

Radiofrequency Ablation for Treating Resistant Intercostal Neuralgia

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Background: Intercostal neuralgia is a complex and difficult-to-treat condition. We present 2 cases that demonstrate the safe and effective use of thermal radiofrequency ablation (RFA) to achieve significant pain relief.

Case Reports: Our first patient was a 62-year-old female who developed chronic chest pain following lumpectomy for breast cancer and failed conservative management. Two intercostal diagnostic nerve blocks were performed with good results. One block provided pain relief for 3 weeks, and the other provided pain relief for 5 weeks. These blocks were followed by RFA that provided excellent improvement in her pain for >1 year. Our second patient was a 67-year-old female with a history of esophageal carcinoma and non-small cell lung cancer. She developed chronic chest pain following surgery and treatment. Conservative management was implemented at first without significant improvement in pain. The patient received intercostal diagnostic blocks that significantly improved her pain. She then underwent RFA for the same nerves and had resolution of her pain at 2-month follow-up.

Conclusion: Our cases suggest that thermal RFA can be safely used to treat patients suffering from intercostal neuralgia. This unique treatment has significant implications for chronic pain physicians and warrants additional studies to elucidate its effectiveness, safety profile, and scope of use.

Keywords: Ablation techniques, intercostal nerves, neuralgia, pulsed radiofrequency treatment

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INTRODUCTION

Intercostal neuralgia is a painful disorder characterized by intense, sharp, and shooting or burning pain. It shares many features with neuropathic pain and is usually located at the distribution of an intercostal nerve.¹ Characteristic symptoms are pain that radiates in a back-to-front distribution and hyperalgesia of the overlying skin. Intercostal neuralgia is most commonly seen in patients with chronic chest wall pain after thoracotomy but has also been reported in patients after breast or abdominal surgery or in patients with nerve entrapment, traumatic or iatrogenic neuromas, or herpes zoster infections.²⁻⁷ Some of the available treatment options for intercostal neuralgia are medical management, nerve blocks, cryoablation, and radiofrequency ablation (RFA).⁸⁻¹¹ Despite these options, intercostal neuralgia remains difficult to treat, and no single treatment modality or combination of modalities has been shown to consistently provide adequate pain relief. We present 2 cases of intercostal neuralgia, both resistant to conservative treatment, that were effectively treated using thermal RFA.

Thermal RFA is a technique generally conducted in the outpatient setting under local anesthesia or conscious sedation anesthesia. During this procedure, heat generated

from medium-frequency alternating current (250-500 kHz) is used to induce cell death from coagulation necrosis.^{12,13} The nerves to be ablated are first identified with a local anesthetic nerve block that provides temporary pain relief and confirmation of the nerves to be targeted with the subsequent image-guided RFA. This technique is particularly appealing because it is minimally invasive and can be performed in an outpatient setting, avoiding the risks associated with general anesthesia. Evidence supports the effectiveness of thermal RFA of medial branch nerves in patients suffering from low back pain; however, research about the effectiveness of thermal RFAs for intercostal neuralgia is limited.^{14,15}

CASE REPORTS

Patient 1

A 62-year-old female with a history of breast cancer treated by lumpectomy and radiotherapy presented with right-sided chest pain after her surgery. When the patient presented to our clinic, she reported sharp stabbing pain in her right breast and right rib area. Her pain had begun 24 months prior to presentation but had increased in severity and frequency in the 3 months preceding her presentation

to the pain clinic. Pain after her surgery was resistant to several conservative measures, including lidocaine patches, nonsteroidal antiinflammatory drugs (NSAIDs), and antidepressants. During presentation, the patient described her pain as very severe, with sensitivity to touch. She reported pain when wearing a brassiere. The pain was referred from the back to the front. The patient underwent right intercostal nerve blocks at ribs number 4, 5, 6, and 7. Two blocks were performed at the level of pain, with complete resolution of pain for 3 weeks and 5 weeks, respectively. To provide prolonged pain relief, we performed thermal RFA for the same intercostal nerves without issues. At her 2-month follow-up visit, the patient reported complete resolution of her pain. The patient continued to report good pain relief for >1 year and did not need to seek any other modalities for pain management.

Patient 2

A 67-year-old female with a history of esophageal carcinoma and non-small cell lung cancer (NSCLC) presented with severe right-sided chest pain that had begun 12 months prior to presentation. Her esophageal carcinoma was treated with chemotherapy-radiation and surgical resection. Her NSCLC was treated with right upper lobe (RUL) resection. Shortly after her RUL resection, the patient began to experience midback pain referred around the ribs on the right side. At her initial appointment, she reported 7/10 numeric rating score (on this scale, 0 corresponds to no pain, and 10 corresponds to the worst pain imaginable), constant, severe, sharp pain in the midback and right rib. Her pain had persisted for approximately 7 months, and she had experienced minimal relief from the combination of daily NSAIDs, hydrocodone acetaminophen, physical therapy, and occasional codeine. Chest computed tomography conducted 1 month prior to presentation showed small bilateral pleural effusions, no rib fractures, and no other abnormalities. We performed intercostal nerve blocks for ribs number 9-12 under fluoroscopy without complications. Postoperatively, the patient reported her pain at 2/10 for 3 days.

During her 1-month follow-up appointment, the patient reported pain of 8/10 with characteristics similar to her initial presentation. A second intercostal block of ribs number 9-12 was performed. She again reported significant pain relief that only lasted 3 days. Because of her response to previous therapies, we proceeded with thermal RFA to provide long-term pain relief. She tolerated the procedure well and had no complications. Immediately following this procedure, she rated her pain as 0/10. At her 2-month follow-up, she rated her pain as 0/10 and reported increased activity because of her pain relief. The patient has not returned to the pain clinic.

Procedures

Intercostal Nerve Blocks. The following protocol was used for all intercostal nerve blocks. Informed consent was obtained. Patients were placed in the prone position. Under fluoroscopic guidance, the ribs being blocked were identified. The skin overlying the rib was anesthetized with 1% lidocaine. A 25-gauge 2.5-inch spinal needle was advanced to the lower border of the rib, with the position confirmed by fluoroscopy. The intercostal space was injected with 1-mL

Omnipaque dye. Following adequate spread, 20 mL of triamcinolone and 2 mL of 0.25% bupivacaine were injected into the intercostal space. This solution was flushed with preservative-free 1% lidocaine.

Thermal Radiofrequency Ablation. The following protocol was used for all thermal RFAs. Informed consent was obtained. Patients were placed in the prone position. The ribs of interest were identified, and 1% lidocaine was used to anesthetize the skin overlying the rib. A 100-mm radiofrequency lesioning needle with a 10-mm active area was inserted and positioned under the inferior border of the intercostal space using fluoroscopy. Care was taken to avoid penetrating the pleura. After correct positioning was confirmed, RFA probes were inserted into each of the needles. Sensory testing and motor testing were performed to confirm location close to the nerve and far from any motor nerve fibers. Next, 2 mL of 2% preservative-free lidocaine was injected. RFA was then performed in the lesion mode. The settings were 80°C and 180 seconds for lesion mode at each level.

DISCUSSION

Thermal RFA is a minimally invasive procedure that is well tolerated by most patients. The most common adverse effects of thermal RFA are infection, bleeding, lung puncture resulting in pneumothorax, headaches, and neuroma formation. With the exception of neuroma formation, which can take months to occur, many of these complications occur in the immediate perioperative period.¹⁶ Our patients did not experience any complications during or immediately after the procedure and reported no complications during follow-up.

Intercostal neuralgia is a painful disorder with a variety of causes. As noted earlier, treatment options for patients suffering from intercostal neuralgia include medical management, nerve blocks, and cryoablation.⁸⁻¹¹ However, none of these modalities has been shown to provide consistent pain relief. We described 2 cases of intercostal neuralgia resistant to conservative management that were effectively treated by RFA. Our results are in line with Engel's 2012 case series of 6 patients with intercostal neuralgia who were treated with thermal RFA. He reported complete pain relief in 4 of 6 patients by their final visit.¹⁶ Our results contribute to the growing body of literature showing the effectiveness of thermal RFA in the treatment of intercostal neuralgia and have significant implications for the treatment of chronic postthoracotomy pain, respiratory complications following thoracic surgery, and disability related to intercostal neuralgia.

The incidence of chronic postthoracotomy pain is reported to be up to 67%, with 80% of patients experiencing pain at 3 months, 75% at 6 months, and 61% at 1 year.¹⁷ Intercostal neuralgia is one of the most common forms of chronic postthoracic surgery pain. We were able to achieve complete resolution of chronic intercostal neuralgia after 1 thermal RFA.

Another promising potential implication of the effectiveness of thermal RFA for intercostal neuralgia treatment is reducing postoperative pulmonary complications after thoracotomy. The major cause of morbidity and mortality in the thoracic surgery population is respiratory complications, with pneumonia, atelectasis, and respiratory failure

being the most common.¹⁸ These complications occur in an estimated 15%-20% of patients after thoracic surgery and account for the majority of the 3%-4% morbidity and mortality associated with thoracic surgery.^{18,19} Adequate postoperative pain control can reduce these pulmonary complications.²⁰ Thermal RFA could be a promising adjunct to the current postoperative pain management regimen that includes neuraxial anesthesia, opioids, NSAIDs, and local anesthetic patches. Furthermore, thermal RFA has the potential advantage of providing longer term pain relief than the medications used to treat intercostal neuralgia and avoiding many of their adverse effects, such as renal damage, sedation, constipation, addiction potential, and gastrointestinal bleeds.

Patients experience disability for an estimated average of 70 days after diagnosis with intercostal neuralgia, and a large percentage of these patients are forced into long-term disability as a result of their pain.²¹ Disability is associated with numerous adverse economic, medical, psychological, and financial outcomes. Thermal RFA has the potential to limit and perhaps prevent disability in patients suffering from intercostal neuralgia.

Thermal RFA has many theoretical implications for the treatment of intercostal neuralgia. To better understand these implications and the potential applications of RFA, a multicenter randomized controlled trial is needed to confirm our findings and those of other small published studies.

CONCLUSION

Intercostal neuralgia remains a difficult pain syndrome for clinicians and patients to manage. We described 2 cases of intercostal neuralgia treated with thermal RFA that resulted in long-term pain relief. These results are promising; however, research is needed to further elucidate the effectiveness of this intervention, its safety profile, and its scope of use.

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