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Original Article

Intra-articularly applied pulsed radiofrequency can reduce chronic knee pain in patients with osteoarthritis

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Abstract

Background: Osteoarthritis (OA) is the most widespread chronic joint disease worldwide. Symptomatic knee OA is observed in approximately 12% of individuals more than 60 years of age. Conservative treatments models may not be effective always, and that some of them have serious adverse effects that prompted the researchers to research different treatment methods. In this study, we investigated short- and mid-term effectiveness of intra-articular pulsed radiofrequency (PRF) applied in patients with chronic knee pain due to OA.
Methods: This study was carried out in the pain management center of a university hospital between January 2009 and June 2009. The patient record files of 31 patients who received intra-articular PRF were retrospectively reviewed. The antero-lateral area of the knee, where the intervention would be applied, was anesthetized with 1% lidocaine. An introducer needle was placed intra-articularly. PRF was started as 42°C at 2 Hz for 15 minutes. The pain of the patients was evaluated by 10 cm Visual Analog Scale (VAS). Furthermore, the ages, the gender, the symptom duration of the patients, the side of the knee on which the intervention was applied, and the complications were collected for statistical evaluation.
Results: Although the mean initial VAS scores of the patients were 6.1 ± 0.9 cm, it was found, respectively, to be 3.9 ± 1.9 cm and 4.1 ± 1.9 cm at the first- and sixth-month follow-ups. In general, a decrease of 32.8% in mean in the VAS scores was achieved in the last follow-up; whereas the rate of patients reporting a minimum decrease of 2 points in the VAS scores was 64.5% and the rate of patients reporting a decrease of ≥50% in their pain was calculated as 35.5%.
Conclusion: PRF applied to the knee joint appears to be an effective and safe method.

Keywords: Knee; Osteoarthritis; Pain; Pulsed radiofrequency; Radiofrequency

1. Introduction

Osteoarthritis (OA) is the most widespread chronic joint disease worldwide. Its primary symptoms are pain, stiffness, loss of function in the joints, and muscle atrophy.[1–3] One of the most incurred joints in OA is the knee joint, which carries the heavy burden of the body.[4] Knee OA is closely related with increasing age and obesity. Symptomatic knee OA is observed in approximately 12% of individuals aged more than 60 years.[5] The conservative treatment of OA usually includes physical therapy, analgesics including nonsteroidal anti-inflammatory drugs (NSAIDs) and intra-articular steroid and hyaluronan injections.[6] Although conservative management is effective in most OA patients, these treatments are not effective in a small percentage of patients, and some of them

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have serious adverse effects, prompting the investigators to research different treatment methods.

Minor and major surgical methods are also applied for treatment of knee OA. The place of arthroscopy, which is one of these methods, is controversial. It was reported that arthroscopy would not be useful in cases where findings of a meniscal rupture or a recent trauma do not exist.[7] Another method that can be applied for surgical treatment of OA is total knee replacement. Despite the successful results achieved by total knee replacement, which is an option considered for end-stage knee diseases, a significant percent of the patients continue suffering from pain despite total knee replacement.[8]

As a general concept, pain treatment by radiofrequency (RF) energy has had wide coverage in the pain management practice for the past 30 years.[9] In conventional radiofrequency thermocoagulation (CRFT) applications, an electrode emitting RF currents is placed on the target nerve and the destruction of the nerve tissue is ensured by the heat produced.[10] CRFT has many fields of application such as "denervation of the medial branch innerving the zygapophycial joint", "dorsal root ganglionotomy", "intradiscal applications", "percutaneous cordotomy for treatment of malign pain", and "trigeminal radiofrequency ganglionotomy for treatment of trigeminal neuralgia".[10]

Pulsed RF (PRF) application is a relatively new method that has been developed as an alternative to CRFT. PRF has much less (if any) neurodestructive characteristic. In PRF, the RF energy is applied at high voltage (typically 45 V) and with 20 millisecond bursts followed by 480 millisecond silent phases.[11] Thus, because of the long silent phase, the tissue temperature will be spread and will not exceed 42°C. So, no tissue damage will develop because the tissue temperature will remain below 45−50°C, which is considered as the irreversible tissue damage threshold.[12] PRF, which can be applied in a similar manner to CRFT applications (such as facet medial nerve or trigeminal nerve applications), is distinguished mainly by peripheral applications where CRFT is never applied. PRF has been reported to be used successfully in treatment of disorders such as myofascial trigger points,[11] phantom limb pain,[13] occipital neuralgia,[14] meralgia paresthetica,[15] and premature ejaculation.[16] One of the fields where PRF was claimed to be effective is that of intra-articular applications.[17,18]

Based on a study published by Sluijter et al[17] in 2008, we have been applying intra-articular PRF for treatment of chronic pain developing due to knee OA in our pain management center. In this study, we intended to survey retrospectively the cases where we applied intra-articular PRF, and to study the effectiveness of this method.

2. Methods

2.1. Study design and setting

This study was carried out with the approval of the Institutional Review Board and in a retrospective, noncontrolled manner. All patients who participated in the study were informed in written and verbal on the intervention to be applied before application, and their written consents accepting the intervention were obtained. The study and all interventions were carried out in the pain treatment center of a university hospital. The files of the patients, on whose knee joints PRF was applied between January 2009 and June 2009, were reviewed independently by a physician who was not involved in the study.

2.2. Participants

The following were used as the criteria for being included in the study: (1) patients with a diagnosis of knee OA according to The American College of Rheumatology criteria[19]; (2) patients between Stage 1 and Stage 3 radiologically, according to the Kellgren-Lawrence classification[20]; (3) patients who had continued to conservative treatment such as physical therapy, analgesic drugs including NSAIDs or opioids, for at least six months, but could not respond to the treatment sufficiently [<2-point improvement in pain severity by Visual Analog Scale(VAS)].

The following were used as the exclusion criteria for the study: (1) patients at Stage 4 radiologically, according to the Kellgren-Lawrence classification; (2) existence of general contraindications against application of invasive intervention (such as hemorrhagic diathesis, systemic infection, or local infection at the area to be intervened); (3) excessive use of opioid; (4)psychiatric disorders.

2.3. Procedures

All procedures were carried out under local anesthesia, with blind technique, in the intervention room of the pain treatment center. After the patients who would be intervened were prepared according to the standard hunger protocol (6−8 hours of hunger), all of them had vascular access and were given isotonic solution of 0.9%. Following the standard monitorization (3-lead ECG, TA, pulsoxymetry), the patients were seated in a chair. After the area to be intervened was wiped with an iodine-based antiseptic solution, it was draped according to the rules of sterility. The antero-lateral part of the knee was palpated, and the entry point was anesthetized with 1% lidocaine. An introducer needle with 22 G 100-mm length and 10-mm active tip (Baylis Medical Inc., Montreal, Canada) was placed intra-articularly through the predefined area. After satisfactory placement, the stylet in the introducer was removed and RF probe (Baylis Medical Inc., Montreal, Canada) was placed through the introducer needle. Then, PRF was applied with 42°C temperature and a pulse width of 20 milliseconds, at 2 Hz for 15 minutes. Because the application was not painful, sedoanalgesia was not applied to any patients during the intervention. After the intervention was completed, a plaster was applied to the entry point and the patients were transferred to the recovery room. The patients who stayed in this room for 30 minutes were monitored by the clinic nurse for early complications and then discharged from hospital with