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Anticoagulation: An Update

It's important to recognize when this therapy is warranted.

Practice Perfect is a continuing every-issue column in which Dr. Shapiro offers his unique personal perspective on the ins and outs of running a podiatric practice

When it comes to podiatric foot and ankle surgery, venous thromboembolism is perhaps the most dreaded complication, since it can lead to pulmonary embolism. It behooves each of us then to remain vigilant and up-to-date on the most current recommendations for prophylaxis, diagnosis, and treatment of these disorders. Here's a high-yield reference to keep us updated.

How Common Is Venous Thromboembolism Related to the Foot and Ankle?

Incidence of DVT: A study conducted between September 2020 and July 2023 reported a DVT incidence of 14.7% among 278 patients undergoing foot and ankle surgery, with most cases being asymptomatic and originating in the calf veins.[1]

Incidence of PE: Another study involving 1,540 ambulatory patients with ankle fractures requiring open reduction and internal fixation found a thromboembolic event rate of 2.99%, with 0.32% involving a non-fatal pulmonary embolism.[2]

Overall VTE Risk: A comprehensive analysis of 23,212 patients

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from the National Surgical Quality Improvement Program (NSQIP) database revealed a VTE incidence of 0.6% following foot and ankle surgery.[3]

sensitivity of Homan's sign ranged from 13% to 48%, and its specificity ranged from 39% to 84%. All of the other physical examination tests are poorly studied and are not recommended for routine clinical use.

Diagnosis depends on a high clinical suspicion and sending the patient immediately for compression *venous duplex ultrasonography* to diagnose a DVT.

Is There a Physical Examination Method That Is Highly Predictive of DVT?

The short answer is no. No single physical examination finding can definitively diagnose or exclude DVT. A review article published in Chest[4] in 1999 reported that the

Diagnosis depends on a high clinical suspicion and sending the patient immediately for compression ***venous duplex ultrasonography*** to diagnose a DVT. Some obvious risk factors include advanced age, obesity, immobilization, and a history of DVT, but an easier way to think about this is to recall Virchow's triad (Figure 1).

What Preventative and Treatment Medications Are Available?

Table 1 lists the common medications used to prevent and treat venous thromboembolisms, including dosages, drug interactions, and monitoring guidelines.

Final Question: Should We Prophylax Against Venous Thromboembolism in Foot and Ankle Surgical Patients?

Unfortunately, this is a controversial topic with no clear yes or no answer. The American Orthopedic Foot and Ankle Society states there is not enough evidence to support routine anticoagulation.[2] Similarly, the American College of Foot and Ankle Surgery recommends against routine prophylaxis, and recommends risk stratification and personalized

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TABLE 1

Current Anticoagulants in Common Use

Anticoagulant	Dosage for Treatment	Dosage for Prevention	Important Drug Interactions	Monitoring Guidelines
Low Molecular Weight Heparin (LMWH) (e.g., Enoxaparin)	1 mg/kg subcutaneously every 12 hours (for VTE treatment)	40 mg subcutaneously once daily (for VTE prophylaxis)	• **Antiplatelet agents:** Increased risk of bleeding • **NSAIDs:** Increased bleeding risk • **Warfarin:** Increased bleeding risk • **Rifampin:** Decreased efficacy	• Monitor **anti-Xa** levels (especially in renal impairment, obesity, or extremes of weight) • Monitor **CBC** for signs of bleeding or thrombocytopenia
Unfractionated Heparin	Initial IV bolus: 60-70 units/kg, followed by infusion of 12-15 units/kg/hr (adjusted based on aPTT)	5000 units subcutaneously every 8-12 hours	• **Antiplatelet drugs:** Increased bleeding risk • **Thrombolytics:** Increased hemorrhage risk • **NSAIDs:** Increased bleeding risk	• Monitor **aPTT** (target range: 1.5-2.5 times the control value) • Monitor **platelet count** (for heparin-induced thrombocytopenia)
Warfarin	Initial: 5 mg daily, then adjust based on INR (target INR: 2.0-3.0 for most indications)	Not typically used for VTE prevention unless specified	• **CYP2C9 inhibitors** (e.g., fluconazole, amiodarone): Increase warfarin effect • **CYP2C9 inducers** (e.g., rifampin): Decrease warfarin effect • **Antiplatelet agents:** Increased bleeding risk	• Monitor **INR** regularly (target: 2.0-3.0 for VTE, 2.5-3.5 for mechanical heart valves) • Adjust dose based on INR
Apixaban (Eliquis)	10 mg twice daily for 7 days, then 5 mg twice daily	2.5 mg twice daily (for VTE prophylaxis after hip/knee replacement surgery)	• **Strong CYP3A4 inducers** (e.g., rifampin): Decrease apixaban effect • **Strong CYP3A4 inhibitors** (e.g., ketoconazole, ritonavir): Increase apixaban effect • **Antiplatelet drugs:** Increased bleeding risk	• No routine monitoring required • **Renal function** should be assessed, especially in elderly or those with renal impairment
Rivaroxaban (Xarelto)	15 mg twice daily for 21 days, then 20 mg once daily	10 mg once daily (for VTE prophylaxis after hip/knee replacement surgery)	• **Strong CYP3A4 inducers** (e.g., rifampin): Decrease rivaroxaban effect • **Strong CYP3A4 inhibitors** (e.g., ketoconazole): Increase rivaroxaban effect • **Antiplatelet drugs:** Increased bleeding risk	• No routine monitoring required • **Renal function** should be assessed, especially in elderly or those with renal impairment
Dabigatran (Pradaxa)	150 mg twice daily (for VTE treatment)	110 mg once daily after 5-10 days of parenteral anticoagulation (for VTE prophylaxis)	• **P-glycoprotein inducers** (e.g., rifampin): Decrease dabigatran effect • **P-glycoprotein inhibitors** (e.g., amiodarone, verapamil): Increase dabigatran effect • **Antiplatelet drugs:** Increased bleeding risk	• No routine monitoring required • **Renal function** should be assessed (adjust dose for CrCl <50 mL/min)
Fondaparinux (Arixtra)	5 mg subcutaneously once daily (for VTE treatment in patients with normal renal function)	2.5 mg subcutaneously once daily (for VTE prophylaxis)	• **Other anticoagulants:** Increased bleeding risk • **NSAIDs:** Increased bleeding risk • **Antiplatelet agents:** Increased risk of bleeding	• No routine monitoring required • **Renal function** should be monitored, particularly in patients with CrCl <30 mL/min

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decision-making.[5] On the other side of the argument is a retrospective cohort study by Claveau, et al.[6] of 425 patients that received prophylactic anticoagulation while undergoing foot and ankle surgery. A number of different medications were used, with the majority taking apixaban or aspirin. Five patients (1.2%) had a DVT, and one patient (0.2%) developed a pulmonary embolism despite being on an anticoagulant. They determined prophylactic anticoagulation was both safe and effective.

For this surgeon, having experienced patients with DVT and PE, it makes the most sense to evaluate each patient for their risk and prophylax those with the following risk factors: advanced age, obesity, a history of VTE, prolonged tourniquet time, NWB immobilization, smoking, or other medical comorbidities. When in doubt, it appears careful prophylaxis is the best option. **PM**

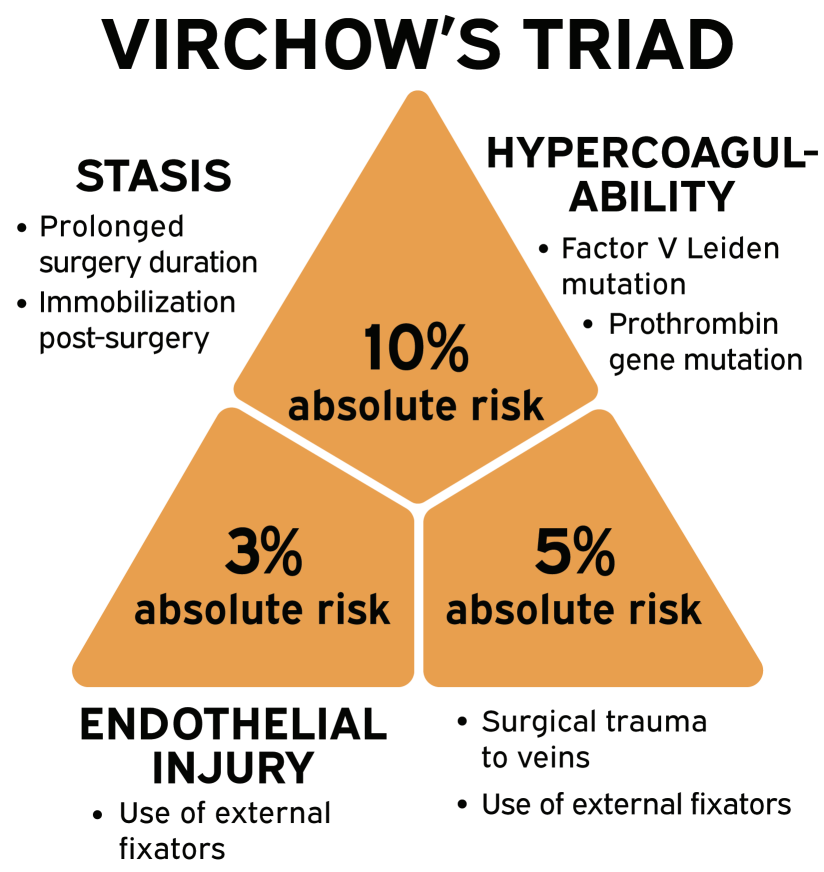

Figure 1: Virchow's triad with foot and ankle risk factors.

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