

How to Approach the Human Patient with Venous Thrombosis

22 Practical Clinical Points

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A. HISTORY

1. **Defining the clot:** When taking a history of a patient with venous thromboembolism (VTE), it is advisable to define the clot: (a) was it a superficial thrombophlebitis or a deep vein thrombosis (DVT)? To help with the determination when no imaging report is available, a detailed review of the extremity symptoms at the time of the clot is often helpful; (b) was it a distal or proximal DVT; (c) was the pulmonary embolism (PE) a massive, submassive, or low-risk PE?
2. **Anatomy, terminology:** Confusion as to which veins are superficial and which deep can lead to misclassification of superficial thrombophlebitis and DVT and, thus, to incorrect treatment decisions. Key terminology: (a) In the *arm*: Basilic and cephalic veins are superficial veins; brachial vein is a deep vein; (b) in the leg: Greater and lesser saphenous veins are superficial veins; popliteal vein and anything proximally to it are proximal veins; gastrocnemius and soleal veins are intramuscular calf veins and part of the deep venous system, and, together with the peroneal and tibial veins, make up the deep veins of the distal leg. The femoral vein is sometimes still mistakenly referred to by its old name, “superficial femoral vein”; it is a deep vein.
3. **VTE risk factors:** In the patient with VTE, it is helpful to identify and list all VTE risk factors in an A..., B..., C fashion, such as: “Right leg proximal DVT. VTE risk factors: A. arthroscopic knee surgery 7 days before onset of leg symptoms; B. body mass index 34.2 kg/m²; C. oral contraceptives (estrogen-progestin); D. family history of VTE (father with unprovoked VTE at age 42; E. heterozygous factor V Leiden”.
4. **Obtaining details of previous and recurrent clots:** Similarly, when evaluating a patient with a history of “recurrent blood clots”, it is advisable to take a history of the symptoms and objective findings of each individual clotting episode and, thus, define each single episode plus the type and length of anticoagulant chosen. Obtaining old medical records (Doppler ultrasound or CT/VQ report, hospital discharge summary) can be very helpful.
5. **Circumstances under which the patient did NOT develop clots:** To assess a patient’s prothrombotic tendency, it is also important in the history to assess VTE risk situations in which VTE did NOT develop: years of oral contraceptive use, number of pregnancies, surgeries, etc.
6. **“Warfarin Hate Factor”:** To assess the impact of being on an anticoagulant on a patient’s lifestyle, I suggest to use the “Warfarin Hate Factor”, asking the patient to rank his/her “Warfarin Hate Factor” on a scale from 0 to 10 (with “0” meaning: it’s not a big deal to be on warfarin, it’s just a pill; and “10” meaning: I hate warfarin so much, I really need to come off it), taking together the need for monitoring, the dietary implications, the risk for bleeding, the fact

that one needs to remember to take the pill every day, and the cost of pill and monitoring. Similarly I ask the patient to define their “rivaroxaban-, apixaban-, dabigatran-, or edoxaban hate factor”; with the latter drugs, the cost of the drug to the patient (copay) needs to be specifically asked about.

7. **Detailed family history:** Family history obtained should be detailed, i.e. not just a bare question whether “anybody in the family has had blood clots”, but rather a determination of how many children the patient has, how many siblings, how many uncles and aunts; and a definition of the risk factors of any VTE that any family member may have had.
8. **Social history** (profession, hobbies) is important to be able to understand the impact of anticoagulation (and postthrombotic syndrome or post-PE syndrome) on a patient’s lifestyle.
9. **Bleeding risk factors:** In the patient to be started on or currently already on anticoagulation, it is helpful to identify and list all bleeding risk factors in an (a)…, (b)…, (c) …. fashion, such as: (a) thrombocytopenia (platelet count 105k), (b) external hemorrhoids, bleeding once/month, (c) h/o duodenal ulcer, (d) esophageal varices, €…

B. PHYSICAL EXAMINATION

10. **Measuring mid-calf circumference:** To assess the degree of leg swelling (of an acute DVT or of a leg with postthrombotic syndrome) I measure the calf circumference below the superior border of patella at the point where the calf appears to be the biggest, and record the difference of one side versus the other.
11. **Post PE-syndrome assessment:** A non-pulmonologist’s evaluation to assess for post-PE syndrome and possible pulmonary hypertension include: (a) assessment of symptoms, (b) pulse oximetry at rest and after walking briskly 2-3 flights of stairs in clinic with the patient, (c) nuclear medicine ventilation--perfusion lung scan (VQ), (d) cardiac echo and (e) , if any of these are abnormal, referral to a pulmonary hypertension clinic for formal 6-minute walk test, right heart catheterization with pulmonary artery pressure measurement and contrast pulmonary arteriogram.

C. DIAGNOSIS

12. **Pre-test probability assessment:** In the patient presenting with leg or respiratory symptoms suspicious for DVT or PE, a pretest probability assessment should be performed (with the DVT or PE Wells score) and a D-dimer used for patients with low pre-test probability, to avoid unnecessary Doppler ultrasound imaging studies.
13. **Caveats about Doppler ultrasound:**
 - Criteria of an “acute” DVT are (i) dilated vein, (ii) hypo-echogenicity of the clot, (iii) sponginess of clot structure upon compression. Criteria of an old clot are (i) retracted, shrunken vein, (ii) hyper-echogenicity of the clot, and (iii) firmness of clot upon compression. The timeline of ultrasound changes from “acute” to “chronic” is poorly

defined and clot may appear “acute” for several weeks to months and are, thus, discrepant to what clinicians typically call an “acute” DVT.

- Doppler ultrasound of the legs can only visualize the veins distal to the inguinal ligament and can, therefore, not assess for DVT in the iliac veins or May-Thurner syndrome. CT or MRI venogram are needed to assess the iliac vein.

14. **Caveats about chest CTA and VQ:**

- CTA findings may be false positive or false negative: A negative CTA in a patient with a high pre-test probability for PE does not rule out PE and should be followed by another imaging study, such as leg Doppler ultrasound or a VQ scan. And, vice versa, a positive CTA in a patient with a low pre-test probability for PE does not mean that the patient does, indeed, have a PE – another imaging study, such as a VQ scan, should be done.
- A VQ scan cannot differentiate between acute or chronic PE - either one presents as a perfusion-ventilation mismatch. VQ scan abnormalities frequently persist for at least several months. Thus, in a patient with previous PE and new respiratory symptoms, an abnormal VQ scan is not diagnostic for recurrent PE, unless an old VQ scan is available for comparison.
- In chronic thromboembolic pulmonary hypertension (CTEPH) chest CTA is often normal. The imaging test of choice is a VQ scan.

15. **Caveats about thrombophilia tests:** Many of the functional coagulation tests (activities of protein C, protein S and antithrombin; lupus anticoagulant) are abnormal at the time of an acute VTE and while on an anticoagulant. Four thrombophilia rules that are generally true: Do not test (a) at the time of an acute thrombotic episode, (b) a hospitalized patients, (c) while patient is on an anticoagulant, (d) if you don’t know how to interpret the test and what to do with the result.

D. TREATMENT

16. **Information for Patients:** (a) A detailed brochure “DVT and PE: Information for newly diagnosed patients” is available on the Clot Connect website (www.clotconnect.org) at http://files.www.clotconnect.org/DVT_and_PE.pdf, and (b) a shorter version with the essential information, entitled “Guide to recovery after deep vein thrombosis or pulmonary embolism”, as a peer-reviewed patient page at <http://files.www.clotconnect.org/about-clot-connect/Circulation-2014-Waldron-e477-9.pdf>.
17. **Recurrence Triangle:** The decision how long to treat a patient with anticoagulation depends on 3 factors: (a) the risk of recurrent VTE if not on anticoagulation, (b) the risk of major bleeding, and (c) a patient’s preference. The complex topic may best be understood and discussed with the patient with the aid of the VTE “Recurrence Triangle”, which includes visualization how D-dimer results and thrombophilia test testing factor into the decision-making. The “Warfarin Hate Factor” and “DOAC Hate Factor” help assess a patient’s treatment preference.
18. **Regular Reevaluation:** The patient who is on long-term anticoagulation should be reevaluated on a regular basis, such as once per year for a new risk-benefit assessment of further anticoagulation, monitoring, and education about new study results and medications.

19. **Clinical Studies:** The patient with VTE should be offered and encouraged to participate in clinical VTE trials.
20. **Getting a Doppler ultrasound of the legs:** The patient who is diagnosed with PE should always get a leg venous ultrasound, even if the patient does not have any leg symptoms. While finding an additional DVT does not change the clinical management of the patient, having the study as a baseline helps the clinician diagnose anticoagulation failure versus no anticoagulation failure, if the patient develops new leg symptoms and is found to have a DVT, but no baseline leg study had ever been done.
21. **Questioning diagnoses and treatments:** In the patient who is on long-term anticoagulation and who is new to our practice we should always question the need for continued anticoagulation and review the medical history and determine whether there is truly an indication for long-term anticoagulation.
22. **Baseline venous Doppler ultrasound:** When anticoagulation is discontinued after an episode of DVT, a baseline Doppler ultrasound of the affected extremity should be obtained to have a baseline for comparison should new extremity symptoms suspicious for a recurrent DVT occur in the future.

F. REFERENCES

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