CASE REPORT

Radiofrequency Ablation for Cancer-Associated Pain

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Abstract: Many treatment options are available for the management of cancer pain including drugs, local excision, radiation, brachytherapy, and nerve blocks. Percutaneous radiofrequency ablation has been used to treat painful neurologic and bone lesions and thus could potentially be used to treat cancer pain in other sites. Two superficial subcutaneous metastatic nodules were treated with percutaneous radiofrequency ablation. The patient received significant pain relief and improved quality of life.

Key words: *Radiofrequency ablation, metastatic cancer pain.*

Cancer-associated pain is often the most debilitating aspect of malignant disease. Because of the lack of effective treatment options, it is a difficult clinical problem to manage. Treatment of pain from metastatic disease is often palliative in nature and is often limited in effectiveness.

Radiofrequency ablation has been studied in recent years for the treatment and eradication of focal tumors.[9] Radiofrequency has long been used to treat painful disorders such as trigeminal neuralgia or osteoid osteoma. Recent developments in the technology and techniques of ablation as well as in image guidance have allowed application of this treatment to other portions of the body. The use of thermal therapy to induce coagulation necrosis is being explored in a host of tumor types for cure, debulking, and palliation.

Case Report

A 58-year-old woman with a 29-month history of metastatic fallopian tube carcinoma presented with multiple painful subcutaneous masses in the left groin and epigastric area. The patient was previously treated with paclitaxel and carboplatin for disease confined primarily to her lymphatics. Surgical history included hysterectomy, omentum resection, and tumor debulking. Pain medications included acetaminophen with oxycodone hydrochloride, oxycodone hydrochloride, and a fenal patch at 75 μg per hour. A 2-page brief pain inventory was used to assess the level of pain and interference with daily function. The groin nodules caused her pain 24 hours per day with an intensity of 4 to 7/10. The pain completely interfered with her ability to walk and to perform her daily responsibilities. Multiple superficial nodules were palpable on physical examination and measured roughly 2 cm in size. The left groin nodule was 4 3 cm, mobile, and tender to touch. The nodule was just superficial and medial to the common femoral neurovascular bundle (Fig 1).

Written informed consent was obtained for the radiofrequency ablation treatment of the 2 superficial nodules. Because treatment of soft tissue masses with radiofrequency ablation is approved by the Food and Drug Administration, no investigational review board approval was obtained. Routine monitoring and conscious sedation were provided with fentanyl and midazolam and subcutaneous 1% lidocaine. The patient was given 1 g of prophylactic intravenous cefazolin periprocedurally. With a RITA 50-W radiofrequency generator and a model 70 RITA 15-gauge coaxial probe (RITA Medical Inc, Mountain View, CA), radiofrequency current was administered for 10 minutes at a target temperature of 110°C for each thermal lesion. The smaller lesion required 1 application of radiofrequency, and the bilobed groin lesion required 2 applications to ablate the entire lesion adequately. Total current application time was 30 minutes at target temperature. After the ablations, the needle track was cauterized to 70°C on the way out to limit the risk of back-bleeding or needle track seeding with tumor cells. The treatment was well-tolerated, and the patient had only mild complaints of superficial pain immediately after procedure that were well-controlled with oral analgesics. Pelvic computed tomography (CT) scan with intravenous contrast was obtained 20 hours after the procedure (Fig 2).

Immediately after the procedure, the patient was without discomfort and was discharged the following morning without complication. Oral and cutaneous opiates were discontinued in the days after the procedure. One month after the procedure, while on no pain med-

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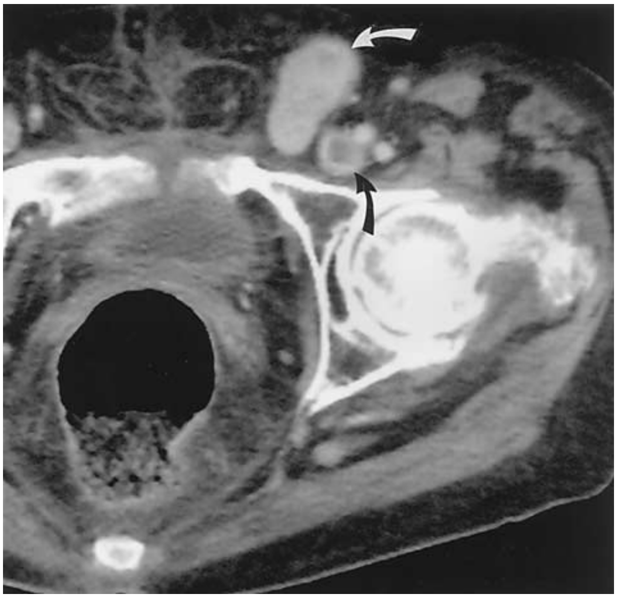

Figure 1. Pretreatment pelvis CT scan after intravenous contrast administration shows enhancing superficial mass (white arrow). Incidental note is made of the deep venous thrombosis in the common femoral vein (black arrow).

Figure 2. Postablation pelvis CT scan after intravenous contrast administration demonstrates loss of contrast enhancement, consistent with coagulation necrosis. Note barely perceptible thin line of enhancement, which could represent incompletely treated tumor or post-treatment inflammatory response (arrow).

ications, her pain was assessed again with the same 2-page brief pain inventory. The intensity of the pain was 1 to 3/10 with no pain experienced while sleeping. Pain did not interfere with walking or other daily activities. The patient died of her metastatic disease 10 weeks later, unrelated to the procedure.

Discussion

Cancer-related pain is a difficult problem, often with limited effective treatments. Pharmacologic management remains the most common method of treating cancer pain,[10] but sedation from opiates can impair mental function and may impair quality of life. Conventional interventional treatments of metastatic pain include local excision, radiation, brachytherapy, and nerve blocks. Each of these treatments has advantages and shortcomings. Surgery is invasive and is often limited by the dissection necessary to isolate the metastases. Repeat surgery can be more difficult or morbid. Radiation offers a noninvasive means of treatment, but collateral damage to adjacent healthy tissue is often inevitable, and maximum doses are often reached. The proximity of neural tissue and its relative sensitivity to radiation may also result in collateral damage. Brachytherapy offers the advantage of treating tumors from the middle of the mass outward, but similar to radiation, it is susceptible to damaging normal adjacent tissue. Brachytherapy is also technically difficult and expensive. Nerve blocks with local anesthetic can provide effective temporary pain relief, but 20% to 50% of patients do not benefit from the local anesthetic, and the effects are usually short-lived.[3] Local neurodestructive techniques are subject to unwanted sensorineural deficits.

Radiofrequency ablation is a form of high temperature thermal therapy that induces coagulation necrosis by heating tissue to temperatures near 100°C. A partially insulated 17-gauge needle probe is inserted directly into the tumor under imaging guidance. Imaging guidance ensures accurate application of energy to the diseased tissue, while minimizing collateral damage. The patient is made into an electrical circuit with grounding pads, and monopolar radiofrequency alternating current (near 500 kHZ) causes the ions in the tissue adjacent to the probe to agitate, leading to frictional heat. Above 50°C to 60°C, tissue denatures and cells die. Electrical parameters are monitored to titrate the delivered energy to treat the tumor and a surrounding margin of normal tissue if possible.

Percutaneous radiofrequency ablation is Food and Drug Administration approved for soft tissue ablation and the treatment of unresectable liver tumors. Radiofrequency ablation is technically straightforward and can be performed by using standard image-guided biopsy skills, with light sedation, as an outpatient procedure. Unlike surgery, ablation can be repeated many times without additional difficulty or morbidity. The equipment to perform radiofrequency ablation is inexpensive and can be guided by ultrasound, CT, or magnetic resonance imaging.

Radiofrequency ablation has been used for more than a decade for the treatment of painful disorders such as trigeminal neuralgia and painful benign bone tumors such as osteoid osteoma.[2,4,6] Recent technical developments in ablation with radiofrequency allow a larger volume of tissue to be treated in a relatively predictable fashion.[1,7] Radiofrequency ablation has been recently applied to a broad spectrum of tumors and locations, including liver, kidney, adrenal, breast, and lung tumors.[1,9] Although others have reported pain relief as a beneficial side effect of radiofrequency ablation,[5] more controlled studies of palliative treatment of cancer pain with radiofrequency ablation need to be done. The exact mechanism of action of thermal ablation for pain control is unknown. For direct nerve ablation, nociceptive input into the central nervous system is arrested, without destroying sensory or motor fibers.[4] Another potential mechanism is a decrease in intratumoral interstitial pressure, or a tissue "softening," leading to decreased pressure on adjacent nerves.

Radiofrequency ablation can be a safe and useful adjunctive treatment for recalcitrant or unresponsive cancer pain. In this patient, ablative therapy eliminated the need for pain medications and was accompanied by dramatic reduction in pain. Although most patients experience procedure-related pain during the immediate postprocedure period, this patient did not report any postprocedural pain. Because of the low cost,[8] technical simplicity, and relatively low complication rate, radiofrequency ablation may be a novel method for treating cancer pain in the near future, and studies are underway to assess its efficacy for the treatment of cancer pain.[11]

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