Percutaneous destruction and alcoholisation for the management of osteoid osteoma

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Osteoid osteoma (OO) is a small, self-limiting, benign osteogenic tumour. Successful treatment of OO requires complete resection or destruction of the nidus. Surgery, which consists of en bloc excision of the nidus, followed by internal fixation, bone grafting, or both, is successful in almost all cases. In a small percentage of cases the nidus may be missed at surgery, resulting in a failed procedure. The aim of this study was to evaluate the results of percutaneous destruction and alcoholisation as a treatment of OO. Fifteen patients with an osteoid osteoma (10 males, 5 females) were treated in the Oncology Unit, Orthopaedic Department, Mansoura University Hospital. Three OOs were localised in the humerus, 5 in the femur, 6 in the tibia and fibula, and one in the talus. All patients underwent destruction of the nidus by determining the nidus by CT, drilling with a cannulated drill bit, curetting with a speed burr and injecting ethanol. The nidus completely disappeared on the postoperative CT-scan. The average follow-up period was 19 months (6-24 months). There were no postoperative complications. This technique for the treatment of OO is minimally invasive, safe, simple, and cost effective. It allows an early return to normal activities. The procedure is particularly useful for a lesion located deep in the skeleton, which would require an extensive approach with conventional surgery.

INTRODUCTION

Osteoid osteoma is a benign bone tumour with a nidus of less than 2 cm, surrounded by a zone of reactive bone. This lesion accounts for approximately 10% of all benign bone tumours (5). It occurs most frequently in the second decade and affects males twice as often as females (5).

The proximal femur is the most common location followed by the tibia, the posterior elements of the spine and finally the humerus. OO is found more often in the proximal than in the distal metaphysis or diaphysis (5).

The distinct clinical picture, the classic radiological presentation and the typical pathological findings make the diagnosis and even symptomatic control an easy problem. The main problem and matter of controversy is the control and eradication of the lesion itself.

Osteoid osteoma can resolve without treatment in an average of 33 months, but if the patient does not wish to endure the pain and the prolonged use of nonsteroidal anti-inflammatory medication, surgical excision or percutaneous removal are indicated (13). Surgical excision has been common place until recently. Many surgeons thought that for surgery to be successful, the tumour including the reactive zone was to be completely removed.

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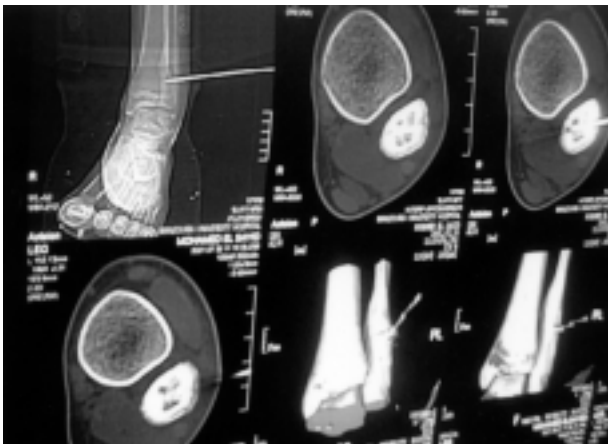

Fig. 1. — Computed tomography is used to insert the guide wire into the center of the nidus, passing through both margins.

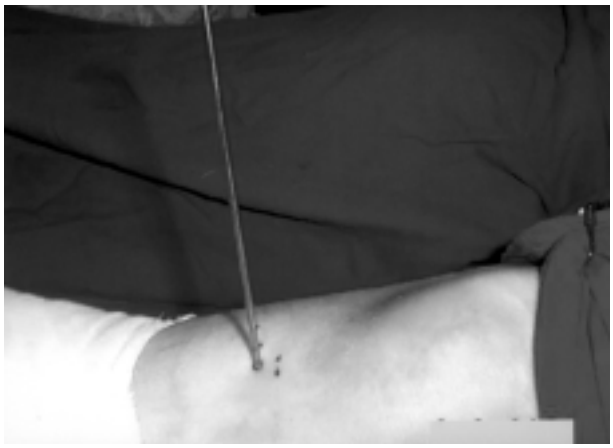

Fig. 2. — The guide wire

Extensive surgery has a greater chance of success, but carries a higher risk of complications and a longer recovery period. It is currently well accepted that removal of the nidus is sufficient.

Most of these tumours are situated in weight-bearing bones, so the recovery from surgery may require a long period of limited weight bearing, often with crutches (13).

Several methods have been proposed as an adjunct to surgery in order to reduce the risk of failed surgery and minimize the amount of bone removed (6, 7, 24, 25). In recent years, several techniques of percutaneous treatment of OO under CT control have been proposed : excision through bone trephination (3, 8, 12), a combination of partial percutaneous resection with subsequent intralesional ethanol injection (1, 22) and destruction of the nidus using radiofrequency electrodes (9, 21) or laser photocoagulation (10).

PATIENTS AND METHODS

In a period of two years, 15 patients (10 males, 5 females) with OO were treated by percutaneous destruction and infiltration with ethanol. The mean age at operation was 22 years (range 14 years to 45 years). The average follow-up period was 19 months (range 6-24 months). The duration of pain before treatment varied from 2 months to one year. The decision concerning treatment was made on the basis of clinical and radiological criteria. Clinical criteria included pain, worse at night and at rest, and relieved by nonsteroidal anti-inflammatory drugs. Radiological criteria included four diagnostic features : (A) a sharp round or oval nidus that was (B) less than 2 cm in diameter, (C) had a homogeneous dense center, and (D) a 1-2 mm peripheral radiolucent zone (13). CT was the preferred method of evaluation, especially if the lesion was in the spine or obscured by reactive sclerosis. The mean size of the nidus was 8 mm (range 6 mm-12 mm). There were six OOs in the tibia and fibula (3 in the tibial shaft, 2 in the lower third of the fibula, and one in the tibial metaphysis), six in the femur (3 in the femoral neck and lesser trochanter, 2 in the femoral shaft), three in the upper third of the humerus and one in the talus.

SURGICAL TECHNIQUE

Computed tomography was used to insert a guide wire (2 mm) into the center of the nidus, passing through its two margins (figs 1, 2). A simple hand drill was sufficient.

A skin incision (1-2 cm) was centered on the guide wire . A sleeve was placed over the guide wire. A cannulated drill bit (4.5 mm caliber) was inserted through the sleeve and over the guide wire ; it was advanced into the bone with a pneumatic drill (fig 3). Both margins of the nidus were drilled. Subsequently a high speed burr (4 mm caliber) was used to remove the remnants of the nidus (fig 4). Finally 2 ml of 96% ethanol were injected through the sleeve in the bone track.

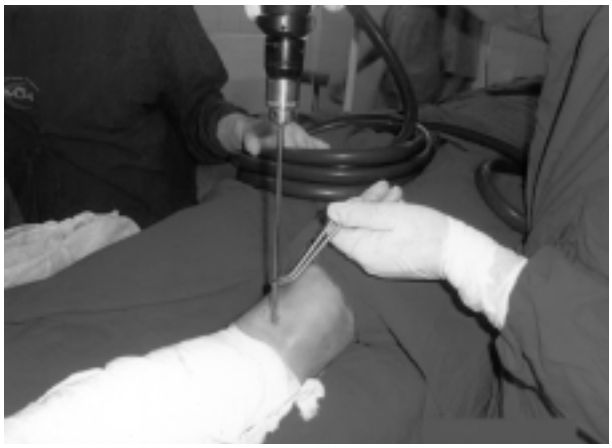

Fig. 3. — A drill bit is passed through the sleeve

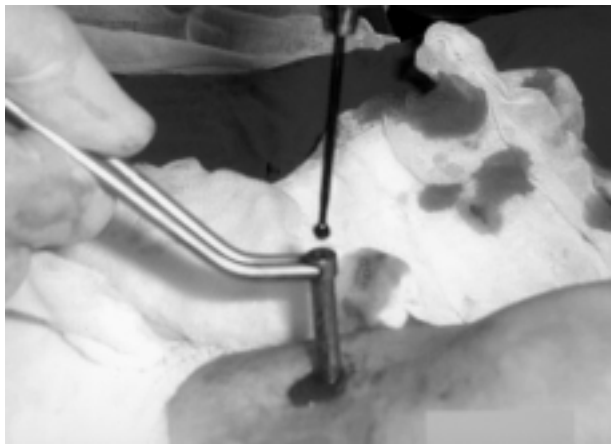

Fig. 4. — A high speed burr is used next

Bone samples obtained from drill bit and speed burr were examined pathologically to confirm the diagnosis. A CT-scan was performed postoperatively to assess the excision of the nidus. All patients left the hospital after 3 to 4 days.

RESULTS

Rapid (24-48 hours) relief of pain was observed in all patients. They all returned to normal daily activities within 2 weeks. Postoperative CT- scans showed that the nidus was completely removed. Six months after surgery, complete sclerosis of the nidus was confirmed with plain radiographs.

Percutaneous treatment was technically successful in all patients. Only one complication was encountered during the procedure : a mild skin burn induced by the heat effect of the drill in the anterior tibia. Excision of necrotic tissue was necessary.

There were no infections or major complications. There were no recurrences.

DISCUSSION

Surgery that consists of en bloc resection of the nidus is successful in the majority of cases (17). However, because OO is a small lesion often surrounded by dense reactive bone sclerosis, peroperative localisation of the nidus may be difficult. In a small percentage of cases the nidus may be missed during surgery, resulting in failure and reoperation (16, 17).

Some locations may be problematic. Surgical excision of a para-articular nidus may require arthrotomy (11), which has its own complications (reflex sympathetic dystrophy, infection, and secondary degenerative changes). Some additional issues related to the treatment of acetabular OO must be considered. First, open surgery often requires an extensive exposure through an anterior, lateral, or posterior approach (2, 4, 14). In addition, removal of the nidus may require an extensive resection of bone, an arthrotomy, or a dislocation of the hip, which carries the risk of vascular damage to the femoral head or of secondary articular damage (4, 14).

In recent years, several techniques of percutaneous treatment of OO under CT control have been proposed. Excision through bone trephination (3, 8, 12), a combination of partial percutaneous resection with subsequent intralesional ethanol injection (1, 22), and destruction of the nidus using radiofrequency electrodes (9, 21) or laser photocoagulation (10).

Percutaneous treatment of OO has several advantages over surgery ; it allows precise localisation and complete destruction of the nidus. A peroperative CT-scan allows accurate placement of the needle. Patients stay 3 or 4 days in the hospital. In

addition, because only a small amount of bone is removed with percutaneous resection, patients are quickly able to return to their normal activities (19).

In a series of 38 patients treated by percutaneous resection with a trephine, the overall rate of complications was 24% (23). These complications included two fractures and two skin burns. Parlier-Cuau *et al* (18) reported that two out of 32 patients had skin and soft tissue burns. In order to prevent secondary fractures their patients were asked to avoid weight bearing and to use crutches for six weeks when the OO was located in the lower limb. Percutaneous resection with a trephine requires relatively large caliber instruments ; therefore subsequent structural weakness of the affected bone can lead to impaired weight bearing for up to six weeks after surgery and even to fracture (18).

In 1995 Adam *et al* (1) described a combination of partial percutaneous excision and alcohol injection to provoke sclerosis of the nidus. Neither recurrence nor complication was observed (1).

In our study, a 4.5-mm bone drill bit, followed by a 4-mm speed burr, through the same track, was sufficient for complete destruction of the nidus. Two milliliters of alcohol were injected after the curettage, which was sufficient to induce necrosis of the remnants of the nidus. The relatively small caliber of drill bit and burr avoided fractures, but there instruments provided enough material for histopathological examination. Moreover a sufficiently large skin incision (2 to 3 cm) and the use of a sleeve protected the skin and the soft tissues against sepsis and burns ; there was only one exception.

Rosenthal *et al* (20) described the technique of percutaneous radiofrequency thermocoagulation in 1992, and later reported their results in 18 patients (21). Sixteen patients had a successful outcome, while two had residual pain. Linder *et al* (15) described 58 cases treated with percutaneous radiofrequency ablation. The treatment was immediately successful in 95% of the patients, and in 100% after a second ablation. De Berg *et al* (9) reported 17 patients treated successfully by percutaneous radiofrequency thermocoagulation of the nidus ; one patient needed two procedures. In 1997 Gangi *et al* (10) discussed their experience with laser interstitial photocoagulation of OO. They had 13 successful results and one failure, due to a technical problem. The main disadvantage of either percutaneous radiofrequency thermocoagulation or laser interstitial photocoagulation is the lack of histological verification (15).

In conclusion, percutaneous treatment of OO is minimally invasive, safe and simple. It allows an early return to normal activities. The procedure is particularly useful for a lesion located deep in the skeleton, which requires an extensive approach with conventional surgery. Surgical en bloc excision should be restricted to cases impossible to treat with percutaneous methods. Combined percutaneous destruction and alcoholisation of the nidus is more cost effective than the other percutaneous methods of destruction of the nidus (either by radiofrequency thermocoagulation or laser interstitial photocoagulation). Moreover, the destruction and alcoholisation technique has fewer risks for the structural integrity of the skin and the subcutaneous tissues.

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