



# The Impact of Osteoporosis on Facet Joint Denervation Treatment Outcomes in Patients with Lumbar Facet Joint Syndrome

*Lomber Faset Eklem Sendromlu Hastalarda Osteoporozun Faset Eklem Denervasyon Tedavisi Sonuçlarına Etkisi*

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## Abstract

**Objective:** The aim of this study was to investigate the effect of osteoporosis (OP) on the outcomes of facet medial branch radiofrequency thermocoagulation (RFT).

**Materials and Methods:** Thirty-six patients with chronic lower back pain due to lumbar facet joint syndrome (LFJS) who underwent facet medial branch RFT were retrospectively reviewed. The patients were divided into two groups: Group I (without OP, n=19) and group II (with OP, n=16). Pre-intervention and post-intervention evaluations of the patients were assessed at 1, 6, and 12<sup>th</sup> months by visual analog scale (VAS).

**Results:** In both groups, VAS scores 1<sup>st</sup>, 6<sup>th</sup>, and 12<sup>th</sup> months after intervention were lower than those at baseline (p=0.001). There were no significant difference between the groups in terms of VAS score improvement.

**Conclusion:** Lumbar facet medial branch RFT is an effective and safe treatment method in both the short and long-term in patients with LFJS. OP therapy had no effect on RFT treatment results.

**Keywords:** Facet joint, facet medial branch, lower back pain, radiofrequency, osteoporosis

## Öz

**Amaç:** Bu çalışmanın amacı, osteoporozun (OP) faset mediyal dal radyofrekans termokoagülasyon (RFT) sonuçları üzerine etkisini araştırmaktır.

**Gereç ve Yöntem:** Lomber faset eklem sendromuna (LFJS) bağlı kronik bel ağrısı şikayeti ile faset mediyal dal RFT uygulanan 36 hasta retrospektif olarak incelendi. Hastalar grup I (OP'siz, n=19), grup II (OP'li, n=16) olmak üzere iki gruba ayrıldı. Hastaların girişim öncesi ve girişim sonrası 1, 6 ve 12. aylarda görsel analog skala (GAS) ile ağrı skorları değerlendirildi.

**Bulgular:** Her iki grupta da girişimden sonraki 1., 6. ve 12. ay GAS değerleri başlangıca göre daha düşük bulundu (p=0,001). Gruplar arasında GAS skorlarındaki iyileşme açısından anlamlı bir fark gözlenmedi.

**Sonuç:** Lomber faset medyan sinir RFT, LFJS'li hastalarda hem kısa hem de uzun dönemde etkili ve güvenli bir tedavi yöntemidir. OP'nin RFT tedavi sonuçları üzerine etkisi yoktur.

**Anahtar kelimeler:** Faset eklem, faset medyan sinir, bel ağrısı, radyofrekans, osteoporoz

## Introduction

Lumbar facet joint syndrome (LFJS) is a mechanical instability syndrome that occurs due to degenerative and traumatic causes in facet joints in the lumbar region. LFJS has been estimated to be responsible for 15-41% of chronic low back pain (CLBP) (1). There is usually CLBP without radicular extension, radiating to the buttocks or groin. The pain increases with standing, changing position, lumbar extension, lateral flexion, and rotation to the side of the pathological facet (2). The best diagnostic method

is pain reduction with medial branch blocks (3). Facet medial nerve denervation by radiofrequency thermocoagulation (RFT) is effective in patients resistant to conservative treatments (4).

Osteoporosis (OP) is a systemic disease characterized by an increased bone fragility as a result of low bone mineral density (BMD) and micro-architecture deterioration of the bone tissue (5). With the increase in the elderly population, it has become an important public health problem. Generally, the most common symptom in patients with OP is persistent back pain (6). Vertebral fractures due to OP are known to cause back pain. In addition,

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increased bone resorption may cause back pain in patients with OP without vertebral fractures (7). Microfractures play a role in the development of chronic back pain by causing deterioration in spinal mechanics; posture disorders; stretching, pulling, and compression in soft tissue; and facet joint dysfunctions (8). Degeneration of the facet joints causes irritation in the nerves innervating the joint. It is thought that this irritation may be the cause of low back pain in some patients with OP (9). The relationship between degenerative changes in the spine and OP is not clear (10).

Although facet medial branch RFT is frequently applied in the treatment of CLBP, there are limited data on the factors affecting the success of the procedure. Moreover, there is no study evaluating the efficacy of facet medial branch RFT on pain in osteoporotic patients with LFJS. Considering that OP and LFJS are two common causes of CLBP, especially in elderly female patients, the effect of OP on RFT results applied in the treatment of LFJS is intriguing. Therefore, the aim of our study was to evaluate the effect of OP on the treatment results in female patients with LFJS treated with facet medial branch RFT.

## Materials and Methods

### Study Design and Participants

This retrospective study was conducted in the Department of Pain Medicine after approval was obtained from Ağrı İbrahim Çeçen University Scientific Research Ethics Committee (decision no: 159, date: 22.06.2023). Due to the retrospective nature of the study, there was no need to obtain informed consent from the patients. Records of patients who presented with a primary diagnosis of LFJS from January 2020 and January 2022 in our clinic were reviewed. The diagnosis of LFJS was based on clinical findings on physical examination and magnetic resonance imaging (MRI) scans. The diagnosis of OP was determined on the basis of the World Health Organization guidelines [i.e., dual-energy X-ray absorptiometry (DXA), BMD at the lumbar spine, femoral neck or total hip T-score  $\leq 2.5$  standard deviations] (11). The inclusion criteria were being 35 years and older, being female, having axial low back pain unresponsive to conservative treatments for at least 3 months, being diagnosed with LFJS, receiving lumbar facet medial branch RFT under fluoroscopy, and having BMD T-score measured by DXA. The following were the exclusion criteria: 1. Presence of extruded or sequestered discs, spondylolisthesis, advanced spinal stenosis, or lateral recess syndrome on lumbar MRI; 2. Previous surgery in the lumbar region; 3. Presence of acute/subacute vertebral fracture; 4. Incomplete medical record.

### Clinical Assessment

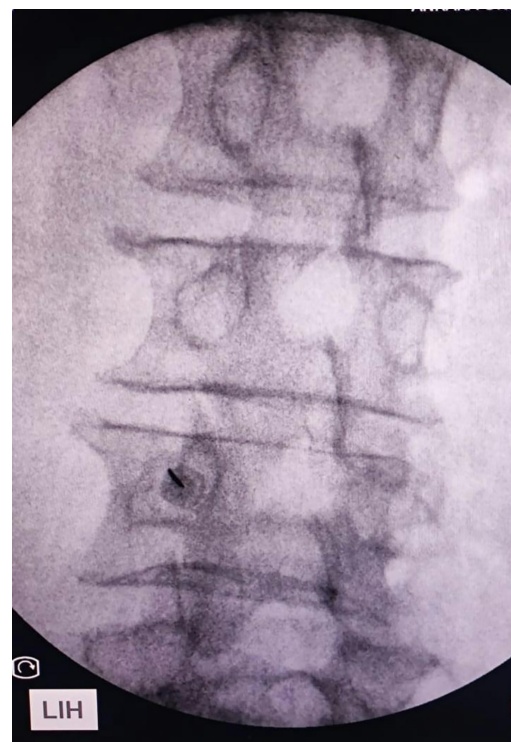
Age, gender, body mass index (BMI), onset of pain, BMD T-score, and visual analog scale (VAS) scores at baseline and 1, 6, and 12 months after the procedure were collected from the medical records and follow-up forms. The pain intensity was evaluated using the VAS (0= no pain and 10= worst imaginable pain).

Significant pain relief was accepted as a decrease of more than 50% on the VAS score.

The patients were categorized into two groups according to OP: those without OP (group I) and those with OP (group II).

### Procedure

The injections were performed in an operating room. The patient was placed in prone position. Each patient was monitored, and vital signs were observed throughout the entire procedure (blood pressure, heart rate, SpO<sub>2</sub>). After the AP view of the target joint was obtained, an oblique view of the patient was obtained until the Scottie dog image was formed (usually in the 15°-20° position). A 22G 10 cm radiofrequency needle with 5 mm active tip was advanced towards the junction of the superior articular process and the transverse process, the target point of which was the "dog's eye", and bone contact was achieved (Figure 1). The needle position was reconfirmed with sensory and motor stimulations (50 Hz sensory stimulation, 2 Hz motor stimulation) using the RF device. In sensory stimulation, the patient felt paresthesia in the waist, while multifidus muscle contractions were observed in motor stimulation. The needle site was verified with the absence of any finding of the radicular nerve in either stimulation. After confirmation of the exact location of the needle, analgesia was provided with 1 mL of lidocaine 1%. Then RFT was applied at 80 °C for 60 seconds for each level. After RFT, 1 mg of dexamethasone mixed with saline (total of 0.5 mL) was administered to each site to prevent neuritis. Two adjacent median branches were blocked for each facet joint block (L3 and L4 median branches were blocked for the L4-L5 facet joint).



**Figure 1.** Oblique fluoroscopic view of lumbar facet medial branch radiofrequency thermocoagulation

RFT was applied to L3, L4 median branches and L5 dorsal rami in all patients.

### Statistical Analysis

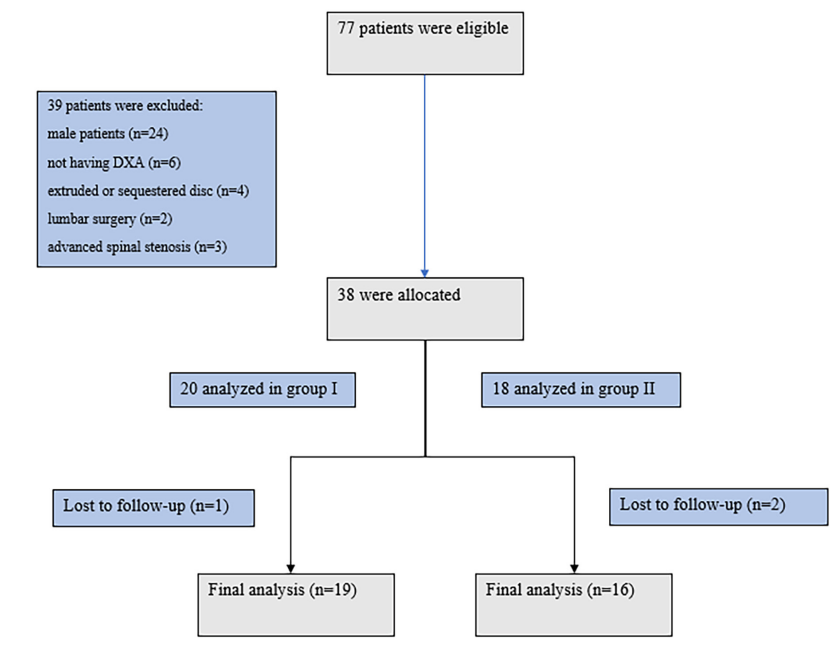
In calculating the sample size of this study, power was determined by taking at least 80% and a type-1 error of 5% for each variable. Kolmogorov-Smirnov ( $n > 50$ ) and Skewness-Kurtosis tests were performed to check whether the continuous measurements in the study were normally distributed and, because the measurements were normally distributed, parametric tests were applied. Descriptive statistics for continuous variables in the study are expressed as mean (mean), standard deviation, minimum, maximum, number (n), and percent (%). The independent t-test was used to compare the measurements according to the categorical groups. In the examination of the difference between the measurement periods of VAS scores, repeated ANOVA was used. Pearson correlation coefficients were calculated to determine the relationship between continuous measurements. The chi-squared test was performed to analyze the relationship between categorical variables and the group.  $P < 0.05$  was accepted as statistically significant. All analyses were

conducted using IBM SPSS Statistics for Windows 25.0 (IBM Corp., Armonk, NY, USA).

### Results

Figure 2 shows the CONSORT of patients. There were 19 patients in group I and 16 in group II.

Table 1 displays the patients' demographic datas. Both groups were similar in terms of height, weight, BMI, and duration of pain. The mean age was  $63.26 \pm 7.71$  years and  $71.31 \pm 6.95$  years in group I and group II, respectively. The mean age was significantly higher in group II than in group I ( $p = 0.003$ ) (Table 1). In group I, the mean VAS score decreased from baseline  $7.05 \pm 0.71$  to  $2.37 \pm 2.01$  at 1 month,  $3.16 \pm 2.27$  at 6 months, and  $4.37 \pm 2.45$  at 12 months. In group II, the mean VAS score decreased from baseline  $7.44 \pm 0.63$  to  $2.44 \pm 2.16$  at 1 month,  $2.88 \pm 2.19$  at 6 months, and  $4.19 \pm 3.04$  at 12 months. In both groups, the VAS scores at each evolution time point were significantly decreased compared with the baseline VAS scores ( $p = 0.001$ ) (Table 2).



**Figure 2.** Flow diagram

DXA: Dual-energy X-ray absorptiometry

Table 1. Descriptive features of patients			
	Group I (n=19)	Group II (n=16)	p-value
Age (mean $\pm$ SD), year	63.26 $\pm$ 7.71	71.31 $\pm$ 6.95	<b>0.003</b>
Height (mean $\pm$ SD), cm	161.53 $\pm$ 8.19	159.94 $\pm$ 9.19	0.592
Weight (mean $\pm$ SD), kg	76.11 $\pm$ 8.03	71.81 $\pm$ 7.56	0.115
BMI (mean $\pm$ SD)	29.44 $\pm$ 4.68	28.19 $\pm$ 3.22	0.374
Duration of pain, (months)	38.11 $\pm$ 34.27	27.06 $\pm$ 28.69	0.314

SD: Standard deviation, BMI: Body mass index

In the comparison of the groups, there was no statistically significant difference in the VAS scores between groups 1, 6, or 12 months after the intervention (1 month:  $p=0.923$ , 6 months:  $p=0.711$ , and 12 months:  $p=0.847$ ) (Table 2).

No correlation was found between significant pain relief at 1, 6, and 12 months and analyzed variables like age, BMI, and duration of pain (Table 3).

No complications were recorded during follow-up.

## Discussion

One of the most common symptoms in patients with OP is back pain (12). Vertebral fractures are known to cause severe low back pain in these patients. On the other hand, patients with OP without vertebral fractures may also report low back pain (7). In rats, increased bone turnover has been shown to cause osteoclast activation, sensitize sensory nerves in the bone marrow, and eventually lead to local inflammation that causes pain even if there is no fracture (13). In addition, increased osteoclastic activity can cause acidosis, leading to overexpression of nociceptors, which activate the sensory nerve fibers, resulting in pain (14,15). OP disrupts the load-bearing balance of the spine by altering the spine biomechanics. This can cause degeneration of the facet joints and irritation of the nerves of the facet joints, which may contribute to low back pain (8,9).

With the increase in the elderly population, both OP and LFJS are seen more frequently. It can be challenge to treat CLBP in both diseases. The factors affecting and predicting the success

of RFT therapy, which is effectively applied in the treatment of LFJS, are not clear. To the best of our knowledge, no study has evaluated the effect of OP on RFT treatment outcomes. Only one study investigated the efficacy of pulse radiofrequency (PRF) in osteoporotic patients with lumbar facet syndrome (16). Paksoy (16) applied median branch PRF (42 °C and 6 minutes) to 18 patients and followed them up for 6 months. Significant pain reduction was achieved in 14 patients and moderate pain relief in 3 patients, which lasted for 6 months, and only 1 patient did not have a decrease in pain. He reported that lumbar facet median branch PRF is an effective and alternative method that can improve patient’s life conditions by reducing medical treatments for lumbar facet pain due to OP. In our study, we achieved successful results in patients with OP. This is consistent with the study by Paksoy (16). However, our study differs from Paksoy’s (16) in terms of performing RFT, comparing it with patients without OP, and a longer follow-up period. It has been reported that the efficacy of PRF for medial nerve denervation in lumbar facet joint pain is shorter and weaker than that of RFT (17,18). Paksoy (16) followed up the patients to whom PRF was applied for 6 months and did not report long-term results. In our study, RFT was effective both in the short and long-term (12 months). The VAS scores were significantly decreased in both groups at each follow-up visit, but we did not detect any difference between the two groups in terms of pre- or post-treatment VAS scores. Possible influencing factors such as age, BMI, and duration of pain had no effect on outcomes.

**Table 2. Comparison of VAS scores before and after the treatment**

	Group I (n=19) (mean ± SD)	Group II (n=16) (mean ± SD)	*p-value
VAS baseline	7.05±0.71 <sup>a</sup>	7.44±0.63 <sup>a</sup>	0.101
VAS-1 <sup>st</sup> month	2.37±2.01 <sup>b</sup>	2.44±2.16 <sup>b</sup>	0.923
VAS-6 <sup>th</sup> month	3.16±2.27 <sup>b</sup>	2.88±2.19 <sup>b</sup>	0.711
VAS-12 <sup>th</sup> month	4.37±2.45 <sup>b</sup>	4.19±3.04 <sup>b</sup>	0.847
**p	<b>0.001</b>	<b>0.001</b>	

\*Significance levels according to independent-samples t-test results, \*\*Comparison results between VAS measurements (repeated ANOVA), <sup>a</sup> <sup>b</sup>Shows the difference between VAS measurement periods. SD: Standard deviation, VAS: Visual analog scale

**Table 3. Inter-measurement correlation analysis results**

		Age	BMI	Duration of pain, (months)
VAS baseline	r	0.065	-0.119	-0.002
	p	0.545	0.263	0.988
VAS-1 <sup>st</sup> month	r	-0.108	0.000	-0.045
	p	0.310	0.997	0.671
VAS-6 <sup>th</sup> month	r	-0.056	0.048	0.037
	p	0.601	0.652	0.730
VAS-12 <sup>th</sup> month	r	-0.130	0.103	-0.047
	p	0.222	0.336	0.658

r: Pearson correlation coefficient, BMI: Body mass index, VAS: Visual analog scale

## Study Limitations

There are several limitations in our study, such as its retrospective nature, its small size, and the lack of patient quality of life measures such as the Oswestry disability index. However, it is valuable because it is the first study, to our knowledge, to investigate the effect of OP on facet medial branch RFT results.

## Conclusion

Lumbar facet medial branch RFT is an effective and safe treatment procedure in both the short and long-term in patients with LFJS. OP has no effect on RFT treatment results. Prospectively designed, controlled studies are needed to identify the factors affecting the success of RFT.

## Ethics

**Ethics Committee Approval:** The present study is retrospective and its permission was obtained from Ağrı İbrahim Çeçen University Scientific Research Ethics Committee (decision no: 159, date: 22.06.2023).

**Informed Consent:** Retrospective study.

## Authorship Contributions

Surgical and Medical Practices: K.S.S., B.M., Concept: K.S.S., Design: K.S.S., Data Collection or Processing: K.S.S., B.M., Analysis or Interpretation: K.S.S., B.M., Literature Search: K.S.S., B.M., Writing: K.S.S., B.M.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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