

Pulmonary Embolism & DVT

The questions signed by * are hard: read their explanation. ● Past Years ● TBL ● Others

This file belongs to the PULSE Cardiology question book: the explanations of the multiple choice answers and the model answers of the essay questions, in the words of the handout.

Answer Key | Multiple Choice Questions

Question no.	1	2	3	4	5	6	7	8	9	10
Answer	b	c	c	d	d	a	a	e	c	d

► Why this answer?

- Which of the following is considered an indirect marker of DVT?
(b) D-dimer
D-dimer is raised in thromboembolism but is not specific; it is a breakdown product of fibrin, so it points to a clot indirectly.
- In suspected cases of deep vein thrombosis, which of the following is the most appropriate investigation?
(c) Duplex ultrasound scan
Colored Doppler and venography are both listed for diagnosis of DVT; duplex ultrasound is preferred because it is accurate and non-invasive. D-dimer is not specific, and CT pulmonary angiography looks for a lung embolus.
- Treatment of Deep venous thrombosis includes all of the following except:
(c) Systemic vasodilator medications
Thrombolytic therapy and heparin iv, and inferior vena cava interruption by filter or umbrella, are all part of treatment. Vasodilators are not listed in the treatment of thromboembolism.
- A blood clot can result from:
(d) All of the above.
The predisposing factors of DVT are Virchow's triad: slow circulation, hyper-coagulability and injury of vascular endothelium, so all three are correct.
- What is the definitive diagnosis of pulmonary embolism?
(d) CT Pulmonary angiography
Pulmonary angiography is the most specific test for pulmonary embolism; CT pulmonary angiography shows the clot directly. The ventilation perfusion lung scan is only more accurate than the perfusion scan alone.
- If pulmonary embolism is unlikely with Wells score < 4, we will order the following test, which is a good...
(a) D-dimer
D-dimer is raised in embolism but not specific: it is also raised in infection, pregnancy, malignancy and post operative. So a normal result rules embolism out when the probability is low.
- The diagnostic tool that is used in DVT:
(a) Duplex US
Investigations for diagnosis of DVT are e.g. colored Doppler & venography or plethysmography; duplex US is the colored Doppler study of the veins.

8 The following is not an indication for prophylaxis against pulmonary embolism:

(e) Dental procedures

Prolonged rest in bed (fracture, surgery) and malignancies are predisposing factors, and hip or knee surgery and malignancy are candidates for prophylaxis. A dental procedure is not among them.

9 Treatment of Deep venous thrombosis include all of the following except:

(c) Systemic vasodilator medication

Thrombolytic therapy, heparin iv and oral anticoagulant (e.g. warfarin) are all part of treatment. Vasodilators are not listed in the treatment of thromboembolism.

10 A patient with DVT and active hematemesis, what is the appropriate treatment?

(d) IVC filter

Inferior vena cava interruption (by filter or umbrella) is performed when anticoagulation is contraindicated or ineffective. Active bleeding contraindicates thrombolysis, heparin and warfarin.

Model Answers | Essay Questions

1 Mention the predisposing factors and risk factors of deep vein thrombosis (DVT).

Predisposing factors (Virchow's triad)

① Slow circulation:

- Prolonged rest in bed (e.g. fracture, surgery, or paralyzed limb).
- Heart failure.
- Varicose veins.
- Obesity, pregnancy.

② Hyper-coagulability:

- Polycythemia, thrombocytosis.
- Dehydration.
- C.C. pills (combined contraceptive pills), pregnancy.
- Malignancies: leukaemia; myeloma; paraneoplastic.
- Nephrotic syndrome.
- Decrease of protein C, S, & decrease of factor V Leiden & decrease of antithrombin III, increase of PAI-1.
- Behcet, vasculitis & APA, PNH, SCA, homocystinuria, DIC and TTP.

③ Injury of vascular endothelium:

- Inflammation.
- Trauma.

2 List the predisposing factors and high-risk conditions of deep venous thrombosis.

Predisposing factors (Virchow's triad)

① Slow circulation:

- Prolonged rest in bed (e.g. fracture, surgery, or paralyzed limb).
- Heart failure.
- Varicose veins.
- Obesity, pregnancy.

② Hyper-coagulability:

- Polycythemia, thrombocytosis.
- Dehydration.
- C.C. pills (combined contraceptive pills), pregnancy.
- Malignancies: leukaemia; myeloma; paraneoplastic.
- Nephrotic syndrome.
- Decrease of protein C, S, & decrease of factor V Leiden & decrease of antithrombin III, increase of PAI-1.
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③ Injury of vascular endothelium:

- Inflammation.
- Trauma.

Candidates for venous thrombosis prophylaxis

Risk	Candidates
Moderate risk of DVT	Major surgery in patients > 40 years or with other risk factor; major medical illness e.g. HF, chest infection, malignancy, IBD.
High risk of DVT	Hip or knee surgery; major abdominal or pelvic surgery for malignancy or with history of DVT or known thrombophilia.

3 Enumerate the risk factors and outline the clinical presentations of acute pulmonary embolism.

Types & source of emboli

I - Thrombo-emboli

* A. Peripheral veins (DVT): predisposing factors (Virchow's triad):

- Slow circulation: prolonged rest in bed (e.g. fracture, surgery, or paralyzed limb); heart failure; varicose veins; obesity, pregnancy.
- Hyper-coagulability: polycythemia, thrombocytosis; dehydration; C.C. pills, pregnancy; malignancies: leukaemia, myeloma, paraneoplastic; nephrotic syndrome; decrease of protein C, S, & decrease of factor V Leiden & decrease of antithrombin III, increase of PAI-1; Behcet, vasculitis & APA, PNH, SCA, homocystinuria, DIC and TTP.
- Injury of vascular endothelium: inflammation; trauma.

* B. Right side of the heart:

- Vegetations of infective endocarditis.
- Mural thrombi over myocardial infarction.
- Arrhythmia esp. AF.

* C. Paradoxical emboli: emboli passing from the left side of the heart through a defect - e.g. VSD or ASD - to the right side of the heart.

II - Other types of emboli

- * Amniotic fluid.
- * Fat.
- * Parasitic or malignant cells emboli.
- * Air.
- * Foreign material.

Clinical picture

Presentations of pulmonary embolism are variable depending on: size of embolus; infected or not; number of emboli; underlying lung disease.

A. Minute embolus

- * Asymptomatic.
 - * Recurrent minute emboli may cause thromboembolic pulmonary hypertension & subacute cor pulmonale.
- B. Medium sized embolus:** causes pulmonary infarction (if occlusion involves **< 65%** of pulmonary vascular bed).
- * Sudden pleuritic stitching chest pain.
 - * Dyspnea, cough, hemoptysis.
 - * In the 2nd day, fever & jaundice may occur.
 - * Pleural rub or hemorrhagic pleural effusion may be present.
 - * There may be features of DVT: pain, tenderness along the course of the thrombosed vein, edema, slight fever + Homans' sign.
 - **Homans' sign:** pain in the calf on dorsiflexion of the foot.
 - **Loewenberg's sign:** pain in the calf on elevating pressure by sphygmomanometer.

N.B. Platypnea in embolism of upper part of lung.

C. Big emboli: occlusion involves **65 - 85%** of the pulmonary vascular bed: massive pulmonary embolism; occlusion involves **> 85%** of the vascular bed: sudden death.

- * Chest pain: sudden severe retrosternal pain due to sudden decrease of coronary blood flow or sudden pericardial distension due to sudden RV dilatation.
- * Dyspnea, manifestations of low CO & may be central cyanosis.
- * Rapid appearance of manifestations of pulmonary hypertension & right ventricular failure (**acute cor pulmonale**).
- * Cardiogenic shock may occur.
- * There may be features of DVT.

N.B. Infected embolus may lead to pneumonia & lung abscess.

Note The handout has no heading "risk factors"; the answer is its Types & source of emboli.

4 How to manage a patient with confirmed acute pulmonary embolism with hemodynamic compromise (high risk)?

Therapeutic

- ① **Hospitalization, preferably in ICU.**
- ② **If the patient is hemodynamically unstable**, i.e. in the presence of shock or heart failure:
 - a) **Thrombolytic therapy:**
 - Using streptokinase, urokinase, or tissue plasminogen activator given intravenously or intrapulmonary.
 - Streptokinase is given as follows: **250,000 - 500,000 I.U.** iv bolus followed by 100,000 I.U./hour for 24 - 72 hours continuously by iv infusion.
 - This is followed by:
 - Heparin (HMWH) iv for 5 days or LMWH SC [fractionated heparin has a longer half life than SH "standard heparin"] (PTT [1.5 - 2.5]).
 - Heparin & oral anticoagulants for 5 days, INR [2 - 3].
 - Oral anticoagulant (e.g. warfarin) for **3 months** at least [up to 6 months].
 - b) **Pulmonary embolectomy** (Trendelenburg's operation): performed in some cases when thrombolytic therapy is contraindicated.

③ Symptomatic treatment:

- Analgesics e.g. pethidine 50 mg IV or IM. Morphine should be avoided because of its respiratory depressant action.
- Oxygen inhalation.
- Mechanical ventilation may be required in severe cases.

④ Treatment of complications:

- Shock.
- Right ventricular failure.

⑤ Correction of predisposing factors of thromboembolism.

5 Answer the following about this patient:

(a) Risk factors for DVT

- * Slow circulation: prolonged rest in bed (e.g. surgery).
- * Hyper-coagulability: malignancies.
- * Moderate risk of DVT: major surgery in patients > 40 years or with other risk factor.
- * High risk of DVT: major abdominal or pelvic surgery for malignancy or with history of DVT.

(b) Prophylactic measures

- * Prophylaxis & treatment of predisposing factors of embolism.
- * Early postoperative & postpartum ambulation.
- * Prophylactic anticoagulation in susceptible patients using heparin **5000 units / 8 hours** S.C. "minidose".
- * Fondaparinux & ximelagatran.
- * Intermittent pneumatic compression stockings: prevent post-operative thrombosis.