

Article

Effects of inferior vena cava filter implantation on anxiety and clinical outcomes in patients with malignancy-associated lower extremity deep vein thrombosis

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Abstract: Background: The incidence of lower extremity deep vein thrombosis (LEDVT) in patients with malignant tumors is relatively high, which brings a significant economic burden and affects prognosis. The use of inferior vena cava (IVC) filter implantation in these patients provides a new approach to optimize disease treatment. **Aim:** To analyze the impact of IVC filter implantation on the anxiety levels and complications in patients with malignant tumors and LEDVT. **Methods:** A total of 90 eligible cases treated in our hospital from February 2021 to October 2023 were selected and randomly divided into a control group and an observation group, each with 45 cases, using the random number table method. The control group was treated with edoxaban, while the observation group was treated with a combination of IVC filter implantation. The levels of anxiety, lower limb circumference, thrombus removal effect, hematological indicators, and the incidence of treatment-related complications in the two groups were compared. In addition to routine clinical indicators, standardized psychometric instruments were used to quantitatively assess anxiety levels before and after treatment. Changes in psychological status were compared between groups alongside somatic and hematological outcomes. **Results:** After treatment, the Self-Rating Anxiety Scale (SAS) scores in the observation group were lower than those in the control group ($P < 0.05$); there were significant differences in the intergroup, time, and interaction effects on the lower limb healthy-affected side circumference difference after treatment ($P < 0.05$), and the observation group had a lower limb healthy-affected side circumference difference than the control group at 1 week after treatment and at discharge ($P < 0.05$); the thrombus removal success rate in the observation group was 88.89%, significantly higher than the 71.11% in the control group ($P < 0.05$); after treatment, the improvement in D-dimer (D-D) and activated partial thromboplastin time (APTT), prothrombin time (PT), fibrinogen (FIB), and thrombin time (TT) in the observation group was better than that in the control group ($P < 0.05$); there was no significant difference in the incidence of treatment-related complications between the two groups ($P > 0.05$). **Conclusion:** IVC filter implantation can alleviate the anxiety of patients with malignant tumors and LEDVT, improve the effect of thrombus removal, and will not significantly increase the risk of complications. It is worth promoting in clinical practice.

Keywords: inferior vena cava filter implantation; malignant tumors; lower extremity deep vein thrombosis; anxiety; complications

1. Introduction

Lower extremity deep vein thrombosis (LEDVT) is one of the common complications in patients with malignant tumors. It is mainly caused by extensive thrombus formation in the return veins, which can lead to obstruction of lower

extremity venous return, venous hypertension, and valve destruction. The main clinical manifestations are swelling and pain in the affected limb, and in severe cases, limb ischemic necrosis [1]. According to surveys [2], compared with healthy individuals, the risk of thrombosis formation in patients with malignant tumors has increased by 4–7 times, and by 6.5 times during chemotherapy. Additionally, some studies have reported [3] that about 20%–30% of the first venous thrombosis events are related to malignant tumors, mainly due to blood hypercoagulability caused by tumors, lower extremity venous return obstruction caused by tumor compression, and prolonged bed rest after tumor resection. These factors not only exacerbate the patient's condition, extend the patient's hospital stay, and increase hospital costs, but also impose a heavy mental burden on the patient, leading to varying degrees of anxiety. In the past, clinical treatment for such diseases mainly used anticoagulant therapy, supplemented by symptomatic treatment with thrombolysis and antiplatelet aggregation. Edoxaban is a new type of anticoagulant drug that does not require routine monitoring of coagulation indicators during use, but the drug takes effect slowly and may have recurring conditions [4,5].

Lower extremity deep vein thrombosis (LEDVT) is one of the common complications in patients with malignant tumors. In addition to its well-established physiological burden, LEDVT represents a significant psychological stressor. The coexistence of malignancy and thrombotic disease often exposes patients to prolonged hospitalization, uncertainty regarding prognosis, and fear of fatal complications such as pulmonary embolism. These factors contribute to a high prevalence of anxiety and emotional distress in this population.

From a psychosomatic perspective, anxiety is not merely a reactive emotional state but may exert bidirectional effects on disease progression. Sustained anxiety has been shown to activate the hypothalamic–pituitary–adrenal axis and sympathetic nervous system, potentially aggravating hypercoagulability, impairing immune function, and reducing treatment compliance. Therefore, incorporating validated psychometric tools into clinical studies of LEDVT is essential for a more comprehensive evaluation of treatment efficacy.

In recent years, the application of inferior vena cava (IVC) filter implantation in the treatment of LEDVT has become more widespread. The combination with anticoagulant drugs can not only prevent patient death from recent pulmonary embolism but also reduce the occurrence of post-thrombotic syndrome in the long term, which is of positive significance for improving patient prognosis. However, there are few reports on its intervention in patients with malignant tumors and LEDVT [6,7]. In view of this, this study innovatively proposes to use IVC filter implantation for the treatment of patients with malignant tumors and LEDVT, and to observe the treatment effect, as follows.

2. Materials and methods

2.1. Participant characteristics

Between February 2021 and October 2023, 90 participants who met the inclusion and exclusion criteria were identified and randomly assigned to two groups of 45 participants each. In the control group, the ratio of males to females was 20:25, with a

mean age of 55.16 ± 4.33 years; there were 33 participants in the acute phase and 12 in the subacute phase of the disease. In the intervention group, the ratio of males to females was 19:26, with a mean age of 55.13 ± 4.25 years; there were 32 participants in the acute phase and 13 in the subacute phase. Comparative analysis of the demographic data between groups showed no significant differences ($P > 0.05$) (Table 1).

Table 1. Baseline data sheet for patients in both groups.

Baseline characteristics	Control group (n = 45)	Intervention group (n = 45)	P
Age (years)	55.16 ± 4.33	55.13 ± 4.25	0.92
Male: Female ratio	20:25	19:26	0.78
Disease phase (n)			
Acute	33	32	0.84
Subacute	12	13	0.84
Weight (kg)	65.4 ± 7.2	64.9 ± 7.1	0.67
Tumor type (n)			
Lung cancer	15	14	
Gastric cancer	10	11	
Colorectal cancer	8	7	
Breast cancer	7	8	
Others	5	5	
Comorbidities (n)			
Hypertension	12	13	
Diabetes	9	8	
Coronary heart disease	5	6	
Others	4	3	
Previous thrombotic history (n)	6	5	0.74
Pre-treatment limb circumference difference (cm)	2.1 ± 0.6	2.0 ± 0.5	0.56
Pre-treatment D-Dimer (mg/L)	1.8 ± 0.4	1.7 ± 0.3	0.42
Pre-treatment a PTT (s)	32.5 ± 3.1	32.3 ± 3.0	0.76
Pre-treatment PT (s)	12.1 ± 1.2	12.0 ± 1.1	0.68
Pre-treatment fibrinogen (g/L)	3.2 ± 0.5	3.1 ± 0.4	0.59
Pre-treatment thrombin time (s)	16.2 ± 1.8	16.0 ± 1.7	0.64

Eligibility Criteria: No prior anticoagulation or thrombolytic treatment; Lower extremity deep vein thrombosis confirmed by venous imaging; Malignant tumors confirmed by pathological examination; Availability of complete clinical records; Informed consent obtained.

Exclusion Criteria: Anticipated survival of less than 3 months; Concurrent multiple organ dysfunctions, such as cardiovascular and cerebrovascular diseases,

hepatic or renal disorders, cardiac conditions, etc.; Presence of hemorrhagic disorders like active ulcers, hemorrhagic stroke, coagulation disorders, etc.; Recent alternative treatment regimens or known drug allergies; Extensive or severe pulmonary embolism with a critical prognosis; Inability to cooperate fully with the study requirements.

Study Design: Participants in the control group were administered edoxaban, whereas those in the intervention group underwent a combined treatment protocol involving the implantation of an inferior vena cava filter. Statistical analyses were conducted utilizing SPSS 26.0 software and Excel for data management and calculations.

2.2. Study Protocol

The control group was treated with edoxaban, a novel anticoagulant drug (manufactured by Boehringer Ingelheim International GmbH, with the national drug approval number J20171035). The drug was administered orally at a dose of 150mg, twice daily, for a continuous period of three months.

The intervention group received additional treatment with inferior vena cava (IVC) filter implantation. Patients were instructed to lie flat in the supine position. Standard disinfected drapes were applied, and a rapid venous access was established. After local anesthesia took effect, the renal vein level was marked based on the results of venography. The entire filter release system was flushed, and the short dilator included in the packaging was used to dilate along the guide wire. The outer sheath and its accompanying long dilator were inserted as a single unit through the guide wire. The appropriateness of the front end insertion position was checked, typically fixed when it was deeper than the level of the deep venous plane, and the sheath was then retracted and the valve at the end of the sheath was closed. The sheath was flushed to prevent thrombosis, and the filter delivery device was inserted, ensuring that its tip was below the level of the renal vein opening. After retracting the sheath, the handle's spiral interface was tightened slowly to release the filter. The sheath was slowly retracted by 3 cm for IVC venography to check if the filter implantation was satisfactory, and if no abnormalities were found, the catheter was removed.

This translation and modification aim to maintain the academic tone and precision required for a scientific manuscript, ensuring that the terminology and procedures are accurately represented.

2.3. Observational indicators

(1) **Anxiety Levels.** The Self-Rating Anxiety Scale (SAS) was employed to assess anxiety before and after treatment. The scale consists of 20 items rated on a 4-point scale based on the frequency of symptoms: "1" for none; "2" for a short time; "3" for a long time; "4" for most or all of the time. The total score is 100, with scores above 50 indicating anxiety, where 50–59 is mild anxiety, 60–69 is moderate anxiety, and above 70 is severe anxiety.

(2) **Lower Extremity Circumference.** Measurements were taken at two sites on the lower limb before treatment, one week after treatment, and at discharge. The sites selected were 15 cm above the patella (Segment A) and 10 cm below the tibial tuberosity (Segment B). Corresponding levels were measured on both the healthy and

affected limbs, and the difference in circumference between the two sides was recorded.

(3) Thrombus Removal Effectiveness. Venous patency scoring was conducted on six segments: lower extremity veins, common iliac veins, external iliac veins, common femoral veins, superficial femoral veins, and popliteal veins, according to the standards set by Porter et al. The scoring criteria are as follows: 0–3 points correspond to fully patent, subsegmental non-occlusive thrombus, subsegmental occlusive thrombus, and full segment occlusive thrombus, respectively. The thrombus removal rate was calculated as the difference in venous patency score after treatment divided by the pre-treatment score. The clearance rate classification standards are as follows: >90%, 50% to 90%, and <50% are considered Grade III, Grade II, and Grade I, respectively. Successful clearance is defined as achieving Grade II or higher.

(4) Hematological Parameters. Fasting venous blood (2 ml) was collected before and after treatment. After centrifugation at 3000 rpm, serum D-dimer (D-D) and four coagulation parameters were measured: activated partial thromboplastin time (APTT), prothrombin time (PT), fibrinogen (FIB), and thrombin time (TT).

(5) Treatment-Related Complications. Records were kept of any bleeding events (subcutaneous hematoma, hematuria, gastrointestinal bleeding) and acute pulmonary embolism that occurred during treatment in both groups.

2.4. Statistical methods

The SPSS26.0 statistical software. Measurement data accord with normal distribution ($X \pm s$), t-test; count data is expressed by rate (%), (X^2 test; different measures (F) for comparison of different measurement data; $P < 0.05$ is statistically significant.

3. Results

3.1. Anxiety

The anxiety score in the observation group was lower than that in the control group ($P < 0.05$). See **Table 2**.

Table 2. Comparison of Anxiety Levels Between the Two Groups ($\bar{x} \pm s$, score).

Group	Before treatment	After treatment
Control ($n = 45$)	58.31 ± 3.16	42.65 ± 2.98^a
Observation ($n = 45$)	58.52 ± 3.29	34.19 ± 2.43^a
t	0.309	14.759
P	0.758	<0.001

Note: The symbol “a” indicates a statistically significant difference compared to before treatment within the same group.

3.2. Surrounding diameter of lower limbs

There were significant differences between groups, time, and interaction in the peripheral diameter of lower limb patients after treatment ($P < 0.05$). See **Table 3**.

Table 3. Comparison of the lateral peripheral diameter difference in the two groups ($\bar{x} \pm s$, cm).

Group	A			B		
	Before	1 week	At discharge	Before	1 week	At discharge
control ($n = 45$)	4.41 $\pm$ 0.42	3.35 $\pm$ 0.29	2.42 $\pm$ 0.22	3.38 $\pm$ 0.36	2.38 $\pm$ 0.22	1.72 $\pm$ 0.16
Observation ($n = 45$)	4.38 $\pm$ 0.40	2.67 $\pm$ 0.26	1.78 $\pm$ 0.19	3.36 $\pm$ 0.33	1.98 $\pm$ 0.19	1.23 $\pm$ 0.14
F_{time}/P	8.129/<0.001			9.542/<0.001		
$F_{interblock}/P$	12.391/<0.001			13.169/<0.001		
$F_{interactive}/P$	14.529/<0.001			16.375/<0.001		

3.3. Effect of thrombus removal

The success rate of thrombus clearance in the observation group was 88.89% significantly higher than that in the control group, 71.11% ($P < 0.05$). See **Table 4**.

Table 4. Comparison of thrombus clearance effects in the two groups (n , %).

group	I	II	III	Clear success rate
Control ($n=45$)	13 (28.89)	20 (44.44)	12 (26.67)	32 (71.11)
Observation ($n=45$)	5 (11.11)	22 (48.89)	18 (40.00)	40 (88.89)
χ^2				4.444
P				0.035

3.4. Hematological indicators

There was no significant difference between the two groups before treatment ($P > 0.05$), and the improvement was better after treatment ($P < 0.05$). See **Table 5**.

Table 5. Comparison of hematological indicators between the two groups ($\bar{x} \pm s$).

group	D-D (ng/ml)		APTT (s)		PT (s)		FIB (g/L)		TT (s)	
	Before	After	Before	After	Before	After	Before	After	Before	After
Control ($n = 45$)	4.12 $\pm$ 0.89	1.22 $\pm$ 0.25 ^a	31.32 $\pm$ 4.12	34.15 $\pm$ 5.12 ^a	12.03 $\pm$ 2.03	13.85 $\pm$ 2.11 ^a	3.15 $\pm$ 0.21	3.01 $\pm$ 0.18 ^a	18.57 $\pm$ 2.45	25.13 $\pm$ 3.12 ^a
Observation ($n = 45$)	4.15 $\pm$ 0.92	1.09 $\pm$ 0.20 ^a	31.36 $\pm$ 4.08	37.12 $\pm$ 5.43 ^a	12.06 $\pm$ 2.07	15.10 $\pm$ 2.45 ^a	3.12 $\pm$ 0.19	2.78 $\pm$ 0.16 ^a	18.69 $\pm$ 2.51	30.19 $\pm$ 3.67 ^a
t	0.157	2.724	0.046	2.670	0.069	2.593	0.711	6.406	0.230	7.047
P	0.875	0.008	0.963	0.009	0.945	0.011	0.479	<0.001	0.819	<0.001

Note: The symbol “a” indicates a statistically significant difference compared to before treatment within the same group.

3.5. Treatment-related complications

There was no significant difference in the incidence of treatment-related complications between the two groups ($P > 0.05$). See **Table 6**.

4. Discussion

A substantial body of research has indicated that individuals with malignancies are at an elevated risk of thrombus formation when compared to the general population [8–10]. Survey data from the 1990s reveal that the rate of lower extremity deep vein

thrombosis (LEDVT) within a one-year period post-cancer diagnosis was 1%, which escalated to 1.9% and 3.4% by 2004 and 2017, respectively [11]. This heightened susceptibility to thrombosis is observed across a spectrum of malignancies and is intrinsically linked to tumor-specific factors, such as location, stage, and the therapeutic interventions employed. Notably, patients with malignancies in the pancreas, brain, and stomach exhibit a higher predisposition to thrombotic events, with those undergoing chemotherapy experiencing a substantial increase in risk, ranging from 6 to 7 times greater than those not receiving chemotherapy [12,13]. The manifestation of thrombotic complications not only intensifies the medical condition of the patient but also prolongs hospitalization, thereby incurring a significant emotional and physical toll. Consequently, it is imperative to implement prompt preventative strategies to curb thrombus progression, ameliorate symptomatology, and mitigate the likelihood of thrombus-related complications.

Table 6. Treatment-related complications in the two groups (*n*, %).

Group	Ecchymoma	Hematuresis	Hemorrhage of digestive tract	Acute pulmonary embolism	Total
Control (<i>n</i> = 45)	1 (2.22)	0 (0.00)	1 (2.22)	0 (0.00)	2 (4.44)
Observation (<i>n</i> = 45)	1 (2.22)	1 (2.22)	1 (2.22)	0 (0.00)	3 (6.67)
χ^2					0.000
<i>P</i>					1.000

Anticoagulant therapy is currently the standard treatment recommended by guidelines for patients with malignant tumors and lower extremity deep vein thrombosis (LEDVT) [14]. a cutting-edge direct oral anticoagulant (DOAC) and direct thrombin inhibitor (DTI), is characterized by high bioavailability and rapid absorption after administration [15]. It is metabolized by esterases into its active form, which effectively competes for the fibrin-binding site on thrombin, thereby inhibiting fibrin generation and preventing thrombus formation. However, anticoagulant therapy alone does not achieve optimal thrombus dissolution. Residual thrombi may slowly be reabsorbed and partially recanalized over time, but they can also cause permanent damage to venous valve function, increasing the risk of post-thrombotic syndrome [16]. In this study, the observation group, in addition to anticoagulant therapy, also received inferior vena cava (IVC) filter implantation. The results showed that the difference in circumference between the healthy and affected lower limbs of the observation group was significantly lower than that of the control group at one week after treatment and at discharge ($P < 0.05$); the success rate of thrombus removal in the observation group was 88.89%, significantly higher than the 71.11% in the control group ($P < 0.05$), indicating that this combined approach can enhance the therapeutic effect on LEDVT. The IVC filter is designed to prevent detached thrombi from causing pulmonary embolism, and while it does not have a thromboprophylactic effect itself, its implantation before anticoagulation can prevent thrombus detachment. By capturing the thrombus and maintaining the patency of the IVC, it is combined with edoxaban to prevent thrombus propagation and enhance thrombus removal, thereby promoting the swelling reduction of the affected limb [17].

The formation of lower extremity deep vein thrombosis (LEDVT) in patients with

malignant tumors is closely related to blood stasis and a hypercoagulable state. Prolonged treatment of tumors often requires bed rest, which can lead to blood stasis, and the compression of surrounding blood vessels by tumors can also contribute to this condition [18]. Additionally, the interaction between tumor cells and the host's response can trigger a hypercoagulable state. This series of reactions can slow down blood circulation, increasing the risk of LEDVT, which is detrimental to the patient's prognosis and can lead to varying degrees of negative emotions. D-dimer (D-D) and the four common coagulation tests are typical laboratory indicators of blood circulation status in clinical settings. Abnormal changes in these indicators suggest the risk of hypercoagulation and bleeding. A survey before the treatment showed that both groups had increased D-D and fibrinogen (FIB) levels and decreased activated partial thromboplastin time (APTT), prothrombin time (PT), and thrombin time (TT), indicating a hypercoagulable state of the blood [19]. After the treatment, the Self-Rating Anxiety Scale (SAS) scores in the observation group were lower than those in the control group, and the improvement in D-D and coagulation tests was greater in the observation group than in the control group ($P < 0.05$), suggesting that the application of inferior vena cava (IVC) filter implantation can alleviate the negative emotions of patients with malignant tumors and LEDVT and improve the hypercoagulable state of the blood. The IVC filter implantation procedure is short, simple, and cost-effective, with a higher acceptance rate among patients. Moreover, it can effectively treat patients with contraindications to anticoagulant therapy or those with bleeding complications, as it maintains the patency of the IVC, accelerates blood circulation, and alters the hypercoagulable state of the blood. When used in combination with edoxaban, it can exert complementary advantages, not only inhibiting thrombus formation but also capturing thrombi to prevent their detachment and blockage of blood vessels, controlling the progression of the disease, alleviating clinical symptoms, and helping patients maintain a good psychological state and relieve anxiety.

Anxiety, as a common emotional response, tends to show high anxiety levels in disease states, especially in the face of severe diseases such as malignant tumors and blood clots. This anxiety can not only negatively affect the mental health of patients, but can also may interfere with the treatment process and prognosis of the disease through a series of physiological mechanisms. For example, long-term anxiety states may lead to sleep disorders, loss of appetite, and decreased immunity, which can further affect the recovery of their physical function and tolerance to treatment. Moreover, anxiety may cause patients to over-focus on their own physical symptoms, thereby increasing subjective dissatisfaction with treatment effects and over-utilization of medical resources [20]. Therefore, paying attention to and effectively alleviating patients' anxiety is of great significance to improve the treatment effect, improve their quality of life and promote disease rehabilitation. In this study, by comparing the anxiety scores before and after treatment in the two groups, we found that the anxiety level of patients in the combination treatment group was significantly lower than that in the drug treatment group. This result indicates that IVC filter implantation, as an active therapeutic intervention, play an important role not only in thrombus removal, but also alleviate patient anxiety to some extent. This may be related to the relief of concerns about the risk of thrombosis, increased confidence in treatment, and more

adequate doctor-patient communication after the filter implantation treatment.

The results of this study showed no significant difference in the incidence of treatment-related complications between the two groups ($P > 0.05$). According to a survey [21], anticoagulant therapy for malignant tumors and lower extremity deep vein thrombosis (LEDVT) is associated with a higher incidence of complications, with bleeding complications as high as 12% annually. In practical application, it is greatly limited by the risk of bleeding, the course of malignant tumors, and the particularity of treatment. However, the inferior vena cava (IVC) filter insertion procedure does not have the concern of contrast agent damage to kidney function, and the filters used have low blood flow resistance, good biocompatibility, good corrosion resistance, and do not damage the lower extremity veins. The combined use does not significantly increase the risk of complications, indicating that the safety is acceptable.

5. Conclusion

In summary, inferior vena cava (IVC) filter implantation combined with anticoagulant therapy offers significant clinical and psychosocial benefits for patients with malignancy-associated lower extremity deep vein thrombosis (LEDVT). Compared with anticoagulation alone, this combined strategy effectively enhances thrombus clearance, reduces lower limb swelling, and improves coagulation-related parameters without increasing the incidence of treatment-related complications, indicating favorable safety and efficacy. Moreover, standardized psychometric assessment demonstrated that IVC filter implantation was associated with a more pronounced reduction in anxiety levels, suggesting that its therapeutic value extends beyond physical outcomes to meaningful improvements in psychological well-being. Given the close interaction between psychological stress, coagulation status, and treatment adherence, the alleviation of anxiety may further contribute to overall recovery and prognosis. These findings support the use of IVC filter implantation as a valuable adjunct in the comprehensive, patient-centered management of malignant tumor patients complicated by LEDVT, while future studies with larger samples and longer follow-up are warranted to confirm its long-term clinical and psychosocial effects.

Author contributions: Designed the research study, JJ; performed the primary literature review and data extraction, XZ; analyzed the data and wrote the manuscript, XZ, JW and CY; were responsible for revising the manuscript for important intellectual content, JJ. All authors have read and agreed to the published version of the manuscript.

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Ethical approval: The procedures for both T1 and T2 surveys adhered to the (i) Declaration of Helsinki, and (ii) ethical principles for medical, psychological, and sociological research involving human participants. The Wuxi No.2 People's Hospital

(Jiangnan University Medical Center) (NO.2023XY-2) Research Ethics Committee approved the study protocol.

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interest.

References

1. Gloviczki P, Lawrence PF, Wasan SM, et al. The 2023 society for vascular surgery, American venous forum, and American vein and lymphatic society clinical practice guidelines for the management of varicose veins of the lower extremities. Part II. *Journal of Vascular Surgery: Venous and Lymphatic Disorders*. 2024; 12(1): 101670. doi: 10.1016/j.jvsv.2023.08.011
2. Wang L, Li J, Arbitman L, et al. Current advances in the diagnosis and treatment of major myeloproliferative neoplasms. *Cancers (Basel)*. 2025; 17(11): 1834. doi: 10.3390/cancers17111834
3. Cheng S, Gao H, Li Y, et al. Analysis of risk factors of postoperative lower extremity deep venous thrombosis in patients with cervical cancer. *Clinical and Applied Thrombosis/Hemostasis*. 2024; 30: 10760296241240747. doi: 10.1177/10760296241240747
4. Ren Y, Li C, Zhang Y. Preclinical study on a novel fluoroderivative of dabigatran etexilate in animal models. *Journal of Cardiovascular Pharmacology*. 2024; 83(1): 55–63. doi: 10.1097/FJC.0000000000001493
5. Tsujii K, Hattori T, Imaoka A, et al. 5-Fluororacil-Induced gastrointestinal damage impairs the absorption and anticoagulant effects of dabigatran etexilate. *Journal of Pharmaceutical Sciences*. 2018 ; 107(5): 1430–1433. doi: 10.1016/j.xphs.2017.12.023
6. Haddad P, Peng J, Drake M, et al. Inferior vena cava filters: An overview. *Methodist DeBakey Cardiovascular Journal*. 2024; 20(3): 49–56. doi: 10.14797/mdcvj.1346
7. Buchholz J, Ronald J, Smith TP. Lumbar artery pseudoaneurysm following inferior vena cava filter placement. *Journal of Vascular and Interventional Radiology*. 2023; 34(12): 2265–2266. doi: 10.1016/j.jvir.2023.08.027
8. Tefferi A, Vannucchi AM, Barbui T. Essential thrombocythemia: 2024 update on diagnosis, risk stratification, and management. *American Journal of Hematology*. 2024; 99(4): 697–718. doi: 10.1002/ajh.27216
9. Bewersdorf JP, How J, Masarova L, et al. Moving toward disease modification in polycythemia vera. *Blood*. 2023; 142(22): 1859–1870. doi: 10.1182/blood.2023021503
10. EL-Sayed HA, Othman M, Azzam H, et al. Assessing the risk of venous thromboembolism in patients with haematological cancers using three prediction models. *Journal of Cancer Research and Clinical Oncology*. 2023; 149(20): 17771–17780. doi: 10.1007/s00432-023-05475-7
11. Hur JY, Choi N, Choi JH, et al. Risk of thrombosis, hemorrhage and leukemic transformation in patients with myeloproliferative neoplasms: A nationwide longitudinal cohort study. *Thrombosis Research*. 2024; 236: 209–219. doi: 10.1016/j.thromres.2024.03.008
12. Zhou S, Zheng J, Zhai W, et al. Spatio-temporal heterogeneity in cancer evolution and tumor microenvironment of renal cell carcinoma with tumor thrombus. *Cancer Letters*. 2023; 572: 216350. doi: 10.1016/j.canlet.2023.216350
13. Sun B, Ji WD, Wang WC, et al. Circulating tumor cells participate in the formation of microvascular invasion and impact on clinical outcomes in hepatocellular carcinoma. *Frontiers in Genetics*. 2023; 14: 1265866. doi: 10.3389/fgene.2023.1265866
14. Xie Y, Lu Z, Styles IK, et al. Lymphatic uptake of a highly lipophilic protease inhibitor prodrug from a lipid-based formulation is limited by instability in the intestine. *Journal of Pharmaceutical Sciences*. 2024; 113(8): 2342–2351. doi: 10.1016/j.xphs.2024.03.029
15. Zhang J, Tang Y, Gao X, et al. Preparation of time-sequential functionalized zns-zno film for modulation of interfacial behavior of metals in biological service environments. *Biomolecules*. 2024; 14(8): 1041. doi: 10.3390/biom14081041
16. Ruiz-Irastorza G, Tektonidou MG, Khamashta M. Anticoagulant and non-anticoagulant therapy in thrombotic antiphospholipid syndrome: Old drugs and new treatment targets. *Rheumatology (Oxford)*. 2024; 63(SI): SI96–SI106. doi: 10.1093/rheumatology/kead538
17. Bejjani A, Khairani CD, Assi A, et al. When direct oral anticoagulants should not be standard treatment: JACC state-of-the-art review. *Journal of the American College of Cardiology*. 2024; 83(3): 444–465. doi: 10.1016/j.jacc.2023.10.038

18. Hicks AC, Sangroula D, Dwivedi AJ, et al. Inferior vena cava perforation during percutaneous filter removal. *Vascular*. 2024; 32(1): 190–194. doi: 10.1177/17085381221135268
19. Zhang F, Gu J, Li HL; China venous thromboembolism and inferior vena cava filter clinical application cooperation group. diagnosis and treatment of venous thromboembolism and clinical application of inferior vena cava filter in China. *Journal of Vascular Surgery-venous And Lymphatic Disorders*. 2023; 11(6): 1149–1156. doi: 10.1016/j.jvsv.2023.05.003
20. Visconti L, Celi A, Carrozzi L, et al. Inferior vena cava filters: Concept review and summary of current guidelines. *Vascul Pharmacol*. 2024; 155: 107375. doi: 10.1016/j.vph.2024.107375
21. Joosten LPT, van Doorn S, van de Ven PM, et al. Safety of switching from a vitamin k antagonist to a non-vitamin k antagonist oral anticoagulant in frail older patients with atrial fibrillation: Results of the FRAIL-AF randomized controlled trial. *Circulation*. 2024; 149(4): 279–289. doi: 10.1161/CIRCULATIONAHA.123.066485