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Editorial comment

Is there a place for pulsed radiofrequency in the treatment of chronic pain?

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In the present issue of the *Scandinavian Journal of Pain*, Lindquist and Bäckryd report on the short-term effect of pulsed radiofrequency (PRF) treatment in chronic non-cancer pain conditions at a tertiary pain centre in Sweden [1]. Most of the patients received PRF because of clinically suspected lumbar facet joint related pain. In smaller groups of patients dorsal root ganglia or peripheral nerves were treated.

1. Radiofrequency treatment for chronic pain

Continuous radiofrequency (CRF) ablation was first described in 1931, after a patient with trigeminal neuralgia had been treated with thermocoagulation of the gasserian ganglion, but radiofrequency (RF) generators did not become commercially available until the late 1950s [2]. Today, facet joint procedures, including PRF or CRF, are among the most frequently performed interventions to relieve pain. The Australian professor Nikolai Bogduk and his co-workers have performed numerous studies within this area to describe the relevant anatomy, patterns of facet joint related pain, and the effect of RF neurotomy [3–5]. However, the clinical evidence of RF treatment for chronic pain conditions is still limited.

2. Predictive nerve blocks

Reversible medial branch blocks have been considered to be the best method to identify facet joint related pain. According to Bogduk et al. the nerve blocks should be performed under fluoroscopic guidance and follow a strict protocol. To recommend CRF ablation two blocks should cause at least 80% reduction in pain intensity with concomitant restoration of movements or activities previously impeded by pain [6]. These criteria are adopted by the Spine Intervention Society [7]. However, the value of repetitive blocks has been debated as this paradigm might increase the number of false-negative results. In a randomized study comparing 0, 1 and 2 medial branch blocks before lumbar CRF [8], double-blocks provided the highest success rate for each RF treatment that was performed, although the overall success rate on group level was highest in the no-block group, in which all patients received CRF. Explanations might be exclusion of patients with a true facet joint related pain in the double-block group as well as inclusion of more placebo-responders in the no-block group. CRF treatment without performing predictive blocks, implies that some patients undergo an unnecessary treatment with a certain risk of complications. We can therefore not recommend such a practice.

3. CRF vs. PRF treatment

In CRF an alternating electrical current in the frequency of the AM radio band (~500,000 Hz) is applied to heat the target tissue (80–90 °C). If the RF needle tip, surrounding the electrode, is placed close to a nerve fibre, this causes protein denaturation and destruction of the axons, which stops the transmission of nociceptive signals from the periphery [9]. A precise needle placement adjacent to the targeted nerve and adequate lesion size, depending on needle diameter, are therefore crucial for successful outcome of CRF.

In contrast to CRF, PRF has been considered to be a non-destructive therapy. The current is delivered in short bursts (~20 ms) that allow time for heat elimination, and the tissue temperature is in general kept at 42 °C [10]. However, histopathologic studies of rat dorsal root ganglia and sciatic nerves have shown transient endoneurial oedema even at this temperature [11]. In an inflammatory pain model in rats [12], PRF treatment of sciatic nerves caused enhancement of descending adrenergic and serotonergic inhibitory pathways. In addition, changes in the expression of genes, e.g. c-FOS in the dorsal horn and dorsal root ganglion, might be involved in the pain modulating effects of PRF [13].

In a systematic review of sham-controlled randomized controlled trials (RCTs) for chronic low back pain [14], Leggett et al. identified six studies involving RF treatment in lumbar facet joint related pain, five using CRF vs. sham and one using CRF or PRF vs. sham. Significantly reduced pain intensity compared to sham was found in three of the five studies with CRF, whereas in the single study with either CRF or PRF [15], only conventional CRF was

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found superior to sham at follow-up. Thus, PRF is a controversial treatment for facet joint related pain. In an RCT on cervical radicular pain, however, PRF of dorsal ganglia was found to provide pain relief and reduction in pain medication superior to sham treatment at 3 and 6 months, respectively [16], but overall the clinical evidence for PRF in the management of cervical and lumbosacral radicular pain remains limited. The reason is not only lack of large RCTs, but also insufficient understanding of underlying pain relieving mechanisms of PRF [13].

4. PRF in a broad clinical practice

In Lindquist and Bäckryd's retrospective study 30% of the patients with suspected lumbar facet joint related pain experienced major improvement one month after PRF targeted to medial branches [1]. The positive predictive value of one median branch block was 52%. PRF against a dorsal root ganglion in patients with suspected lumbar discogenic pain caused major improvement for only 14%. The findings are interesting and can be used to evaluate and adjust clinical practice, not least in light of the fact that interventional pain procedures also entail a risk of complications. However, the present study is not designed to assess the efficacy of PRF and suffers from a rather brief follow-up.

5. Future RF studies

To decide if PRF or CRF should be a part of future treatment regimens, more randomized, double-blind, sham-controlled clinical trials are needed, as interventional pain procedures are highly associated with placebo effects [17,18]. The patients should be carefully selected, and pain reduction, physical function and potential side effects be assessed along a 6 or 12-month follow-up.

Conflict of interest

None declared.

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