

## Pulsed Radiofrequency of Non-neural Tissues

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Pulsed radiofrequency (PRF) has been used to manage a wide spectrum of chronic pain modalities because it produces fewer histopathological changes than conventional RF and takes advantage of a significant reduction in complications or side effects [1]. Many reports have indicated that PRF improves chronic pain when applied to various neural tissues, including the dorsal root ganglion [2], cranial nerves [3], medial branches of spinal nerves [4], and other peripheral nerves [5]. Unlike neural tissues, few reports have investigated the effect of applying PRF to non-neural tissues.

In the latest issue of *The Korean Journal of Pain*, Fukui et al. [6] reported a clinical study that compared the effects of intradiscal PRF and electrothermal therapy in 31 patients with lumbar discogenic pain. In this trial, intradiscal PRF was as effective as electrothermal therapy. At up to the 6 month follow-up, the mean numeric rating scale and Roland-Morris Disability Questionnaire score improved significantly after intradiscal PRF was applied for 15 min under conditions  $5 \times 50$  ms/s and 60 V. Three other pilot studies, which included no control group, showed the effectiveness of intradiscal PRF for discogenic pain [7-9]. However, we are unaware of the long-term effectiveness and safety of intradiscal PRF. Further randomized controlled studies with long-term follow-up durations are crucial to verify the efficacy and safety of intradiscal PRF.

The editor found a retrospective study and two case reports by PubMed search regarding the effect of intra-articular application of PRF. Karaman et al. [10] reviewed 31 patients with osteoarthritis of the knee who received intra-articular PRF retrospectively. After applying PRF at 42°C and 2 Hz for 15 minutes, the mean initial visual analog scale scores of patients ( $6.1 \pm 0.9$ ) decreased to  $3.9 \pm 1.9$  cm and  $4.1 \pm 1.9$  cm at the 1- and 6-month follow-ups respectively. Sluiter et al. [11] reported six cases of patients with intractable arthrogenic pain who were treated with intra-articular PRF. In this case series, PRF was applied by placing an electrode into joint spaces, including the cervical facet joint, the knee joint, the sacroiliac joint, the radiocarpal joint, the shoulder joint, and the atlanto-axial joint. All participants experienced a significant reduction in pain or a pain-free state. Ozyuvaci et al. [12] reported somewhat negative results for a patient with ruptured shoulder ligaments and two patients with degeneration and osteoarthrosis of the glenohumeral joint. Applying PRF to the glenohumeral joint provided some pain relief to patients at 3 weeks but not at 8 weeks. They concluded that PRF can be used as an alternative and palliative treatment with both analgesic and physiotherapeutic procedures, but that it may not be sufficient therapy for patients with chronic shoulder pain.

Some case reports have described the effect of apply-

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ing PRF to soft tissues, including the pain-relieving point, the trigger point, and other tissues. Lee et al. [13] reported a patient who experienced pain relief lasting more than 5 months after PRF treatment to the pain-relieving point in the posterior neck. In a case series of PRF treatment of myofascial trigger points and scar neuromas, nine patients were treated over an 18-month period [14]. Eight patients experienced 75–100% reduction in their pain following PRF treatment at 4 weeks following treatment. Six patients experienced 6 months to longer than 1 year of pain relief. Park et al. [15] observed that PRF treatment to the trapezius muscle trigger point produces long lasting myofascial pain relief. Misra et al. [16] treated chronic testicular pain with PRF stimulation of the spermatic cord in a preliminary report. Of the nine patients evaluated, four had complete pain resolution, whereas one had partial pain relief. They concluded that PRF applied to the spermatic cord appeared to be a safe, minimally invasive outpatient procedure that should be investigated further in placebo-controlled trials.

Although some case reports, case series, and preliminary studies of PRF have been conducted on non-neural tissues, we do not have confirmation of the safety and the effectiveness on these tissues and do not know the exact mechanism of action. More prospective randomized controlled studies on applying PRF to non-neural tissues are mandatory to guarantee the safety and effectiveness of this therapy on such tissues. Experimental studies on histopathological and biochemical changes produced by PRF are necessary to understand the precise mode of action of PRF.

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