**Anticoagulation versus IVC filter in Pulmonary Embolism:**

While anticoagulation, usually unfractionated heparin, is considered the standard definitive therapy in most cases of pulmonary embolism (PE), inferior vena cava (IVC) filters are useful when anticoagulation is contraindicated. The timing and decision of which therapy to use is based on the patient’s respiratory and hemodynamic status, w/u and likelihood of PE, and the risk of bleeding or other complications from anticoagulation. As we’ll see, the two are not necessarily mutually exclusive, and some patients may benefit from both anticoagulation and subsequent IVC filter placement depending on risk of future thromboembolic events.



**Heparinization in PE:**

As stated above, anticoagulation is the mainstay of therapy for patients with confirmed PE. When the pre-test probability of PE is high based on Wells’ Criteria or PERC Rule or diagnostic imaging such as CXR or CTPA will be delayed, anticoagulation may be started before diagnosis of PE is confirmed.

IV heparin may be preferred as initial therapy in patients with VTE/DVT/PE, even in those who are hemodynamically unstable, may need invasive procedures or thrombolysis, are obese, have renal failure, or those who may need rapid reversal of anticoagulation. Heparin should be discontinued if thrombolysis is required, and it may be resumed upon completion of thrombolysis.

Heparin is administered IV, and it’s dosage is usually weight-based. Preferred initial dosage is 80 units/kg IV bolus followed by 18 units/kg/hour ***or*** 5,000 unit bolus followed by 1,333 units/hour. Dosage may be adjusted based on response to therapy and desired anti-factor Xa activity or aPTT.

Patients must also be monitored throughout therapy for bleeding, heparin resistance, hyperkalemia, thrombocytopenia, or hypersensitivity reactions. Osteoporosis may also occur with long-term use, but that is not a concern in acute PE therapy. Use with caution in patients >60 y/o due to increased risk of bleeding.

Patients with life-threatening PE may require additional treatment beyond anticoagulation, including thrombolysis, IVC filter, and embolectomy. Below are a list of patients or circumstances where alternative or additional therapies may be required:

* Patients with malignancy – LMW is preferred for anticoagulation
* Pregnant patients – dose-adjusted subcutaneous LMW preferred for fetal safety
* Patients with history of heparin-induced thrombocytopenia – all forms of heparin are CI’d. Fast-acting non-heparin anticoagulation such as Agatroban is preferred.
* Patients with contraindication to anticoagulation – IVC filter or embolectomy preferred
* Patients who are hemodynamically unstable or fail anticoagulation – fluid resuscitation, reperfusion therapy, IVC, or more aggressive therapies required such as thrombolysis or surgical embolectomy. Hemodynamic instability does not preclude the use of heparin.

**IVC Filter Placement in PE:**

In most patients, IVC filters are not necessary. For those patients in whom the risk of bleeding is unacceptably high an IVC filter should be placed. Patients in whom complications develop over the course of anticoagulation should also have an IVC filter placed. However the timing and duration of IVC filter placement depends on the originally planned duration of anticoagulation and the risk of recurrence when anticoagulation is discontinued.

 Retrievable filters are preferred so that once the complications or contraindications to anticoagulation have resolved, the filter can be removed and anticoagulation can be resumed.

 When contraindications to anticoagulation are present in acute PE, an IVC filter should be placed, even in the absence of a proven lower extremity thrombus. Thrombus may remain undetected in the pelvis or calf veins or clotting may reform in leg veins after embolization.

 The decision to place an IVC filter, most of which are infrarenal, is modified in the following settings:

* Patients with confirmed upper extremity thrombus in the absence of lower extremity thrombosis, an IVC will not be effective and a superior vena cava (SVC) filter should be placed instead.
* When thrombus is present in renal vein (identifiable on CT angiography), a suprarenal filter is placed instead.



**In hemodynamically unstable PE patients:**

 In those who present as hemodynamically unstable or those who become unstable over the course of treatment, more aggressive therapies than either heparinization or IVC filtration are recommended. Thrombolytic therapy (tPA) or embolectomy are usually indicated, provided the patient is also receiving adequate fluid resuscitation, high-flow oxygen, and reperfusion therapy.

**Sources:**

<https://www-uptodate-com.york.ezproxy.cuny.edu/contents/heparin-unfractionated-drug-information?search=heparin&source=panel_search_result&selectedTitle=1~148&usage_type=panel&kp_tab=drug_general&display_rank=1#F178715>

<https://www-uptodate-com.york.ezproxy.cuny.edu/contents/overview-of-acute-pulmonary-embolism-in-adults?search=pulmonary%20embolism&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1#H15>

<https://www-uptodate-com.york.ezproxy.cuny.edu/contents/treatment-prognosis-and-follow-up-of-acute-pulmonary-embolism-in-adults?search=pulmonary%20embolism&topicRef=8253&source=see_link#H13594723>