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ORIGINAL INVESTIGATION / ÖZGÜN ARAŞTIRMA

Comparison of Radiofrequency Thermocoagulation Alone with Radiofrequency Thermocoagulation and Steroid Injection in Combination for the Treatment of Lower Back Pain

Bel Ağrılı Hastalarda Tek Başına Radyofrekans Termokoagülasyon ile Radyofrekans Termokoagülasyon ve Steroid Enjeksiyonu Kombinasyonunun Etkinliğinin Karşılaştırılması

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ABSTRACT

Objective: Lower back pain is the most common disease of the musculoskeletal system. Analgesics, myorelaxant drugs, bed rest, physical therapy, and conventional treatments are first-line treatments for lower back pain. In addition, conventional radiofrequency thermocoagulation (RFT) and caudal steroid injection (CSI) are common conventional therapies. The present study aims to compare the results of RFT alone with combination therapy using RFT and CSI. The effectiveness of these treatment methods in patients with chronic lower back pain is evaluated.

Method: A total of 62 patients with lower back pain who underwent epidural CSI and RFT in neurosurgery clinic between January 2018 and May 2019 were included.

Results: Of the 62 patients included in the study, RFT+CSI was performed in 30 patients (48.3%). A visual analog scale (VAS) scores before and after the procedure; a statistically significant difference was only observed between the RFT+CSI and RFT group scores (p=0.030) in the sixth month after the procedure, and it was observed that the pain decreased more in the RFT+CSI group.

Conclusion: The present study considered body mass index (BMI), occupation, gender, age, and procedure levels. We conclude that both RFT and RFT+CSI are effective treatment methods for chronic lower back pain that does not improve after conservative or physical therapy. BMI has a direct effect on lower back pain. The VAS score decreased significantly in patients who underwent both the RFT and RFT+CSI procedures, and RFT+CSI appeared more effective in terms of the 6-month VAS score.

Keywords: Low back pain, radiofrequency thermocoagulation, steroid injection

ÖZ

Amaç: Bel ağrısı, kas-iskelet sisteminin en yaygın görülen hastalığıdır. Analjezikler, miyorelaksan ilaçlar, yatak istirahati, fizik tedavi ve geleneksel tedaviler bel ağrısı için ilk basamak tedavilerdir. Ek olarak, konvansiyonel radyofrekans termoagülasyon (RFT) ve kaudal steroid enjeksiyonu (CSI) yaygın tedavilerdendir. Bu çalışma sadece RFT yapılan hastaların sonuçlarını RFT ve CSI kombinasyon tedavisi yapılan hastaların sonuçları ile karşılaştırmayı amaçlamaktadır. Kronik bel ağrısı olan hastalarda bu tedavilerin etkinliği değerlendirmek amaçlanmaktadır.

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Yöntem: Ocak 2018-Mayıs 2019 tarihleri arasında beyin cerrahisi kliniğinde epidural CSI ve RFT uygulanan 62 hasta çalışmaya dahil edildi.

Bulgular: Çalışmaya dahil edilen 62 hastanın 30'una (%48,3) RFT+CSI uygulandı. İşlem öncesi ve sonrası VAS skorları; işlem sonrası altıncı ayda RFT+CSI yapılan ve sadece RFT yapılan grup skorları (p=0,030) arasında istatistiksel olarak anlamlı bir fark gözlendi ve RFT+CSI grubunda ağrının daha fazla azaldığı gözlendi.

Sonuç: Bu çalışmada BMI, meslek, cinsiyet, yaş ve prosedür göz önünde bulunduruldu. Hem RFT hem de RFT+CSI'nın konservatif veya fizik tedaviden sonra düzelmeyen kronik bel ağrısı için etkili tedavi yöntemleri olduğu sonucuna vardık. BMI'nin bel ağrısı üzerinde doğrudan etkisi vardır. Hem RFT hem de RFT+-CSI prosedürleri uygulanan hastalarda VAS skoru önemli ölçüde azaldı ve RFT+CSI altı aylık VAS skoru açısından daha etkili göründü.

Anahtar kelimeler: Bel ağrısı, radyofrekans termokoagülasyon, steroid enjeksiyonu

INTRODUCTION

Lower back pain is the most common disease of the musculoskeletal system. Although disc hernias are the most common cause of lower back pain, facet joint syndrome (FJS) accounts for 15–35% of cases of chronic lower back pain.[1,2] The prevalence of lower back pain varies between 20% and 50% per annum.[3] In 1911, Goldwaith first mentioned that facet joints could cause pain.[4]

FJS is caused when repetitive micro- and macrotraumas that occur with age in the facet joints first lead to synovitis, which in turn leads to synovial cell proliferation. Then, vertical fibrillation develops in the articular cartilage. Over time, sclerosis and hypertrophy of the subchondral bone develop, and the process escalates. With time, osteophytes occur in the adhesion areas of the ligamentum flavum and joint capsule.[5]

Overweight, strenuous activity, cumulative low-level traumas, and gender differences are predisposing factors for lower back pain. Analgesics, myorelaxant drugs, bed rest, physical therapy, and conventional treatments are first-line treatments for lower back pain. In addition, conventional radiofrequency thermocoagulation (RFT) and caudal steroid injection (CSI) are common conventional therapies.

RFT is a denervation and neuroablation method that uses heat. However, neural damage can occur due to high temperatures. RFT treatment should be applied to C fibers selectively, while myelinated fibers should be protected. However, in RFT treatment, neuropathic pain may be encountered.[6]

The purpose of CSI is to eliminate edema in the disc region and reduce inflammation and possible nerve root compression, which are responsible for chronic lower back pain. CSI is commonly used because of its low risk of complications and its lack of side effects. Thus, CSI can be considered an alternative to operative procedures in patients who do not respond to conservative treatment.[7] The present study aims to compare the results of RFT alone with combination therapy using RFT and CSI. The effectiveness of these treatments in patients with chronic lower back pain is evaluated.

METHOD

A total of 62 patients with lower back pain who underwent epidural CSI and RFT between January 2018 and May 2019 were included. Informed written consent was obtained from all patients. The principles of the Helsinki Declaration were followed. The study was approved by the local ethics committee (Number: 2019/301).

Patients aged 30–67 years were included in the study, which was planned retrospectively. The patients who underwent only RFT and RFT+CSI were divided into two groups for the study. Patients with a history of lumbar surgical treatment, lumbar deformities, severe spinal trauma, or coagulopathy disorders were excluded from the study. All patients had been treated for at least 6 weeks without success. Symptoms were correlated with facet hypertrophy and bulging-type disk herniation in lumbar magnetic resonance imaging (MRI). Medical and physical therapy was not given to patients after the procedure.

Demographics of the patients including age; gender; body mass index (BMI); occupational intensity; the detected pathology in lumbar MRI; treatment; and visual analog scale (VAS) of the patients in the first, third, and sixth months after the procedure were analyzed. The occupational intensity was classified as light, medium, or heavy. Light work was defined as unemployed, undertaking less than 4 h of physical activity per day or undertaking a job that does not require weightlifting. Medium work was defined as working at a desk or working for more than 4 h without weightlifting. Heavy work was defined as undertaking more than 8 h of physical activity per day or undertaking a job that requires weightlifting.

The VAS is a frequently used method to grade lower back pain. The VAS is a pain scale consisting of a horizontal or vertical line of 0–100 mm; 0 describes pain that does not exist, while 100 describes unbearable pain.[8]

RFT Method

As a pioneer for the use of RFT to treat spinal pain, Shealy defined the medial branch lesion in the treatment of pain caused by the facet joints in the lumbar and cervical regions.[9]

The most used radiofrequency cannula was developed by Sluijter and Mehta in 1981, a 22-G cannula of 5–10 cm in length that carries the "thermocouple" probe inside. The thermocouple probe measures the temperature of the tissue and provides X-ray imaging during the surgical procedure.[10]

Conventional radiofrequency ablation uses a needle that delivers continuous high-voltage current to produce a heat lesion. The needle-shaped electrode is covered with an insulating material, with the exception of its distal-most part, the "active tip." The length of the active tip varies from 2 to 15 mm. The patient is part of a closed-loop circuit that includes an electrode needle and a large dispersive electrode (ground pads); a radio generator is positioned between them. An alternating electric field is created within the area because of the relatively high electrical resistance of the tissue. In the target tissue that surrounds the electrode, there is marked ionic agitation, which results in frictional heat and an electromagnetic field around the electrode.[6,11]

All patients assumed a prone position on abdominal rolls. Patients were monitored and sterilized with batticon, and light intravenous sedation was administered. Using the standard radiofrequency target point (at the medial base of the transverse process as it joins the base of the superior facet) after standard sterile preparation and draping, the skin entry points for placing the electrodes were anesthetized with 2% lidocaine. The needle entry point was located 3 cm lateral to the midline. Using anteroposterior or slightly oblique fluoroscopic guidance, the needle was positioned and bone contact was made. The motor testing of up to 2 Hz with a voltage of 3 V was performed. Then, sensory stimulation was performed at 50 Hz at a voltage of 3 V. A standard RFA lesion is made at 80°C for 120 s. After introducing the radiofrequency lesion, patients were observed for at least 1 h in the clinic.

During the procedure, only two patients had complaints of sciatica, and the procedure was terminated immediately. No other complications were observed.

Caudal Steroid Injection

Patients were taken to the administration room for CSI. Vascular access was obtained and a 0.9% NaCl isotonic solution was infused. Arterial blood pressure, pulse, peripheral oxygen saturation (SpO_2), and electrocardiogram monitoring were performed. The patient was placed in the prone position on abdominal rolls. Povidone iodine-containing antiseptic solution was used for sterilization, and the sterile area was covered. Local anesthesia was applied with a 2-mL 27-G dental tip (Germany) needle containing lidocaine using fluoroscopy guidance. A 5-cm 20-G Epican® Paed (Braun, Melsungen, Germany) caudal block needle was used in all patients. Before injection of diluted depo-steroid or the local anesthetic mixture, the needle was aspirated with a 2-mL syringe for blood or cerebrospinal fluid. Analgesia was achieved with 10 mL of solution that was diluted with 0.5% bupivacaine (15 mg), 6 mg betamethasone (Celestone Chronodose®, Schering AG, Berlin, Germany), and 0.9% NaCl.[12]

Patients were taken to the postoperative follow-up room after the procedure for 30 min, and Bromage scale measurements were taken every 15 min. Patients with stable hemodynamics and a Bromage scale score of 0 were discharged.

Statistical Analysis

The data of this study were analyzed using the "SPSS for Windows, Version 20.0" program. The mean, standard deviation, number, and percentage values were obtained. The Chi-squared test was used in categorical data analysis. Correlation analysis was performed in the Chi-squared test. The groups were primarily analyzed in terms of their suitability to normal distribution. Kolmogorov-Smirnov and Shapiro-Wilk normal distribution tests were used in the analysis, and graphics of suitability to normal distribution were made. Student's t-test was used in the comparison of variables showing normal distribution, and Mann–Whitney U test was used for the analysis of independent data that did not fit the normal distribution. Tukey's test was used in post hoc multiple comparisons. A p-value less than 0.05 was considered significant.

RESULTS

Of the 62 patients included in the study, CSI+facet RFT was performed in 30 patients (48.3%). RFT was applied in 32 patients (51.7%). Two patients had complaints of sciatica during RFT, and therefore the operation was terminated immediately. No patients presented with neurological deficits.

The study included 31 female (50%) and 31 male (50%) patients. There were 23 female patients (76.7%) and 7 male patients (23.3%) in the RFT+CSI group and 8 female patients (25.0%) and 24 male patients (75%) in the RFT group. All patients were aged between 30 and 67 years with a mean age of 51.48±8.85 years. The mean age of the RFT+CSI group was 52.57±9.65 years, whereas the average age of the RFT group was 50.47±7.51 years (Table 1).

The minimum BMI was 19 kg/m^2 and the maximum was 42 kg/m^2 (mean BMI=27.02±5.04 kg/m^2, median=26.18 kg/m^2). The average BMI was 28.52±5.85 kg/m^2 (median BMI=28.15

Table 1. Distribution of age, gender, BMI, and MRI findings according to the procedure performed

Procedure	Age	Gender	BMI (kg/m²)	MRI
RFT+CSI	52.57±9.65	23 F/7 M	28.44±5.73 kg/m²	L3–4/L4–5=56.7% L4–5/L5–S1=43.3%
RFT	50.47±7.51	8 F/24 M	25.68±3.94 kg/m²	L3–4/L4–5=37.5% L4–5/L5–S1=62.5%
Total	51.48±8.85	31 F/31 M	27.02±5.04 kg/m²	L3–4/L4–5=46.8% L4–5/L5–S1=53.2%
p	0.837	0.001	0.012	0.104

BMI: Body mass index; MRI: Magnetic resonance imaging; RFT: Radiofrequency thermocoagulation; CSI: Caudal steroid injection

kg/m², min-max=19–42 kg/m²) in females and 25.52±3.58 kg/m² (median BMI=25.31 kg/m², min-max=19–34 kg/m²) in males. The average BMI was 28.44±5.73 kg/m² (median BMI=27.80 kg/m², min–max=20–42 kg/m²) in the RFT+CSI group and 25.68±3.94 kg/m² (median BMI=25.48 kg/m², min-max=19–35 kg/m²) in the RFT group (Table 1).

Patients in the moderate group were more than others in both groups. Patients working in heavy jobs in the RFT group were also high numbered, and this was statistically significant (p=0.012) (Table 2).

Two levels of treatment were applied to all patients. The treatments were made to L3–4 and L4–5 levels in 29 patients (46.8%) and L4–5 and L5–S1 levels in 33 patients (53.2%). In 17 patients (56.7%) in the RFT+CSI group, RFT+CSI was performed to L3–4 and L4–5 levels, while RFT was performed to L4–5 and L5–S1 levels in 13 patients (43.3%). In 12 patients (37.5%), L3–4 and L4–5 levels were treated in the RFT group and L4–5 and L5–S1 levels of the 20 patients (62.5%) (p=0.104). Table 3 shows the VAS scores before and after the procedure; a statistically significant difference was only observed between the RFT+CSI and RFT group scores (p=0.030) in the sixth month after the procedure, and it was observed that the pain decreased more in the RFT+CSI group.

VAS scores before and 1 day after the procedure were statistically significant in the patients who had 5 points of pain and a BMI of 25.10 kg/m², 6 points of pain and a BMI of 26.11 kg/m², 7 points of pain and a BMI of 31.15 kg/m², 8 points of pain with a higher BMI (p=0.000, p=0.035). However, there was no significant relationship between BMI and VAS score 3 (p=0.056) and 6 (p=0.698) months after the procedure.

When the VAS score was evaluated according to gender, no statistically significant differences were observed (pre-procedure, p=0.087; 1 day after the procedure, p=0.153; 3 months after the procedure, p=0.527; 6 months after the procedure, p=0.983).

According to work intensity groups, no statistically significant differences have been observed (e.g., pre-procedure, p=0.978; 1 day after the procedure, p=0.488; 3 months after the procedure, p=0.934; and 6 months after the procedure, p=0.873).

When the VAS scores were evaluated according to pathology localization, no significant differences were observed for pretreatment (p=0.151), the first day after the procedure (p=0.609), 3 months after the procedure (p=0.505), or 6 months after the procedure (p=0.372).

Table 2. Work intensity distribution by process and gender

	Female (n) %	Male (n) %	RFT+CSI (n) %	RFT (n) %	Total (n) %
Light		(5) 16.1	(2) 6.7	(3) 9.4	(5) 8.1
Moderate	(31) 100	(15) 48.4	(27) 90	(19) 59.4	(46) 74.2
Heavy		(11) 35.5	(1) 3.3	(10) 31.3	(11) 17.7
	p=0.006	p=0.012			

RFT: Radiofrequency thermocoagulation; CSI: Caudal steroid injection

Table 3. Comparison of procedures and the VAS scores

VAS	Before the procedure (%)		1 day (%)		3 months (%)		6 months (%)	
Group	CSI RFT (n) %	RFT (n) %	CSI RFT (n) %	RFT (n) %	CSI RFT (n) %	RFT (n) %	CSI RFT (n) %	RFT (n) %
Point								
0	0.0	0.0	(6) 20.0	(5) 15.6	0.0	0.0	0.0	0.0
1	0.0	0.0	(10) 33.3	(10) 31.3	(4) 13.3	(2) 6.3	(1) 3.3	0.0
2	0.0	0.0	(10) 33.3	(15) 46.9	(8) 26.7	(11) 34.4	(6) 23.3	(2) 6.3
3	0.0	0.0	(1) 3.3	(2) 6.3	(13) 43.3	(15) 46.9	(12) 36.7	(11) 34.4
4	0.0	0.0	(3) 10.0	0.0	(3) 10.0	(4) 12.5	(8) 26.7*	(13) 37.5*
5	(12) 40.0	(13) 40.6	0.0	0.0	(1) 3.3	0.0	(2) 6.7*	(5) 18.8*
6	(12) 40.0	(12) 37.5	0.0	0.0	(1) 3.3	0.0	(1) 3.3	(1) 3.1
7	(3) 10.0	(7) 21.9	0.0	0.0	0.0	0.0	0.0	0.0
8	(2) 6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	(1) 3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
p	p=0.607		p=0.809		p=0.757		p=0.030	
							*p<0.05	

VAS: Visual analog scale

DISCUSSION

Among the structural etiologies, FJS accounts for 15–45% of cases of lower back pain, mainly owing to degeneration in the facet joints. As age increases, the frequency of facet syndrome in chronic lower back pain also increases. On average, facet syndrome most commonly affects people aged 45–60 years.[2,13,14]

In the present study, the mean age was 51.48 years. The incidence of facet syndrome increased with age, but age did not affect the VAS score before and after the procedure.

Multiple minimally invasive interventions are available for the treatment of facet syndrome. These include foraminal injections (anesthetic, hyaluronidase, and steroid), RFT, neurolysis, CSI, intramuscular injections, spinal muscle injections, and intradiscal ozone application.

The cause of lower back pain in facet syndrome is the medial branch of the dorsal nerve root. As medial branches innervate two levels of the facet joints, it is more appropriate to block two levels. Studies have shown that RFT is one- or two-sided, and two-level block has more successful results.[15] In the present study, RFT was applied at two levels-those that were thought to be responsible for the pain. Regression in lower back pain was observed.

Predisposing factors in chronic lower back pain include obesity, aging, gender differences, and heavy occupational conditions. Multiple studies have shown that being overweight or obese can increase the risk of lower back pain. Being overweight or obese is strongly associated with seeking care for lower back pain and chronic lower back pain.[16,17]

Biering-Sørensen et al.,[18] reported that spondylosis increased in elderly patients when their BMI was high. They also found that males and females with a BMI of 30 kg/m^2 or greater experienced two times more difficulty in performing daily physical activities owing to lower back pain. In the present study, we observed an obvious relationship between the VAS score and BMI; however, aging was not responsible for the increase in preoperative VAS score.

Many epidemiological studies have revealed whether chronic lower back pain varies between genders. Deyo and Tsui-Wu[19] did not identify significant differences between genders, Heliövaara et al.[20] reported that the frequency of lower back pain was equal among groups but was greater in females when evaluated in the context of other factors like giving birth or obesity. In contrast, in the retrospective studies of DePalma et al.,[2] and Nagi et al.,[21] lower back pain was more common in females than in males. Conversely, Schwarzer et al.,[13] studied the Australian population and showed that

chronic lower back pain is more common in males (66%). In our study, no significant difference was identified between the genders in VAS score and lower back pain. Furthermore, no clear differences were observed in the association between occupational conditions and the incidence of lower back pain.

In patients suffering from lower back pain owing to lumbar facet syndrome, radiofrequency neurotomy is a good treatment option as it allows medial root block.[22–24] In one study, it was concluded that repeated RFT application 13 months after the RFT procedure provided a longer relief time from chronic lower back pain compared with when the procedure was carried out once.[23] Similarly, in our study, it was observed that the VAS score decreased in patients after RFT or RFT+CSI.

Dobrogowski et al.,[25] carried out a prospective study, which enrolled 45 patients with lower back pain. They divided the patients into three groups according to whether they were administered pentoxifylline, methylprednisolone, or saline (placebo) after RFT. In all three groups, pain decreased after the procedure, and there was no statistically significant difference between the groups in terms of VAS score in 1 week, 1 month, 3 months, or 6 months after RFT treatment. Similarly, in our study, we observed that pain regressed after RFT or RFT+CSI. However, 6 months after the procedure, the VAS score was significantly lower in the RFT+CSI group.

Adilay et al.,[26] showed that epidural CSI applied in L4–5 disc hernias is more effective than that applied in L5–S1 disc hernias. In the present study, patients diagnosed with L3–4 and L4–5 or L4–5 and L5–S1 (two-level) bulging lumbar disc hernias in chronic lower back pain had epidural CSI. Their VAS scores decreased after the procedure, but there was no significant difference between the levels of herniation or treatment. Studies have shown that the administration of steroids with local anesthetics prolongs nerve blockade.[27]

In the present study, the 6-month VAS score was lower after CSI. Increasing BMI causes surgical difficulties in interventional procedures, causing surgeons to avoid the procedure. Overweight patients and patients with lumbar stenosis may have caused difficulty in reaching the epidural space. Patient compliance is also important. Despite the exposure of the patient and surgical team to radiation, fluoroscopy should be the gold standard in RFT and CSI applications.

CONCLUSION

The present study considered BMI, occupation, gender, age, and procedure levels. The VAS scores were evaluated in patients who underwent RFT and RFT+CSI. We conclude that both RFT and RFT+CSI are effective treatment methods for chronic lower back pain that does not improve after conservative or physical therapy. BMI has a direct effect on lower back pain. The VAS score decreased significantly in patients who underwent both the RFT and RFT+CSI procedures, and RFT+CSI appeared more effective in terms of the 6-month VAS score.

Disclosures

Ethics Committee Approval: The study was approved by the University of Health Sciences Gazi Yaşargil Training and Research Hospital Clinical Research Ethics Committee (No: 2019/301, Date: 28/06/2019).

Informed Consent: Written informed consent was obtained from all patients.

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