

Clinical Management of PE and Prophylaxis of PE

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Rajan Memorial Lecture
January 9, 2022

Introduction

- Pulmonary Embolism- disruption to flow of blood in pulmonary artery or its branches by a thrombus that originated somewhere else
- Occurs when a thrombus breaks off and enters pulmonary circulation
- Together, PE and DVT are collectively known as VTE (Venous Thromboembolism)

Etiology of PE

- Most PE's originate as lower extremity DVT
- There are both genetic and acquired risk factors
- Genetic- thrombophilia- (factor V leiden mutation, protein C deficiency, etc.)
- Acquired- immobilization for prolonged time, recent orthopedic surgery, malignancy, obesity, pregnancy, smoking, oral contraceptives, etc.
- Cancer and COVID-19 also carries a high risk for thrombosis and hence, PE

Types of PE

- Hemodynamically unstable PE
 - Serious incidence of PE
 - Causes hypotension
 - Patients are more likely to die from obstructive shock
- Hemodynamically stable PE
 - Mild incidence of PE (sometimes asymptomatic)
 - Causes mild hypotension
 - Overall low-risk

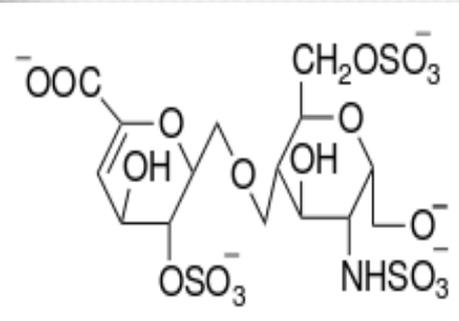
Treatment/Management of PE

- Initial Management
 - Supportive Measures
 - Supplemental Oxygen- (for patients that have <90 % oxygen saturation levels)
 - IV fluid resuscitation- (for patients that have massive PE)
 - Vasopressors- (medicines that contract blood vessels administered for hemodynamic support)
 - Mechanical cardiopulmonary support devices- (devices such as Extracorporeal membrane oxygenation, may be used in hemodynamically unstable patients with PE)
 - Anticoagulation
 - LMWH, UFH can be administered- (preferred due to lower incidence of inducing major bleeding and heparin-induced thrombocytopenia)
 - NOAC's and Vitamin K Antagonists are also used

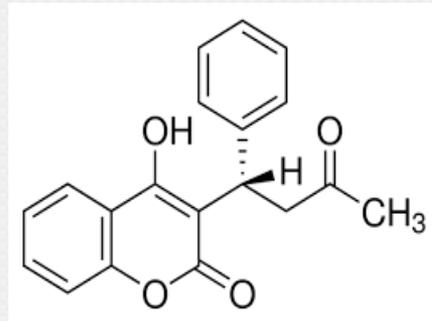
Anticoagulants

- Traditionally, low molecular weight heparin and warfarin are administered.
- Recently, Direct Oral Anticoagulants (DOAC's) are also being administered.

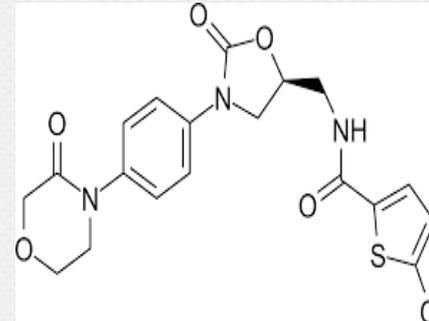
Heparin



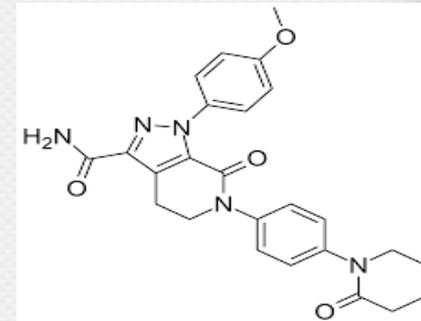
Warfarin



Riveroxaban



Apixaban



Hemodynamically Stable Patients

- Anticoagulation should be started even before diagnostic imaging if there is a high clinical suspicion for PE.
- If there is a low clinical suspicion for PE, diagnostic imaging should occur prior to establishing a definitive diagnosis, if it can be performed within 24 hours.
- If there is an intermediate clinical suspicion for PE, diagnostic imaging should occur prior to establishing a definitive diagnosis, if it can be performed within 4 hours.

Hemodynamically Unstable Patients

- Patients with a high clinical suspicion for PE who are also hemodynamically unstable should have emergent CTPA, portable perfusion scanning, or echocardiography performed immediately.
- Thrombolysis is the reperfusion strategy of choice for patients with hemodynamically unstable PE.
- Patients with high-risk PE can be switched from parenteral to oral anticoagulation following reperfusion treatment.

Treatment/Management of PE (cont.)

– Reperfusion Strategies

- Thrombolysis- (treatment to dissolve dangerous clots in blood vessels, preferred reperfusion strategy)
- Catheter-Directed Treatment- (Involves the insertion of a catheter into the pulmonary arteries, which can then be followed by thrombolysis, embolectomy, or thrombus aspiration)
- Surgical Embolectomy- (Involves the surgical removal of PE from the lungs. Usually only performed in patients with hemodynamically unstable PE)
- Vena Cava Filters- (Administered to those with a rare contraindication to anticoagulants and in patients with recurrent VTE despite anticoagulation. Involves filters that block the path of emboli and restricts them from moving to the heart/lungs.)

Treatment/Management of PE (cont.)

- Extended Treatment and Prevention of Recurrence
 - Patients with PE should receive at least 3 months of anticoagulant treatment
 - Longer periods of anticoagulant treatment result in less likelihoods of recurrence
 - 30% of PE cases are unprovoked (2-3 fold likelihood of recurrence)
 - Patients with persistent risk factors (cancer, antiphospholipid antibodies) have a higher rate of recurrence than those with just transient risk factors (immobilization, surgery, trauma)

Complications

- Recurrent thromboembolism
 - Most common cause is inadequate anticoagulation
- Chronic thromboembolic pulmonary hypertension
 - Persistent or progressive dyspnea development
 - Lifelong anticoagulant therapy is recommended
- Right heart failure
- Cardiogenic Shock
- Bleeding

Conclusion

- Pulmonary Embolism occurs when a blood clot breaks off and enters into the pulmonary circulation.
- Treatment is divided into three sections: initial management, anticoagulation, and reperfusion strategies.
- Equally as important as treatment is prevention of recurrence, which can be done through proper anticoagulation.