ORIGINAL ARTICLE DOI: 10.20515/otd.1805048

Osmangazi Journal of Med, 2026;48(3):449-453

Osmangazi Journal of Medicine

e-ISSN: 2587-1579

Evaluation of Inflammatory and Thrombotic Risk after Endovenous Laser Ablation in Patients with Chronic Venous Insufficiency

Kronik Venöz Yetmezlik Nedeniyle Endovenoz Lazer Ablasyon Uygulanan Hastalarda İnflamasyon ve Tromboz Risklerinin Araştırılması

Tarık Taştekin[1], Hamdi Mehmet Özbek[2],

[1]Department of Cardiovascular Surgery, Burdur State Hospital, Burdur, Türkiye
[2]Department of Cardiovascular Surgery, Sincan Training and Research Hospital, Ankara, Türkiye

Correspondence / Sorumlu yazar
Tarık TAŞTEKİN

Department of Cardiovascular Surgery, Burdur State Hospital, Burdur, Türkiye

e-mail: tariktastekin@gmail.com

Received 16.10.2025

Accepted : 12.02.2026

Abstract: Chronic venous insufficiency (CVI) is a common vascular disorder, and endovenous laser ablation (EVLA) is a widely used minimally invasive treatment. This study aimed to evaluate perioperative changes in inflammatory and thrombotic markers following EVLA.This retrospective study included patients who underwent EVLA for CVI at Burdur State Hospital between January and September 2025. Fibrinogen, D-dimer, C-reactive protein (CRP), platelet count (PLT), mean platelet volume (MPV), hemoglobin (Hb), and hematocrit (Hct) were recorded preoperatively and on postoperative days 1 and 10. Statistical analyses were performed using paired t-tests or Wilcoxon signed-rank tests. A total of 24 patients were included in the study. The mean age was 48.4 ± 11.6 years (range: 27–72), with an equal distribution of females (n=12, 50%) and males (n=12, 50%). D-dimer levels increased significantly on postoperative day 1 ($p < 0.001$) and decreased by day 10 ($p < 0.001$). Fibrinogen levels showed no significant change on day 1 but increased by postoperative day 10 ($p = 0.018$). CRP levels increased on postoperative day 1 ($p < 0.001$) and returned toward baseline by day 10 ($p=0.107$). MPV decreased on day 1 ($p = 0.004$) and increased by day 10 ($p = 0.047$). PLT declined on day 1 ($p < 0.001$) and normalized by day 10, while Hb and Hct showed transient postoperative decreases. EVLA induces transient inflammatory and thrombotic changes that tend to normalize by postoperative day 10, supporting the overall safety of the procedure.

Keywords: Chronic venous insufficiency, D-dimer, Endovenous laser ablation, Fibrinogen, İnflammation, Mean platelet volume, Thrombosis

Özet: Kronik venöz yetmezlik (KVY) sık görülen bir damar hastalığıdır ve endovenöz lazer ablasyon (EVLA) yaygın olarak kullanılan minimal invaziv bir tedavi yöntemidir. Bu çalışmada, EVLA uygulanan hastalarda perioperatif dönemde inflamatuvar ve trombotik belirteçlerdeki değişimlerin değerlendirilmesi amaçlandı Bu retrospektif çalışmaya, Ocak–Eylül 2025 tarihleri arasında Burdur Devlet Hastanesi'nde KVY nedeniyle EVLA uygulanan hastalar dahil edildi. Fibrinojen, D-dimer, C-reaktif protein (CRP), trombosit sayısı (PLT), ortalama trombosit hacmi (MPV), hemoglobin (Hb) ve hematokrit (Hct) düzeyleri preoperatif, postoperatif 1. gün ve 10. günde kaydedildi. İstatistiksel analizlerde eşleştirilmiş t-testi veya Wilcoxon işaretli sıralar testi kullanıldı. Çalışmaya toplam 24 hasta dahil edildi. Hastaların yaş ortalaması 48.4 ± 11.6 yıl olup (27–72), cinsiyet dağılımı %50 kadın (n=12) ve %50 erkek (n=12) şeklindeydi. D-dimer düzeyleri postoperatif 1. günde anlamlı olarak artarken ($p<0,001$), 10. günde azalma gösterdi ($p<0,001$). Fibrinojen düzeylerinde 1. günde anlamlı değişiklik izlenmezken, 10. günde anlamlı artış saptandı ($p=0,018$). CRP düzeyleri 1. günde yükseldi ($p<0,001$) ve 10. günde başlangıç değerlerine yaklaştı ($p=0,107$). MPV 1. günde azalırken ($p=0,004$), 10. günde artış gösterdi ($p=0,047$). PLT 1. günde azalmakla birlikte 10. günde normale döndü; Hb ve Hct değerlerinde ise geçici postoperatif düşüş izlendi. EVLA sonrası erken dönemde inflamatuvar ve trombotik belirteçlerde geçici değişiklikler meydana gelmekte olup, bu değişiklikler 10. gün itibarıyla büyük ölçüde normale dönmektedir. Bu bulgular EVLA'nın güvenilirliğini desteklemektedir.

Anahtar Kelimeler: D-dimer, Endovenöz lazer ablasyon, Fibrinojen, İnflamasyon, Kronik venöz yetmezlik, Ortalama trombosit hacmi, Tromboz

Ethics Committee Approval: The study was approved by the Ethics Committee of Suleyman Demirel University (decision date:04.07.2025, number:46).

Informed Consent: The authors declared that it was not considered necessary to obtain informed consent from patients because the study was based on retrospective data analysis.

Authorship Contributions: Concept: TT, HMÖ. Design: TT, HMÖ. Data Collection or Processing: TT. Analysis or Interpretation: TT. Literature Search: TT, HMÖ. Writing: TT.

Copyright Transfer Form: Copyright Transfer Form was signed by all authors.

Peer-review: Internally peer-reviewed.

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

Financial Disclosure: The authors declared that this study received no financial support.

How to cite/ Atıf için: Taştekin T, Özbek HM, Evaluation of Inflammatory and Thrombotic Risk after Endovenous Laser Ablation in Patients with Chronic Venous Insufficiency, Osmangazi Journal of Medicine, 2026;48(3):449-453

1. Introduction

O Chronic venous insufficiency (CVI) is one of the most common vascular disorders, affecting 25–40% of women and 10–20% of men worldwide. The pathophysiology involves venous valve incompetence, reflux, and ambulatory venous hypertension, which may lead to varicose veins, edema, skin changes, and venous ulcers in advanced cases. The socioeconomic burden is substantial, as CVI is associated with impaired quality of life, work disability, and increased healthcare costs (1).

During the past two decades, conventional surgical stripping has largely been replaced by endovenous procedures such as endovenous laser ablation (EVLA), radiofrequency ablation (RFA), and cyanoacrylate embolization. These techniques provide high occlusion rates, reduced morbidity, and shorter recovery times (2, 3). EVLA in particular has gained widespread acceptance as a safe and effective modality, with long-term occlusion rates exceeding 90% and durable symptom relief over 5–10 years (4, 5).

CVI is a disease that typically activates the inflammatory system, and EVLA induces thermal endothelial injury, which may trigger an acute inflammatory response and a transient prothrombotic state. Nevertheless, Arase et al. reported that appropriate surgical treatment reduces systemic inflammatory biomarkers (6). Although the overall incidence is low, complications such as endothermal heat-induced thrombosis (EHIT), deep vein thrombosis (DVT), and pulmonary embolism (PE) have been reported (7, 8).

The role of thromboprophylaxis following EVLA remains a matter of debate. Keo et al. demonstrated that thromboprophylaxis reduces venous thromboembolism after EVLA, and later suggested that short pharmacological prophylaxis may be sufficient (7, 8).

The present study aimed to evaluate perioperative changes in hematological and biochemical markers (Hb, Hct, PLT, MPV, fibrinogen, D-dimer, and CRP) in patients undergoing EVLA for CVI. The main objective was to determine whether there is an early postoperative tendency toward bleeding or thrombosis, and whether these changes normalize by the 10th postoperative day.

2. Materials and Methods

This retrospective study was conducted at the Department of Cardiovascular Surgery, Burdur State Hospital, between January 1, 2025, and September 1, 2025. Patients diagnosed with chronic venous insufficiency who underwent endovenous laser ablation (EVLA) and had accessible preoperative and postoperative laboratory data were included.

The study protocol was approved by the Ethics Committee of Süleyman Demirel University (Decision Date: 04.07.2025; Approval No: 46). All procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

EVLA procedures were performed using a 1470-nm diode laser system with a radial fiber (ELVeS Radial, Biolitec AG, Jena, Germany) under spinal anesthesia. The laser energy was applied in continuous pull-back mode at an average power of 8–10 W, corresponding to a linear endovenous energy density (LEED) of approximately 60–80 J/cm, depending on vein diameter and segment length. In addition, tumescent anesthesia (0.05% lidocaine with epinephrine) was infiltrated perivenously along the treated vein under ultrasound guidance.

Hematological and biochemical parameters, including hemoglobin, hematocrit, platelet count, mean platelet volume (MPV), fibrinogen, D-dimer, and C-reactive protein (CRP), were recorded at three time points: preoperatively, on postoperative day 1, and on postoperative day 10. Postoperatively, procedural success and venous occlusion were evaluated during the routine outpatient follow-up visit on postoperative day 10 using Doppler ultrasonography. The treated vein was assessed for complete occlusion and for the presence of thrombotic extension consistent with endothermal heat–induced thrombosis.

Patients who underwent additional venous interventions other than EVLA, including concomitant phlebectomy or treatment of small saphenous vein insufficiency, were excluded from the study, as these combined procedures could potentially influence hematological and biochemical parameters. Accordingly, the study population consisted exclusively of patients who underwent isolated EVLA for great saphenous vein insufficiency.

Patients were excluded for preoperative deep vein thrombosis or superficial thrombophlebitis, perioperative thrombotic complications, or incomplete laboratory data. In addition, patients with

active malignancy, rheumatologic or systemic inflammatory diseases, active infection or inflammatory focus at the time of the procedure, known congenital or acquired platelet function disorders, a history of previous surgical or endovenous intervention for chronic venous insufficiency, or the use of medications known to affect platelet function or mean platelet volume (including antiplatelet agents, anticoagulants, corticosteroids, or cytotoxic drugs) were also excluded from the study.

Statistical analysis was performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using the Shapiro–Wilk test. Data with normal distribution were expressed as mean ± standard deviation (SD) and compared using the paired Student's t-test, whereas non-normally distributed variables were presented as median (interquartile range, IQR) and compared using the Wilcoxon signed-rank test. A p-value < 0.05 was considered statistically significant.

3. Results

A total of 24 patients were included in the study. The mean age was 48.4 ± 11.6 years (range: 27–72), with an equal distribution of females (n=12, 50%) and males (n=12, 50%). Hemoglobin and hematocrit values were significantly reduced on postoperative day 1 compared with baseline (both $p < 0.001$). By postoperative day 10, these parameters showed partial recovery toward preoperative levels; however, the differences remained statistically significant (hemoglobin: $p = 0.039$; hematocrit: $p = 0.041$) (Table 1). Platelet counts (PLT) showed a significant decrease on postoperative day 1 compared with baseline ($p < 0.001$). By postoperative day 10, platelet levels had returned to or slightly exceeded preoperative values, and no statistically significant difference was observed ($p = 0.742$). Mean platelet volume (MPV) demonstrated a mild decrease on postoperative day 1 ($p = 0.004$), followed by a modest increase by postoperative day 10 ($p = 0.047$) (Table 2). Fibrinogen levels did not differ significantly between the preoperative and postoperative day 1 measurements (p=0.143). However, a significant increase was observed between postoperative day 1 and day 10 (p=0.018). D-dimer levels were markedly elevated on postoperative day 1 compared with baseline (p<0.001). By postoperative day 10, a significant reduction was observed (p<0.001), and values approached preoperative levels (p=0.107). CRP levels were significantly elevated on postoperative day 1 (p=0.004). By postoperative day 10, CRP values had declined, but no significant difference was noted (Table 3).

Table 1. Changes in Hemoglobin and Hematocrit Levels Before and After EVLA

Parameter	Preoperative Median (IQR)	Postoperative day 1 Median (IQR)	Postoperative day 10 Median (IQR)	p value (PRE vs Day1)	p value (PRE vs Day10)
Hemoglobin (g/dL)	14,73	13,43	14,39	**p<0,001**	**p = 0,039**
Hematocrit (%)	44,32	40,55	42,16	**p<0,001**	**p = 0,041**

IQR: Interquartile range

Table 2. Platelet Count and Mean Platelet Volume (MPV) at Different Time Points

Parameter	Preoperative Median (IQR)	Postoperative day 1 Median (IQR)	Postoperative day 10 Median (IQR)	p value (PRE vs Day1)	p value (PRE vs Day10)
Mean Platelet Volume	7,65	7,36	7,93	**p=0,004**	**p=0,047**
Platelet (×10⁹/L)	244,5	209	263	**p<0,001**	p=0,742

IQR: Interquartile range

Table 3. Changes in Fibrinogen, D-dimer and C-reactive Protein (CRP) Levels Following EVLA

Parameter	Preoperative Median (IQR)	Postoperative day 1 Median (IQR)	Postoperative day 10 Median (IQR)	p value (PRE vs Day1)	p value (PRE vs Day10)
Fibrinojen (mg/dL)	280	262	275,5	p=0,143	**p=0,018**
D-dimer (ng/mL)	170	438	205	**p<0,001**	p=0,107
C-Reactive Protein (mg/L)	2,5	6,5	3	**p<0,001**	p=0,107

IQR: Interquartile range

4. Discussion

Our study demonstrated that EVLA leads to transient hematological and biochemical alterations in the postoperative period. Hemoglobin and hematocrit values significantly decreased on postoperative day 1. The observed decrease in hemoglobin and hematocrit levels in the early postoperative period may be related to transient perioperative hemodynamic changes, including minor procedural factors and fluid shifts, rather than clinically significant blood loss. Partial recovery was observed by day 10, but values did not return completely to baseline. Similarly, Arase et al. reported that appropriate varicose vein treatment is associated with reductions in systemic inflammatory biomarkers (6). Previous studies have demonstrated that, due to the disease itself, certain sensitive biochemical parameters may be elevated during the preoperative period. Following surgery, some parameters may subsequently decrease to levels even below preoperative values. In our study, among the parameters evaluated, fibrinogen levels were significantly higher in the preoperative period compared to postoperative day 10 (9).

The decrease in platelet count and the transient increase in MPV observed in our cohort reflect platelet consumption and activation. Sarica et al. emphasized that MPV may serve as a marker of thrombotic tendency in patients with chronic venous insufficiency and following interventions (10). Likewise, Guven and Dogukan reported significant changes in platelet count and MPV after cyanoacrylate embolization (11).

The marked rise in D-dimer levels on postoperative day 1 reflects activation of the coagulation and fibrinolytic systems. This finding indicates that the risk of thrombotic activity may increase in the immediate postoperative period but tends to subside by day 10. Dzieciuchowicz et al. compared hemostatic activation following EVLA, RFA, and surgical stripping, and similarly found a transient but significant postoperative increase (12). Keo et al. also investigated venous thrombosis after EVLA and demonstrated that the risk was lower in patients who received thromboprophylaxis (7).

The increase in fibrinogen levels by day 10 suggests a delayed acute-phase response, while CRP elevations on day 1 reflect the inflammatory nature of EVLA. Hinterhuber et al. observed comparable fluctuations in hemostatic parameters following varicose vein surgery (13).

5. Limitations

This study has some limitations, including the relatively small sample size and its single-center design, which may limit the generalizability of the results. Moreover, only short-term follow-up was performed, and long-term changes in inflammatory and thrombotic markers remain to be clarified. Due to the retrospective nature of the study, detailed data regarding the mean diameter of the great saphenous vein and the severity of venous reflux could not be consistently obtained and therefore were not included in the analysis. Another limitation of this study is the lack of standardized fasting conditions and a predefined blood sampling protocol for laboratory measurements, which could not be consistently ensured due to the retrospective study design. Future multicenter studies with larger cohorts and longer follow-up periods are warranted to confirm these findings and to identify patient subgroups who may benefit from prophylactic strategies.

6. Conclusion

Endovenous laser ablation is associated with transient changes in inflammatory and thrombotic markers in the early postoperative period. These alterations largely return toward baseline levels by postoperative day 10. The findings are consistent with existing literature and support the short-term hematological and biochemical safety of EVLA.

.

REFERENCES

1. Ortega MA, Fraile-Martínez O, García-Montero C, Álvarez-Mon MA, Chaowen C, Ruiz-Grande F, et al. Understanding Chronic Venous Disease: A Critical Overview of Its Pathophysiology and Medical Management. J Clin Med. 2021;10(15).
2. Karathanos C, Spanos K, Batzalexis K, Nana P, Kouvelos G, Rousas N, et al. Prospective comparative study of different endovenous thermal ablation systems for treatment of great saphenous vein reflux. J Vasc Surg Venous Lymphat Disord. 2021;9(3):660-8.
3. El Kilic H, Bektas N, Bitargil M, Balkaya IA, Demir T, Koramaz I. Long-term outcomes of endovenous laser ablation, n-butyl cyanoacrylate, and radiofrequency ablation for treatment of chronic

venous insufficiency. J Vasc Surg Venous Lymphat Disord. 2022;10(4):865-71.
4. Pavei P, Spreafico G, Bernardi E, Giraldi E, Ferrini M. Favorable long-term results of endovenous laser ablation of great and small saphenous vein incompetence with a 1470-nm laser and radial fiber. J Vasc Surg Venous Lymphat Disord. 2021;9(2):352-60.
5. Eggen CAM, Alozai T, Pronk P, Mooij MC, Gaastra MTW, Ünlü Ç, et al. Ten-year follow-up of a randomized controlled trial comparing saphenofemoral ligation and stripping of the great saphenous vein with endovenous laser ablation (980 nm) using local tumescent anesthesia. J Vasc Surg Venous Lymphat Disord. 2022;10(3):646-53.e1.
6. Arase H, Sugasawa N, Kawatani Y, Sugano M, Kurobe H, Fujimoto E, et al. Appropriate Surgical Treatment of Symptomatic Primary Varicose Veins Decreases Systemic Inflammatory Biomarkers. Ann Vasc Dis. 2019;12(3):367-71.
7. Keo HH, Knoechel J, Diehm N, Kalka C, Staub D, Gaehwiler R, et al. Venous thrombosis following endovenous laser ablation with and without thromboprophylaxis. J Vasc Surg Venous Lymphat Disord. 2024;12(1):101656.
8. Keo HH, Spinedi L, Staub D, Diehm N, Holtz D, Broz P, et al. Duration of pharmacological thromboprophylaxis after outpatient endovenous laser ablation: a propensity score-matched analysis. Swiss Med Wkly. 2019;149:w20166.
9. Kalinin R, Suchkov I, Kamaev A, Mzhavanadze N, Povarov V. Effects of low-energy EVLA with the use of a 1470-nm laser on vascular inflammation and remodeling parameters in patients with chronic venous disease. Lasers in Medical Science. 2025;40(1):516.
10. Mehmet Akif Sarıca, Betül Kızıldağ, Mustafa Yavuz Selçuk, Ayşe Şahin Tutak, Ali Haydar Baykan, Hacı Taner Bulut, et al. Mean Platelet Volume in Patients with Chronic Venous Insufficiency. Journal of Clinical and Experimental Investigations. 2016;7(1):73-7.
11. Güven C, Doğukan M. Siyanoakrilat ile Safen Ven Embolizasyonunda Ortalama Trombosit Hacmi ve Trombosit Sayısının Değişimi. Harran Üniversitesi Tıp Fakültesi Dergisi. 2019;16(2):272-9.
12. Dzieciuchowicz L, Espinosa G, Páramo JA. Haemostatic activation and inflammatory response after three methods of treatment of great saphenous vein incompetence. Phlebology. 2014;29(3):154-63.
13. Hinterhuber G, Böhler K, Kittler H, Quehenberger P. Extended monitoring of hemostatic activation after varicose vein surgery under general anesthesia. Dermatol Surg. 2006;32(5):632-9.