Pulsed radiofrequency

Pulsed radiofrequency (PRF) is a therapeutic modality with many potential applications in pain management. A variation of conventional continuous radiofrequency (CRF), which has been in use since the mid-1970s, PRF offers the advantage of pain control without the tissue destruction and painful sequelae associated with CRF. This theoretical benefit of PRF is especially alluring in cases of neuropathic pain in which CRF is relatively contraindicated.

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2913603/.

Pulsed radiofrequency although present for many years has been used little compared to ablative procedures for pain relief. Its use in trigeminal neuralgia is sparse and unreported in the ophthalmic division, where the possibility of sensory loss can lead to high morbidity.

The objective of a review was to evaluate the efficacy of Pulsed Radiofrequency (PRF) treatment of pain associated with different spinal conditions. The mechanisms of action and biological effects are shortly discussed to provide the scientific basis for this radiofrequency modality.

We systematically searched for clinical studies on spinal clinical conditions using PRF. We searched the MEDLINE (PubMed) database. We classified the information in one table focusing on RCTs and other type of studies. Date of last electronic search was October 2016.

We found four RCT that evaluated the efficacy of PRF on cervical radicular pain and five observational studies. Two trials and three observational studies were conducted in patients with facet pain. For disc related pathology we found one RCT with PRF applied intradiscal and 3 RCTs for DRG PRF modulation lumbosacral radicular pain. For sacroiliac joint pain, spondylolisthesis, malignancies and other minor spinal pathology limited studies were conducted.

From the available evidence, the use of PRF to the dorsal root ganglion in cervical radicular pain is compelling. With regards to its lumbosacral counterpart, the use of PRF cannot be similarly advocated in view of the absence standardization of PRF parameters, enrollment criteria and different method in reporting results, but the evidence is interesting. The use of PRF in lumbar facet pain was found to be less effective than conventional RF techniques. For the other different spinal conditions we need further studies to assess the effectiveness of PRF [1)].

Experimental studies

Hailong et al. aimed to observe changes in pain behavior after the application of PRF on the ligation site of the sciatic nerves (SNs) of rats with chronic constriction injury (CCI) and to investigate the effects of PRF on the transcription and translation levels of glial cell line-derived neurotrophic factor (GDNF) in nerve tissues at the treatment site. STUDY DESIGN:

A randomized, experimental trial. SETTING:

Experimental Animal Center, Beijing Tiantan Hospital. METHODS:

Ninety-six adult male Sprague-Dawley rats were randomly divided into 4 groups: sham-sham (SS) group, sham-PRF (SP) group, CCI-sham (CS) group, and CCI-PRF (CP) group. The right SNs of rats in the CS and CP group were ligated to establish the CCI model. The right SNs in the SS and SP groups were isolated and exposed but without being ligated. On the fourteenth day after CCI/sham operation, PRF treatment was performed on the midpoint of the ligation sites of the SN in the CP group and the corresponding sites in the SP group. The electrode was only placed at the ligation sites of the SN in the CS group and the corresponding sites in the SS group without current being applied. The 50% paw withdrawal threshold (50%PWT) and thermal withdrawal latency (TWL) of rats in all of the groups were measured. The transcription and translation levels of GDNF of the PRF/sham treatment sites were measured before and after treatment by reverse transcription-polymerase chain reaction (RT-PCR) and enzyme-linked immunosorbent assays (ELISAs). RESULTS:

The 50%PWT value of the hind paws of rats in the CP group gradually increased on day 6 after the PRF treatment and was significantly higher than that in the CS group (6 days after treatment $P < 0.05$; 14 days after treatment $P < 0.01$). The TWL value in the CP group was higher than that in the CS group 2 days after treatment ($P < 0.05$) and was significantly higher ($P < 0.01$) from day 6 until the end of the experiment. On the day 6 and 14 after PRF treatment, the mRNA and protein expression levels of GDNF at the ligation sites of the SNs of rats in the CP group were higher than both the levels before treatment and those in the CS group ($P < 0.01$). LIMITATIONS:

The efficacy of PRF treatment in the CCI model was only tested within 14 days, and the changes in GDNF levels were only tested at 3 time-points before and after treatment.

The direct application of PRF on SN ligation sites in the CCI model can safely and effectively alleviate NP. One of the mechanisms of this effect could be the upregulation of the transcription and translation of GDNF in compressed SNs [2].

1)
Facchini G, Spinnato P, Guglielmi G, Albisinni U, Bazzocchi A. A comprehensive review of pulsed radiofrequency in the treatment of pain associated with different spinal conditions. Br J Radiol. 2017 Feb 10:20150406. doi: 10.1259/bjr.20150406. [Epub ahead of print] PubMed PMID: 28186832.
2)
Hailong J, Hao R, Zipu J, Nan J, Fang L. Pulsed Radiofrequency Improves Neuropathic Pain in Chronic Constriction Injury Rats through the Upregulation of the Transcription and Translation Levels of Glial Cell Line-Derived Neurotrophic Factor. Pain Physician. 2018 Jan;21(1):33-40. PubMed PMID: 29357329.