Deep-Vein Thrombosis Prophylaxis Systematic Reviews

Latest PubMed Deep-Vein Thrombosis Prophylaxis Systematic Reviews- Related Articles

- Assessing the impact of perioperative allogenic blood transfusion in spinal surgery: a comprehensive systematic review, meta-analysis, and meta-regression analysis
- Safety of early chemoprophylaxis for venous thromboembolism after traumatic brain injury: a systematic review and meta-analysis. A military traumatic brain injury initiative study
- Venous Thromboembolism and Prevention Strategies in Patients with Cushing's Disease: A Systematic Review
- Effect of heparin for the prevention of venous thromboembolism in patients with spontaneous intracranial cerebral hemorrhage: a meta-analysis
- Effect of the administration route on the hemostatic efficacy of tranexamic acid in patients undergoing short-segment posterior lumbar interbody fusion: a systematic review and meta-analysis
- The safety of early pharmacological venous thromboembolism prophylaxis in patients with traumatic intracranial haemorrhage: a systematic review and meta-analysis
- Tranexamic Acid Demonstrates Efficacy without Increased Risk for Venous Thromboembolic Events in Cranial Neurosurgery: Systematic Review of the Evidence and Current Applications in Nontraumatic Pathologies
- The association of thromboembolic complications and the use of tranexamic acid during resection of intracranial meningiomas: systematic review and meta-analysis of randomized controlled trials

Introduction

In the context of DVT prophylaxis, systematic reviews may focus on various interventions and strategies used to prevent DVT, including:

Anticoagulant Medications: Systematic reviews may examine the effectiveness and safety of anticoagulant drugs such as heparin, low-molecular-weight heparin (LMWH), or direct oral anticoagulants (DOACs) in preventing DVT in specific patient populations.

Mechanical Prophylaxis: These reviews may evaluate the use of mechanical devices like compression stockings, intermittent pneumatic compression (IPC) devices, or inferior vena cava filters for DVT prevention.

Risk Assessment Models: Some systematic reviews may investigate the accuracy and usefulness of risk assessment models and scoring systems to identify patients at high risk of DVT.

Lifestyle Measures: Reviews may also explore the role of lifestyle measures like early ambulation, hydration, and calf muscle exercises in DVT prevention.

To find specific systematic reviews on DVT prophylaxis, you can search medical databases like

PubMed, Cochrane Library, or Embase. Using relevant keywords such as “deep-vein thrombosis prophylaxis systematic review,” “DVT prevention review,” or “DVT prophylaxis meta-analysis” can help you identify relevant studies. Additionally, consulting medical journals and guidelines from professional medical organizations may also provide valuable information on this topic.

Systematic Reviews

A literature search was performed in PubMed, Embase, Web of Science, Cochrane Library, and EmCare, based on a sensitive search string combination. Studies were selected by predefined selection criteria, and risk of bias was assessed by Newcastle-Ottawa Quality Assessment Scale and Cochrane risk of bias.

Twenty-five studies were included, half of which had a low risk of bias (21 case series, 3 comparative studies, 1 RCT). VTE was substantially higher if the evaluation was done by duplex ultrasound (DUS), or another systematic screening method, in comparison to clinical evaluation (clin). Without prophylaxis DVT, incidence varied from 4 (clin) to 10% (DUS), studies providing low molecular weight heparin (LMWH) reported an incidence of 2 (clin) to 31% (DUS), providing LMWH and compression stockings (CS) reported an incidence of 6.4% (clin) to 29.8% (DUS), and providing LMWH and intermittent pneumatic compression devices (IPC) reported an incidence of 3 (clin) to 22.3% (DUS). Due to a lack of data, VTE incidence could not meaningfully be compared between patients with intracranial and spine surgery. The reported incidence of pulmonary embolism (PE) was 0 to 7.9%.

Low molecular weight heparin, compression stockings, and intermittent pneumatic compression devices were all evaluated to give a reduction in VTE, but data were too widely varying to establish an optimum prevention strategy. Systematic screening for DVT reveals much higher incidence percentages in comparison to screening solely on clinical grounds and is recommended in the follow-up of neurosurgical procedures with an increased risk for DVT development in order to prevent the occurrence of PE [1)].

---

compared the efficacy and safety of prophylaxis for venous thromboembolism (VTE) in brain neoplasm patients undergoing neurosurgery. We searched Cochrane Central Register of Controlled Trials, Ovid MEDLINE(R), and Embase from inception to January 2022 for randomized controlled trials (RCTs) comparing the prophylactic measures efficacy and safety for VTE in brain neoplasm patients undergoing neurosurgery. The main efficacy outcome was symptomatic or asymptomatic VTE. The safety outcomes included major bleeding, minor bleeding, all occurrences of bleeding, and all-cause mortality. We used (Log) odds ratio (OR) of various chemoprophylaxis regimens to judge the safety and effectiveness of VTE. Additionally, all types of intervention were ranked by the Surface Under the Cumulative Ranking (SUCRA) value. We included 10 RCTs with 1128 brain neoplasm patients undergoing neurosurgery. For symptomatic or asymptomatic VTE and proximal DVT or PE, DOACs, compared with placebo, can significantly reduce the events. DOACs were superior to all other interventions in the rank plot of these events. For major bleeding reduction, unfractionated heparin (SUCRA value = 0.21) demonstrated better safety efficacy than others. For minor bleeding reduction, DOACs had a significantly higher risk of minor bleeding compared with placebo [Log OR 16.76, 95% CrI (1.53, 61.13)], LMWH [Log OR 15.68, 95% CrI (0.26, 60.10)] and UFH [Log OR 15.93, 95% CrI (0.22, 60.16)] respectively. Except for placebo (SUCRA values of 0.13), UFH (SUCRA values of 0.37) depicted better safety efficacy than others. For all-cause mortality, we found UFH always had

significantly lower all-cause mortality compared with low-molecular-weight heparin (LMWH) [Log OR = 14.17, 95% CrI (0.05, 48.35)]. UFH plus intermittent pneumatic compression (IPC) (SUCRA value of 0.12) displayed the best safety for all-cause mortality. In our study, DOACs were more effective as prophylaxis for VTE in brain neoplasm patients undergoing neurosurgery. Regarding the safety of prophylaxis for VTE, UFH of chemoprophylaxis consistently demonstrated better safety efficacy, involving either major bleeding, minor bleeding, bleeding, or all-cause mortality [2].

A systematic review under PRISMA guidelines was conducted within PubMed, Embase, Web of Science, and Cochrane databases through July 2022. Of the 3207 papers retrieved, seven articles were included in this systematic review. Four hundred forty-eight patients were presented in the reviewed studies and the overall reported mortality was 2.67% (12/448). Three studies utilized prophylaxis methods including graduated compression stockings (GCS) and early ambulation (EA) while the remaining four studies only used anticoagulation medicine. Only 20 patients received pre-operative prophylactic treatment, while 366 patients received post-operative prophylaxis which was delivered either immediately after surgery or at different time intervals within 2 days following the surgery. Thrombotic events mainly occur within two to 3 months after surgery. Overall, a higher frequency of thromboembolic events and mortality was observed in the control groups in comparison to groups receiving prophylaxis. A combination of anticoagulation, EA, and GCS might reduce thrombotic events and mortality in CD patients after treatment. Although the early commencement of a prophylactic anticoagulation regimen on the same day of surgery and continuing up to 3 months seems beneficial, the application of a prophylactic regimen should be utilized with caution since the number of included studies was insufficient to draw a strong conclusion, as well as neither prospective study nor randomized controlled trials existed [3]

Clinicians should pay attention to the prevention and management of Venous Thromboembolism after Spontaneous Intracerebral Hemorrhage. Intermittent pneumatic compression should be applied to patients with sICH on the day of hospital admission. After documentation of bleeding cessation, early initiation of pharmacological Venous Thromboembolism prophylaxis (24 h to 48 h from sICH onset) seems to be safe and effective in pulmonary embolism prophylaxis [4].

Acute ischemic stroke (AIS) cases have been reported post-COVID-19 vaccination. Kolahchi et al. systematically reviewed the reported cases of AIS after COVID-19 vaccination.

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. We searched PubMed and Scopus until April 14, 2022, to find studies that reported AIS post-COVID-19 vaccination.

They found 447 articles. From those, 140 duplicates were removed. After screening and excluding irrelevant articles, 29 studies (43 patients) were identified to be included. From all cases, 22 patients (51.1%) were diagnosed with AIS associated with Vaccine-induced immune thrombotic thrombocytopenia (VITT). Among AIS associated with VITT group, all received viral vector vaccines except one. The majority of cases with AIS and VITT were female (17 cases, 77.2%) and aged below 60 years (15 cases, 68%). Fourteen patients (32.5%) had additional thrombosis in other sites. Four of them (0.09%) showed concurrent CVST and ischemic stroke. Hemorrhagic transformation following AIS occurred in 7 patients (16.27%). Among 43 patients with AIS, at least 6 patients (14%) died during

hospital admission.

AIS has been reported as a rare complication within 4 weeks post-COVID-19 vaccination, particularly with viral vector vaccines. Healthcare providers should be familiar with this rare consequence of COVID-19 vaccination in particular in the context of VITT to make a timely diagnosis and appropriate treatment plan [5)].

The authors sought to evaluate the efficacy and safety of heparin in the treatment of aSAH.

PubMed, EBSCOhost, Europe PMC, and Cochrane Central databases were searched to find studies including patients with aSAH who were treated with intravenous unfractionated heparin (UFH) after an aneurysm-securing procedure. Studies that did not include a comparison with UFH or low-molecular-weight heparin in deep vein thrombosis prophylactic doses were excluded. The primary outcome was cerebral vasospasm, and the secondary outcomes were cerebral infarction, clinical deterioration caused by delayed cerebral ischemia, bleeding complications, and thromboembolism complications.

Overall, 5 nonrandomized studies were included; 4 studies evaluated the safety and 3 studies evaluated the efficacy of intravenous heparin. From the analysis of 3 studies with a total of 895 patients, administration of intravenous UFH for > 48 hours was related to a significantly lower rate of cerebral infarction (OR 0.44, 95% CI 0.25-0.79). No significant association was found with other efficacy outcomes. Regarding cognitive outcome, one study found a significant improvement in Montreal Cognitive Assessment scores; however, the functional outcome as indicated by the modified Rankin Scale score was not improved by heparin administration. From the analysis of 4 studies with 1099 patients, no significant increases in bleeding and other complications were found.

Administration of intravenous UFH for more than 48 hours reduced the rate of cerebral infarction with a good safety profile. This result supports the ongoing clinical trial [6)].

Using the PubMed, Scopus, and Springer Link databases, the authors performed a systematic review of the literature with regard to the incidence of VTE in pediatric patients with central DI. Inclusion criteria were availability of the full text in English, diagnosis of central DI and VTE in the same patient, and pediatric age defined as ≤ 21 years. Data were reported as median and interquartile range for continuous variables and as frequencies and percentages for categorical variables. Risk of bias assessments of the individual studies were performed using the Joanna Briggs Institute Critical Appraisal Checklists for case series and case reports.

Of 2094 search results, 12 articles met the inclusion criteria and described a total of 17 cases of VTE in pediatric patients with central DI. Two additional patients from the authors' institution were added to this cohort. The underlying pathologies included craniopharyngioma (n = 6), suprasellar germinoma (n = 4), epileptic encephalopathy (n = 2), pilocytic astrocytoma (n = 2), prolactinoma (n = 2), Cushing disease (n = 1), failure to thrive (n = 1), and congenital hypothalamic syndrome (n = 1). Thrombotic complications included deep vein thrombosis (n = 10 [53%]), cerebral venous sinus thrombosis (n = 6 [32%]), pulmonary embolism (n = 4 [21%]), inferior vena cava thrombosis (n = 2 [11%]), and disseminated intravascular coagulation (n = 1 [5%]). There was a 26% mortality rate.

VTE is a rare but potentially devastating postoperative complication that appears to have a higher incidence among patients with central DI. Although this review was limited by heterogeneous

information across limited reports, pediatric neurosurgical patients with DI may benefit from more aggressive VTE surveillance and prophylaxis [7].

Shojaei et al. performed a comprehensive literature review of PubMed to identified relevant studies. The primary and secondary endpoints included venous thromboembolism, deep venous thrombosis, pulmonary emboli, rebleeding, hematoma enlargement (defined as an increase in hematoma volume of ≥33%), major disability (defined as modified Rankin score of 3-5), and death. Pooled outcomes were estimated by fitting the random effects model with a restricted maximum likelihood method. A total of 8 original studies including 3893 patients were analyzed.

Compared to the control group, pharmacologic thromboprophylaxis was associated with a lower risk of pulmonary embolism (odds ratio [OR]: 0.34, 95% CI: 0.15-0.80, P = 0.01). There was no significant difference in the risk of DVT (OR: 0.75; [95% CI: 0.37-1.53], P = 0.44) and VTE (OR: 0.65; [95% CI: 0.34-1.25], P = 0.20). Finally, anticoagulation was not associated with an increased rate of major disability (OR:1.36; [95% CI: 0.57 - 3.23], P = 0.48), rebleeding (OR: 0.35; [95% CI: 0.10-1.19], P = 0.09), hematoma enlargement (OR:1.34; [95% CI: 0.58-3.12], P = 0.49), or death (OR:0.90; [95% CI: 0.68-1.19], P = 0.46).

Among patients with intracerebral hemorrhage, pharmacologic thromboprophylaxis was associated with a significant reduction in pulmonary embolism, without an increase in rebleeding or hematoma enlargement. The results of this meta-analysis need to be further validated in large-scale clinical trials [8].

Karathanos et al. searched PubMed, Medline, the Cochrane Library, Embase, and the Web of Science for studies reporting on the development of PTS after acute DVT. The outcomes were the risk reduction of PTS, PTS severity, the presence of residual vein thrombosis, and the incidence of recurrent venous thromboembolic (VTE) events.

A total of 59,199 patients from six retrospective and two randomized controlled studies had received DOAC treatment and were followed up for the development of PTS. In all studies, rivaroxaban had been compared with initial low-molecular-weight heparin followed by warfarin. Of the 59,199 patients, 19,840 (33.5%) had received rivaroxaban and 39,377 (66.5%), warfarin. The rivaroxaban group had a significant reduction in PTS development compared with the warfarin group (odds ratio [OR], 0.52; 95% confidence interval [CI], 0.43-0.63; P < .001). Severe PTS was less common in the rivaroxaban group than in the warfarin group (3.7% vs 6.4%; OR, 0.55; 95% CI, 0.36-0.85; P = .024). Additionally, rivaroxaban was associated with a significant reduction in VTE recurrence (OR, 0.83; 95% CI, 0.59-1.18; P = .03) and low rates of residual vein thrombosis compared with warfarin (36.5% vs 51.8%; P = .037).

Rivaroxaban after acute DVT was associated with a reduced risk of PTS compared with warfarin. Patients treated with rivaroxaban more rarely developed severe PTS and recurrent VTE events compared with patients treated with warfarin [9].

Hamilton MG, Hull RD, Pineo GF. Venous Thromboembolism in Neurosurgery and Neurology Patients: A Review. Neurosurgery. 1994; 34:280–296

Ganau M, Prisco L, Cebula H, Todeschi J, Abid H, Ligarotti G, Pop R, Proust F, Chibbaro S. Risk of Deep vein thrombosis in neurosurgery: State of the art on prophylaxis protocols and best clinical practices. J Clin Neurosci. 2017 Nov;45:60-66. doi: 10.1016/j.jocn.2017.08.008. Epub 2017 Sep 7. Review. PubMed PMID: 28890040.

Discussion

The provided information highlights the importance of systematic reviews in evaluating DVT prophylaxis strategies. These reviews help healthcare providers make informed decisions by assessing the effectiveness and safety of various interventions. Key findings from the discussed systematic reviews include:

VTE (Venous Thromboembolism) Incidence: Systematic screening methods, such as duplex ultrasound (DUS), tend to identify higher VTE incidence rates compared to clinical evaluation. The incidence of DVT varied across studies, with differences depending on the use of prophylactic measures like LMWH, compression stockings (CS), or intermittent pneumatic compression devices (IPC).

Mechanical Prophylaxis: Studies suggest that mechanical prophylaxis measures, such as compression stockings and IPC devices, can reduce VTE but lack sufficient data to determine the optimal strategy.

Anticoagulant Medications: DOACs, LMWH, and heparin are evaluated for their effectiveness in preventing VTE, with DOACs appearing superior in some cases. The choice of anticoagulant may vary depending on patient factors.

Brain Neoplasm Patients: For patients undergoing neurosurgery with brain neoplasms, DOACs are found to be effective in reducing VTE events. Unfractionated heparin (UFH) may offer better safety in terms of major bleeding.

Central Diabetes Insipidus: Prophylactic measures, including graduated compression stockings (GCS) and early ambulation (EA), may reduce thrombotic events and mortality in central diabetes insipidus patients after treatment. However, more research is needed.

Spontaneous Intracerebral Hemorrhage: Intermittent pneumatic compression is recommended for patients with spontaneous intracerebral hemorrhage on the day of admission. Early initiation of pharmacological VTE prophylaxis after bleeding cessation is considered safe and effective.

AIS (Acute Ischemic Stroke) Post-COVID-19 Vaccination: AIS cases have been reported post-COVID-19 vaccination, particularly with viral vector vaccines. Healthcare providers should be vigilant about this rare consequence, especially in the context of vaccine-induced immune thrombotic thrombocytopenia (VITT).

Heparin in Aneurysmal Subarachnoid Hemorrhage (aSAH): Intravenous unfractionated heparin (UFH) for over 48 hours is associated with a lower rate of cerebral infarction and appears safe.

Pediatric Central Diabetes Insipidus: Pediatric neurosurgical patients with central DI may have a higher risk of VTE and may benefit from more aggressive surveillance and prophylaxis.

Rivaroxaban for DVT Prophylaxis: Rivaroxaban is associated with a reduced risk of PTS (Post-Thrombotic Syndrome) and a lower rate of severe PTS compared to warfarin, with a good safety

profile.

These systematic reviews provide valuable insights into DVT prophylaxis strategies, aiding healthcare providers in making informed decisions to prevent this serious medical condition. However, the choice of prophylactic measures should be tailored to individual patient needs and risk factors, and further research may be required to optimize prevention strategies.

Conclusions

VTE Incidence: The incidence of DVT and VTE varies depending on the method of evaluation. Systematic screening methods like duplex ultrasound (DUS) tend to identify higher VTE incidence rates compared to clinical evaluation alone. This emphasizes the importance of thorough screening to detect DVT cases.

Mechanical Prophylaxis: Mechanical prophylaxis measures such as compression stockings and intermittent pneumatic compression devices (IPC) show promise in reducing VTE. However, determining the optimal mechanical prophylaxis strategy requires further investigation due to varying data.

Anticoagulant Medications: Anticoagulant drugs, including low-molecular-weight heparin (LMWH) and direct oral anticoagulants (DOACs), are assessed for their effectiveness and safety in preventing DVT. DOACs appear to be particularly effective in some cases. The choice of anticoagulant should consider patient-specific factors.

Brain Neoplasm Patients: DOACs are found to be effective in reducing VTE events in patients undergoing neurosurgery for brain neoplasms. Unfractionated heparin (UFH) may offer better safety in terms of major bleeding.

Central Diabetes Insipidus: Prophylactic measures such as graduated compression stockings (GCS) and early ambulation (EA) may reduce thrombotic events and mortality in patients with central diabetes insipidus after treatment. However, further research is needed.

Spontaneous Intracerebral Hemorrhage: Intermittent pneumatic compression is recommended for patients with spontaneous intracerebral hemorrhage on the day of admission. Early initiation of pharmacological VTE prophylaxis after bleeding cessation is considered safe and effective.

AIS Post-COVID-19 Vaccination: AIS cases have been reported post-COVID-19 vaccination, particularly with viral vector vaccines. Healthcare providers should be vigilant about this rare consequence, especially in the context of vaccine-induced immune thrombotic thrombocytopenia (VITT).

Heparin in Aneurysmal Subarachnoid Hemorrhage (aSAH): Intravenous unfractionated heparin (UFH) for over 48 hours is associated with a lower rate of cerebral infarction and appears safe in the context of aSAH.

Pediatric Central Diabetes Insipidus: Pediatric neurosurgical patients with central diabetes insipidus may have a higher risk of VTE, and more aggressive surveillance and prophylaxis may be beneficial.

Rivaroxaban for DVT Prophylaxis: Rivaroxaban shows promise in reducing the risk of Post-Thrombotic Syndrome (PTS) and severe PTS compared to warfarin, with a good safety profile.

These conclusions underscore the complexity of DVT prophylaxis and the need for tailored

approaches based on patient-specific factors. Healthcare providers should carefully consider the available evidence and individual patient characteristics when selecting prophylactic measures to prevent DVT. Additionally, ongoing research and clinical trials may provide further insights into optimizing DVT prevention strategies.

Test

What is the purpose of systematic reviews in the context of DVT prophylaxis?

a. To recommend a single universal method for preventing DVT b. To evaluate the effectiveness and safety of various interventions and strategies for preventing DVT c. To provide treatment guidelines for DVT management d. To report the incidence of DVT in different patient populations

Which of the following methods tends to identify higher VTE incidence rates compared to clinical evaluation alone?

a. Compression stockings b. Intermittent pneumatic compression devices (IPC) c. Duplex ultrasound (DUS) and systematic screening d. Direct oral anticoagulants (DOACs)

Which prophylactic measure is recommended for patients with spontaneous intracerebral hemorrhage on the day of hospital admission?

a. Graduated compression stockings (GCS) b. Early ambulation (EA) c. Intermittent pneumatic compression devices (IPC) d. Low-molecular-weight heparin (LMWH)

According to the systematic review, what is the recommended prophylactic method for reducing VTE in brain neoplasm patients undergoing neurosurgery?

a. Direct oral anticoagulants (DOACs) b. Compression stockings (CS) c. Low-molecular-weight heparin (LMWH) d. Unfractionated heparin (UFH)

In the context of DVT prophylaxis, what is the main advantage of using systematic screening methods like duplex ultrasound (DUS)?

a. They are less expensive than clinical evaluation. b. They reduce the incidence of pulmonary embolism (PE). c. They tend to identify higher VTE incidence rates than clinical evaluation. d. They have no associated risks or complications.

Which prophylactic measure appears to be associated with a lower rate of cerebral infarction in patients with aneurysmal subarachnoid hemorrhage (aSAH)?

a. Early ambulation (EA) b. Compression stockings (CS) c. Intermittent pneumatic compression devices (IPC) d. Intravenous unfractionated heparin (UFH)

What is the recommended prophylactic approach for reducing the risk of Post-Thrombotic Syndrome (PTS) in patients with deep vein thrombosis (DVT)?

a. Graduated compression stockings (GCS) b. Early ambulation (EA) c. Low-molecular-weight heparin (LMWH) d. Rivaroxaban

Which patient population may benefit from more aggressive surveillance and prophylaxis for VTE due to their increased risk?

a. Pediatric patients with central diabetes insipidus b. Elderly patients with a history of hypertension c. Athletes with high levels of physical activity d. Patients with a family history of VTE

In cases of acute ischemic stroke (AIS) occurring after COVID-19 vaccination, what should healthcare providers be particularly vigilant about?

a. Increased risk of hemorrhagic transformation b. Development of post-thrombotic syndrome (PTS) c. Vaccine-induced immune thrombotic thrombocytopenia (VITT) d. Elevated blood pressure

Which anticoagulant medication appears to be more effective as prophylaxis for VTE in brain neoplasm patients undergoing neurosurgery?

a. Low-molecular-weight heparin (LMWH) b. Direct oral anticoagulants (DOACs) c. Unfractionated heparin (UFH) d. Warfarin

Answers:

b. To evaluate the effectiveness and safety of various interventions and strategies for preventing DVT c. Duplex ultrasound (DUS) and systematic screening c. Intermittent pneumatic compression devices (IPC) a. Direct oral anticoagulants (DOACs) c. They tend to identify higher VTE incidence rates than clinical evaluation. d. Intravenous unfractionated heparin (UFH) d. Rivaroxaban a. Pediatric patients with central diabetes insipidus c. Vaccine-induced immune thrombotic thrombocytopenia (VITT) b. Direct oral anticoagulants (DOACs)

References

1)
Zhang Z, Cai H, Vleggeert-Lankamp CLA. Thromboembolic prophylaxis in neurosurgical practice: a systematic review. Acta Neurochir (Wien). 2023 Oct 5. doi: 10.1007/s00701-023-05792-3. Epub ahead of print. PMID: 37796296.
2)
Liu D, Song D, Ning W, Zhang X, Chen S, Zhang H. Efficacy and safety of prophylaxis for venous thromboembolism in brain neoplasm patients undergoing neurosurgery: a systematic review and Bayesian network meta-analysis. J Thromb Thrombolysis. 2023 May;55(4):710-720. doi: 10.1007/s11239-023-02780-3. Epub 2023 Feb 10. PMID: 36763224.
3)
Rabiei H, Shahbandi A, Sabahi M, Mandel M, Adada B, Borghei-Razavi H. Thrombosis in Cushing's disease; raising the flag of concern. Neurosurg Rev. 2023 Jan 6;46(1):32. doi: 10.1007/s10143-022-01941-x. PMID: 36604392.
4)
Dong C, Li Y, Ma Md Z. Venous Thromboembolism Prophylaxis After Spontaneous Intracerebral Hemorrhage: A Review. Neurologist. 2023 Jun 29. doi: 10.1097/NRL.0000000000000509. Epub ahead of print. PMID: 37582632.
5)
Kolahchi Z, Khanmirzaei M, Mowla A. Acute ischemic stroke and vaccine-induced immune thrombotic thrombocytopenia post COVID-19 vaccination; a systematic review. J Neurol Sci. 2022 Aug 15;439:120327. doi: 10.1016/j.jns.2022.120327. Epub 2022 Jun 20. PMID: 35752132; PMCID: PMC9212261.
6)

Lukito PP, Lie H, Helsa K, July J. Heparin in the treatment of aneurysmal subarachnoid hemorrhage: a systematic review and meta-analysis. Neurosurg Focus. 2022 Mar;52(3):E9. doi: 10.3171/2021.12.FOCUS21419. PMID: 35231899.

7) Lambert WA, Paro M, Pinci E, Bookland MJ, Martin JE, Riba-Wolman R, McKay L, Hersh DS. Venous thromboembolism in the setting of pediatric central diabetes insipidus: a systematic review of the literature and report of 2 cases. J Neurosurg Pediatr. 2022 Feb 25;29(5):580-589. doi: 10.3171/2022.1.PEDS21469. PMID: 35213827.

8) Shojaei F, Chi G, Memar Montazerin S, Najafi H, Lee JJ, Marszalek J, Kaddouh F, Seifi A. Clinical outcomes of pharmacological thromboprophylaxis among patients with intracerebral hemorrhage: Systematic review and meta-analysis. Clin Neurol Neurosurg. 2022 Jan;212:107066. doi: 10.1016/j.clineuro.2021.107066. Epub 2021 Dec 2. PMID: 34883283.

9) Karathanos C, Nana P, Spanos K, Kouvelos G, Brotis A, Matsagas M, Giannoukas A. Efficacy of rivaroxaban in prevention of post-thrombotic syndrome: A systematic review and meta-analysis. J Vasc Surg Venous Lymphat Disord. 2021 Nov;9(6):1568-1576.e1. doi: 10.1016/j.jvsv.2021.04.016. Epub 2021 May 6. PMID: 33965611.