J Surg Med. 2020;4(12):1133-1136.
DOI: 10.28982/josam.819626

Research article
Araştırma makalesi

Journal of Surgery and Medicine
e-ISSN=2602-2079

Effect of classical surgical treatment under spinal anesthesia on venous thromboembolism in varicose veins patients

Klasik cerrahi tedavinin spinal anestezi altında varisli hastalarda venöz tromboembolizme etkisi

Mevlüt Doğukan [1], Esma Kaplan Çalışkan [1]

[1] Department of Anesthesiology and Reanimation, Faculty of Medicine, Adıyaman University, Adıyaman, Turkey

ORCID ID of the author(s)

MD: 0000-0002-4890-758X
EKÇ: 0000-0002-2399-8534

Corresponding author/Sorumlu yazar:
Mevlüt Doğukan
Address/Adres: Adıyaman Üniversitesi Tıp Fakültesi Anesteziyoloji ve Reanimasyon Anabilim Dalı, Adıyaman, Türkiye
E-mail: drmevlud@hotmail.com

Ethics Committee Approval: The study was approved by the Adıyaman University Ethics Committee for Non-Invasive Research (2018/5-40). All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.
Etik Kurul Onayı: Çalışma Adıyaman Üniversitesi İnvaziv Olmayan Araştırmalar Etik Kurulu (2018 / 5-40) tarafından onaylandı. İnsan katılımcıların katıldığı çalışmalardaki tüm prosedürler, 1964 Helsinki Deklarasyonu ve daha sonra yapılan değişiklikler uyarınca gerçekleştirilmiştir.

Conflict of Interest: No conflict of interest was declared by the authors.
Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Financial Disclosure: The authors declared that this study has received no financial support.
Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

Published: 12/30/2020
Yayın Tarihi: 30.12.2020

Abstract

Aim: Although minimally invasive methods have developed rapidly in the treatment of varicose veins in recent years, high ligation + stripping (S/L), which is the classical surgical treatment, is still considered gold standard. Some thromboembolic events may occur due to varicose disease. Our aim is to determine the changes in mean platelet parameters after the procedure in patients who underwent S/L with spinal anesthesia and investigate the effect of this procedure on thromboembolic events.

Methods: Patients who visited the Anesthesia Reanimation outpatient clinic of Adiyaman University Faculty of Medicine and underwent S/L with spinal anesthesia were evaluated in this retrospective cohort study. Data was collected electronically with file scanning. Patients whose hemograms were obtained before and 1 day after the operation were included. Among the laboratory tests, MPV, PLT, platelet distribution width (PDW) and plateletcrit (PCT) were noted.

Results: Postoperative MPV (P<0,001) and PLT (P=0.01) values showed a significant decrease compared to the preoperative period, while PDW (P=0.194) and PCT (P=0.863) values remained similar.

Conclusion: If it is assumed that varicose veins and MPV are associated with thromboembolic events, a significant decrease in postoperative MPV value in patients who underwent S / L with spinal anesthesia will reduce thromboembolic events.

Keywords: Mean platelet volume, Thromboembolism, Stripping and ligation, Spinal anesthesia

Öz

Amaç: Varis tedavisinde minimal invaziv yöntemler özellikle son yıllarda hızla gelişme göstermesine rağmen klasik cerrahi tedavi olan yüksek ligasyon+stripping (S/L) halen altın standart kabul edilir. Varis hastalığına bağlı bazı tromboembolik olaylar meydana gelebilmektedir. Amacımız, spinal anestezi ve S/L uygulaması olan hastalarda işlem sonrası ortalama trombosit parametrelerindeki değişiklikleri belirlemek ve bu işlemin tromboembolik olaylara etkisini araştırmaktır.

Yöntemler: Bu çalışma retrospektif kohort çalışması olarak tasarlandı. Çalışmaya dahil edilen hastalar Adıyaman Üniversitesi Tıp Fakültesi Anestezi Reanimasyon polikliniğine başvuran ve spinal anestezi ile S/L yapılan hastalardan seçildi. Veriler elektronik ortamda dosya taraması şeklinde toplandı. Dosya taramasından operasyon öncesi ve 1 gün sonrası hemogram alınan hastalar çalışmaya dahil edildi. Laboratuvar tetkiklerinden MPV, PLT, trombosit dağılım genişliği (PDW) ve plateletcrit (PCT) tespit edilerek kaydedildi. İstatistiksel analizler SPSS 22,0 kullanılarak yapıldı.

Bulgular: Postoperatif MPV (P<0,001) ve PLT (P=0,01) değeri preoperatif döneme göre anlamlı düşüş gösterdi. PDW (P=0,194) ve PCT (P=0,863) değerlerinde postoperatif 1. gün, preoperatif döneme göre anlamlı bir değişim olmadığı görüldü.

Sonuç: Spinal anestezi altında S/L uygulanan hastalarda postoperatif MPV değerinde anlamlı bir düşüş gözlenmesi, varis hastalığının ve MPV ün tromboembolik olaylarla ilişkili olduğu varsayılırsa uygulanan cerrahi tromboembolik olayları azaltır.

Anahtar kelimeler: Mean platelet volüm, Tromboembolizm, Stripping ve ligasyon, Spinal anestezi

How to cite/Atıf için: Doğukan M, Çalışkan EK. Effect of classical surgical treatment under spinal anesthesia on venous thromboembolism in varicose veins patients. J Surg Med. 2020;4(12):1133-1136.

Introduction

Varicose veins and chronic venous insufficiency is a disease with high prevalence: It affects about half of the population [1,2]. Advanced age, sedentary lifestyle, positive family history, smoking, trauma, obesity, and previous thromboembolism play a role in the etiology [3]. Although minimally invasive methods such as thermal or non-thermal endovascular ablation have developed rapidly in recent years, the classical surgical method is still considered the gold standard treatment [2,4]. It is known that the tendency to thromboembolic events increases in patients with advanced varicose veins [5].

Stasis, slowing in blood flow and turbulence in varicose veins can activate coagulation mechanisms. Phlebothrombosis progresses to thrombophlebitis, which is a particularly painful condition. Delay in intervention may dislodge clots in the venous system and cause a severe and mortal complication, such as pulmonary embolism. This clinical progression can be prevented with timely treatments [5].

Many studies have shown that platelets play a role in cardiovascular events. Increased MPV levels are associated with an increased risk of thromboembolism [6,7]. Platelets, heterogeneous in activity and size, contain mitogenic and chemotactic factors that cause neointimal proliferation.

The most commonly used measure of platelet size is MPV. It is inexpensive and can be easily detected from the hemogram obtained from almost all patients undergoing surgery. Increased MPV is associated with increased platelet activity [8].

Our aim is to examine the changes in MPV and thrombocytes following the surgery, and the effect of varicose treatment on thrombogenicity in patients undergoing varicose vein surgery under spinal anesthesia, in light of the literature.

Materials and methods

The patients were selected from those who applied to Adıyaman University Faculty of Medicine Anesthesia Reanimation outpatient clinic between June 2018-December 2020 and underwent varicose vein surgery under spinal anesthesia. Adıyaman University Ethics Committee for Non-Invasive Research approved this retrospective cohort study with the reference number 2018/5-40. Patient data were obtained digitally with file scanning. Among 97 patients operated for varicose veins, 49 patients who had pre- and postoperative hemograms were included (Confidence interval: 95% (P<0.05), power: 80%). Patients with acute or chronic deep vein thrombosis, using anticoagulants for any other reason, those with peripheral artery disease, diabetes and those not receiving spinal anesthesia were not included in the study.

Blood samples for MPV and other platelet parameters were collected in tubes containing Ethylene Diamine Tetra Acetic Acid (EDTA) after an overnight fast and analyzed in the Cell DynRuby blood counter within half an hour. Coefficient of variation (inter assay) was <5 % in all measurements.

Statistical analysis

Analyses were performed with SPSS 22.0. The distribution of variables was evaluated with the Kolmogorov-Smirnov test. Descriptive statistics were presented as mean, standard deviation, median, lowest, highest, frequency and ratio values. A *P*-value of <0.05 was considered significant.

Results

A total of 49 patients (27 males, 22 females) who underwent S / L under spinal anesthesia with preoperative and postoperative hemogram values were included in the study. The mean age and body mass index values were 41.57 (11.3) years and 27.16 (3.26) kg/m^2, respectively (Table 1). The patients' white blood cell (WBC) (*P*<0.001), hemoglobin (HBG) (*P*=0.08) and hematocrit (HCT) (*P*<0.001) values showed a significant change on postoperative day 1 compared to the preoperative period (Table 2).

Table 1: Demographic data

		Min-Max	Median	Mean (SD)
Age		20-67	41.57	41.57(11.85)
BMI		19.40-35.40	27.50	27.16 (3.2)
		n (%)		
Gender	Male	27(55.1)		
	Female	22(44.89)		

Min: Minimum, Max: Maximum, SD: Standard deviation

Table 2: Preoperative and postoperative 1st day WBC, HBG and HCT values

	Min-max	Median	Mean (SD)	*P*-value
WBC				
Preoperative	4.50-17.50	7.80	8.48(2.73)	<0.001
Postoperative	5.40-14.50	10.30	10.13(2.37)	
HG				
Preoperative	9.90-17.30.	14.4	14.10(1.7)	0.008
Postoperative	9.20-17.10	13.6	13.67(1.8)	
HCT				
Preoperative	34.7-52.0	43.7	40.50 (4.0)	<0.001
Postoperative	31.4-50.0	41.0	840.50(4.8)	

WBC: White Blood Cell, HGB: Hemoglobin, HCT: Hematocrit, SD: Standard Deviation

On the 1st postoperative day, MPV (*P*<0.001) and PLT (*P*=0.001) values decreased significantly compared to the preoperative values, while platelet distribution width (*P*=0.194) and plateletcrit *(P*=0.863) values remained similar (Table 3). No thromboembolic event was noted in any of the patients in the study series.

Table 3: Preoperative and postoperative 1st day platelet parameters

	Min-max	Median	Mean (SD)	*P*-value
PLT				
Preoperative	80-349	227	229.28 (7.78)	0.001
Postoperative	72-343	206	212.26 (7.76)	
MPW				
Preoperative	5.6-15.7	7.4	8.1 (2.1)	0.000
Postoperative	4.9-16	6.8	7.3 (2.0)	
RDV				
Preoperative	11.30-22.1	18.6	17.6 (2.8)	0.194
Postoperative	10.8-22.8	18.9	17.9 (3.0)	
PCT				
Preoperative	0.08-0.65	0.17	0.18 (0.08)	0.863
Postoperative	0.08-09	0.15	018 (0.15)	

PLT: Platelet, PCT: Plateletcrit, MPV: Average platelet volume, PDW: Platelet distribution width, SD: Standard deviation

Discussion

Traditional anesthesia methods used in surgical treatments of varicose veins are general and spinal anesthesia [9]. Complications such as respiratory problems, nausea, vomiting and deep vein thrombosis are known to occur less frequently in spinal anesthesia compared to general anesthesia [10]. Neuraxial blocks reduce peripheral vasodilation and vascular resistance by creating efferent autonomic block and sympathetic block in nerve roots at the spinal level. [11]. After sympathetic block, tissue perfusion index increases, and tissue oxygenation improves. In a study performed on 355 patients who underwent classical varicose veins surgery, 10 patients (2.8%) received general anesthesia, 80 patients (22.5%), peripheral border block, and 265 patients (74.6%), spinal anesthesia [12].

In our study, the effects of classical varicose vein surgical treatment, performed under spinal anesthesia, on thromboembolic events was investigated. We showed that the postoperative value of MPV, which is predictive of venous thromboembolic events, significantly decreased compared to the preoperative period. This was an important result in terms of showing the protective effect of varicose surgery performed under spinal anesthesia against thromboembolic events.

Due to chronic venous insufficiency, venous hypertension and slow flow in varicose veins, intravascular coagulation mechanisms are activated. The event begins as superficial thrombophlebitis characterized by edema, pain, and hyperemia. If left untreated, this process may extend into the deep veins, causing deep vein thrombosis and even pulmonary embolism with high mortality. Varicose veins were detected in 32-100% of patients with superficial venous thrombophlebitis. Pulmonary embolism and deep vein thrombosis can develop in patients with varicose veins. Therefore, treatment of varicose veins is important [13,14]. Virchow's triad, consisting of endothelial damage, hypercoagulability, and stasis, plays a significant role in the etiopathogenesis of venous thromboembolism. Venous stasis is expected in patients with varicose veins, especially in those with dense pacts, which predisposes to thromboembolic events [15].

Inflammation and thrombogenic events cause changes in PLT size, which is determined by MPV and routine analyzers. MPV is affected by PLT aging and varies with turnover balance. Platelets, nucleated cells synthesized from megakaryocytes, play a role in vasoconstriction, hemostasis, vascular endothelial repair, and host defense. Recent studies have shown that atherogenesis formation is also effective in the development of many hematological diseases, tumor growth factor release and metastasis [16,17].

MPV is an inexpensive and easily measurable marker of platelet functions and activity. It is used in many routine clinical and preoperative applications. According to many reviews, increased MPV is associated with increased mortality in acute coronary syndromes, acute ischemic cerebrovascular events, and venous thromboembolic events [18–21].

In their study conducted with a total of 1094 patients, Chang et al. [17] showed that higher MPV in patients with acute coronary syndrome was associated with higher cardiovascular risk factors and higher cardiovascular events. Adam et al. [19] demonstrated that MPV, RDW and WBC are independent predictors of short-term mortality, and they are used in conjunction with coagulation profiles in the diagnosis of acute coronary syndrome in patients presenting with chest pain. Mayda-Domaç et al. [22] showed that MPV may be an early and important predictor for ischemic stroke, but the number of PLT plays a role in the outcome in hemorrhagic stroke. Again, in a different study of 327 patients, Farah et al. [21] concluded that MPV and the neutrophil-to-lymphocyte ratio may be useful for early detection of acute venous thromboembolism.

In thromboembolism, laboratory values are mostly used in differential diagnosis. Thrombocyte and platelet indices (such as MPV, platelet distribution width (PDW), plateletcrit (PCT)) increase in thromboembolic events. Normally, there is an inverse proportion between Platelets and MPV. Large MPV indicates low platelet count. Large platelets have been shown to contain more granules, are more adhesive, more metabolically and enzymatically active, more tightly bound to collagen, and therefore have increased thrombogenic properties [23].

Factors involved in the formation of varicose veins cause the remodeling of the vascular wall, the destruction and failure of the venous valves. With the inclusion of leukocyte-mediated inflammation, it may cause endothelial dysfunction, edema, ulcers and, in advanced stages, deep vein thrombosis [15]. All these events cause an increase in thrombocyte volume, a.k.a. MPV, in patients with varicose veins.

MPV can be studied on all hematology devices. Although the normal reference range varies depending on the device used, it is 7.2-11.7 fL. This value is affected by many factors, such as the device used, the tubes from which the blood samples are obtained, operating time, seasonal changes and even altitude [24].

In our study, blood samples were collected in tubes containing EDTA and studied within half an hour. There was no infectious disease, diabetes or other hematological diseases in patients that would affect MPV value. In addition, control blood samples were taken on the first postoperative day, preventing the result from being affected by intervening diseases. To the best of our knowledge, there has been no previous study in the literature investigating thromboembolic events with MPV value after surgical treatment under spinal anesthesia in varicose veins patients. None of the patients developed thromboembolic events postoperatively.

Limitations

The small number of patients, the retrospective nature of the study and the lack of a control group were the main limitations of our study. We believe that more effective results can be obtained with further prospective, controlled study conducted on larger patient populations.

Conclusions

Considering that MPV is involved in thromboembolic events, treatment of varicose veins may prevent related complications. We showed that a decrease in MPV can be achieved by treatment of varicose veins with the classical surgical method under spinal anesthesia.

Acknowledgements

I would like to thank a member of our faculty, a cardiovascular surgeon who I am happy to work with, Dr. Cengiz Güven, for sharing valuable information.

References

1. Callam MJ. Epidemiology of varicose veins. Br J Surg. 1994 Feb;81(2):167-73. doi: 10.1002/bjs.1800810204. PMID: 8156326.
2. Güven C, Haydar AB. Comparison of stripping/ligation and embolization with cyanoacrylate in venous insufficiency treatment. J Surg Med. 2020;4(5):400-5.
3. Youn YJ, Lee J. Chronic venous insufficiency and varicose veins of the lower extremities. Korean J Intern Med. 2019 Mar;34(2):269-83. doi: 10.3904/kjim.2018.230. Epub 2018 Oct 26. PMID: 30360023; PMCID: PMC6406103.
4. Güven C. Use of Cyanoacrylate in Venous Insufficiency and Varise Treatement and its Results. FÜ Sağ Bil Tıp Derg. 2020;34 (1):07-11.
5. Cosmi B. Management of superficial vein thrombosis. J Thromb Haemost. 2015 Jul;13(7):1175-83. doi: 10.1111/jth.12986. Epub 2015 May 25. PMID: 25903684.
6. Davi G, Patrono C. Platelet activation and atherothrombosis. N Engl J Med. 2007 Dec 13;357(24):2482-94. doi: 10.1056/NEJMra071014. PMID: 18077812.7.
7. Koza K, Grzelązka P, Trofimiuk A, Suppan K, Wasielewski M, Wiśniewska J, et al. Clinical risk factors for loss of stent primary patency in patients with chronic legs ischemia. Adv Clin Exp Med. 2017 Mar-Apr;26(2):311-8. doi: 10.17219/acem/58997. PMID: 28791851.
8. Rao AK, Goldberg RE, Walsh PN. Platelet coagulant activities in diabetes mellitus. Evidence for relationship between platelet coagulant hyperactivity and platelet volume. J Lab Clin Med. 1984 Jan;103(1):82-92. PMID: 6690642.9.

9. Memetoglu ME, Kurtcan S, Kalkan A, Özel D. Combination technique of tumescent anesthesia during endovenous laser therapy of saphenous vein insufficiency. Interact Cardiovasc Thorac Surg. 2010 Dec;11(6):774-7. doi: 10.1510/icvts.2010.240762. Epub 2010 Sep 16. PMID: 20847066.
10. Bar-Or D, Lau E, Winkler JV. A novel assay for cobalt-albumin binding and its potential as a marker for myocardial ischemia-a preliminary report. J Emerg Med. 2000 Nov;19(4):311-5. doi: 10.1016/s0736-4679(00)00255-9. PMID: 11074321.
11. Demirel CB, Kalayci M, Ozkocak I, Altunkaya H, Ozer Y, Acikgoz B. A prospective randomized study comparing perioperative outcome variables after epidural or general anesthesia for lumbar disc surgery. J Neurosurg Anesthesiol. 2003 Jul;15(3):185-92. doi: 10.1097/00008506-200307000-00005. PMID: 12826965.
12. Özyaprak B, Anarat K, Erkan G, Kahraman N, Retrospective evaluation of anesthesia methods applied in varicose surgery in our clinic. 6th Rize Thematic Anesthesia Symposium E-booklet. 2019:22-27.
13. Demirel CB, Kalayci M, Ozkocak I, Altunkaya H, Ozer Y, Acikgoz B. A prospective randomized study comparing perioperative outcome variables after epidural or general anesthesia for lumbar disc surgery. J Neurosurg Anesthesiol. 2003 Jul;15(3):185-92. doi: 10.1097/00008506-200307000-00005. PMID: 12826965.
14. Lee SH, Kim WH. Superficial Vein Thrombosis and Severe Varicose Veins Complicating Venous Thromboembolism. J Cardiovasc Imaging. 2019 Apr;27(2):154-5. doi: 10.4250/jcvi.2019.27.e14. PMID: 30993952; PMCID: PMC6470065..
15. Wu NC, Chen ZC, Feng IJ, Ho CH, Chiang CY, Wang et al.,Severe varicose veins and the risk of mortality: a nationwide population-based cohort study. BMJ Open. 2020 Jun 21;10(6):e034245. doi: 10.1136/bmjopen-2019-034245. PMID: 32565451; PMCID: PMC7311034.
16. Gasparyan AY, Ayvazyan L, Mikhailidis DP, Kitas GD. Mean platelet volume: a link between thrombosis and inflammation? Curr Pharm Des. 2011;17(1):47-58. doi: 10.2174/138161211795049804. PMID: 21247392.
17. Altunisik N, Turkmen D, Sener S. Investigation of the relationship between inflammatory blood parameters and rosacea and demodex infestation. J Cosmet Dermatol. 2020 Aug;19(8):2105-8. doi: 10.1111/jocd.13254. Epub 2019 Dec 16. PMID: 31840349.
18. Chang HY, Hsu LW, Lee CH, Lin CC, Huang CW, Chen PW, et al. Impact of Platelet Volume on the Clinical Outcomes of Patients with Acute Coronary Syndrome. Acta Cardiol Sin. 2019 Nov;35(6):563-70. doi: 10.6515/ACS.201911_35(6).20190423B. PMID: 31879507; PMCID: PMC6859097.
19. Adam AM, Ali MA, Shah AA, Rizvi AH, Rehan A, Godil A, et al. Efficacy of Hematological and Coagulation Parameters in the Diagnosis and Prognosis of Patients with Acute Coronary Syndrome. J Tehran Heart Cent. 2018 Jul;13(3):115-25. PMID: 30745924; PMCID: PMC6368913.
20. Sadeghi F, Kovács S, Zsóri KS, Csiki Z, Bereczky Z, Shemirani AH. Platelet count and mean volume in acute stroke: a systematic review and meta-analysis. Platelets. 2020 Aug 17;31(6):731-9. doi: 10.1080/09537104.2019.1680826. Epub 2019 Oct 26. PMID: 31657263.
21. Farah R, Nseir W, Kagansky D, Khamisy-Farah R. The role of neutrophil-lymphocyte ratio, and mean platelet volume in detecting patients with acute venous thromboembolism. J Clin Lab Anal. 2020 Jan;34(1):e23010. doi: 10.1002/jcla.23010. Epub 2019 Sep 11. PMID: 31508844; PMCID: PMC6977138.
22. Mayda-Domaç F, Misirli H, Yilmaz M. Prognostic role of mean platelet volume and platelet count in ischemic and hemorrhagic stroke. J Stroke Cerebrovasc Dis. 2010 Jan;19(1):66-72. doi: 10.1016/j.jstrokecerebrovasdis.2009.03.003. PMID: 20123229.
23. Machin SJ, Briggs C. Mean platelet volume: a quick, easy determinant of thrombotic risk? J Thromb Haemost. 2010 Jan;8(1):146-7. doi: 10.1111/j.1538-7836.2009.03673.x. Epub 2009 Oct 30. PMID: 19874471.
24. Beyan C, Beyan E. Were the measurements standardized sufficiently in published studies about mean platelet volume? Blood Coagul Fibrinolysis. 2017 Apr;28(3):234-6. doi: 10.1097/MBC.0000000000000586. PMID: 27388283.

This paper has been checked for language accuracy by JOSAM editors.
The National Library of Medicine (NLM) citation style guide has been used in this paper.