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Case Report / *Olgu Sunumu*

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Radiofrequency ablation of phalangeal osteoid osteoma: technical challenges encountered in small bones

Falangeal osteoid osteomada radyofrekans ablasyon: Küçük kemiklerde karşılaşılan teknik zorluklar

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Osteoid osteoma, a benign bone tumor, is characterized by a generally less than 1 cm nidus surrounded by a zone of reactive sclerosis. It is frequently located in the femur and tibia; on the other hand in up to 5% of cases it may be presented in upper extremities. In previous years, its treatment was usually open surgery with en-bloc resection or curettage of the tumor. Various minimal invasive percutaneous treatments including radiofrequency ablation became popular in last years. In this report, the difficulties encountered during radiofrequency ablation treatment in small bones is described in a 19-year-old female case of osteoid osteoma.

Key words: Ablation techniques; finger phalanges; osteoid osteoma.

Osteoid osteoma benign bir kemik tümörüdür ve genellikle etrafı reaktif sklerotik halka ile çevrili, 1 cm'den küçük nidusla karakterizedir. Sıklıkla femur ve tibia yerleşimli olmakla birlikte olguların %5 kadarı üst ekstremitede görülebilmektedir. Önceki yıllarda tedavisi genellikle açık cerrahi ile tümörün küretajı veya en-blok rezeksiyonu idi. Son yıllarda radyofrekans ablasyon gibi çeşitli minimal invaziv perkütan tedavi yöntemleri popüler hale geldi. Bu yazıda 19 yaşındaki osteoid osteomalı bir kadın hastada küçük kemiklerde radyofrekans ablasyon tedavisi sırasında karşılaşılan zorluklar anlatıldı.

Anahtar sözcükler: Ablasyon teknikleri; parmak falanksları; osteoid osteoma.

Osteoid osteoma, first described in 1935, accounts for 10-12% of primary benign bone tumors.[1] Although generally located in the femur and proximal tibia, 13% to 31% of these lesions are found in the upper extremity, and may be present in the hand in up to 5% of cases.[2] It generally affects children and young adults. Approximately 80% of patients are between five and 24 years of age, with a male: female ratio of 3:1.[3,4] On histology, osteoid osteomas show a small nidus of osteoblasts and osteoid marginated by neural and arterial supply.[5] Clinical signs include pain that is not related to physical exercise, worsens with rest and has characteristic nocturnal exacerbations.[6] Traditional medical treatment for pain relief includes acetyl salisilic acid or other nonsteroidal anti-inflammatory drugs (NSAIDs). However, long-term medication is not acceptable to most parents and children due to inadequate pain relief and the gastro-intestinal complications associated with NSAIDs. In some cases more definitive treatment is preferable. In the past, such treatment comprised open surgery with en-bloc resection or curettage of the tumor and high success rates were reported.[1] Despite the small size of the lesion, the operative procedure for its removal can be extensive. The tumor may be difficult to identify at the time of the operation, and it may recur if it is not removed completely. The tumor has a propensity for the major weight-bearing bones, especially the femur. There is a risk of fracture at such sites if a substantial amount of cortical bone is removed, and therefore internal fixation and bone grafting may be necessary. The location within a given bone is variable, and

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the operative approach can be difficult.[7] Over the past 10 years, various authors have reported their experience with the use of computed tomography (CT)-guided percutaneous treatments. Techniques such as nidus destruction using alcohol injections, laser photocoagulation or radiofrequency, were subsequently applied.[6] Radiofrequency ablation (RFA) is now an accepted, safe and cost-effective treatment for osteoid osteoma and is routinely used in some tertiary referral centers.[1]

Although the typical features of osteoid osteomas are well known, those arising in phalanges are frequently misdiagnosed. This is partly because of their rarity (9% of osteoid osteomas in the Bristol Bone Tumors Registry occur in phalanges), and also because of atypical radiological features. The most common appearance is of an eccentric lesion with soft-tissue swelling and a relative absence of sclerosis, suggesting osteomyelitis.[8] Therefore, the aim of this report was to review our initial experience with the difficulties of treatment of phalangeal osteoid osteoma with RFA.

CASE REPORT

A 19-year-old female was referred to our clinic for swelling and pain complaints in her right hand. Her pain began approximately six months before, was becoming obvious at night and did not respond to salicylic acid. On physical examination the pain and swelling were localized to the level of the 4th finger. Her neurologic examination motor and sensory testing was unremarkable and finger perfusion was very good. Anteroposterior and lateral radiographs demonstrated a small radiolucent nidus with cortical thickening and overlying soft tissue swelling. Computed tomography confirmed the diagnosis of osteoid osteoma. On CT examination, the nidus measured 5x3 mm. The subcutaneous tissue thickness measured 4 mm and the diameter of the proximal phalanx measured 9 mm in the plane where RFA was planned.

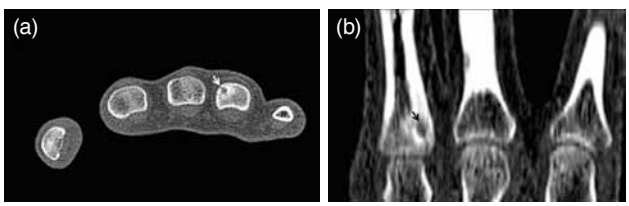

Figure 1. Computed tomography scan in the **(a)** axial **(b)** sagittal plane shows a thypical nidus (arrow) in the dorsal aspect of the phalanx.

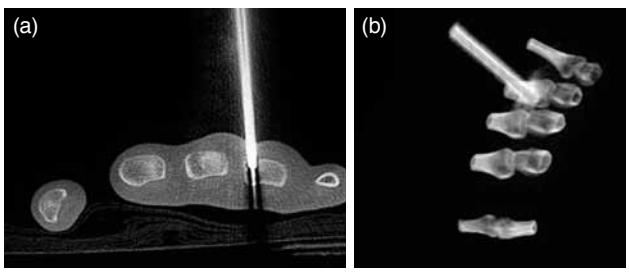

Figure 2. Computed tomographic **(a)** axial plane image **(b)** three-dimensioned volume rendering technique image shows the bone biopsy needle within the nidus.

Procedure

Before the procedure written informed consent was obtained from the patient. Axillary blockade was administered with a nerve stimulator. The efficacy of the blockade was controlled; afterwards the patient was taken to the CT table in decubitus position. Grounding pads were attached to the patient's scapular area. The first CT images provided the localization of the nidus of the osteoid osteoma (Figure 1). Subcutaneous tissue around the nidus location was expanded by dextrose solution. An anterior access, which is to the most appropriate approach to avoid vessel, nerve and tendon structures was utilized. A 14-gauge bone biopsy needle was inserted into the nidus (Figure 2). The hub of the needle was removed and a Uniblate radiofrequency (RF) needle (Rita Medial Systems AngioDynamics) was inserted. The needle has a capability of spherical ablation in the range of 1-3 cm however because the nidus and bone was small, it was set to 1 cm. The radiofrequency generator was set to maximum 30 watts of energy and 90-degree heat. Before the process of ablation, ice was applied in a sterile condition to the skin around the needle to prevent skin burns. The operation was successfully completed without complications (Figure 3).

DISCUSSION

Approximately 6% of osteoid osteomas in the hand and half to three quarters of these are located in the phalanges, especially in the proximal phalanx.[2] The standard treatment option for patients with painful osteoid osteomas is conservative treatment with NSAIDs or surgery (en-bloc resection of the nidus and surrounding reactive bone or curettage).[1] The traditional treatment for osteoid osteoma like osteochondroma has been surgery with en bloc excision,[9,10] which while highly effective, is not free from various complications;

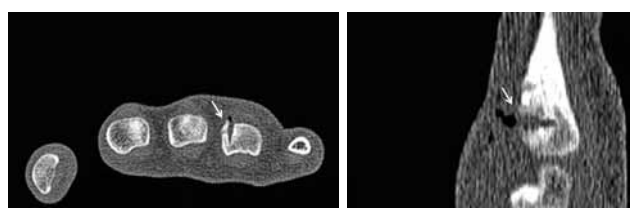

Figure 3. Control computed tomographic image obtained immediately after the intervention shows the biopsy tract (arrow) with no sign of bleeding.

tumor relapse, fractures, need for using external fixators, long hospital stay and functional recovery, among other adverse effects reported.[6] Since the first described clinical application of percutaneous RFA for treatment of osteoid osteoma, many case series have confirmed the safety and efficacy of RFA for such lesions. Compared with other minimally invasive techniques, such as drill removal, ethanol injection, or surgical techniques, RFA proved to be advantageous because of its minimal invasiveness and its reliable creation of coagulation necrosis. Moreover, this technique is considered cost-effective compared with surgery and is now accepted as a routine treatment for osteoid osteoma.[5]

In the process of RFA to the small bones with needle or drill, fractures may develop due to the force applied while attempting to reach the nidus,. Therefore, clinicians have to pay attention to prevent bone fractures that may occur while accessing the nidus. In our case, bone fracture did not occur.

Radiofrequency needles that have small spherical ablation diameters should be preferred in the treatment of osteoid osteoma. In RFA systems Uniblate RFA needle makes spherical ablation at least 10 mm in diameter, Covidien Valleylab RFA needle (Covidien-Valleylab, Boulder, CO, MA, USA) makes a 7 mm diameter and Boston Scientific Soloist RF needle (RadioTherapeutics,. Boston. Scientific, Boston, USA) a 10x15 mm diameter. Needles with a greater diameter than the lesion can damage the subcutaneous soft tissues and neurovascular structures. For this reason, manufacturers of RFA needles should design new needles, which make ablations smaller than 5 mm diameter. In our case, Uniblate RFA needle was set to 10 mm diameter and was applied to the 5x3 mm size nidus. To avoid damage to soft tissues, the bone biopsy needle was inserted into the deeper parts of the bone bypassing the lesion. In this way, soft tissues will be preserved.

Another problem is the skin burns that may occur during the process because subcutaneous tissues around the small bones are thin. For this reason, before the process subcutaneous tissues need to be expanded with non-conductive liquid and during the procedure ice should be applied to the skin.

Osteoid osteoma is rarely seen in the hands and this case suggests that minimal invasive treatment seems to be the best alternative as it prevents the tissue damage.

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