https://doi.org/10.30702/ujcvs/23.31(01)/KhCh004-7479
UDC 616-616.1-616-08

Yaroslav V. Khrebtiy[1, 2], Ph.D., Surgical Director, Associate Professor of the Department of Endoscopic and Cardiovascular Surgery, https://orcid.org/0000-0002-0721-076X

Larisa M. Chernukha[3], Doctor of Medical Science, Professor, https://orcid.org/0000-0003-3101-4133

Oleh M. Skupyy[1], Ph.D., Head of the Vascular Department, https://orcid.org/0000-0003-4178-4078

Viacheslav M. Maiko[1], Doctor of Medical Science, Head of the Traumatological Department, https://orcid.org/0000-0002-0715-4104

Halyna I. Khrebtii[4], Ph.D., Associate Professor of the Department of Internal Medicine, Physical Rehabilitation and Sports Medicine, https://orcid.org/0000-0002-5177-6277

[1]Vinnytsia Regional Pyrohov Clinical Hospital, Vinnytsia, Ukraine

[2]National Pirogov Memorial Medical University, Vinnytsia, Ukraine

[3]Shalimov National Institute of Surgery and Transplantation, Kyiv, Ukraine

[4]Bukovinian State Medical University, Chernivtsi, Ukraine

Treatment of Venous Thromboembolism in Trauma Patients: Features and Possibilities

Abstract

The aim. Treatment of venous thromboembolism continues to be one of the most controversial problems of modern angiology. This issue is especially relevant in the treatment of patients with traumatological pathology.

Methods. Treatment of 1915 patients with fractures of lower extremities from 2017 to 2022 at the Vinnytsia Regional Pyrohov Clinical Hospital was analyzed. During the study period, 727 (38%) deep vein thromboses were diagnosed.

Results. During the study period, 4 (0.2%) pulmonary embolisms were diagnosed, among which 3 (0.15%) were fatal.

In 99.5% of patients with venous thrombosis and injuries, it was possible to achieve clinical improvement and regression of the thrombotic process.

Conclusions. Treatment tactics for trauma patients with venous thromboembolism should be individualized and take into account the severity and localization of the injury, the need and urgency of trauma surgery, the risk of pulmonary embolism.

Keywords: *deep vein thrombosis, pulmonary embolism, cava filters.*

Introduction. To date, the treatment of venous thromboembolism (VTE) continues to be a serious problem. The active development of modern technologies does not allow this problem to be fully resolved. In the USA, more than 500 000 VTE-related deaths are registered annually, and healthcare costs associated with VTE account for 7-10 billion USD each year [1].

If we talk about trauma patients, the statistics of the problem are more impressive. Patients with fractures have 2.8 times higher risk of VTE. The risk of VTE hospitalization was 4.2-fold greater in the time period when immobility occurred [2]. Results of previous studies suggest that patients with a hip fracture have considerably high prevalence of preoperative VTE ranging from 9% to 12.7% [3]. Despite the use of modern approaches and technologies for the prevention and treatment of VTE, the level of thromboembolic complications remains high [4, 5, 6].

Materials and methods. The treatment of 1915 patients with fractures of lower extremities at the Vinnytsia Regional Pyrohov Clinical Hospital from 2017 to 2022 was analyzed. There were 650 (33.9%) patients with hip fracture, 800 (41.8%) with tibial fracture, 45 (2.3%) with vertebral fracture, 120 (6.2%) with pelvic fracture, 300 (15.6%) with humerus fracture. VTE was diagnosed in 727 (38%) patients. There were 1014 (53%) women, 936 (47%) men. The age of the patients ranged from 18 to 90 years.

During the study period, 727 (38%) deep vein thromboses (DVTs) were diagnosed. Among them, venous thrombosis was detected in 348 (48%) patients with hip fractures, in 297 (41%) patients with tibial fractures, in 74 patients (10%) with pelvis fractures, in 3 (0.41%) patients with humerus fracture, and in 5 (0.68%) patients with spine fracture (Table 1). Floating thrombosis was diagnosed in 35 patients (4.8%) with DVT.

To prevent thromboembolic complications, temporary cava filters were implanted in 8 (0.4%) patients, and in one case a permanent cava filter was implanted.

For the diagnosis of VTE, clinical examination with an assessment of the patient's condition based on the Wells score was used. Duplex scanning of the veins of the lower extremities was used for instrumental diagnosis of all patients with injuries who came to the clinic since 2019.

This method of diagnosis is non-invasive, allows diagnosing thrombotic masses in asymptomatic patients who do not have clinical manifestations. Duplex scanning makes it possible to determine the localization of the thrombotic process, the extent of occlusion, the presence of flotation, the echogenicity of thrombotic masses, which can indirectly characterize the time that has passed since the start of thrombotic process.

All the trauma patients underwent standard prophylaxis of thromboembolic complications using anticoagulant therapy and elastic compression according to the TESS score [7]. Patients diagnosed with DVT were treated with therapeutic doses of anticoagulants (enoxaparin and rivaroxaban). In the absence of emergency and urgent indications, conservative treatment was carried out for a month with subsequent control and, in the absence of negative dynamics, surgical intervention.

If urgent surgical intervention was needed in the case of traumatological pathology and venous thrombosis, treatment tactics were developed, based on the fact that the risk of thromboembolic complications in this category of patients is as high as possible, since the thrombotic masses are fresh, which can lead to their migration in the proximal direction and progression of thrombosis during surgery.

The situation was complicated by the fact that therapeutic doses of anticoagulants were inappropriate in this situation, since they significantly increase the risk of intraoperative bleeding. Thus, we used temporary cava filters for the prevention of thromboembolic complications in this category of patients.

In the presence of floating thrombosis of deep veins in trauma patients, anticoagulant therapy was prescribed with subsequent follow-up. In the case of regression of flotation, treatment was carried out with the use of therapeutic doses of anticoagulants and, if necessary, subsequent elective surgical intervention. When maintaining flotation, depending on the risk of thromboembolic complications, the question of thrombectomy or implantation of a cava filter was considered.

In case of the need for emergency surgical intervention due to traumatological pathology and the presence of a floating part of the thrombus, the issue of implantation of a cava filter was considered.

Results and discussion. In our study, cava filters were implanted in 9 patients who were admitted to the trauma department with injuries and indications for urgent surgical interventions and in whom DVT was diagnosed during the preoperative examination using duplex scanning of the veins of the lower extremities. All these patients underwent emergency surgical interventions due to the injury. It should be noted that, in 6 cases these patients had contraindications for anticoagulant therapy.

Two patients had bleeding gastric ulcer. These patients were scheduled to undergo hip replacement, which carried a high risk of intra- and postoperative bleeding due to the trauma of the surgical intervention. Thus, implantation of a temporary cava filter allowed surgical intervention without the risk of bleeding and eliminated the risk of thromboembolic complications, taking into account the presence of DVT of the proximal segment in these patients.

In 3 cases, temporary cava filters were implanted in patients with floating DVT and indications for trauma surgery. Anticoagulant therapy was prescribed and the patients were followed-up. If the floating nature of the thrombosis was maintained and it was impossible to postpone the traumatic surgical intervention, the patients underwent implantation of a cava filter with its subsequent removal after the surgical intervention.

The absence of thromboembolic complications and massive bleeding in this group of patients showed sufficient effectiveness of such tactics.

During the study period, 4 (0.2%) pulmonary embolisms were diagnosed, among which 3 (0.15%) were fatal. All the patients who developed complications in the form of pulmonary embolism (PE) had asymptomatic venous thrombosis, duplex scanning of veins was not performed, the diagnosis was confirmed by autopsy data.

Table 1

Distribution of patients according to clinical and ultrasound examination methods

Location of fractures	Number of patients (% of the total number of patients)	Number of patients with venous thrombosis (% of the total number of patients with venous thrombosis)
Hip	650 (33.9%)	348 (48%)
Tibia	800 (41.8%)	297 (41%)
Spine	45 (2.3%)	5 (0.68%)
Pelvis	120 (6.2%)	74 (10%)
Humerus	300 (15.6%)	3 (0.41%)
Total	1915 (100%)	727 (100%)

In 99.5% of patients with venous thrombosis and injuries, it was possible to achieve clinical improvement and regression of the thrombotic process.

The problem of VTE in trauma patients attracts the attention of specialists all over the world. Most of the works are devoted to the prevention of venous thromboembolic complications [8, 9]. If we talk about treatment, the amount of data is limited. During an injury, all components of Virchow's triad appear in patients, and this quite often leads to the formation of thrombotic masses in the lumen of the deep veins of the lower extremities. Preoperative DVT in trauma patients is known to occur in as high as 9% to 62% of patients receiving prophylaxis [10, 11].

Clinical data are used for diagnosis, for which purpose the Wells score was introduced into clinical practice, which allows determining the probability of venous thrombosis [12]. According to this scale, almost all trauma patients have high probability of venous thrombosis. Duplex scanning is widely used for instrumental confirmation of the diagnosis [13]. For the diagnosis of proximal DVT, duplex ultrasonography provides a sensitivity of 94–97% and a specificity of 98%. Ultrasonography has a positive predictive value of 100% and a negative predictive value of 100% for symptomatic DVT [14, 15].

Considering the high clinical probability of venous thrombosis in trauma patients, in our opinion, it is necessary to visualize the patency of the deep venous system in all trauma patients. According to European Society for Vascular Surgery guidelines for patients with suspected DVT requiring imaging, ultrasound is recommended as the first modality (IC class) [13]. Some authors talk about the expediency of using spiral computed tomography venography in trauma patients [9]. In our opinion, computed tomography venography has a high cost, while the sensitivity and specificity of the method is almost equal to those of duplex scanning. Thus, in our clinic, we use duplex scanning in all trauma patients to rule out venous thrombotic complications.

This is how we can explain the rather large percentage of venous thrombosis in our trauma patients. The expediency of total screening of hospitalized patients is shown by the fact that deaths related to VTE in our observation group were observed at the beginning of the study, when total screening was not performed. The patients had asymptomatic DVT, they underwent surgical intervention with the use of prophylactic doses of anticoagulants, which is insufficient in DVT.

This led to the progression of venous thrombosis, migration of thrombotic masses in the proximal direction and the occurrence of fatal PE in the intra- and postoperative period. After total screening of patients and detection of symptomatic and asymptomatic DVT, followed by development of the necessary treatment tactics, not a single case of fatal PE was noted.

Regarding treatment tactics, the study by Erkens et al., 2010, proved the advantage of using low molecular weight heparin (LMWH) over unfractionated heparin in the treatment of patients with venous thrombosis. Thrombotic complications were detected in 3.6% of patients receiving LMWH, while in the unfractionated heparin group it was 6.3%. Also, the use of LMWH demonstrated lower risk of bleeding (1% and 2.1%, respectively) [16].

In the EINSTEIN-DVT and EINSTEIN-PE study, the results of treatment of 8282 patients with VTE were analyzed. The use of rivaroxaban at a dose of 15 mg twice a day for 21 days with a subsequent transition to 20 mg and enoxaparin at a dose of 1 mg/kg twice a day with a subsequent transition to vitamin K antagonist was compared. Efficacy was slightly greater in rivaroxaban (2.1% VTE recurrence compared to 2.3% in the enoxaparin group), while the rate of bleeding was significantly lower in the rivaroxaban group (1% and 1.7%, respectively) [17].

Thus, the EINSTEIN randomized trial demonstrated the efficacy and safety of rivaroxaban for the treatment of VTE. Thus, for the treatment of trauma patients with VTE, we used anticoagulant therapy using LMWH and rivaroxaban.

The problem of treatment of venous thrombosis in trauma patients is that a significant percentage of patients require surgical treatment of trauma pathology, which significantly increases the risk of complications during surgical treatment of existing venous thrombosis. Most treatment guidelines suggest medical assessment of hip fracture patients and immediate surgical intervention, and recommend early surgical treatment within the first 48 hours after admission [18, 19]. In the literature, we found only separate reports devoted to this issue [8]. Thus, the problem lies in the formation of a treatment strategy taking into account the need for traumatological treatment and the risks of thromboembolic complications.

In our opinion, the risk of thromboembolic complications during the treatment of venous thrombosis is increased for 21 days when clot retraction processes occur. This explains why, in the EINSTEIN study, increased doses of rivaroxaban 15 mg twice a day in the treatment of VTE were used for 21 days with a subsequent dose reduction to 20 mg a day.

Thus, in the presence of indications for surgical treatment in trauma patients with venous thrombosis, we treated venous thrombosis with therapeutic doses of LMWH for 21 days, followed by trauma surgery with a reduction in the dose of anticoagulants to prevent intraoperative bleeding.

The use of cava filters for the prevention of extranodal thromboembolic complications has been studied in a recent randomized, open-label, blinded end-point trial (PREPIC 2, Prevention of Recurrent Pulmonary Embolism by Vena Cava Interruption) [20]. A 6-month follow-up study in 17 French centers investigated 200 acute PE patients with a combination of anticoagulation therapy and retrievable inferior vena cava filters and 199 patients with the use of anticoagulants alone. In the cava filter group, the

filter was successfully inserted in 193 patients and was retrieved as planned in 153 of the 164 patients in whom retrieval was done at 3 months. By 3 months, recurrent PE occurred in 6 (3.0%) patients in the cava filter group and in 3 (1.5%) patients in the group with anticoagulation alone. Among the 193 patients in the cava filter group, access site hematoma occurred in 5 (2.6%), filter thrombosis in 3 (1.6%) and retrieval failure due to mechanical reasons in 11 (5.7%) patients.

Thus, most guidelines do not recommend routine use of cava filters for VTE. However, the level of evidence is quite low: Grade 3B according to the guidelines of the European Society for Vascular Surgery (ESVS) as well as those of the American College of Chest Physicians (ACCP). ACCP also recommends against using cava filters for VTE prevention in orthopedic surgery patients (Grade 2C) [13, 8]. In the European Society of Cardiology guidelines for the diagnosis and treatment of PE, this is the IIIA level of evidence [21]. The recommendations of the Western Trauma Association mention the use of cava filters in case of contraindications to anticoagulation in trauma patients [22].

The European Society of Cardiology guidelines for the diagnosis and treatment of PE show feasibility of using cava filters in case of contraindications to anticoagulation or ineffectiveness of anticoagulant therapy with the IIaC level of evidence [21]. Thus, we can state that, despite objections to the routine use of cava filters in some cases, modern recommendations allow the use of cava filters, especially in trauma patients. Attention should also be paid to the rather low level of evidence for recommendations on this issue, which allows specialists to make a final decision based on their own experience and a specific clinical situation.

At the same time, there are no recommendations in situations regarding the presence of VTE in trauma patients before surgical intervention due to trauma. This issue is raised only in individual works. Researchers talk about the expediency of preoperative screening of trauma patients for VTE, as the presence of venous thrombosis during hip fracture surgery can lead to fatal PE.

It is recommended to implant temporary cava filters in a limited number of patients with DVT before the need for urgent surgical intervention due to trauma, when pharmacological prophylaxis is not possible. The possibility of using more aggressive methods of removing thrombotic masses is also indicated [3].

We believe that indications for implantation of cava filters in trauma patients with DVT may be contraindications to anticoagulant therapy, the need for urgent surgical intervention due to trauma pathology, and impossibility of prescribing adequate doses of anticoagulants or the presence of floating thrombosis.

The absence of thromboembolic complications and massive bleeding in this category of patients showed sufficient effectiveness of such treatment tactics.

Conclusion. Thus, the conducted research made it possible to form the following conclusions:

Treatment tactics for trauma patients with VTE should be individualized and take into account the severity and localization of the injury, the need and urgency of trauma surgery, the massiveness and nature of the damage to the venous system, the risk of PE, concomitant pathology.

It is necessary to carry out total screening using duplex scanning of the veins of the lower extremities in trauma patients if surgical intervention is necessary.

Anticoagulant therapy with therapeutic doses for one month in the presence of DVT allows to maximally reduce the risk of thromboembolic complications in the subsequent traumatic surgical intervention.

Implantation of a temporary cava filter in a limited number of patients with DVT and absolute contraindications to anticoagulant therapy and floating thrombosis allows to carry out traumatological surgical interventions under urgent indications and in cases when postponing surgical intervention due to traumatic pathology is not possible.

References

1. He LX, Xie JY, Lv J, Liu H, Liao DB, Wang GL, et al. Quality evaluation of clinical practice guidelines for thromboprophylaxis in orthopaedic trauma based on AGREE II and AGREE-REX: a systematic review protocol. BMJ Open. 2022;12(11):e059181. https://doi.org/10.1136/bmjopen-2021-059181
2. Rogers MA, Levine DA, Blumberg N, Flanders SA, Chopra V, Langa KM. Triggers of Hospitalization for Venous Thromboembolism. Circulation. 2012;125(17):2092-9. https://doi.org/10.1161/CIRCULATIONAHA.111.084467
3. Barceló M, Torres OH, Mascaró J, Casademont J. Hip fracture and mortality: study of specific causes of death and risk factors. Arch Osteoporos. 2021;16(1):15. https://doi.org/10.1007/s11657-020-00873-7. Erratum in: Arch Osteoporos. 2021 Mar 4;16(1):53.
4. Khrebtiy Y, Chernukha L. Is there a place for aggressive tactics in the treatment of deep vein thrombosis today? Clinical case of aspiration thrombectomy in the treatment of deep vein thrombosis. Acta Phlebol. 2021;22(2):61-8. https://doi.org/10.23736/S1593-232X.20.00476-2
5. Chernuha LM, Skupii OM, Mitiuk OI, Khrebtiy YV. [Some Aspects of Treatment of Deep Venous Thrombosis of the Inferior Vena Cava System Complicated by Pulmonary Embolism – Opportunities and Outcomes]. Novosti Khirurgii. 2015;23(3):309-13. Russian. https://doi.org/10.18484/2305-0047.2015.3.309
6. Khrebtiy YV. [An Integrated Approach to the Treatment of Pulmonary Embolism: Current State of the Problem]. Ukrainian Journal of Cardiovascular Surgery. 2022;30(2):39-43. Ukrainian. https://doi.org/10.30702/ujcvs/22.30(02)/Kh026-3943
7. Ho KM, Rao S, Rittenhouse KJ, Rogers FB. Use of the Trauma Embolic Scoring System (TESS) to Predict Symptomatic Deep Vein Thrombosis and Fatal and Non-

Fatal Pulmonary Embolism in Severely Injured Patients. Anaesth Intensive Care. 2014;42(6):709-14. https://doi.org/10.1177/0310057X1404200605
8. Falck-Ytter Y, Francis CW, Johanson NA, Curley C, Dahl OE, Schulman S, et al. Prevention of VTE in Orthopedic Surgery Patients: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest. 2012;141(2 Suppl):e278S-e325S. https://doi.org/10.1378/chest.11-2404
9. Li J, Zhu Y, Chen W, Zhao K, Zhang J, Meng H, et al. Incidence and locations of deep venous thrombosis of the lower extremity following surgeries of tibial plateau fractures: a prospective cohort study. J Orthop Surg Res. 2020;15(1):605. https://doi.org/10.1186/s13018-020-02136-0
10. Sedani A, Yakkanti R, Allegra P, Mattingly L, Aiyer A. Thromboprophylaxis across orthopaedic surgery: Bibliometric analysis of the most cited articles. J Clin Orthop Trauma. 2021;16:157-67. https://doi.org/10.1016/j.jcot.2020.12.015. Erratum in: J Clin Orthop Trauma. 2021 Aug 05;21:101560.
11. Yang W, Wei Q, Wang H, Ding K, Li M, Li C, et al. Preoperative incidence and risk factors of deep venous thrombosis in patients with isolated femoral shaft fracture. BMC Surg. 2022;22(1):83. https://doi.org/10.1186/s12893-022-01534-x
12. Imura M, Yamamoto T, Hiasa KI. Pulmonary Thromboembolism Developed During Hospitalization: A Nationwide Retrospective Observational Study Using Claims Data. Cardiol Ther. 2022 Dec 8:1-15. https://doi.org/10.1007/s40119-022-00290-6. Epub ahead of print.
13. Kakkos SK, Gohel M, Baekgaard N, Bauersachs R, Bellmunt-Montoya S, Black SA, et al. Editor's Choice – European Society for Vascular Surgery (ESVS) 2021 Clinical Practice Guidelines on the Management of Venous Thrombosis. Eur J Vasc Endovasc Surg. 2021;61(1):9-82. https://doi.org/10.1016/j.ejvs.2020.09.023
14. Ngarmukos S, Kim KI, Wongsak S, Chotanaphuti T, Inaba Y, Chen CF, et al.; Asia-Pacific (AP) Region Venous Thromboembolism (VTE) Consensus Group. Asia-Pacific venous thromboembolism consensus in knee and hip arthroplasty and hip fracture surgery: Part 1. Diagnosis and risk factors. Knee Surg Relat Res. 2021;33(1):18. https://doi.org/10.1186/s43019-021-00099-y
15. Canakci ME, Acar N, Bilgin M, Kuas C. Diagnostic value of point-of-care ultrasound in deep vein thrombosis in the emergency department. J Clin Ultrasound. 2020;48(9):527-31. https://doi.org/10.1002/jcu.22892.
16. Erkens PM, Prins MH. Fixed dose subcutaneous low molecular weight heparins versus adjusted dose unfractionated heparin for venous thromboembolism. Cochrane Database Syst Rev. 2010;(9):CD001100. https://doi.org/10.1002/14651858.CD001100.pub3
17. Prins MH, Lensing AW, Bauersachs R, van Bellen B, Bounameaux H, Brighton TA, et al.; EINSTEIN Investigators. Oral rivaroxaban versus standard therapy for the treatment of symptomatic venous thromboembolism: a pooled analysis of the EINSTEIN-DVT and PE randomized studies. Thromb J. 2013;11(1):21. https://doi.org/10.1186/1477-9560-11-21
18. National Institute for Health and Care Excellence. Venous thromboembolism in over 16s: reducing the risk of hospital-acquired deep vein thrombosis or pulmonary embolism. NICE guideline [NG89] [Internet]. Published: 2018 March 21 [updated: 2019 August 13; cited 2022 Dec 25]. Available from: www.nice.org.uk/guidance/ng89
19. Pankratz C, Cintean R, Boitin D, Hofmann M, Dehner C, Gebhard F, et al. Early Surgical Care of Anticoagulated Hip Fracture Patients Is Feasible-A Retrospective Chart Review of Hip Fracture Patients Treated with Hip Arthroplasty within 24 Hours. J Clin Med. 2022;11(21):6570. https://doi.org/10.3390/jcm11216570
20. Young T, Sriram KB. Vena caval filters for the prevention of pulmonary embolism. Cochrane Database Syst Rev. 2020;10(10):CD006212. https://doi.org/10.1002/14651858.CD006212.pub5
21. Konstantinides SV, Meyer G, Becattini C, Bueno H, Geersing GJ, Harjola VP, et al.; ESC Scientific Document Group. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). Eur Heart J. 2020;41(4):543-603. https://doi.org/10.1093/eurheartj/ehz405
22. Ley EJ, Brown CVR, Moore EE, Sava JA, Peck K, Ciesla DJ, et al. Updated guidelines to reduce venous thromboembolism in trauma patients: A Western Trauma Association critical decisions algorithm. J Trauma Acute Care Surg. 2020;89(5):971-81. https://doi.org/10.1097/TA.0000000000002830

Лікування венозного тромбоемболізму у травматологічних хворих: особливості та можливості

Хребтій Я. В.[1, 2], канд. мед. наук, керівник хірургічної служби, доцент кафедри ендоскопічної та серцево-судинної хірургії

Чернуха Л. М.[3], д-р мед. наук, професор

Скупий О. М.[1], канд. мед. наук, завідувач центру серцево-судинної хірургії

Майко В. М.[1], д-р мед. наук, завідувач центру травматології

Хребтій Г. І.[4], канд. мед. наук, доцент кафедри внутрішньої медицини, фізичної реабілітації та спортивної медицини

[1]Вінницька обласна клінічна лікарня ім. М. І. Пирогова, м. Вінниця, Україна

[2]Вінницький національний медичний університет ім. М. І. Пирогова, м. Вінниця, Україна

[3]Національний інститут хірургії та трансплантології імені О. О. Шалімова, м. Київ, Україна

[4]Буковинський державний медичний університет, м. Чернівці, Україна

Резюме

Вступ. Лікування венозного тромбоемболізму продовжує залишатися однією з найбільш дискусійних проблем сучасної ангіології. Особливо актуальним це питання постає при лікуванні пацієнтів з травматологічною патологією.

Методи. Проаналізовано лікування 1915 хворих з переломами нижніх кінцівок з 2017 по 2022 рік у Вінницькій обласній клінічній лікарні ім. М. І. Пирогова. За період дослідження було діагностовано 727 (38 %) тромбозів глибоких вен.

Результати. За період дослідження діагностовано 4 (0,2 %) випадки тромбоемболії легеневої артерії, серед яких 3 (0,15 %) летальні.

У 99,5 % пацієнтів з венозним тромбозом і травмами вдалося досягти клінічного поліпшення і регресу тромботичного процесу.

Висновки. Тактика лікування травматологічних хворих з венозним тромбоемболізмом має бути індивідуальною та враховувати тяжкість і локалізацію ушкодження, необхідність і терміновість травматологічного хірургічного втручання, ризик тромбоемболії легеневої артерії.

Ключові слова: *тромбози глибоких вен, тромбоемболія легеневої артерії, кава-фільтри.*

Стаття надійшла в редакцію / Received: 18.01.2023
Після доопрацювання / Revised: 06.02.2023
Прийнято до друку / Accepted: 14.03.2023