12 Management of Pulmonary Embolism

Abstract: The key factor in 'management' of pulmonary embolism (PE) is prevention of deep venous thrombosis (DVT) in the critical care setting. Symptomatic PE may occur in about 30% of patients with DVT of which about 10% may be fatal. Asymptomatic PE may occur in as many as 50 to 60%. Overall morbidity and mortality can be reduced significantly by preventing DVT.

PEOPLE AT RISK

Several risk assessment models are available to assess the need for prophylaxis. Major risk factors include prolonged immobility, stroke, malignancy, prior thromboembolic disease, increased age, major surgery, trauma, obesity, congestive heart failure, pregnancy and estrogen use. It is important to recognize that DVT is as common among patients with medical illness as it may be in surgical patients. The effect of surgery on DVT risk may depend on the site of operation and duration and degree of immobilization. The frequent need for indwelling vascular catheters in the ICU also leads to increased risk of DVT, not only in the lower extremities but also axillary and subclavian vein thrombosis. In all of these patients it is important to weigh the risk of thromboembolism against the risk of bleeding associated with prophylactic anticoagulation.

PREVENTION

- Early ambulation
- Mechanical modalities such as elastic stocking, intermittent compression devices
- Anticoagulants
  - Subcutaneous low dose unfractionated heparin
  - Low molecular weight heparin (LMWH)
  - Factor Xa inhibitor (Fondaparinux)
  - Warfarin.

Readers are referred to an evidence based recommendation for prophylaxis by ACCP Consensus Group (See Annexure).

TREATMENT OF PULMONARY EMBOLISM[2-5]

- Currently LMWH has become the preferred agent for acute nonmassive PE. In the setting of renal insufficiency, unfractionated heparin or adjusted dose of LMWH may need to be used.
- When unfractionated heparin is used for treatment of PE, it should be administered as continuous intravenous infusion at a dose that maintains the activated partial thromboplastin time (APTT) in a range of 1.5 to 2.5 times control.
- Oral anticoagulation with warfarin is started concomitantly with heparin and overlapped at least for four days to allow adequate therapy to minimize relapse. Injectable anticoagulants may be discontinued after achieving an INR of at least 2.5 to 3.0.

  - Warfarin is recommended for 3 to 6 months for patients who have a first event with a reversible or time-limited risk factor (e.g. surgery, trauma, immobilization or estrogen use).
  - Minimum of 6 months recommended for an initial idiopathic episode.
  - 12 months to lifetime use should be considered for patients with malignancy, anticardiolipin antibodies or recurrent event of any kind.
- In the setting of hemodynamically unstable PE, thrombolytic agents may be considered to hasten clot resolution.[6]
  - There has been no definitive evidence of survival benefits with thrombolytics, and there is a 1-2% risk of intracranial hemorrhage
- For patients with PE who cannot be anticoagulated because of bleeding diathesis or recurrent embolic episodes despite therapeutic anticoagulation, placement of inferior vena cava filter should be considered.

COMPLICATIONS OF TREATMENT

- Major risk while treating PE with anticoagulants is bleeding.
- Heparin induced thrombocytopenia (HIT) is a rare but recognized complication. Although the incidence is higher with unfractionated heparin, it has been noted with use of LMWH as well.
- LMWH cannot be used as a substitute for unfractionated heparin in the setting of HIT.
- Argatroban and Lepirudin may be used in patients with HIT and HIT associated thrombosis.

ANNEXURE

The prevention of venous thromboembolism (VTE) is part of the Seventh American College of Chest Physicians Conference on Antithrombotic and Thrombolytic Therapy: Evidence-Based Guidelines. Grade 1 recommendations are strong and indicate that the benefits do, or do not, outweigh risks, burden, and costs. Grade 2 suggests that individual patients' values may lead to different choices (for a full understanding of the grading see Guyatt et al, *Chest 2004; 126:179S–187S*). Among the key recommendations in this chapter are the following. We recommend against the use of aspirin alone as thromboprophylaxis for any patient group (Grade 1A). For moderate-risk general surgery patients, we recommend prophylaxis with low-dose unfractionated heparin (LDUH) (5,000 U bid) or low-molecular-weight heparin (LMWH) [≤ 3,400 U once daily] (both Grade 1A). For higher risk general surgery patients, we recommend thromboprophylaxis with LDUH (5,000 U tid) or LMWH (> 3,400 U daily) [both Grade 1A]. For high-risk general surgery patients with multiple risk factors, we recommend combining pharmacologic methods (LDUH three times daily or LMWH, > 3,400 U daily) with the use of graduated compression stockings and/or intermittent pneumatic compression devices (Grade 1C+). We recommend that thromboprophylaxis be used in all patients undergoing major gynecologic surgery (Grade 1A) or major, open urologic procedures, and we recommend prophylaxis with LDUH two times or three times daily (Grade 1A). For patients undergoing elective total hip or knee arthroplasty, we recommend one of the following three anticoagulant agents: LMWH, fondaparinux, or adjusted-dose vitamin K antagonist (VKA) [international normalized ratio (INR) target, 2.5; range, 2.0 to 3.0] (all Grade 1A). For patients undergoing hip fracture surgery (HFS), we recommend the routine use of fondaparinux (Grade 1A), LMWH (Grade 1C+), VKA (target INR, 2.5; range, 2.0 to 3.0) [Grade 2B], or LDUH (Grade 1B). We recommend that patients undergoing hip or knee arthroplasty, or HFS receive thromboprophylaxis for at least 10 days (Grade 1A). We recommend that all trauma patients with at least one risk factor for VTE receive thromboprophylaxis (Grade 1A). In acutely ill medical patients who have been admitted to the hospital with congestive heart failure or severe respiratory disease, or who are confined to bed and have one or more additional risk factors, we recommend prophylaxis with LDUH (Grade 1A) or LMWH (Grade 1A). We

recommend, on admission to the intensive care unit, all patients be assessed for their risk of VTE. Accordingly, most patients should receive thromboprophylaxis (Grade 1A).

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