Scandinavian Journal of Pain 12 (2016) 68–73

Contents lists available at ScienceDirect

Scandinavian Journal of Pain

journal homepage: www.ScandinavianJournalPain.com

Clinical pain research

Pulsed radiofrequency in clinical practice – A retrospective analysis of 238 patients with chronic non-cancer pain treated at an academic tertiary pain centre

Jan Lindquist, Emmanuel Bäckryd *,[1]

Pain and Rehabilitation Centre, and Department of Medical and Health Sciences, Linköping University, Linköping, Sweden

HIGHLIGHTS

- Pulsed radiofrequency (PRF) is a non-neurodestructive invasive pain treatment method.
- The clinical effect of a broad use of PRF was analysed in 238 patients.
- 30% experienced major improvement when treated for suspected facetogenic lumbago.
- Treatment niches for pulsed radiofrequency need to be defined in future studies.

ARTICLE INFO

Article history:
Received 13 January 2016
Received in revised form 16 April 2016
Accepted 20 April 2016

Keywords:
Chronic
Dorsal root ganglion
Medial branch
Pain
Pulsed
Radiofrequency

ABSTRACT

Background and aims: Pulsed radiofrequency is a non-neurodestructive invasive pain treatment which, in contrast to conventional continuous radiofrequency treatment, does not entail nerve tissue destruction. The aim of this study was to retrospectively analyse the short-term benefits of a broad use of pulsed radiofrequency in clinical practice.

Methods: The medical records of all patients treated with pulsed radiofrequency, or who received a diagnostic test block with a local anaesthetic in view of such a treatment, were retrospectively analysed. The patients had been referred to a tertiary pain centre in Sweden. The treatment effect one month after pulsed radiofrequency was retrospectively graded as follows, based on the wordings of the medical records: major improvement; minor improvement; no change; or worsened.

Results: A total of 238 patients received 587 interventions from 2009 to 2014. Chronic low back pain (CLBP) was by far the most common treatment indication (57% of patients), followed by CLBP with sciatica (9%). The age at first pulsed radiofrequency was 55 (15–94) years (mean, range), and 65% were female. Thirty-six patients (15%) underwent only a diagnostic test block using a local anaesthetic, i.e., the test block did not lead to treatment with pulsed radiofrequency. A total of 445 pulsed radiofrequency interventions were performed on 202 patients.

Dichotomizing data into responders (i.e., minor or major improvement) and non-responders (i.e., worsened or no change), we found that, out of 63 responders to a median branch diagnostic test block (either at the cervical or lumbar level), 33 were responders to the first following median branch pulsed radiofrequency. Hence the positive predictive value of a median branch test block was 52%.

In 127 patients, the lumbar level was targeted for median branch pulsed radiofrequency because of clinically suspected lumbar facetogenic pain. Looking at the first treatment, 30% experienced major improvement after 1 month, 16% minor improvement, 36% no change, 5% a worsened situation, and the effect was not assessable in 13% of patients. Lone dorsal root ganglion L2-treatment for suspected discogenic lumbar pain was done on 39 patients and, after one month, the effect was not assessable in 17% of patients, 14% had major improvement, 14% minor improvement, and 55% had no change.

In 40 patients, a dorsal root ganglion or a peripheral nerve was targeted because of a non-axial chronic pain condition. There was a plethora of indications, but the most common was by far related to some form of neuropathic pain (52% of interventions, mainly because of neuralgia), followed by chronic nociceptive shoulder pain (8% of interventions).

DOI of refers to article: http://dx.doi.org/10.1016/j.sjpain.2016.04.002.
* Corresponding author at: Department of Medical and Health Sciences, University of Linköping, SE-581 85 Linköping, Sweden. Tel.: +46 10 103 3661.
E-mail address: emmanuel.backryd@regionostergotland.se (E. Bäckryd).
[1] Co-first author.

http://dx.doi.org/10.1016/j.sjpain.2016.04.008

Conclusions: This study shows that, after one month, the effect size of a broad and indiscriminate clinical use of pulsed radiofrequency is rather small.
Implications: The clinical effectiveness of pulsed radiofrequency has to be investigated further in carefully selected and more homogenous patient groups, in order to define effective treatment niches for this nondestructive invasive treatment method.

1. Introduction

Pulsed radiofrequency (PRF) is a non-neurodestructive invasive pain treatment [1]. Compared to conventional continuous radiofrequency treatment (CRF), PRF offers the advantage of pain control without tissue destruction. In CRF, a high frequency alternating current is applied in the vicinity of a nerve, leading to neurodestructive thermocoagulation. In contrast, PRF entails short current bursts followed by silent phases, leading to heat dissemination and therefore to non-neurodestructive effects [2,3]. The analgesic effect of PRF is somewhat difficult to explain, but animal data suggest that PRF has neuromodulatory effects [1,2]. For instance, in an animal neuropathic pain model, PRF has been shown to modulate the expression of pain genes at several sites along the nociceptive pathways [4]. In the specific case of radicular pain, it is thought that the rather strong electromagnetic field generated by PRF around the electrode tip potentially disrupts the pathophysiological processes in the dorsal root ganglion (DRG) and/or centrally; however, the precise way in which PRF interacts with afferent nociceptive signalling remains unclear [5].

CRF is frequently used to treat facetogenic back pain, i.e., pain that is thought to be caused by the facet joints. It is thought that repetitive stress and/or cumulative low-level trauma can lead to facet joint inflammation and subsequent pain generation [6]. Nociception from a facet joint can be interrupted by lesioning the medial branches of the posterior primary rami above and below the joint [7]. However, other structures can also generate back pain, e.g. the intervertebral discs, the sacroiliac joint, or myofascial structures [6,8]. Concerning the treatment of facet joint pain, the evidence favours CRF over PRF [1]. However, the neurodestructive nature of CRF is a drawback, prompting some interventional pain physicians to use PRF instead.

In an analysis of randomised controlled trials (RCTs) of radiofrequency treatment for chronic low back pain (CLBP), the authors of a recent Cochrane systematic review [9] concluded that the available evidence is of poor quality. Short term, there is moderate evidence that CRF has a greater pain-reducing effect than placebo in facetogenic CLBP. When comparing facet joint CRF with steroid injections, there is evidence of very low to low quality showing that facet joint CRF provides better pain reduction both short and long term. Overall, the review concluded that high quality RCTs with larger patient samples are needed, as are data on long-term effects [9].

Concerning the treatment of radicular pain, CRF on the DRG is not recommended, but PRF might be a possible option [10]. PRF on peripheral nerves (PN) has also been described, either as treatment of neuropathic pain [11] or as treatment of a well-localized nociceptive pain, e.g. PRF of the suprascapular nerve because of chronic shoulder pain [12].

At our clinical department, PRF is preferred over CRF for chronic non-cancer pain. This paper was a quality improvement project in real-life patients. The aim was to retrospectively and self-critically analyse the short-term benefit of a broad use of PRF in clinical practice.

2. Material and methods

2.1. Patients and retrospective analysis

The medical records of all patients treated with PRF, or who received a diagnostic test block with a local anaesthetic in view of PRF, during the period 2009–2014 were retrospectively analysed. The patients had been referred to a tertiary pain centre in Sweden. Approximately one month after PRF, the treatment effect was retrospectively and clinically graded as follows, based on the wordings of the medical records: major improvement; minor improvement; no change; or worsened. Wordings like “at least 50% pain relief”, “very much better”, “substantially less pain”, and the like, were considered as major improvement. Expressions like “somewhat better”, “some effect”, or “amelioration”, and the like, were graded as minor improvement. Instances like “only marginal improvement” or “uncertain” were equated with no change. Sometimes, the wordings were equivocal and no conclusion could be reached, rendering a verdict of “not assessable”.

2.2. Clinical assessment of low back pain patients

The clinical assessment of patients with unspecific CLBP is difficult, potential pain generators being e.g., the intervertebral discs (discogenic pain), facet joints (facetogenic pain or “facet syndrome”), the sacroiliac joint, or myofascial structures [6,8]. Generally speaking, the combination of unilateral localized back pain without radiculopathy, pain on movement, and paravertebral pressure pain appears to support the diagnosis of facetogenic pain, but it is important to acknowledge that no physical examination findings are pathognomonic for this condition [6]. Radiological finding did only play a minor role in the overall clinical workup. Clinical suspicion of facetogenic pain warranted a median branch PRF (MB-PRF), often preceded by a corresponding diagnostic test block using 0.5 ml of lidocaine 10 mg/ml without corticosteroids. The effect of the test block was clinically evaluated by a follow-up telephone call. For the purpose of the present study, the effect of the test block was retrospectively graded as described above according to the wordings of the medical records.

2.3. Pulsed radiofrequency treatment

Patients were treated with PRF using NeuroTherm® NT1100 (St. Jude Medical, St. Paul, MN, USA), with or without a previous diagnostic test block with a local anaesthetic. The technique used for the cervical, thoracic and lumbar regions was *ad modum* Sluijter [7] with a 20 or 22 Gauge OWL insulated radiofrequency needle (Diros Technology Inc., Markham, Ontario, Canada) and c-arm fluoroscopy (or sometimes ultrasound for peripheral nerves). Sensory stimulation at 50 Hz was effectuated, and a sensory threshold of 0.5 V was considered appropriate in order to confirm correct needle placement. Motor stimulation at 2 Hz was also effectuated as appropriate. The patients were then treated with PRF at 42 °C for 120 s (at 40 V, 2 Hz, and pulse duration 20 ms), provided the impedance