

INVITED SYMPOSIUM XV

Thrombotic and Hemorrhagic Problems in Surgery

MICROEMBOLISM, DIFFUSE INTRAVASCULAR COAGULATION AND RESPIRATORY INSUFFICIENCY. L. Henry Edmunds, Jr. University of Pennsylvania, Philadelphia, Pennsylvania, U.S.A.

Clinically significant pulmonary microembolism and/or diffuse intravascular coagulation (DIC) may occur in critically ill patients with hemorrhagic shock, septicemia, multiple injuries, transfusions, open heart surgery and certain other diseases. Platelet aggregates, fibrin, fibrin-platelet aggregates and fat emboli may form in stored and extracorporeally circulated blood or during DIC. While evidence indicates that many microemboli break up in lung capillaries, others block capillaries or induce a local reaction. In DIC emboli and thrombosis are thought to occlude pulmonary capillaries. The result is a mismatch in ventilation and perfusion, arterial hypoxemia, decreased compliance, increased pulmonary vascular resistance and respiratory insufficiency which may progress to acute respiratory failure. In severe cases lung biopsies and autopsies show hemorrhagic atelectasis with blood found in peribronchial and perivascular spaces and in alveoli. Few emboli or thrombi are seen. Since platelet aggregates may disaggregate and fibrin may lyse, the cause and effect relationship between pulmonary microembolism and respiratory insufficiency in critically ill patients is implied rather than proven. The pathogenesis of the pulmonary injury may be related to circulating substances or substances released from emboli that cause leakage of blood through capillaries. Experimental bland microemboli do not reproduce respiratory insufficiency as seen clinically.

COMPLICATIONS OF EXTRACORPOREAL PERFUSION - Robert Rodvien, M.D.
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Presently, extracorporeal circulation (ECC) is being used for cardio-pulmonary bypass, and to support individuals with liver, renal or lung failure. The recognized clinical complications of ECC are primarily bleeding, thrombosis and microvascular occlusive disease. These complications are always modified by the patient's underlying illnesses and by the technique of ECC (the quality of the foreign surface, the perfusion, and the surgical intervention required). The abnormal surface to which blood is exposed may be the actual polymer of the device, the gas bubbles of the oxygenator or the altered endothelium induced by the disease. Because foreign surfaces are thrombogenic, all techniques of ECC require heparin to inactivate the coagulation proteins and prevent thrombosis. Despite heparin, platelets can be retained by the surface transiently or permanently, and release of pharmacologically active materials from platelets and leucocytes is expected. Other surface-activated portions of the blood have not received as much attention, but they may produce significant morbidity. These other elements include the kinin, complement, and fibrinolytic systems. The immediate and most overt complications of bleeding and thrombosis as well as specific long-term complications of ECC such as neurologic dysfunction will be discussed in the context of how ECC produces alterations in blood cells, proteins and lipids.