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Original Research Article

Computed tomography guided laser ablation of osteoid osteoma: a study of 30 cases

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ABSTRACT

Background: Osteoid osteoma (OO) is a benign but painful bone lesion that primarily occurs in children and young adults 1. Male:Female ratio is 3:1. The aim of the study was to present our experience of CT guided LASER ablation of radiologicaly proven Osteoid osteomas in the various bones.
Methods: Over the period of 5 years 30 cases of osteoid osteomas in various bones diagnosed on various modalities were treated by CT guided LASER ablation. Bone wise distribution of cases was spine (3), upper end of femur (11), lower end of femur (6), upper end of tibia (4), upper end of humerus (3), lower end of radius (2) and calcaneum (1). 22 patients were treated under spinal and regional anesthesia and 8 patients were treated under short general anesthesia. All the patients were treated on day care basis. The LASER fiber was inserted in the nidus under CT guidance through bone biopsy needle and 1800 joules energy delivered in the lesion continuous mode.
Results: 29 (96%) patients have complete relief of pain in twenty-four hours after LASER ablation, One week after treatment all 30 patients were pain free. No neurologic complication was observed in any of our patients with spinal osteoid osteomas.
Conclusions: CT guided LASER ablation is a safe, simple and effective method of treatment for osteoid osteoma.

Keywords: CT, Laser photocoagulation, Osteoid osteoma

INTRODUCTION

Osteoid osteoma (OO) is a benign but painful bone lesion that primarily occurs in children and young adults.[1] Male:Female ratio is 3:1 .The most common symptom is bone pain, which often worsens at night and is typically relieved by aspirin or other nonsteroidal anti-inflammatory drugs.[2] On plain-film studies, OO is seen as dense reactive bone with a radiolucent nidus at the core, which may be difficult to visualize.[3] Computed tomography (CT) is the imaging modality of choice.[4,5] The treatment options available for OO are conservative medical treatment, surgical treatment and percutaneous intervention. Laser photocoagulation as a method for treating osteoid osteomas was first described by Gangi et al[6]. The same author recently reported a series of 114 osteoid osteomas.

METHODS

Over the period of 5yrs 30 cases of osteoid osteomas in various bones diagnosed on various modalities were treated by CT guided LASER ablation. Bone wise distribution of cases was spine(3), upper end of femur (11), lower end of femure (6), upper end of tibia (4), upper end of humerus (3), lower end of radius (2) and

calcaneum (1). 22 patients were treated under spinal and regional anesthesia and 8 patients were treated under short general anesthesia.

Osteoid osteoma is cortical lesion. Plain X-ray show dense cortical sclerosis and small lucency within (Figure 1). On CT Scan osteoid osteoma appears hypodense lesion with surrounding sclerosis (Figure 2).

Figure 1: Plain radiograph of both femur showing sclerotic lesion with small lucency within in medial cortex of middle 3rd of diaphysis of left femur.

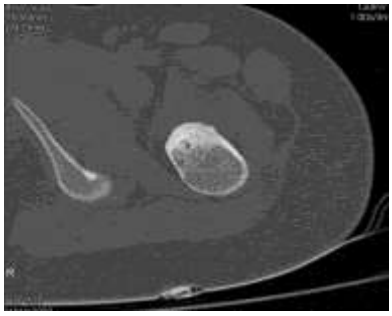

Figure 2: Plain CT sclerotic lesion with hypodense nidum in intertrochanteric region.

MRI reveals small focal predominantly cortical oval lytic lesion which appears hypointense on T1WI and hyperintense on T2WI and STIR. Diffuse extensive sclerosis and hyperostosis of bone seen surrounding the lesion appearing hypointense on T1WI and T2WI. Mild diffuse marrow oedema noted in the adjacent bone appearing hyperintense on STIR. Mild diffuse soft tissue oedema seen in the surrounding muscles (Figure 3a and 3b).

Before the procedure blood cell count and blood clotting analyses were performed. Procedures were performed on day care basis. Anesthesia was given. On Asterion super 4 CT scanner (Toshiba Medical systems, Tokyo, Japan) lesion was located in the bone by taking 2mm axial cuts. The maximum size of the nidus was 8 mm. Using the images, we adjusted the position of the patient's and marked the skin at the planned access point.

The skin was prepared and draped. Osseous access was established with a 13G bone biopsy needle (High Tech Surgical system) (Figure 3). The LASER fiber was connected to Diode 810 LASER machine (UK) and the fiber was inserted into the nidus after withdrawing the stellete of bone marrow needle(Figure 4a and 4b).

Figure 3: (a) Coronal flair; (b): Axial T2WI nidus with surrounding sclerosis.

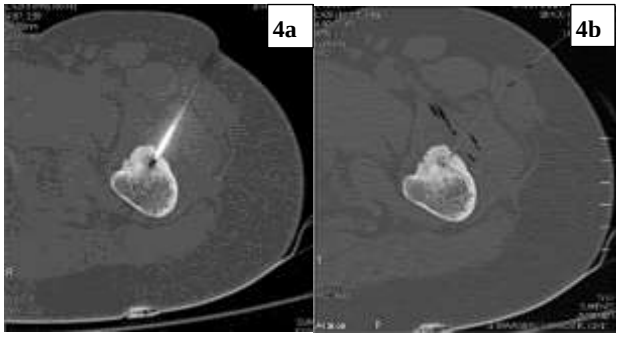

Figure 4: (a) Tip of bone biopsy needle in the nidus; (b) LASER fibre in the centre of nidus.

After conforming the fiber tip in the nidus 1500- 1800 joules energy was delivered in the lesion in continuous mode at 10W power[3]. Post-procedure CT was performed to confirm the lack of soft tissue swelling and hematoma. All the patients tolerated the procedure well, no intraprocedure and postprocedure complications. Patient was discharged after 12 hours. Patients were advised no weight baring activity of Lt leg for 1 month and follow –up after 1month.Complete relief of pain was noted in most of the patients after 24 hours.[4] Follow –up CT and MRI was done after 1month which revealed mild sclerosis of the nidus (Figure 5).

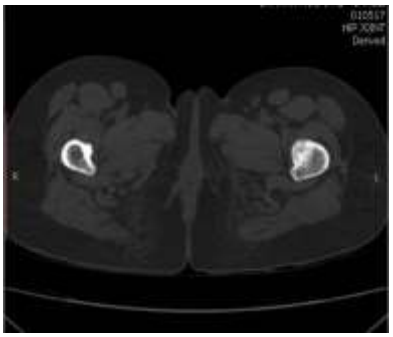

Figure 5: Follow-up CT after 1month show mild sclerosis of the nidus.

RESULTS

Pain reduction was the main purpose for evaluation of the effectiveness of CT guided LASER ablation in our study. 29 (96%) patients have complete relief of pain in twenty-four hours after LASER ablation, One week after treatment all 30 patients were pain free. No neurologic complication was observed in any of our patients with spinal osteoid osteomas. We called patients for follow-up at 1months, 6 months and 1year after treatment. No patient had recurrence and repeat treatment required in our study.

Complete or partial sclerosis of the nidus was observed after 12 months on CT scans in all 30 patients. One patient had ring sequestrum after 1.5months at the site of needle insertion which was surgically removed under local anesthesia. Postprocedural CT scans confirmed the lack of soft-tissue swelling, edema, or hematoma. No late complications were observed. All the patients were able to return to normal activities within 1 week.

DISCUSSION

Osteoid osteoma is benign bone tumor.[7] Osteoid osteoma is a benign, extremely painful and well-localized bone tumour. Pain is often worse at night and it can be relieved by salicylates. The most common anatomic sites of this tumour are the femur and the tibia, although any bone can be involved. CT is helpful in localizing the nidus and thus aids in planning the surgical approach. It may also sometimes reveal a nidus that cannot be seen on plain X-rays, either because it is obscured by an intense sclerotic reaction or because the sclerotic bone is absent, such as with an intramedullary osteoid osteoma. MRI was compared with CT and was found to be inferior to it, and even misleading in correctly diagnosing and localizing osteoid osteoma.[8-10] For treating patients, the nidus should be removed or destructed. As regards treatment, currently available options are conservative medical treatment, surgical treatment and percutaneous intervention.[13] Pain may disappear after several years of conservative treatment with an average time to pain resolution of 5-6 years however long-term medical therapy may be unacceptable due to refractory pain and complications with the chronic use of anti-inflammatory agents. Surgery has been considered as a curative treatment. Because intraoperative localization of the nidus is difficult, which is usually smaller than 10 mm in maximum diameter and surgical removal of the tumor often necessitates significant bone resection, there are very high chances of recurrenence.[11] Attempts to overcome this problem have led to the development of numerous methods of allowing accurate intraoperative localization of the nidus.[14,15] Laser photocoagulation as a method for treating osteoid osteomas was first described by Gangi et al.[6,17] The same author reported a series of 114 Osteoid osteomas. CT-guided radiofrequency ablation (RFA) has also been accepted as a demonstrably safe, minimally invasive, and cost-effective treatment for OO. There is no case series in the literature comparing radiofrequency ablation and laser photocoagulation in the treatment of osteoid osteoma.[12] LASER photocoagulation has some advantages over radiofrequency ablation. With LASER therapy coagulation and tissue destruction starts from the probe, which is acting as a point heat source and radiates from the center to the periphery. Size of necrosis is produced in proportion to the energy delivered and is therefore predictable.

CONCLUSION

CT guided LASER ablation is a safe, simple, and effective method of treatment for osteoid osteoma.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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