

Case Report

Bipolar Radiofrequency Neurotomy to Treat Neck and Back Pain in Patients with Automatic Implantable Cardioverter Defibrillator

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Manuscript received: 08-30-2015
Revised manuscript received: 09-29-2015
Accepted for publication: 10-14-2015

Free full manuscript: www.painphysicianjournal.com

We report 2 cases of successful treatment of neck and back pain with bipolar radiofrequency ablation (RFA) of the cervical and lumbar facet joints in patients with an automatic implantable cardioverter defibrillator (AICD).

Two patients with complex cardiac histories and AICD devices were treated with bipolar RFA of the facet joints. One presented with axial neck pain and the other with axial back pain. The histories and physical examinations were consistent with facetogenic pain. Diagnostic medial branch block resulted in more than 70% pain relief lasting for several days, allowing patients to perform routine daily activities without significant pain. However, we were concerned about the use of conventional RFA of the medial branches of nerves for the fear of interference with the function of AICD by the RF currents and energy. We took advantage of the localized and limited current of bipolar RFA to perform this procedure for the cervical or lumbar facet joints avoiding any interference with the function of AICD. The procedures provided long-term pain relief to the patients, and marked improvement in their functional status without any evident complications related to the function of their AICD.

This case report describes the safe and successful completion of bipolar RFA of the medial branch nerves to treat cervical and lumbar facetogenic pain in patients with AICD. This modality of treatment may be considered in patients with AICD. We are finding it to be increasingly common that patients who present with chronic neck and back pain have AICDs in place.

Key words: Back pain, neck pain, facet, AICD, radiofrequency neurotomy, bipolar lesioning

Pain Physician 2016; 19:E505-E509

Chronic neck and lower back pain is a very common health problem that affects work performance and general well-being. When asked about the common types of pain experienced in the past 3 months, respondents to a National Center for Health Statistics survey indicated that low back pain was the most common (28.4%), followed by severe headache or migraine pain (16.6%), and neck pain (15.1%) (1). The lifetime prevalence of these 3 most common types of pain is estimated at 60 – 80% and the resulting medical health care utilization exceeds \$96 million annually (2). Hence, axial pain is regarded as the leading reason for work-related disability and economic burden in the United States (3,4).

Facetogenic pain accounts for 15 – 40% of low back pain and neck pain attributable to a mechanical cause (5). The performance of diagnostic blocks (i.e., medial branch blocks) reliably identifies the facet joints as the source of pain. This will then prognosticate patients who might respond to radiofrequency (RF) neurotomy and recommend them to the medial branch that can offer substantial pain reduction for 6 – 12 months post treatment (6). The therapeutic application of percutaneous RF denervation of the lumbar medial branch nerves is safe and has had few associated complications (7).

Since the 1980s, a growing number of patients with automatic implantable cardioverter defibrillators

(AICD) and pacemakers have presented to pain clinics for evaluation and treatment. The existence of these devices complicates the treatment plan for patients with facet-mediated pain. The manufacturers of these cardiac devices advise their patients against any medical procedures where diathermy treatment is utilized that may include high frequency, short waves, or microwaves. Although there is a case report on successful RF neurotomy for lumbar facet joints in patients with brain neurostimulators (8), the safe application of bipolar RF ablation in patients with AICD has not been described in the literature. This case report aims to present 2 cases of successful, with no apparent complications, cervical and lumbar medial branch bipolar RF neurotomy for the treatment of facet-mediated pain in patients with AICD.

THE CASES

Case #1

The patient is a 74-year-old man diagnosed with ischemic cardiomyopathy, coronary artery disease, peripheral vascular disease, and s/p AICD who presented with chronic low back pain. He had L4 laminectomy and posterior spine fusion in 2011. He was reportedly unsuccessful with conservative medical management and physical therapy. Pain interventions that included epidural steroid injection and sacroiliac joint injections done at an outside pain clinic did not afford relief of symptoms. The patient was offered surgical revision of his spinal fusion but declined this intervention. Upon physical examination, he exhibited limited range of motion with spinal extension and pain reproduction with facet loading. The diagnostic work-up evaluation, which included a lumbar x-ray and computed tomography (CT) of his spine, showed stable lumbar fusion at L4-5 with evidence of multi-level degenerative disease, lumbar facet degenerative changes, and bilateral foraminal narrowing. A diagnosis of post-laminectomy syndrome with lumbar facet arthropathy was made and the patient was subsequently scheduled for a diagnostic and therapeutic right L2, L3, L4, and L5 medial branch nerve block with 1% lidocaine and 40 mg triamcinolone. For several days, the block provided 70% relief of his axial back pain. The decision was then made to proceed with bipolar RF lesioning, given the presence of AICD, to minimize the spread of RF energy and avoid interference with the function of the AICD.

Case #2

The patient is a 76-year-old woman with a complex medical history that includes rheumatoid arthritis, insulin dependent diabetes mellitus, hypertension, coronary artery disease, and ischemic cardiomyopathy s/p AICD who presented with a 2-year history of right-sided neck pain. Physical examination and imaging was consistent with right cervical facet arthropathy. A diagnostic right C2 to C6 cervical facet medial branch nerve block was performed with 0.25% bupivacaine. The patient obtained 100% pain relief for 2 hours following the procedure and reported that pain slowly returned to baseline over the days following. She had a similar response to her first cervical medial branch block. We then offered her a bipolar RF lesioning of her cervical medial branch nerve.

INTERVENTION

After written informed consent, the patients were brought to the fluoroscopy suite. Intravenous access was placed and patients were positioned prone on the fluoroscopy table. Conscious sedation was administered incrementally, when appropriate, to allow the patients to remain comfortable and conversant throughout the procedure. The area of the lumbar spine was prepped with povidone-iodine and draped into a sterile field. Fluoroscopy was used to identify the location of the lumbar and cervical medial branch nerves on both patients. Skin anesthesia was achieved using 3 mL of lidocaine 1% over the injection sites. A 22 gauge, 100 mm (10 mm active tip) straight RF needle was slowly inserted at each level under fluoroscopic guidance. After sensory (< 0.5 mV) and motor tests (1.5 mV) (Fig.1) and with impedance of less than 300 ohms yielded appropriate results, we proceeded with anesthetizing each level with 1.5 mL of 1% lidocaine. Bipolar RF lesioning was performed for 150 seconds at 80 degrees once at each level using a 4-output RF generator (Cosman G4) (Fig. 2). The needles were removed and bleeding was negligible. A sterile dressing was applied and the patients were taken to the post-block recovery area for further observation.

Follow-up

We followed up with both patients by telephone several days post-procedure and 4 weeks thereafter. Both patients reported more than 50% sustained pain relief and improvement in their functionality without apparent complications or malfunctions of their AICD.

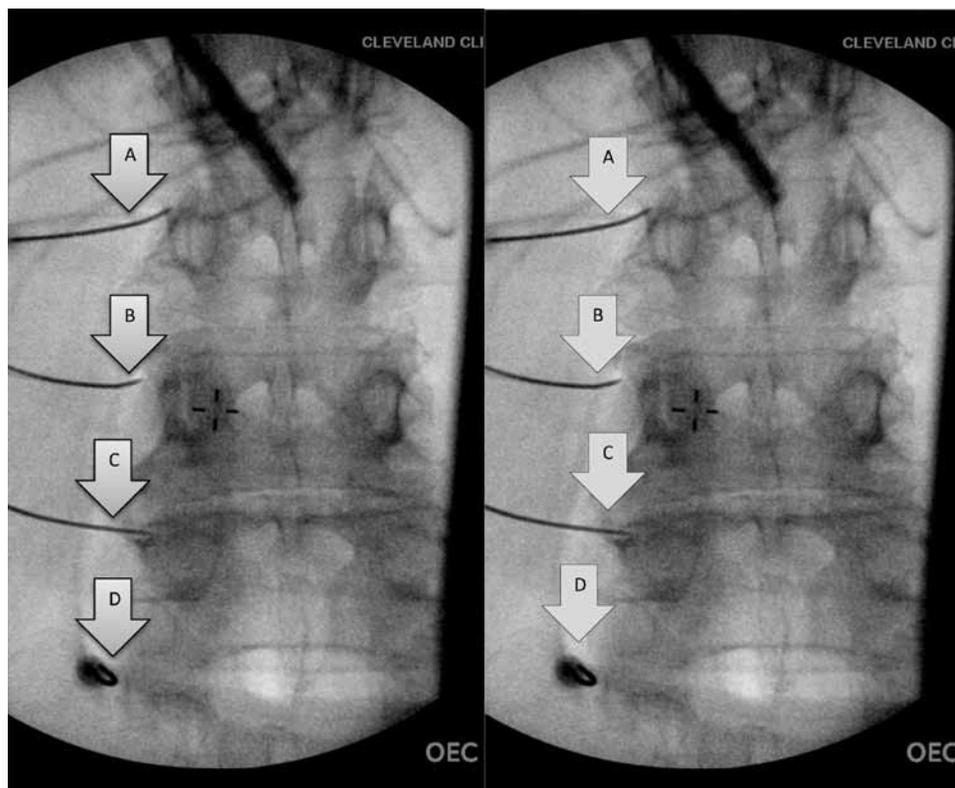
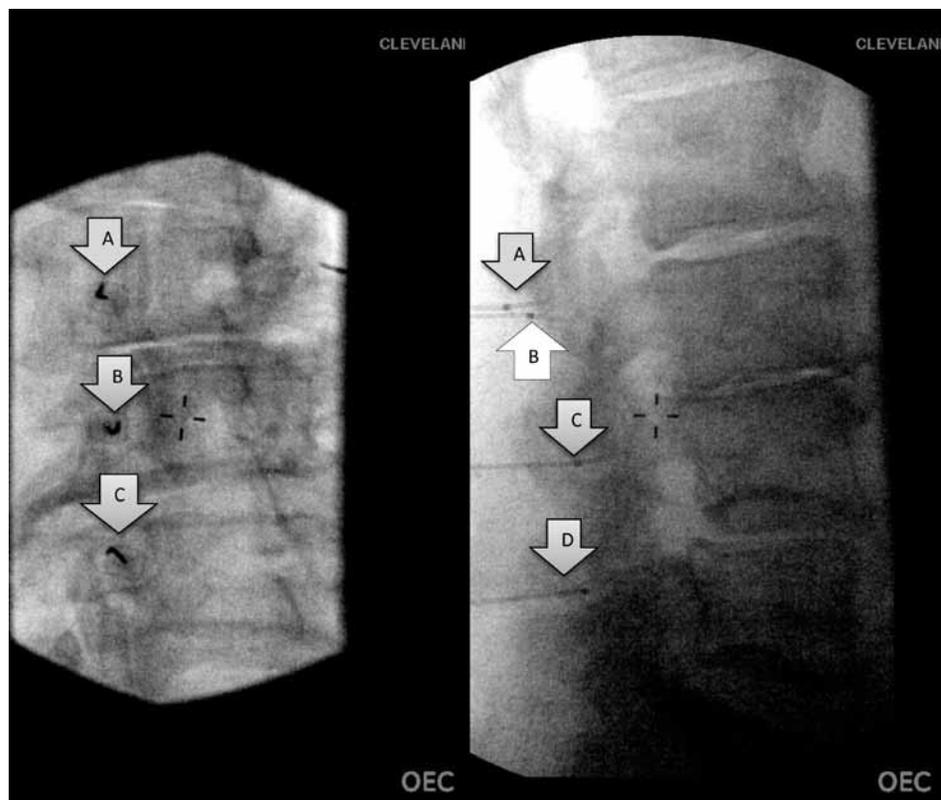


Fig. 1. Fluoroscopic images demonstrate needle placement for bipolar RF. There is no difference with the placement of the needle probe with unipolar and bipolar RF neurotomy. Bipolar connections were completed between A and B, C and D, and B and C, respectively.



Discussion

RF treatment is currently considered the standard treatment for joints in facet-mediated persistent pain (9). It is a relatively simple procedure with low incidence of side effects (7). Studies have shown that a significantly greater improvement in pain symptoms, global perception of improvement, and quality of life were observed after 6 months in patients who received RF treatment (10).

The utility of the conventional RF treatments may be of concern in patients with an implantable device such as an AICD. Electromagnetic interference (EMI) is the main safety concern that arises when patients with ICDs undergo surgery (11). Theoretically, EMI from diathermy devices can interfere with ICD sensing which may result in spurious detection of a ventricular arrhythmia (over-sensing) and delivery of a defibrillator shock. Other potential risks to the ICD include reprogramming, temporary inhibition of pacing functions, or irreversible damage to the internal circuitry (11,12).

Conventional RF ablation may create an interference with AICD functions. The use of monopolar electrical current enters the patient via an active electrode. The current travels through the patient and returns to the generator via a dispersing ground electrode. The active electrode usually discharges current through the conventional RF probe. If activated prior to contact between the active electrode and the probe, the electric current may arc through the air toward the instrument and demodulate the electronic signal. Such a signal may be over-sensed by the ICD resulting in an inappropriate discharge (13).

With the potential catastrophic consequence of monopolar RF, we propose the use of bipolar RF in patients with facetogenic pain. The theoretical explanation for the use of bipolar RF involves the flow of current between the forceps of the tool. Current passes from the active electrode at one tip through the patient (but only at the diathermy site) to the dispersive electrode at the other forceps tip (12). A regional electromagnetic field of low intensity results in the direct

area of intervention (13). Therefore, the theoretical risk of EMI associated with bipolar is substantially less than with monopolar RF.

It will be noted that there was a difference between the duration of pain relief between the patient who received lidocaine and bupivacaine. The duration of pain relief with MBB (10) is often unpredictable and far exceeds the duration of local anesthetic such as 1% lidocaine or bupivacaine. The response to short/long acting local anesthetic comparative blocks in the same patient will not be clinically comparable or predictive in any particular case. This phenomenon however, should not deter us from offering radiofrequency ablation (RFA) to our patients.

To our knowledge, this is the first case report that describes the successful use of bipolar RF neurotomy in a patient with AICD.

Conclusion

We have presented 2 cases of patients with AICD who found relief from their facetogenic pain through bipolar RF lesioning of the medial branch nerves. This denervation technique offers a safe and valuable tool for the management of facet-mediated pain without any complications in relation to AICD. The resulting effects on pain, disability, and satisfaction are encouraging. Further investigation of this novel technique is warranted to ensure safety and efficacy in this subset of patients.

Disclaimer

There was no external funding in the preparation of this manuscript.

Conflict of interest

Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.

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