

Radiofrequency ablation for Spinal osteoid osteoma

Complete excision With osteoid osteomas, only complete surgical excision ensures the least risk of local recurrence, and effectively provides immediate pain relief and early mobilization. Newer, minimally invasive methods, including percutaneous CT-guided radiofrequency ablation (RFA), are gaining popularity internationally for the treatment of extra spinal tumors ¹⁾.

Complete surgical excision of the nidus is curative, providing symptomatic relief, and is the traditionally preferred treatment. However, surgery has disadvantages, including the difficulty of locating the lesion intraoperatively, the need for prolonged hospitalization, and the possibility of postoperative complications ranging from an unsatisfactory cosmetic result to a fracture. Percutaneous radiofrequency (RF) ablation, which involves the use of thermal coagulation to induce necrosis in the lesion, is a minimally invasive alternative to surgical treatment of osteoid osteoma. With reported success rates approaching 90%, RF ablation should be considered among the primary options available for treating this condition ²⁾.

Review

Sagoo et al. sought to systematically assess and summarize the available [literature](#) on the clinical [outcomes](#) and complications following [radiofrequency ablation](#) (RFA) for painful spinal [osteoid osteoma](#) (OO).

[PubMed](#), [Scopus](#), and [CENTRAL databases](#) were searched in accordance with [PRISMA](#) guidelines. Studies with available data on safety and clinical outcomes following RFA for spinal OO were included.

In the 14 included studies (11 retrospective; 3 prospective), 354 patients underwent RFA for spinal OO. The mean ages ranged from 16.4 to 28 years (Females = 31.3%). Lesion diameters ranged between 3 and 20 mm and were frequently seen in the posterior elements in 211/331 (64%) patients. The mean distance between OO lesions and neural elements ranged between 1.7 and 7.4 mm. The estimated pain reduction on the numerical rating scale was 6.85/10 (95% confidence intervals [95%CI] 4.67-9.04) at a 12-24-month follow-up; and 7.29/10 (95% CI 6.67-7.91) at a >24-month follow-up (range 24-55 months). Protective measures (e.g., epidural air insufflation or neuroprotective sterile water infusion) were used in 43/354 (12.1%) patients. Local tumor progression was seen in 23/354 (6.5%) patients who were then successfully re-treated with RFA or open surgical resection. Grade I-II complications such as temporary limb paresthesia and wound dehiscence were reported in 4/354 (1.1%) patients. No Grade III-V complications were reported.

RFA demonstrated safety and clinical efficacy in most patients harboring painful spinal OO lesions. However, further prospective studies evaluating these outcomes are warranted ³⁾.

Case series

Percutaneous Radiofrequency Ablation Using a Navigational Bipolar Electrode System ⁴⁾

Between 2002 and 2012, a total of 61 patients (46 male and 15 female, mean age 26.4 ± 12.7 years) were subjected to RFA for spinal OO. The diagnosis of OO was made after a period of pain and symptoms of 20.6 ± 14.4 months. RFA was performed under conscious sedation and local analgesia. Clinical symptoms were evaluated at 3, 6, and 12 months, and at the end of the time of the present investigation. Mean follow-up was 41.5 ± 7.1 months.

Results: The primary efficacy of RFA, complete regression of symptoms, was obtained in 57 out of 61 patients (93.4%). Four out of 61 (6.5%) patients showed a relapse of OO (after 3 months); 2 out of 4 were subjected to a second RFA, the remaining ones were subjected to surgery. There was one complication (case of lower limb paresthesia for 30 days after the ablation) and one possible complication (a disc herniation).

Conclusion: CT-guided RFA is an excellent treatment for spinal OO. Our data suggest that this procedure should be considered for the first stage of therapy for this disease ⁵⁾

Between March 2009 and July 2016, 8 consecutive patients with spinal osteoid osteomas were enrolled in the study and underwent 9 CT-guided RFA procedures. All patients presented with spinal pain (median preoperative visual analog scale [VAS] score 7.55, range 6-8.8) predominantly during the night, and they all had normal neurological examination results before the procedure. Pain (according to the VAS score) and neurological status were reassessed immediately before discharge, with further follow-up at 1, 6, and 12 months after the procedure. At the final follow-up, VAS score, neurological examination, patient satisfaction, and a radiological control (CT scan) were documented (median 48 months, range 12-84 months). VAS scores before and after the procedure were compared during the 3 days before surgery (D0), on the day of the surgery, Day 1 (D1), and at the final follow-up. RESULTS No neurological deficit was documented following the procedure or at the final follow-up. A statistically significant reduction in the VAS score was observed on Day 1 (mean 2.56 ± 0.68 , $p = 0.005$) compared with D0. At the final follow-up, all patients reported a VAS score of 0 and a satisfaction rate of 100%. Only 1 patient had recurrent symptoms (pain, VAS score 8.1) 6 months after the initial RFA. A second procedure was performed, and the patient was subsequently symptom free at the final follow-up. CT scanning performed in all patients (12-84 months post-RFA) showed residual sclerosis in 4 patients and complete resolution of the radiological lesion in the remaining 4 patients. CONCLUSIONS CT-guided RFA appears to be a safe and effective method for the management of spinal osteoid osteoma and can be safely performed for lesions close to the dura or exiting nerve root based on the motor response threshold testing performed during the procedure. It should be considered the treatment of choice for spinal osteoid osteomas refractory to conservative treatment, thus avoiding more aggressive spinal approaches with subsequent potential morbidity ⁶⁾.

The records of all patients with osteoid osteomas of the spine managed with thermal ablation at two academic centers from 1993 to 2008 were reviewed.

Results: Seventeen patients (13 male patients, four female patients; mean age, 25.9 years) had lesions in the lumbar (seven patients), thoracic (six patients), cervical (three patients), and sacral (one patient) regions of the spine. Two lesions were in the vertebral body, one was within the dens, and the others were in the posterior elements. The mean lesion diameter was 8.8 mm, and the mean distance between the lesion and the closest neural element was 4.3 mm. The lesions were managed with laser (13 lesions) or radiofrequency (four lesions) ablation. Special thermal protection techniques involving the epidural injection of gas or cooled fluid were used. Pain levels were assessed immediately before the procedure and on the day after the procedure. Long-term follow-up findings were available for 11 patients. No complications were encountered, and all patients reported relief of pain. The 11 patients who participated in long-term follow-up reported continued relief of pain.

Conclusion: Percutaneous thermal ablation can be used to manage spinal osteoid osteomas close to the neural elements. Special thermal protection techniques may add a margin of safety ⁷⁾.

A prospective study on 24 patients with spinal osteoid osteoma treated with radiofrequency ablation (RFA).

Objective: To determine if and when computed tomography (CT)-guided RFA is a safe and effective treatment for spinal osteoid osteomas.

Summary of background data: Surgery has been considered the standard treatment for spinal osteoid osteomas. Surgery may cause spinal instability, infection, and nervous injury. We evaluated CT-guided RFA as an alternative treatment.

Methods: A total of 28 RFA procedures in 24 patients with spinal osteoid osteoma were performed, using a 5-mm noncooled electrode. Clinical symptoms and spinal deformity were evaluated before and after the procedure. Unsuccessful treatment was defined as the presence of residual or recurrent symptoms. The mean follow-up was 72 months (range: 9-142 months).

Results: Nineteen (79%) patients were successfully treated after 1 RFA, and all except one after repeat RFA. One patient with nerve root compression needed further surgery. No complications were observed. Spinal deformity persisted in 3 of 7 patients after successful RFA.

Conclusion: CT-guided RFA is a safe and effective treatment for spinal osteoid osteoma. Surgery should be reserved for lesions causing nerve root compression ⁸⁾.

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