Agri 2026;38(1):29–37
doi: 10.14744/agri.2025.54679

ORIGINAL ARTICLE

Does central sensitization affect responses to genicular radiofrequency and intra-articular injection in elderly knee osteoarthritis patients?

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SUMMARY

Objectives: This study aimed to evaluate the effect of central sensitization level on treatment response in individuals older than 65 years who underwent genicular nerve radiofrequency and intra-articular injection treatments for knee osteoarthritis (OA).

Methods: In this retrospective cohort study, 37 patients were divided into two groups according to the Central Sensitization Inventory (CSI) score (CSI<40 and CSI≥40). All patients underwent genicular nerve radiofrequency ablation and intra-articular injection. Pain (NRS), functionality (WOMAC), walking capacity (6MWT), sleep quality (PSQI), and satisfaction levels were evaluated at baseline and at 1 and 3 months following the procedure. Variance and regression analyses were used for statistical evaluation.

Results: Significant clinical improvements were observed in all patient groups for the evaluated parameters (p<0.001). However, variance analysis for pain (F=22.566, p<0.001), function (F=15.283, p<0.001), sleep quality (t=−3.87, p<0.001), and walking capacity (F=13.301, p=0.001) showed lower scores in the CSI≥40 group compared with the CSI<40 group. Regression analysis confirmed lower responses in CSI≥40 patients: pain (β=−2.1; 95% CI: −3.1 to −1.1; p<0.001), function (β=−4.6; 95% CI: −7.2 to −2.0; p=0.001), walking (β=−24.6; 95% CI: −40.7 to −2.8; p=0.026), and sleep (β=−1.9; 95% CI: −2.9 to −0.9; p=0.001).

Conclusion: The presence of central sensitization significantly limits the clinical response to genicular radiofrequency ablation and intra-articular injection treatments in older patients with OA. Routine use of screening tools such as CSI in treatment planning may guide more effective and personalized approaches.

Keywords: Central nervous system sensitization; elderly; knee; osteoarthritis; radiofrequency ablation.

Introduction

Knee osteoarthritis (OA) is a common cause of chronic pain and is frequently seen in older individuals.[1] Traditional treatment methods include anti-inflammatory drugs, physical therapy applications, and intra-articular injections, which focus on the peripheral nature of OA.[2] However, studies indicate that the pain mechanism associated with OA is more complex.[3] An important component of this complexity is central sensitization, which is characterized by hypersensitivity to non-painful stimuli, enlargement of pain areas, and decreased pain thresholds.[4] In a large number of patients with knee OA, there is a discrepancy between radiological findings and pain intensity, which suggests that the associated pain cannot be explained by local pathology alone.[5] Clinical and neurophysiological studies show that patients with knee OA often have widespread hyperalgesia and impaired pain inhibition.[6] One of the widely used and validated tools for the clinical assessment of central sensitization is the Central Sensitization Inventory (CSI).[7] The CSI groups patients with knee OA according to their symptom profiles and stands out as an important scale, especially for determining the response to interventional or conservative treatments.[8,9] Scores of 40 and higher indicate the presence of central sensitization.[10] Studies

Submitted: 15.05.2025 **Received:** 15.06.2025 **Accepted:** 07.07.2025 **Available online:** 12.01.2026

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indicate that patients with high CSI scores benefit less from physical therapy, surgery, or medication.[11–13] Intra-articular injections and genicular nerve radiofrequency treatments (RFT) are minimally invasive pain treatment options that are effective and reliable for the management of knee OA.[14] However, the effect of these treatments on specific parameters, such as functionality and walking capacity, in elderly patients with central sensitization is not yet clear.[15] Our hypothesis is that increased central sensitization might impair the effectiveness of minimally invasive pain treatments, similar to its effects on other conservative treatments. In this context, we are the first to subgroup older patients (age ≥65 years) with knee OA according to CSI scores. Thus, we aimed to evaluate the effects of the combination of intra-articular injection and genicular nerve conventional RFT on pain scores, functionality, sleep quality, walking capacity, and patient satisfaction.

Materials and Methods

Study Design and Patient Selection

Ethical approval was obtained from the local ethics committee for this retrospective cohort study (date: 29.04.2025; number: 418). Data from patients who presented to our outpatient pain clinic with knee pain between October 1, 2024, and April 10, 2025, were investigated. The inclusion criteria were: (i) age ≥65 years, (ii) satisfying the American College of Rheumatology (ACR) osteoarthritis criteria.[16] (iii) having undergone intra-articular injection and genicular nerve RFT for pain management, (iv) being class III–IV according to the Kellgren–Lawrence classification system, (v) having complete follow-up scales, and (vi) having knee pain for at least 3 months. Patients with incomplete file data, additional diseases that could lead to central sensitization (e.g., fibromyalgia, irritable bowel disease, migraine), inflammatory joint disease, previous knee surgery, or those who did not have regular outpatient clinic follow-ups were excluded. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Collection

As part of the study, the CSI, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the Pittsburgh Sleep Quality Index (PSQI) follow-up scales were recorded as self-reports from the patients. Other follow-up scales included the 6-Minute Walk Test (6MWT) distance measurement, the Numerical Rating Scale (NRS), and a short satisfaction survey (i.e., satisfied, not satisfied, or undecided), which were recorded in manuscript form by the researchers. All scale data (except patient satisfaction) were recorded at the first application and at months 1 and 3 post-treatment. Patient satisfaction was recorded at 3 months post-treatment. All assessment scales used in the study are part of our routine outpatient clinic follow-up. In addition, age, pain duration, body mass index (BMI), and gender data were recorded. Demographic data, medical history, and scale data screening were performed using the Hospital Information Management System (HBYS) and the researchers' manuscript data. Data analyses were performed by assigning the participants to two groups: those with central sensitization (CSI score ≥40) and those without central sensitization (CSI score <40). In accordance with patient ethics committee policies, patients' personal data were anonymized before analysis.

Intra-articular Injections and Genicular Nerve Radiofrequency Ablation Procedure

Before intra-articular injection and genicular branch RFT applications, a detailed medical history focusing on symptoms was obtained from all patients, and a physical examination was performed. Imaging techniques (e.g., X-ray or MRI, if necessary) were reviewed, and when differential diagnosis was required, appropriate tests (e.g., blood tests, cytology, fluid culture) were requested. Informed consent was obtained from patients who were suitable for interventional procedures. In addition, all patients were asked to undergo the necessary blood tests (e.g., complete blood count, activated partial thromboplastin time, international normalized ratio, and hepatitis and HIV serology) before the procedure. After standard monitoring in the operating room environment, all patients were administered minimal sedation (midazolam 0.05–0.1mg/kg) intravenously by the anesthesia team. The procedure area was prepared with an iodine-based solution, and sterile surgical draping was applied. Local infiltration was then performed on the skin of the treatment area with 2% prilocaine. All

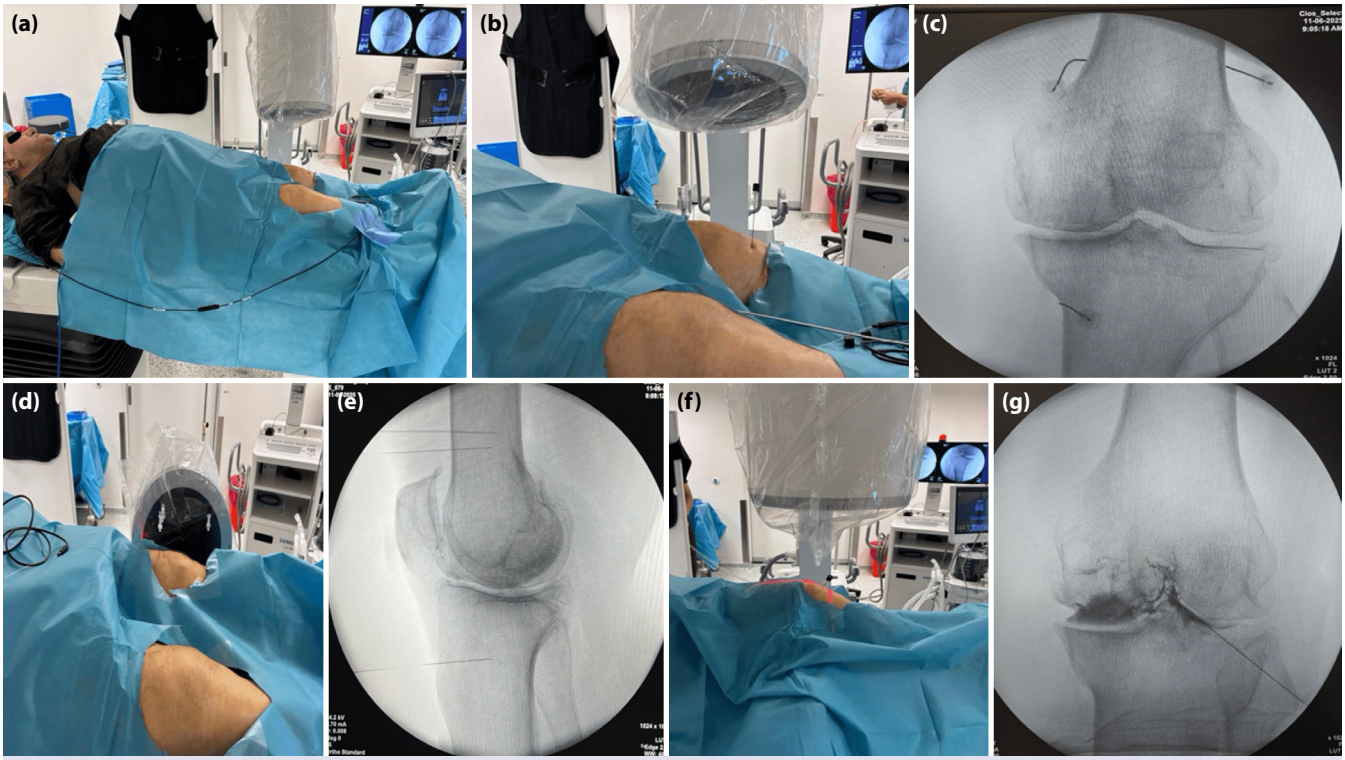

Figure 1. The fluoroscopic guidance stages of radiofrequency ablation of the genicular branches of the knee (superior lateral, superior medial, inferior medial genicular nerves) and intra-articular knee block via the anterolateral approach are presented for each image. **(a)** Patient positioning and anteroposterior fluoroscopic imaging, **(b)** Positioning of radiofrequency cannulas, **(c)** Anteroposterior fluoroscopic view of the cannulas, **(d)** Lateral positioning of the cannulas, **(e)** Lateral fluoroscopic view of the cannulas and needle placement, **(f)** Needle placement via the anterolateral approach, **(g)** Fluoroscopic imaging of intra-articular contrast medium distribution. Note: Patient permission was obtained.

procedures were performed under fluoroscopy (GE OEC 9900 C-Arm, GE Healthcare, USA). For radiofrequency ablation of the genicular branches (i.e., superior lateral, superior medial, and inferior medial), needle positioning was confirmed by anteroposterior and lateral fluoroscopic imaging. RFT was performed using a 22G×10cm×10mm active motor RF hybrid cannula (Diros Technology Inc., Canada) and an RF generator (Kimberly-Clark Pain Management Generator Version 4.0, Halyard Health, Alpharetta, GA, USA). The presence of paresthesia with sensory stimulation (≤0.5mA, 50Hz) and the absence of motor stimulation (1mA, 2Hz) were confirmed. Conventional ablation was performed on all branches at 90°C for 60 seconds. For the intra-articular procedure, the knee was flexed to 90°. A 22G spinal needle was advanced using an anterolateral approach, and intra-articular placement was confirmed with contrast imaging. A mixture of 5–10ml containing 0.5% bupivacaine (2.5ml), 16mg dexamethasone, and 0.9% saline was injected. All pain procedures were performed by a specialist in accordance with the standard protocol (Fig. 1).

Statistical Analyses

Data analysis was performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics included mean, standard deviation, minimum, and maximum values. Normal distribution of continuous variables was assessed using skewness and kurtosis values, and parametric tests were applied to normally distributed data.[17,18] An independent samples t-test was used for comparisons between two independent groups, and a dependent samples t-test was used for within-group comparisons over time. Repeated measures ANOVA was applied for three or more measurements. Categorical variables were analyzed using the chi-square test. For comparisons according to CSI score (<40 versus ≥40), time and group interactions were tested using two-way ANOVA. The effect of CSI score on clinical parameters was evaluated using linear regression analysis. The significance level was set at $p<0.05$. Post hoc power analysis, based on the smallest effect size (time×group interaction for 6MWT; $\eta^2=0.111$; Cohen's $f=0.353$), was conducted using repeated-

Table 1. Demographic characteristics by CSI groups

Variables	CSI<40 (N=19)	CSI≥40 (N=18)	Total (n=37)	p
Gender (male/female)	8 / 11	7 / 11	15 / 22	**0.842†**
Age (years)	70.95±6.14	74.28±6.85	72.57±6.62	**0.128***
Body Mass Index (kg/m^2)	27.17±3.24	29.77±5.15	28.43±4.42	**0.079***
Pain duration (months)	11.05±7.99	26.67±13.37	18.65±13.38	**<0.001***

Table 1 shows the demographic and clinical characteristics of the study participants categorized by CSI score groups. Participants were grouped into CSI<40 and CSI≥40 categories. The demographic variables include age, gender distribution, BMI: body mass index, and pain duration (in months). Mean±standard deviation is reported for continuous variables. CSI: Central Sensitization Inventory; † : Pearson's Chi-square test, *: Independent samples T-test.

Table 2. Comparison of clinical outcomes by CSI groups

Outcome measure	Timepoint	CSI<40 (n=19) Mean±SD	CSI≥40 (n=18) Mean±SD	p*
NRS	Baseline	7.58±0.84	8.00±0.59	**0.086**
NRS	Month 1	3.74±1.85	6.33±1.33	**<0.001**
NRS	Month 3	4.47±2.04	7.00±1.33	**<0.001**
WOMAC	Baseline	42.16±6.54	50.28±11.17	**0.012**
WOMAC	Month 1	30.82±6.93	43.52±10.58	**<0.001**
WOMAC	Month 3	32.47±7.08	44.98±9.97	**<0.001**
6MWT	Baseline	361.16±61.32	301.50±65.49	**0.007**
6MWT	Month 1	425.79±65.57	344.39±55.53	**<0.001**
6MWT	Month 3	422.95±68.44	338.67±70.25	**0.001**
PSQI	Baseline	8.11±1.59	6.83±1.15	**0.008**
PSQI	Month 3	4.26±1.82	4.89±1.13	**0.213**

The variables include the Numerical Rating Scale (NRS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), 6-Minute Walk Test (6MWT), and Pittsburgh Sleep Quality Index (PSQI), measured at baseline, post-treatment follow-up 1 month and follow-up 3 month where available. Values are expressed as mean±standard deviation. Patients with higher CSI scores demonstrated significantly worse pain, function, and sleep outcomes at multiple time points. This table highlights the potential influence of central sensitization on treatment response and recovery trajectory. *: An independent samples t-test was used to compare the groups; SD: Standard deviation; CSI: Central Sensitization Inventory.

measures ANOVA (within–between interaction) in G*Power. With α=0.05, three measurements, a repeated measures correlation of 0.5, nonsphericity correction ε=1, and n=37, the calculated power was approximately 99.8%.

Results

Within the scope of the study, data from 37 patients who met the inclusion criteria and did not meet the exclusion criteria were analyzed. The demographic data of the participants are summarized in Table 1. Eighteen participants were in the central sensitization group (CSI≥40) with a mean CSI score of 51.6±7.76, while 19 participants without central sensitization (CSI<40) had a mean score of 32.8±4.1 ($p<0.05$). The relationships between the participants' demographic variables and CSI scores were evaluated. No significant differences were found between the two CSI groups in terms of gender distribution, age, or BMI ($p>0.05$). However, pain duration was significantly longer in the CSI≥40 group ($p<0.001$).

The baseline, month 1, and month 3 NRS, WOMAC, 6MWT, and PSQI values are presented in Table 2. Repeated measures ANOVA revealed significant improvements in NRS, WOMAC, and 6MWT scores over time in both groups ($p<0.001$). In two-way ANOVA, these improvements were more pronounced in the CSI<40 group ($p<0.001$). Paired samples t-test showed that PSQI scores decreased in both groups, while independent samples t-test demonstrated that this decrease was more evident in the CSI<40 group ($p<0.001$). One-way ANOVA showed that both base-

Table 3. Time, group, and interaction effects for clinical outcomes in CSI < 40 vs. CSI ≥40 groups

Outcome measure	Effect type	Test (F or t)	p	η^2	Post-hoc power (1-β)
NRS	Time effect (all participants)	F=64.313	<0.001*	**0.648**	**>99%‡**
	CSI<40 vs CSI≥40	F=22.566	<0.001†	**0.392**	**>99%‡**
	Time×group interaction	F=12.686	<0.001†	**0.266**	**>99%‡**
WOMAC	Time effect (all participants)	F=149.783	<0.001*	**0.811**	**>99%‡**
	CSI<40 vs CSI≥40	F=15.283	<0.001†	**0.304**	**>99%‡**
	Time×group interaction	F=10.721	<0.001†	**0.234**	**>99%‡**
6MWT	Time effect (all participants)	F=85.786	<0.001*	**0.710**	**>99%‡**
	CSI<40 vs CSI≥40	F=13.301	0.001†	**0.275**	**>99%‡**
	Time×group interaction	F=4.353	0.017†	**0.111**	**>99%‡**
Satisfaction level	CSI<40 vs CSI≥40	F=6.640	0.004**	**0.281**	**>99%‡**
PSQI	Time effect (all participants)	t=10.032	<0.001***	NA	**>99%§**
	CSI<40 vs CSI≥40	t=-3.87	<0.001****	NA	**>99%§**

Table 3 evaluates the effects of time, group (CSI<40 and CSI≥40), and time×group interaction across all time points (baseline, 1 month, and 3 months) for the Numerical Rating Scale (NRS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the 6-Minute Walk Test (6MWT). Repeated-measures ANOVA and two-way ANOVA analyses were used for these outcomes. For statistically significant findings, the partial eta squared (η^2) value represents the effect size. For the Pittsburgh Sleep Quality Index (PSQI), paired samples t-tests and independent samples t-tests were used. Satisfaction Level was assessed using a 3-point Likert scale (Satisfied / Undecided / Not Satisfied) at the 3rd month. Group differences were analyzed using one-way ANOVA. NA: Not applicable; *: Repeated-measures ANOVA; †: Two-way ANOVA; **: One-way ANOVA; ***: Paired samples t-test; ****: Independent samples t-test; ‡: Repeated-measures ANOVA (within-between interaction); post-hoc power analysis based on observed η^2; §: Paired and independent samples t-tests (post-hoc power calculated based on observed Cohen's d values)

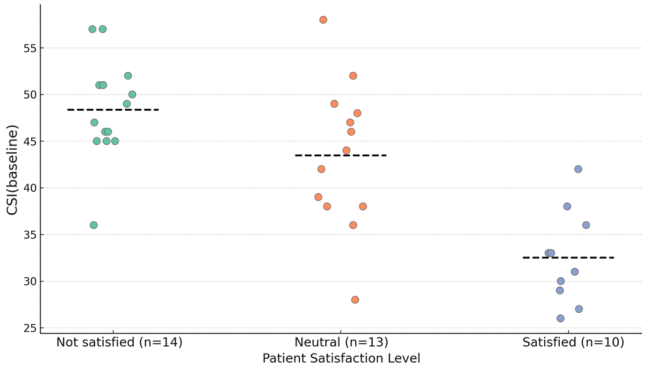

Figure 2. Each dot represents an individual patient. Dots are presented in three groups according to their level of satisfaction: "Not satisfied" (n=14), "Undecided" (n=13), and "Satisfied" (n=10). Black dashed lines indicate the mean baseline CSI score for each group. As patient satisfaction increases, a decreasing trend is observed in baseline CSI scores.

line and 3-month CSI scores were higher in dissatisfied and undecided participants (p=0.004). All statistical results and the corresponding post hoc power analyses for the 37 patients are presented in Table 3. The 3-month post-procedure patient satisfaction levels according to baseline CSI values are shown in Figure 2. Paired samples t-test demonstrated a significant decrease in CSI scores after treatment in both groups compared with baseline (CSI<40: t=3.15, p=0.006 versus CSI≥40: t=5.05, p<0.001).

For linear regression analysis, the pre-treatment CSI score was used as the independent variable, and ΔNRS, ΔWOMAC, Δ6MWT distance, and ΔPSQI scores were used as dependent variables (Δ: pre-treatment to month 1 change). The decreases in ΔNRS, ΔWOMAC, and ΔPSQI scores and the increase in Δ6MWT distance were significantly greater in the CSI<40 group than in the CSI≥40 group (p<0.05). Table 4 presents the regression analysis results. These findings suggest that the response to interventional treatment may be less effective in individuals with high CSI scores, particularly in terms of pain, functionality, and sleep, and that the increase in walking distance may be related to the CSI score.

None of the patients reported any complications during the follow-up period.

Discussion

This study investigated how central sensitization influences the response to intra-articular injections and genicular nerve RFT in elderly patients (age≥65 years) with knee OA. Both patients with central sensitization (CSI≥40) and those without (CSI<40) showed statistically significant improvements in

Table 4. Multivariate linear regression analysis for predictors of treatment response based on baseline CSI (≥40 vs <40)

Outcome measure	β coefficient (β)	95% CI	p	R^2 / adjusted R^2
Δ NRS (pain score change)	-2.105	**-3.14 to -1.07**	<0.001	0.309
Δ WOMAC (function score change)	-4.581	**-7.20 to -1.97**	0.001	R^2=0.244
Δ 6MWT (walking distance change, meters)	-24.62	**2.75 to 40.74**	0.026	Adjusted R^2=0.108
Δ PSQI (sleep quality score change)	-1.898	**-2.91 to -0.89**	0.001	R^2=0.275

CSI: Central Sensitization Inventory; Δ: difference between pre-treatment and 1st month scores; NRS: Numeric Rating Scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; 6MWT: Six-Minute Walk Test; PSQI: Pittsburgh Sleep Quality Index. β coefficients represent the estimated change in the outcome variable associated with having a baseline CSI ≥40 compared to <40, after adjusting for covariates. 95% confidence intervals (CI) are presented for each β coefficient. R^2 indicates the proportion of variance explained by the model. Adjusted R^2 was used where appropriate. All regression models were statistically significant (overall model p<0.05), explaining 10.8% to 30.9% of the variance.

pain (by NRS score), function (by WOMAC score), sleep quality (by PSQI score), and walking distance (by 6MWT distance). However, this effect was lower in patients with central sensitization, in line with our hypothesis. Furthermore, regression analysis found that central sensitization was predictive of therapeutic outcomes. We focused on two main points in discussing our findings: the effect of central sensitization on knee osteoarthritis treatment and the effect of interventional treatments in older patients with knee osteoarthritis.

Central sensitization describes a pain experience not fully explained by peripheral joint pathology and can significantly affect treatment response in knee OA. Kim et al.[12,18] explored the effect of central sensitization on treatment response, showing that patients with high central sensitization had significantly worse pain, functionality, and satisfaction levels after total knee arthroplasty. Carlesso et al.[6] also reported that pain patterns were closely related to central sensitization in studies evaluating quantitative sensory testing and CSI scores together in patients with knee OA. Campbell et al.[19] showed a decrease in sleep quality in patients with knee osteoarthritis and high central sensitization using CSI and PSQI scores. Additionally, Arendt-Nielsen et al.[20] found that patients with knee osteoarthritis who had central sensitization experienced more widespread pain sensitivity, weaker pain control, and longer-lasting pain.

Yüzügüldü et al.[11] reported that high CSI values negatively affected the response to physical therapy. Our research shows that individuals with a CSI score of 40 and higher had a significantly longer duration of pain and a poorer treatment response, which is consistent with these mechanistic foundations. Studies to date have generally focused on the effects of central sensitization on surgical and physical therapy modalities for knee OA. However, no study has examined the combined effects of genicular radiofrequency and intra-articular injection on pain, function, walking distance, or sleep quality in patients with central sensitization.

In chronic knee OA, inflammatory and neuropathic pain components are often present together.[6] Genicular RFT targets the neuropathic component, whereas intra-articular steroid injections target the inflammatory component. Yilmaz et al.[21] showed in their randomized study that combinations of genicular block and intra-articular injection treatments were superior to single injections. Recent meta-analyses report that genicular RFT has a longer-lasting effect on pain and functionality.[22,23] Based on this information, we often prefer this combination treatment in patients with advanced-stage OA to achieve a more effective and long-lasting clinical response. Central sensitization could limit treatment response not only to surgery but also to minimally invasive interventional pain treatments. Lluch Girbés et al.[24] emphasized that the presence of central sensitization in patients with OA might limit the response to classical treatments and that patients should therefore be grouped in advance using criteria such as CSI. Our findings underscore the significance of including central sensitization scales in routine clinical evaluation processes when planning interventional treatment.

Our regression analysis results showed that high CSI scores are associated with poor clinical outcomes. Easily administered self-report scales such

as the CSI could help identify patients who are less likely to respond to treatment, facilitating the development of more personalized and multimodal treatment approaches. It should be noted that midazolam and steroids administered during the procedure might have affected central sensitization in our study. Animal and human studies have shown that midazolam can affect central sensitization.[25,26] However, these studies have mostly evaluated the effects of high doses or effects occurring shortly after administration. It is unlikely that the low and single dose of midazolam affected central sensitization throughout the follow-up period in our study. In addition, studies on steroids have shown that their effect on central sensitization is limited.[27,28] This supports our findings regarding steroid use. Furthermore, since both treatments were applied equally to both CSI<40 and CSI≥40 groups, the observed differences depend on the CSI score, and there was no confounding effect of the drugs.

Although there is limited research directly evaluating intra-articular injection and genicular radiofrequency in older patients with knee OA, many studies have included populations with similar age ranges to ours.[29–31] These studies generally focus on the efficacy and safety of treatment. Ma et al.[32] reported that ultrasound-guided genicular RFT in older patients with OA provided substantial improvement in pain relief and functionality. However, their study evaluated patients aged 50 years and older based on NRS and WOMAC scores. Unlike the study by Ma et al.,[32] we evaluated genicular radiofrequency results in patients aged 65 years and older. We assessed multiple parameters, including pain, function, sleep, and walking distance. In addition, our study focused on the evaluation of central sensitization as a parameter predicting treatment response.

Studies directly examining the clinical effects of central sensitization in older individuals with OA are limited. Tavares et al.[15] reported that the response to conservative treatment and functional gains are reduced due to deterioration of descending pain inhibitory systems in older patients with knee OA. Cruz-Almeida et al.[33] reported that differences in psychological profile and central pain processing in older patients affect pain intensity independently of the peripheral location of pain. The main finding of our study, namely the inadequate treatment response observed in the CSI≥40 group, is consistent with these published findings. The fact that improvement in sleep quality was less in the group with central sensitization suggests that this sensitization status affects not only pain but also a wider range of quality-of-life parameters. Petersen et al.[5] reported that central pain sensitivity increases with age in patients with osteoarthritis and that this effect is more pronounced than in healthy individuals. Additionally, neuropathic comorbidities frequently seen in older individuals could make the experience of pain more complex.

A striking aspect of our findings is the limited response observed in patient satisfaction. Although treatment follow-up parameters improved significantly, patients did not always report this positively. The satisfaction level was significantly low, especially in those with central sensitization, indicating that central sensitization affects pain perception not only at the physical level but also at emotional and cognitive levels. Central sensitization is not merely a neurophysiological phenomenon; it is a dynamic process involving psychosocial factors such as depression, anxiety, and somatic complaints.[34,35] In this context, psychological parameters might have affected patient satisfaction. However, Rehm et al.[36] emphasized that central sensitization is more closely related to pain intensity and reported that the effect of psychosocial factors might be limited. In retrospect, a study evaluating comorbidities, medication use, and psychosocial factors together in older patients could help clarify the relationship between central sensitization and patient satisfaction.

This study is a multidimensional investigation that evaluates the effects of central sensitization on the response to intra-articular injection and genicular nerve RFT in older patients with knee OA. Combining objective and subjective scales improves the clinical validity of the findings. In addition, CSI-based grouping indicates that treatment responses depend on both age and the level of central sensitization. These findings suggest that central mechanisms should also be taken into consideration in the pain management of older individuals.

This study has some limitations. The retrospective design limits the ability to establish a causal relationship. The single-center structure and specific inclusion criteria might have limited the generalizability of the results despite sufficient statistical power. Although comorbidities such as fibromyalgia, irritable bowel syndrome, migraine, and temporomandibular dysfunction that affect central sensitization were excluded, factors common in older people such as anxiety, depression, and medication use were not evaluated, which could limit the interpretation of CSI scores as a purely neurophysiological indicator. In addition, advanced measurements such as neuropathic pain scales, psychological assessment tools, and neurophysiological tests were not included in the study. These limitations underscore the need for future prospective, multicenter studies that also account for psychosomatic factors and medication use.

Conclusion

This study shows that central sensitization has a significant effect on multiple clinical parameters such as pain, functionality, sleep, and walking in older patients undergoing interventional treatment for knee osteoarthritis. The limited response to treatment in individuals with high CSI scores suggests that central sensitization could negatively affect recovery. These findings highlight the importance of complementary strategies targeting not only peripheral but also central pain mechanisms in older individuals. In addition, screening tools such as the CSI could help guide personalized treatment planning.

Ethics Committee Approval: The Kayseri City Hospital Ethics Committee granted approval for this study (date: 29.04.2025, number: 418).

Informed Consent: Informed consent was obtained from patients who were suitable for interventional procedures.

Conflict of Interest: The authors declare that there is no conflict of interest.

Financial Disclosure: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Use of AI for Writing Assistance: None declared.

Authorship Contributions: Concept – AB; Design – AB; Supervision – AB, ASEZ; Resource – AB, ASEZ; Materials – AB, ASEZ; Data collection and/or processing – AB, ASEZ; Analysis and/or interpretation – AB; Literature review – AB, ASEZ; Writing – AB, ASEZ; Critical review – AB, ASEZ.

Peer-rewiew: Externally peer-reviewed.

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