

Cortical Osteoid Osteomas of the Calcaneus Managed by En Bloc Resection and Autogenous Iliac Bone Grafting

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Keywords: Osteoid osteomas; Calcaneus; En bloc resection

Introduction

Osteoid osteoma was firstly described by Bergstrand [1] as a benign osteoblastic tumor in 1930, then followed by Jaffe [2] in 1935 who described it and he was the first one to recognize it as a unique entity. The most common sites of osteoid osteomas are the femur, especially the intertrochanteric or intracapsular regions of the hip, which are affected in two thirds of cases [2,3] the other common sites are the diaphyseal parts of the tibia and the humerus. This osteoid osteoma is not common in the foot and its incidence ranges from 4% to 16%, the preferred locations in the foot are the talus which ranges from 31% to 59% followed by the calcaneus which ranges from 12.5% to 22% of all osteoid osteomas of the foot [3-5]. There are frequent difficulties in the diagnosis and the localization of osteoid osteomas in the foot and also difficulties for the standard x-ray films to detect the tumor especially if there are extensive sclerosis in cortical lesion or arthritic changes in subarticular regions in the small tarsal bone [3-6]. In this study we evaluated the results of six rare cases of cortical osteoid osteomas of the calcaneus managed by en bloc resection of osteoid osteomas with autogenous iliac bone grafting.

Patients and Methods

Six cases of lateral cortical calcaneal osteoid osteomas, were managed by en bloc resection and autogenous iliac bone grafting at, Zagazig University Hospital, Egypt. All the patients gave the informed consent prior to being included into this study; the study was authorized by the local ethical committee and was performed in accordance with the ethical standards of the 1964 declaration of Helsinki as revised in 2000. There were five males and one female, their ages varying from 18 to 24 years old, four were right and two were left calcaneus. They were presented to our orthopedic clinic at Zagazig University Hospital, with a histories of prolonged treatment for a period varying from one to two years of uncured persistent planter fasciitis and severe calcaneal pain with non steroidal anti inflammatory which were (brufen in two patients, aspirin in three patients, feldene in one patient), physiotherapy which were (ultrasound, hot-moist packs, infra-red) and local injections which were (diprofos and lidocaine). We noticed from their histories that the pains were first started at night with intermittent periods of improvement especially with non steroidal anti inflammatory and the pain improvement was not related to the rest, and then it became persistent. The X ray reports done before did not reveal any significant changes in the calcaneus but later on the X ray showed extensive sclerosis of the infero-lateral cortex of the calcaneus, the laboratory investigations reports were normal. The computed tomographies without contrast medium were done for all the cases (scan in 10 mm in thickness) showing a rounded radiolucent area not more than 2 cm in dimensions with calcification inside and halo of extensive cortical bone medullary sclerosis around a radiolucent nidus. Those findings were concomitant with osteoid osteoma (Figures 1-3). The patients were scheduled for operation of en bloc surgical resection. We used the verbal rating scale (VRS) (simple 4-point scale) [7] for the

pain evaluations which consisted of a list of adjectives describing the different levels of pain intensity and they ranged from none to severe, its categories were as following (zero = no pain, 1= no pain at rest, slight pain on movement, 2 = slight pain at rest, moderate pain on movement, 3 = moderate pain at rest, severe pain on movement, 4 = severe pain at rest and on movement [7]. Two patients were graded as 4 and four patients were graded as 3. The patients were asked then to indicate their pain intensity using the VRS the night before and the nights after the operation. The spinal anesthetics were used for all the patients. Under the guide of image intensifier the tumors were approached through the lateral approach, the lateral cortical calcaneal bone was resected with an osteotome and the reddish niduses were seen. The surrounding sclerotic bones were removed with a curette and autogenous iliac bone grafting was done for all the patients. The diagnoses of osteoid osteomas were confirmed by the histopathological examinations (Figure 4). Postoperatively, feldene (piroxicam) intramuscular injections were given as analgesia for all the patients. The patients were placed in a cast for 2 weeks then sutures removed after 2 weeks. All the patients performed rehabilitation program which consisted of foot and calf muscles exercises for one hour, five times per day (total five hours per

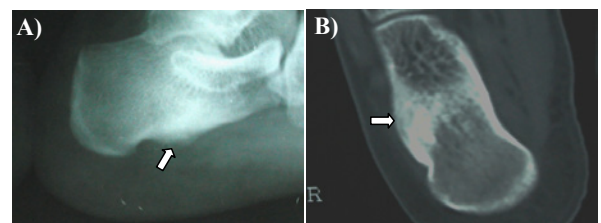


Figure 1: Case 1 (1a) X ray and (2b) CT of right calcaneal osteoid osteoma.

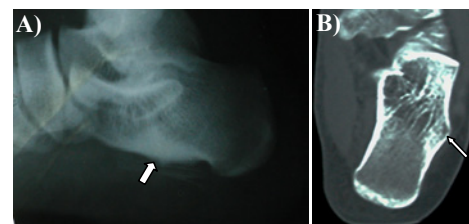


Figure 2: Case 2 (2 a) X ray and (2 b) CT of left calcaneal osteoid osteoma.

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day) for 4 weeks, of and full weight bearing was allowed after 8 weeks.

Results

The follow up periods ranged from 25 months to 32 months. The pre-operative calcaneal pain disappeared at the same night after the operation in four patients and in the second post operative day in two patients by (VRS) and the swelling gradually decreased. The wounds healed with no complications in all patients with no stress calcaneal fractures. Their pains also were completely resolved and they had returned to full activities without stiffness or restriction (Table 1).

Discussion

There were few reports in the literature about osteoid osteomas of the calcaneus which were misdiagnosed either as planter fasciitis, chronic sprain, ligamentous injury, os trigonum syndrome or subtalar arthritis [3-5]. The difficulties in the diagnosis came from the low incidence of osteoid osteomas of the calcaneus compared to the other common causes of foot or calcaneal pain for example, retrocalcaneal bursitis achilles tendinitis, sever's disease, chronic ankle instability, and plantar fasciitis, also the early X ray reports always misleading because the symptoms may present long for period before significant radiological changes could be detected [3-6]. The key for diagnosis was in the history that the pain was usually at the night and relieved by non-steroidal anti-inflammatory, but later on the persistence of the symptoms with the reluctant response to non-steroidal anti-inflammatory resulted in follow up X ray and CT which showed significant changes in the calcaneus concomitant with osteoid osteomas [3-6]. We should not also forget the other lesions which

may give radiological features shared with osteoid osteomas as stress fractures, chronic sclerosing osteomyelitis and osteogenic sarcoma. Those will be differentiated according to their special histories, radiological characters and histopathological examinations. There are different modalities for the treatment of osteoid osteomas including medical treatment with non-steroidal anti-inflammatory [8,9], surgical treatment including wide en bloc resection and unroofing with excision [9-11], also the minimally invasive surgical techniques including many surgical options as radionuclide-guided excision [12-15], CT-guided percutaneous excision [16,17], percutaneous laser photocoagulation [18,19], percutaneous radiofrequency coagulation [20,21] and computer-assisted surgery [22,23]. As regarding the medical treatment there were studies about the success of this modality within a period varying from 3 to 5 years with continuous use of non-steroidal anti-inflammatory [8,9]. The problems encountered with this method include the need of prolonged period of treatment with its hazardous side effects (CNS, hepato-renal toxicity, gastritis and peptic ulcer) especially in young active peoples who will not accept this long period of treatment with it's adverse side effects [8,9]. The open surgical treatments of osteoid osteoma include two main techniques which are wide en bloc resection and unroofing with excision with or without prophylactic internal fixation and grafting [10]. The advantages of open surgical treatment include direct visualization and intralesional excision of the nidus is which associated with a primary cure rate of 100% [10]. Assenmacher et al. [24] described immediate relief of pain in their patients, with a mean symptom-free duration of 6.6 years after surgery. The successful excision leads to elimination of pain related to the tumor within hours to days after surgery. The invasive approach of enbloc surgical resection of the tumor leads to extended hospital stay; perioperative fractures; the need for bone grafts, internal fixation, or both; periarticular stiffness; and delayed functional recovery [24]. Healey et al. [25] in their study noted that intralesional resection or curettage had the highest recurrence rate compared to en bloc resection which had the lowest recurrence rate. The authors linked this finding to incomplete removal of the nidus and they found that the recurrence was observed within 1 year after excision; so they concluded that the patient with osteoid osteomas should be monitored for a minimum of 1 year [24,25]. In our patients done by en bloc resection and autogenous grafting we found that there was a great improvement of pain within the first to the second post operative days. We used the autogenous iliac bone grafts to prevent the stress fractures and all the lesions healed with no complications or recurrence. The use of the techniques of proper preoperative and intraoperative localization of the tumor is critical to ensure adequate resection of the tumor and to minimize the recurrence which includes the preoperative CT scan and the good quality image intensifier intra operative. There were several reports that discussed the minimally invasive surgical techniques which included radionuclide-guided excision, CT-guided percutaneous excision, percutaneous laser photocoagulation, percutaneous radiofrequency coagulation, and computer-assisted surgery. The success rates could be approximately 100% [12-23]. The disadvantages include incomplete resection, persistence of symptoms, recurrence and inability to examine the lesion by histopathological examination [12-23].

Conclusions

Osteoid osteoma should be in our expectations during the differential diagnosis of foot pain especially in the cases with reluctant

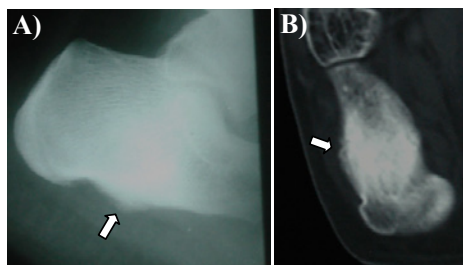


Figure 3: Case 3 (3a) X ray and (3b) CT of right calcaneal osteoid osteoma.

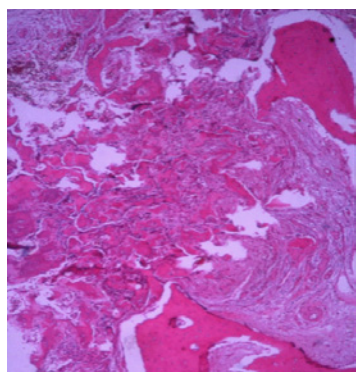


Figure 4: Microscopic examination of osteoid osteoma: The nidus is typically composed of a mass of irregular osteoid tissues that lie in a highly vascular stroma of connective tissue containing osteoblastic cells. It consists of irregular lacelike osteoid and calcified matrix lined by plump osteoblasts and osteoclasts with a well-vascularized but bland stroma.

| Cases | Site | Sex | Duration Of preoperative pain | The received treatment | Pain rating Scale VRS | Improvement of pain | complications | Fellow-up period |
|--------|-------|--------|-------------------------------|-------------------------|-----------------------|----------------------|---------------|------------------|
| Case 1 | Right | Male | 12 months | Brufen P.T.S L.I | 3 | Same night | No | 25months |
| Case 2 | Left | Male | 14 months | Aspirin P.T.S L.I | 4 | Same night | No | 28months |
| Case 3 | Right | Male | 17 months | Brufen P.T.S L.I | 3 | Second Postoperative | No | 32months |
| Case 4 | Right | Male | 24 months | Feldene P.T.S L.I | 3 | Same night | No | 27 months |
| Case 5 | Right | Female | 15 months | Aspirin P.T.S L.I | 3 | Same night | No | 28 months |
| Case 6 | Left | Male | 19 months | Aspirin P.T.S L.I | 4 | Second Postoperative | No | 30 months |

NB: P.T.S = Physiotherapy. L.I = Local injection. V.R.S = Verbal rating scale.

Table 1: Results of en bloc resection with autogenous iliac grafting of cortical calcaneal osteoid osteoma.

response to the treatment. Osteoid osteoma may be resolved with non-steroidal anti-inflammatory treatment in an average of 33 months. If the patient does not withstand the pain and the prolonged use of non-steroidal anti-inflammatory medications, the surgical interventions are the solution. The goal of the surgical intervention is complete surgical excision because it is the most predictable way to cure the osteoid osteoma. The exact localization of the lesion is the most important determinant for successful surgical removal.

Cases Presentations

X ray showed extensive sclerosis of the infero-lateral cortex of the calcaneus. The CT without contrast medium was done for all the cases (scan in 10 mm in thickness) showing a rounded radiolucent area not more than 2 cm in dimensions with calcification inside and halo of extensive cortical bone medullary sclerosis around a radiolucent nidus. These findings were concomitant with osteoid osteoma (Figures 1-3).

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