

# Pulmonary Endarterectomy: An Arteries Thrombus

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## Introduction

In thoracic surgery, a Pulmonary Thrombo Endarterectomy (PTE), also mentioned as Pulmonary End Arterectomy (PEA) is an operation that removes organized clotted blood (thrombus) from the pulmonary arteries, which supply blood to the lungs. Surgery is indicated in patients with arterial pulmonalis emboli that are surgically accessible. Thrombi are usually the explanation for recurrent/chronic pulmonary emboli and thus of Chronic Thrombo Embolic Pulmonary Hypertension (CTEPH). PTE is that the only definitive treatment option available for CTEPH. Thanks to the character of the procedure, patients with significant hemodynamic or ventilation complications or impairments could also be unable to undergo PTE.

A PTE has significant risk; mortality for the operation is usually 5%, but less in centers with high volume and knowledge. Individuals with favorable hemodynamic risk profiles also demonstrate lower mortality rates (1.3%). PTEs are risky due to the character of the procedure. PTEs involve a full Cardiopulmonary Bypass (CPB), deep hypothermia and cardioplegia (a crystalline fluid which stops the guts from beating). Actual removal of the embolus is administered during a standstill operation (deep hypothermia and periods of cessation of circulation). There are varieties of reasons why these high-risk elements of the procedure are necessary. CPB is required to divert blood from the guts and lungs and provide the body with oxygen and blood while the pulmonary vasculature is operated on. Cardioplegia is initiated because the approach to the pulmonary arteries is performed through the pericardium, a fibrous sac surrounding the guts. Furthermore, movement from the guts makes delicate work on the closely attached pulmonary arteries complex.

Hypothermia is important because the embolus is extremely delicate and therefore the risk of disruption is high, so as to

appropriately visualize the clot and take away it a bloodless field is required. Clot visualization is achieved through dissection of the pulmonary arteries which is technically challenging. If possible the clot is removed during a single piece to avoid the formation of mobile emboli. So as to realize this CPB is periodically stopped, leading to an entire cessation of blood circulation. This is often only feasible if the patient is hypothermic (cooled to 18-20C) as metabolism is slowed and therefore the body can better tolerate the resulting lack of blood supply. Circulatory arrest is restricted to twenty minute intervals to guard brain function. Typically an experienced surgeon can perform a whole unilateral procedure during this time. After each interval of arrest circulation is sustained for 10 minutes or until pulmonary venous oxygen saturation is a minimum of 90%. Bypass time is usually 345 minutes.

Recovery from this procedure are often complex. Thoracic surgery, CPB and cardioplegia are related to their own complications and management challenges, as is hypothermia. Specifically, endarterectomy is related to reperfusion pulmonary edema and "pulmonary artery steal." Reperfusion pulmonary edema occurs in up to 30% of patients and may be a result of changes in permeability to the vascular endothelium. Management of this condition may require the utilization of supportive ventilation including (BiPAP) Bidirectional Positive Airway Pressure and fluid management with diuretics. In patients who are non-aware of this management extra corporeal circulation could also be indicated. Each of those strategies is complex and need careful consideration of patient physiology.

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