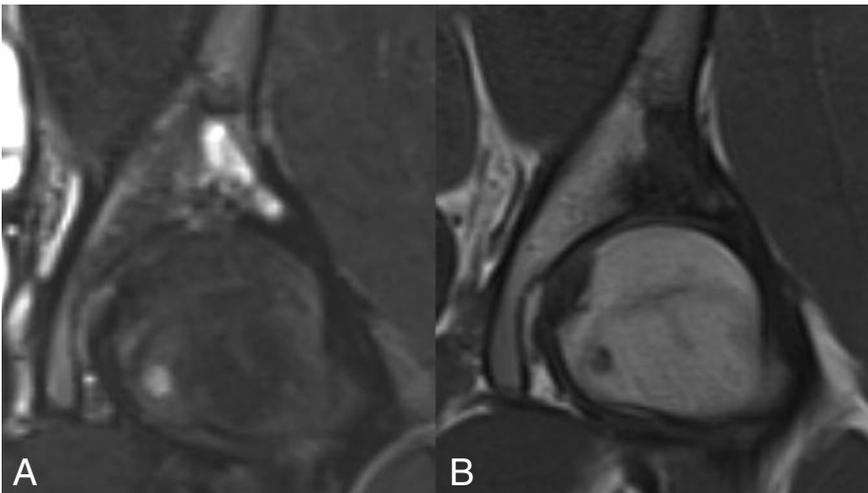


Fig. 4. — Coronal MRI imaging. (A) T2-weighted and (B) T1-weighted images reveal a 25 mm wide subchondral cyst (hypoT1- and hyperT2-weighted signal), near the osteoid osteoma.

the RFA site (Fig. 5). The femoral head cartilage was normal. We concluded that this focal chondropathy was a mid-term complication of the

osteoid osteoma thermo-coagulation, probably heightened and aggravated by intensive sports. Dance training was therefore discon-

tinued which resulted in the disappearance of hip pain. No specific treatment was further advised at this stage.

## Discussion

Osteoid osteoma (O.O.) is a benign skeletal tumor of unknown origin with a low rate of growth and rarely exceeding a diameter of 10-15 mm. It represents 12% of benign bone tumors, affects teenagers or young adults and causes nocturnal pain often relieved by salicylates. If located near a joint, other symptoms of O.O. include swelling and restricted movement. Resolution may be spontaneous but is unpredictable, and surgery or a less invasive procedure such as percutaneous RFA is usually required. Definitive treatment is achieved by complete destruction of the nidus. In 2003, Rosenthal et al. (2) reported that RFA was preferred to open surgery as the primary treatment for this type of bone tumor. RFA therefore became «the standard treatment for O.O. over the past decade» (3). Permanent success occurs in approximately 90% of patients after a single treatment. This procedure is provided on an outpatient basis and has a short recovery period. It can only be performed if the patient has the typical clinical and imaging findings. The location of the tumor must permit a safe access without risking damage to nerves, major blood vessels or the skin. If the nidus is more than 1 cm away from these structures, the procedure usually can be safely performed, but the treating physician must be vigilant because there is no hard direct data to support RFA in all situations.

Few complications were reported with O.O. RFA. Among the more frequent of them are infections and skin burns, and also tendonitis or thrombosis and even some bone fractures. In addition, the needle passage may cause bleeding and nerve injury. If the tumor is in the proximity of the spinal cord or peripheral nerves with disrupted intervening cortical bone, then this procedure is not advised due to the lower thermal threshold of nerves. In their large-scale research, Rosenthal et al. mention many of these complications but does not mention any delayed complications such as articular damage.

Technically, because of its small gauge, the Soloist Single Needle Electrode can be accurately placed and a small ablation zone targeted of approximately 1 cm in diameter,

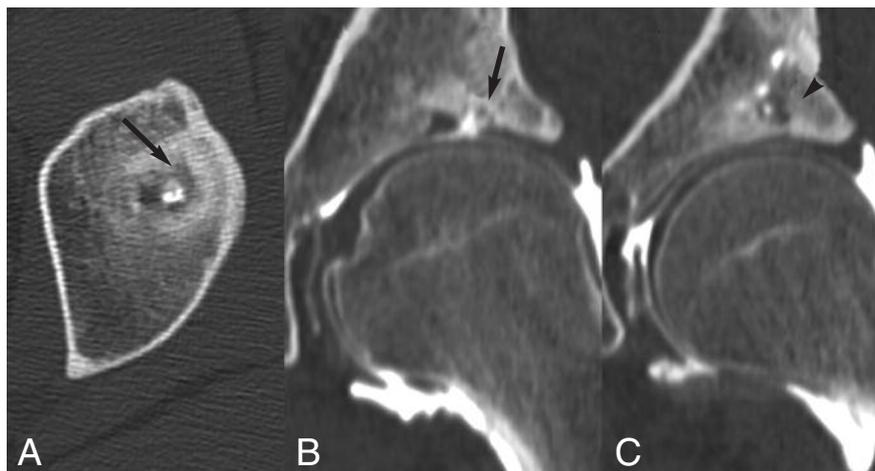


Fig. 5. — CT imaging after joint opacification. Demonstration of a focal 4 mm<sup>2</sup> acetabular cartilage loss under RFA site (A: axial and B: coronal, arrow), associated with a subchondral cyst (C: coronal, arrowhead).

with some variability of size and shape (usually slightly oval). Moreover, cortical bone is usually considered a good insulator against heat transmission. Vanderschueren et al. (4) described no significant relationship between intra- or extra-articular localization and unsuccessful treatment risk. Rosenthal et al. suspected that there was a risk of thermal injury for the articular cartilage but didn't report any damage. Pinto et al. (5) also described thermal ablations of para-articular lesions without any complications. Martel and colleagues (6) specifically

studied the effects of RFA on joint surfaces. After they induced multiple RF lesions on the femoral heads of dogs, they concluded that cortical bone retained its integrity and articular cartilage was never damaged.

The current case seems to be the first published case showing a mid-term articular cartilage damage after RFA of an O.O. Extra-articular access and exact positioning of the drill and the RF needle electrode exclude direct operative chondral damage. In this case, regular intense dance practice could be an aggravating factor for the chondropathy. It is difficult

to determine whether the acetabular cartilage joint was damaged only by thermo-ablation or if it had also been weakened before by the O.O.. We therefore want to caution practitioners using RF treatment of para-articular lesions, especially for weight-bearing joints.

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