Pain Medicine

PAIN MEDICINE
Volume 10 • Number 6 • 2009

CASE REPORT

A Case Series of Pulsed Radiofrequency Treatment of Myofascial Trigger Points and Scar Neuromas

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ABSTRACT

Introduction. Pulsed radiofrequency (PRF) current applied to nerve tissue to treat intractable pain has recently been proposed as a less neurodestructive alternative to continuous radiofrequency lesioning. Clinical reports using PRF have shown promise in the treatment of a variety of focal, neuropathic conditions. To date, scant data exist on the use of PRF to treat myofascial and neuromatous pain.

Methods. All cases in which PRF was used to treat myofascial (trigger point) and neuromatous pain within our practice were evaluated retrospectively for technique, efficacy, and complications. Trigger points were defined as localized, extremely tender areas in skeletal muscle that contained palpable, taut bands of muscle.

Results. Nine patients were treated over an 18-month period. All patients had longstanding myofascial or neuromatous pain that was refractory to previous medical management, physical therapy, and trigger point injections. Eight out of nine patients experienced 75–100% reduction in their pain following PRF treatment at initial evaluation 4 weeks following treatment. Six out of nine (67%) patients experienced 6 months to greater than 1 year of pain relief. One patient experienced no better relief in terms of degree of pain reduction or duration of benefit when compared with previous trigger point injections. No complications were noted.

Discussion. Our review suggests that PRF could be a minimally invasive, less neurodestructive treatment modality for these painful conditions and that further systematic evaluation of this treatment approach is warranted.

Key Words. Pulsed Radiofrequency; Radiofrequency; Neuromatous Pain; Scar Neuroma; Myofascial Pain; Trigger Point

Introduction

Radiofrequency (RF) neurotomy has been used for over 30 years to treat a variety of pain conditions [1]. RF treatment was originally designed to thermally coagulate nerve tissue and thereby block nocioceptive input [2]. More recently, it has been hypothesized that pain relief from RF treatment results not from tissue destruction per se but rather from strong electric fields induced by voltage fluctuations in the area of treatment [3,4].

Pulsed radiofrequency (PRF) treatment has been proposed as less neurodestructive alternative to *continuous* RF (CRF) [4]. PRF utilizes the same frequency utilized in thermal RF neurotomy treatment but delivers energy in higher voltage, (45V typically), 20-millisecond (msec) bursts followed by a 480-msec quiescent period to prevent neurodestructive rises in tissue temperature.

There is a growing body of literature showing promise in the use of PRF to treat a variety of

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 1526-2375/09/$15.00/1140 1140–1143 doi:10.1111/j.1526-4637.2009.00646.x

focal, neuropathic conditions [5–10]. Although there are three recent randomized controlled trials, the majority of these reports are retrospective observations of the treatment of the dorsal root ganglion, the medial branch of the dorsal primary ramus, or other peripheral nerves. Scant data exist on the use of PRF to treat myofascial or neuromatous pain. A recent review by Cahana et al. [5] identified three small case series of successful treatment of neuromata using PRF; there were no reports of treatment of myofascial pain with PRF.

Myofascial pain is local, often referred, musculoskeletal pain that arises from trigger points. Trigger points are discrete, very sensitive areas of skeletal muscle that contain palpable, taut bands of muscle [11]. Traditional treatment approaches for myofascial pain have included pharmacotherapy, injection therapy (trigger point injection with local anesthetic with or without steroid, Botulinum toxin injection, or simply dry needling), physical therapy, and behavior modification. Benefit with traditional therapy has thus far proven to be transient, variable, often incomplete, or nonexistent [12].

Treatment for neuromatous pain has proven equally challenging. A terminal neuroma naturally results from transection of a peripheral nerve if the nerve ends are not reunited [13]. It has been estimated that as many as 30% of all neuromas are painful [14]. A variety of both conservative and interventional treatment modalities for painful neuromas has thus far proven unreliable [15].

Both myofascial and neuromatous pain are highly prevalent in our practice. In light of success we and others have had treating other focal pain conditions using PRF, we elected to employ PRF in the treatment of focal myofascial and neuromatous pain. This case series summarizes our results of treating nine such patients.

Methods

A series of cases in which PRF was used to treat myofascial and neuromatous pain within our practices were evaluated retrospectively. Evaluation was performed via chart review for technique, efficacy, and complications. Telephone follow-up was performed as necessary to fill information gaps.

Nine patients were treated over an 18-month period. All patients had longstanding myofascial or neuromatous pain that was refractory to previous medical management, physical therapy, trigger point injections, and Botox injections. Patients were generally chosen based on the presence of relatively focal lesions that often responded transiently to trigger point injections.

Patients were treated using a 21- or 22-gauge 50-mm straight tipped cannula with a 4-mm active tip. Following local anesthetic skin wheal infiltration, the cannula was advanced until the patients' pain was reproduced or exacerbated. Sensory stimulation was also performed at 50 Hz, also in an attempt to reproduce or exacerbate the patients' pain and to rule out contact with a larger peripheral nerve. Treatment was performed when tissue impedance was below 400 ohms.

Treatment consisted of 20-msec bursts at 2 Hz for 240 seconds at a voltage to prevent active tip temperature from exceeding 42°C. In some cases, PRF treatment was followed by injection of steroid solution (typically triamcinolone 20 mg) through the cannula.

Timing of initial follow-up was variable but typically occurred 4–6 weeks following treatment. In some cases, follow-up occurred only upon the return of painful symptoms. Treatment was repeated when appropriate.

Results

Eight out of nine patients (89%) experienced 75–100% reduction in their pain following PRF treatment; 6 out of 9 (67%) experienced 6 months to greater than 1 year of pain relief (see Table 1). One patient (patient number 2) experienced no better relief in terms of degree of pain reduction or duration of benefit when compared with previous trigger point injections.

Several patients experienced mild postprocedural tenderness and pain for 1–2 days following the procedure. This was followed by gradual diminution of overall pain over the course of 1–2 weeks.

No complications from the treatments were noted.

Discussion

As described above, myofascial trigger points and painful neuromas are common and often very difficult to effectively treat. Our review suggests that RPF could be a safe, effective, simple, and less neurodestructive treatment modality for these painful conditions.

Although we and others have observed positive results from PRF treatment, knowledge of its precise mechanism of action remains elusive. The

Table 1 Summary of results of pulsed radiofrequency treatment for myofascial trigger points and scar neuromas

Patient	Age (Years)	Sex	Diagnosis	Previous Therapies	Number of PRF Points*	Degree of Benefit	Duration of Benefit
1	26	F	1. Abdominal pain 2. Myofascial abdominal wall pain	Botox	2 (iliohypogastric region)* ×1 on July 27, 2006	>50%	>6 months
2	71	M	1. Sacroillitis 2. Myofascial pain 3. Lumbar spondylosis	SI injections and PRF of sacral lateral branches, Botox, Medial branch block and PRF, TPI	3 parasacral points ×4*	>50%	4–6 weeks relief
3	55	F	Fibromyalgia	TPI; 1 month relief	5 PRF* ×1	50%	>6 months in treatment area but persisting diffuse myofascial pain
4	62	M	1. Stump neuroma 2. Phantom limb pain	TPI; temporary relief	6 PRF ×1	100%	>1 year
5	42	F	1. Neck pain 2. Upper extremity pain 3. Cervical DJD 4. Myofascial pain	Multiple TPI; 3 weeks relief	6 PRF ×1	70%	>9 months
6	28	F	1. Low back pain 2. Mild DJD 3. Myofascial pain	TPI ×5; 2 weeks relief	6 PRF paraspinus; 3 each side; repeat ×1 after 9 months	100%	9 months
7	55	F	Fibromyalgia	TPI ×6; 1 month benefit	6 PRF	>50%	1 month
8	66	M	1. Shoulder pain 2. Post shoulder arthroplasty 3. Myofascial pain	1. TPI ×3; 1 (1 week relief) 2. Peripheral nerve block ×2 (limited relief)	3 PRF	70%	>1 year
9	20	F	Subxiphoid myofascial pain	TPI ×4; 3 weeks relief	1 PRF; 2 cycles ×2	100%	6 months

* These treatments were followed by steroid injection.
M = male; F = female; TPI = trigger point infections; PRF = pulsed radiofrequency treatment; SI = sacroiliac joint; Botox = botulinum toxin A; DJD = degenerative joint disease.

preponderance of theory and evidence thus far points to a neuromodulatory effect [15]. PRF has been shown to subject tissue to much stronger electric fields than CRF. These fields, along with heat bursts and high electric currents, may be capable of disrupting neuronal membrane structure and function [3]. At the neurobiological level, it is believed that PRF results in the expression of the c-fos gene in lamina I and II of the dorsal horn [16,17]. It has been shown that c-fos gene expression leads to formation of the second RNA messenger, preprodinorphin, which in turn increases production of endorphins to modulate analgesic action [18].

PRF treatment is performed at a less neurodestructive temperature not to exceed 42°C. Evidence suggests that the less destructive effects of PRF are not solely due to lower temperature, however. It has been shown that CRF applied in nonthermal conditions when compared with PRF in similar conditions produces longer inhibition of evoked synaptic activity. This suggests that we may need to abandon the concept of thermal vs nonthermal RF lesioning and consider instead the mode of application [19].

The majority (67%) of our patients obtained >6 months of pain relief from PRF treatment. Our results suggest that patients with more diffuse painful conditions show a less effective response. The two patients with diagnoses of fibromyalgia continued to suffer diffuse myofascial pain at 1 month following treatment. This result is consistent with our knowledge of the narrow geometry of the PRF treatment field [20].

Obvious weaknesses of this series include its retrospective design, lack of randomization, lack of a control population, small sample size, and lack of objective outcome measures. Moreover, PRF parameters of tissue impedance, RF current delivered or voltage applied during treatment were not recorded. The recent work of Martin et al. [6] suggests that close proximity to nerves and lower tissue impedance (allowing for higher delivered current) could improve outcomes. Practitioners should make an effort to document all relevant treatment parameters to help facilitate development of optimum treatment protocols.

Notwithstanding the shortcomings of this small retrospective series, the positive response demonstrated through this review suggests that further

systematic evaluation of this treatment approach is warranted.

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