Original Article/*Özgün Araştırma*

doi: 10.54875/jarss.2022.58076

# Effect of the Lumbar Sympathetic Block on Pain in Patients with Symptomatic Peripheral Arterial Disease-Retrospective Analysis

## Semptomatik Periferik Arter Hastalarında Lomber Sempatik Bloğun Ağrı Üzerine Etkisi-Retrospektif Analiz

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**ABSTRACT**

**Objective:** To study the effect of lumbar sympathetic block (LSB) with a mixture of local anesthetics and steroids on pain in patients with chronic ischemic lower limb disease.

**Methods:** Retrospectively 23 patients were reviewed with peripheral arterial disease who underwent LSB using a mixture of 8 mg of dexamethasone, 80 mg of 2% lidocaine, and 4 mL of saline at 2 levels, L2 and L4, under the guidance of fluoroscopy. Recordings of the Visual Analog Scale (VAS) scores at 3 days before the blockage, and 1 month and 3 months after treatment were obtained.

**Results:** The study included 20 (87%) male and 3 (13%) female patients. The mean age of the patients was 59.65±13.33 years. The patients' post-blockage 3rd day, and 1st and 3rd month VAS scores were significantly lower than the baseline VAS scores ($p<0.05$). The proportion of patients with 50% improvement in the VAS scores at 3rd days, and 1st and 3rd months was 47.8%, 21.7%, and 21.7%, respectively. No complications or side effects were observed.

**Conclusion:** Lumbar sympathetic block with a mixture of local anesthetics and steroids appears to be effective in patients who have non-reconstructable arterial occlusive disease, with reduced pain scores and low complication rates.

**Keywords:** Sympathetic nerve block, claudication, visual analog scale, peripheral arterial disease, pain

**ÖZ**

**Amaç:** Alt ekstremitenin kronik iskemik hastalığı olan hastalarda, lokal anestezik ve steroid karışımı ile uygulanan lomber sempatik blokajın (LSB) ağrı üzerine etkisinin araştırılması.

**Yöntem:** Floroskopi eşliğinde L2 ve L4 seviyelerinden 8 mg deksametazon, 80 mg %2 lidokain ve 4 mL salin karışımı kullanılarak LSB uygulanan 23 hasta retrospektif olarak incelendi. Vizüel Analog Skala (VAS) değerleri blokaj öncesi ve blokajdan 3 gün, 1 ve 3 ay sonra kaydedildi.

**Bulgular:** Çalışmaya 20 (%87) erkek ve 3 (%13) kadın hasta dahil edildi. Hastaların yaş ortalaması 59,65±13,33 yıl idi. Hastaların blokaj sonrası 3. gün, 1. ve 3. ay VAS skorları başlangıç VAS skorlarından anlamlı derecede düşüktü ($p<0,05$ ). Üçüncü gün, 1. ve 3. ayda VAS skorlarında %50 iyileşme olan hastaların oranı sırasıyla %47,8, %21,7 ve %21,7 idi.

**Sonuç:** Lokal anestezik ve steroidle uygulanan LSB, revaskülarizasyonu mümkün olmayan periferik arter hastalığı olan hastalarda iskemik ağrıyı azaltmak için güvenli ve etkili bir yöntemdir.

**Anahtar sözcükler:** Sempatik sinir bloğu, kladikasyo, görsel analog skala, periferik arter hastalığı, ağrı

## INTRODUCTION

Peripheral arterial disease (PAD) is a chronic, occlusive, progressive disease caused by atherosclerosis of the lower extremities (1). In Turkey, the prevalence of PAD has been reported as 19.76% in people over the age of 40 (2). The prevalence is higher in patients with diabetes and reported between 10% and 42% (3).

The clinical manifestations of PAD result from impaired tissue perfusion secondary to narrowing of the arterial system. While patients with PAD may remain asymptomatic for a long time, they describe intermittent claudication when more than 50% obstruction occurs in the lumen of the affected vessel. If the perfusion of the extremity worsens, resting pain, ulcer, gangrene, and critical ischemia findings may occur (4).

Received/Geliş tarihi : 28.04.2022
Accepted/Kabul tarihi : 07.07.2022
Publication date : 29.07.2022

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**Cite as:** Kaya SS, Celik S, Akcaboy EY, Goksu H, Ayhan MY, Sahin S. Effect of the lumbar sympathetic block on pain in patients with symptomatic peripheral arterial disease-retrospective analysis. JARSS 2022;30(3):188-192.

Peripheral arterial disease is commonly staged according to the Fontaine classification based on the patient's symptomatology (5).

Critical lower limb ischemia is the most severe form of PAD and although revascularization is the gold standard treatment, it may not be applicable to all patients (6). In cases where revascularization is not possible, other treatment methods, such as analgesics, vasodilators, and anticoagulants, can relieve pain at rest and avoid amputations (7,8). Lumbar sympathetic block (LSB) is recommended in the case of persistent pain (9,10). In the literature, LSBs with local anesthetics are used for diagnostic purposes before the neurolytic blockade. There is no study on the effect of LSBs with a mixture of local anesthetic and steroids on ischemic pain. In this study, it was aimed to evaluate the efficacy of LSB with a mixture of local anesthetics and steroids on ischemic pain in PAD.

## MATERIAL and METHODS

### Study Design and Participants

The medical records of patients with PAD who underwent LSB with local anesthetics and steroids between January 2019 and December 2021 were retrospectively reviewed. Local Institutional Review Board approval was obtained (reference number: E1-22-2523).

Inclusion criteria were as follows: 1) Patients having peripheral vascular disease with ischemic pain. 2) Patients classified as stages 3 and 4 according to the Fontaine Classification. 3) Patients who could not be treated with revascularization treatment methods.

Patients with acute embolic obstruction, local anesthetic or contrast allergy, bleeding diathesis, uncontrolled diabetes, and previous lumbar sympathetic interventional management history were excluded.

### Clinical Assessment

Age, sex, diagnosis, side of the painful area, presence of diabetes mellitus, Fontaine Classification and Visual Analog Scale (VAS) scores before and after the LSB (3$^{rd}$ day, and 1$^{st}$and 3$^{rd}$ months) were collected from the medical records. The pain was assessed with VAS (0=no pain and 10=worst imaginable pain). More than 50% reduction in the VAS scores was defined as a successful block. The Fontaine classification uses four stages: asymptomatic patients (stage 1), intermittent claudication (stage 2), ischemic rest pain (stage 3) and ischemic ulcers or gangrene (stage 4) (5).

### Procedure

The injections were performed in an operating room. The patient was placed on the prone position, and hemodynamic monitoring was performed (blood pressure, heart rate, $SpO_2$). After the L2 and L4 vertebral levels were determined, the C-arm fluoroscopy was rotated in an oblique direction until the image of the transverse processes disappeared under the vertebral body (Figure 1). Local anesthesia was performed with 2 mL of 1% lidocaine using a 25 G needle. A 15 cm, 21 G needle was advanced until it hit the vertebral body. Then, the needle was slowly advanced to the anterior border of the vertebra in lateral view. Following the negative aspiration test, needle localization was confirmed by 2 mL of non-ionic contrast spread as a straight line anterior to the vertebral body (Figure 2). Then, a mixture of 8 mg of dexamethasone, 80 mg of 2% lidocaine, and 4 mL of saline were injected at the L2 and L4 levels.

### Statistical Analysis

All of the analyses were carried out using IBM SPSS Statistics for Windows 25.0 (IBM Corp., Armonk, NY, USA). Analysis of

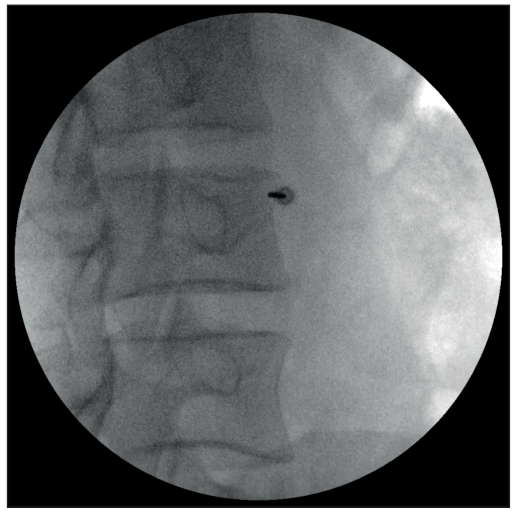

**Figure 1.** Correct placement of needle seen in oblique view.

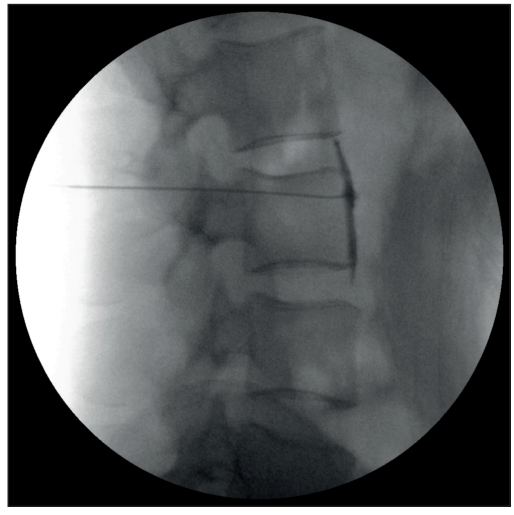

**Figure 2.** Craniocaudal spread of dye in lateral view.

normality was evaluated using Kolmogorov-Smirnov test. The normally distributed quantitative data like age were shown with mean ± standart deviation. Friedman test was performed within repeated measures with abnormal distribution and non-homogeneous variance. Numerical data between two-dependent measurements were assessed using the Wilcoxon signed ranks test due to the small number of patients. A p<0.05 was accepted as statistically significant.

**Table I.** Descriptive Features of the Patients

| | n (%) | Mean ± Standart deviation |
|---|---|---|
| Age | | 59.65 ± 13.33 |
| Sex | | |
| Female | 3 (13.0) | |
| Male | 20 (87.0) | |
| Side of symptom | | |
| Right | 18 (78.3) | |
| Left | 5 (21.7) | |
| Fontaine stage | | |
| Stage 3 | 5 (21.7) | |
| Stage 4 | 18 (78.3) | |
| Diabetes Mellitus | | |
| Diabetic | 11 (47.8) | |
| Non-diabetic | 12 (52.2) | |
| Medications | | |
| Acetylsalicylic acid | 15 (65.2) | |
| Clopidogrel | 6 (26.0) | |
| Apixaban | 11 (4.8) | |
| Cilostazol | 2 (8.6) | |
| Pentoxifylline | 9 (39.1) | |

**VAS:** Visual analog scale.

**Table II.** Analysis of VAS Scores by Time

| | Mean Rank | p |
|---|---|---|
| VAS baseline | 3.54 | <0.001 |
| VAS 3rd day | 1.41 | |
| VAS 1st month | 2.37 | |
| VAS 3rd month | 2.67 | |

**VAS:** Visual analog scale.

## RESULTS

Of the 23 patients, 20 (87%) were male, and 3 (13%) were female. The median age of the patients was 59.65 (min–max: 39–84). While 11 of the patients (47.8%) had diabetes, 12 patients (52.2%) did not. Five patients were in Fontaine Stage 3, and 18 patients were in stage 4. Mean VAS scores were 8.17 ± 1.0 at pre-intervention, 4.09 ± 2.76 at 3rd day, 5,57 ± 2.57 at 1st, and 6.04 ± 2.61 at 3rd months. The demographic and clinical data of the patients are summarized in Table I.

Because of the small number of patients, determining the VAS score change over time was performed using the Friedman test. There was a significant difference between the VAS scores (p<0.001) (Table II). Then, the VAS scores at different times were analyzed with the Wilcoxon test. The pain scores were significantly lower at all of the post-block evaluation times when compared to the baseline value during the 3rd month follow-up period (3rd day: p<0.001, 1st month: p=0.001, and 3rd month: p=0.001, respectively). In addition, a statistically significant difference was found between the 3rd day VAS scores and the 1st and 3rd month VAS scores and between the 1st and 3rd month VAS scores. Although there was an increase in VAS scores overtime at the 3rd month follow-up, a statistically significant decrease was still maintained when compared to the baseline values (Table III).

The proportion of patients with 50% improvement in the VAS scores was 47.8% on day 3, and 21.7% at 1st and 3rd months (Table IV). No complications were observed during or after the procedure in any of the patients.

## DISCUSSION

Lumbar sympathetic block is recommended to reduce pain, accelerate wound healing, and prevent amputation in patients with PAD with critical limb ischemia who cannot be revascularized (11-13). The claimed mechanism is based on LSB increasing the blood flow by decreasing the vascular tone in the relevant region. Ischemic pain leads to increased sympathetic activity therefore, vasoconstriction, leading to a vicious circle. Sympathetic blocks decrease the tone on the collaterals, increase blood flow and aid the development of revascularization over time (14,15). The increase in tis-

**Table III.** Analysis of Difference Between VAS Scores at Evaluation Times

| | VAS baseline - VAS 3rd day | VAS baseline - VAS 1st month | VAS baseline - VAS 3rd month | VAS 3rd day - VAS 1st month | VAS 1st month - VAS 3rd month |
|---|---|---|---|---|---|
| Z | -4.024[a] | -3.302[a] | -3.194[a] | -2.862[b] | -2.232[b] |
| Asymp. Sig. (2-tailed) | .000 | .001 | .001 | .004 | .026 |

Wilcoxon Signed Ranks Test, a. Based on positive ranks. b. Based on negative ranks.
**VAS:** Visual analog scale.

**Table IV.** Meaningful Pain Relief by Time

| | VAS baseline - VAS 3rd day | VAS baseline - VAS 1st month | VAS baseline - VAS 3rd month |
|---|---|---|---|
| ≤50% pain relief | 12 (52.2%) | 18 (78.3%) | 18 (78.3%) |
| >50% pain relief | 11 (47.8%) | 5 (21.7%) | 5 (21.7%) |

**VAS:** Visual analog scale.

sue oxygenation leads to a decrease in tissue damage, and thus a reduction in pain. In addition, decreased ischemia of nociceptors with increased perfusion may also reduce pain by breaking the vicious cycle of pain-sympathetic activity (16). Moreover, reduced pain with LSB may contribute to this effect (12).

Neurolytic agents or radiofrequency were used in most of the studies on LSB in PAD in the literature (17). The short duration of action of LSB with local anesthetics led to their use for diagnostic purposes before radiofrequency or neurolytic applications. However, it was reported that adding steroids to local anesthetics can prolong the action of the block (18-20). In addition, the antiinflammatory and systemic effects of steroids can directly reduce pain (21). Accordingly, a LSB with steroids and local anesthetics may also be therapeutic.

In this study, it was observed that LSB significantly reduced ischemic pain in patients with PAD, and pain relief was maintained 3 months after performing the block, suggesting the long-term analgesic effects of the treatment. More than a 50% decrease was also observed in the VAS score at 3rd months in 21.7% of the patients. Holiday et al. evaluated 70 patients with critical limb ischemia (22). The success rates of patients treated with chemical sympathectomy were 18% at 6 weeks, whereas the success rates at first year were 45%. Chahal et al. performed CT-guided lumbar sympathectomy in patients with chronic limb-threatening ischemia of the lower limbs and reported significant pain reduction in patients over a follow-up of 2 years (23). Verma et al. reported a significant decrease in pain at the 6 week and 6 month follow-up of patients who underwent chemical lumbar sympathectomy for chronic arterial ischemia of the lower limbs (24). They also reported significant pain reduction (decrease of ≥5 on the VAS) at 6 weeks in 53.3% of the patients and at 6 months in 40% of the patients. Although the follow-up period herein was shorter than in these other studies, pain reduction was observed in our patients that was consistent with the literature. The variation of the location, size, and quantity of ganglia, the different levels of LSB applied in the studies, and the fact that some fibers bypass the sympathetic ganglia and directly join the somatic nerves may have affected the results of the LSB. The main difference between the current study and these other studies is that we did not apply neurolysis or radiofrequency. However, pain was reduced in the short and medium term by adding steroids to the local anesthetics. Ozturk et al. applied LSB with a mixture of 40 mg of triamcinolone and 10 mL of 0.5% bupivacaine in 2 patients with postherpetic neuralgia and reported more than 50% improvement in pain scores at 6 months (25). Similarly, Cheng et al. administered LSB with a mixture of 12 mL of 1% lidocaine and 20 mg of triamcinolone to a patient with refractory painful diabetic neuropathy, and they reported the relief of pain for more than 6 weeks (16). Moreover, they reported that the analgesic effects were reproducible and prolonged in repeated blocks (continuing for 2–4 months after each block).

Although the mechanism of the prolonged analgesic effect of blocks made with a mixture of local anesthetics and steroids is not fully known, there may be several potential reasons. Corticosteroids can block nociceptive input due to their membrane stabilizer effects (26). Additionally, they can inhibit neuropeptide synthesis, suppress ectopic neuronal discharges, and block conduction in C fibers (27,28).

Complications of LSB, can be listed as bleeding, retroperitoneal hematoma, nerve root injury, genitofemoral neuralgia, lateral femoral cutaneous nerve injury, neuraxial injection, paralysis, and ureteral and renal injury (29). In the current study none of these complications were observed because neurolytic agents were not used, while fluoroscopic guidance was used and the target area was confirmed with a contrast injection.

The study had several limitations. The first was its retrospective nature without a control group. The second was that the population size was relatively small. The third was the short follow-up period. And finally, functional parameters such as the walking distance should have been used to assess the success of the block.

## CONCLUSION

Lumbar sympathetic block with a mixture of local anesthetic agents and steroids in patients with non-reconstructable arterial occlusive disease is a safe and effective method to reduce ischemic pain. The analgesic effect of the blocks may be long-lasting.

## AUTHOR CONTRIBUTIONS

**Conception or design of the work:** KSS, GH, CS

**Data collection:** KSS, AEY

**Data analysis and interpretation:** GH, SS, AMY

**Drafting the article:** KSS, GH, AEY

**Critical revision of the article:** AEY, SS, CS

**Other (study supervision, fundings, materials, etc.):** CS, AMY, SS

All authors (KSS, GH, AEY, CS, SS, AMY) reviewed the results and approved the final version of the manuscript.

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