

Also useful as aids to the diagnosis of pulmonary embolism are various procedures for assessing the patency of the deep veins of the legs. A strong association between pulmonary embolism and deep vein thrombosis was documented recently by Sevvit, who found deep vein thrombosis in virtually all his patients who suffered fatal pulmonary embolism. Similarly, another physician, who assessed thrombosis using the radioactive fibrinogen test, found pulmonary embolism to be present only when radioactive clots were detected in the deep veins.

In the author's own experience, deep vein thrombosis was detected in 95 per cent of patients with pulmonary embolism confirmed by selective pulmonary angiography. Contrast ascending phlebography is more definitive for detecting venous thrombosis than the simpler electrical impedance phlebography. However, its usefulness is limited because it is not readily available. Another limitation is that contrast ascending phlebography is an invasive test. Therefore, non-invasive procedures—electrical impedance phlebography and Doppler ultrasound—have been used with increasing frequency. For detecting deep vein thrombosis, impedance phlebography appears to be more sensitive and more specific than Doppler ultrasound.

Based on these non-invasive, readily available tests, a practical diagnostic sequence can be formulated to assess the many clinical situations in which perfusion lung scans and selective pulmonary angiograms cannot be obtained immediately.

If Pulmonary Embolism Is Suspected

When pulmonary embolism is suspected, an immediate "covering dose" of 7,500 to 10,000 units of heparin should be given intravenously; a routine chest x-ray and an electrocardiogram should be obtained; arterial oxygen tension should be measured; and patency of the deep veins should be assessed.

If an accurately performed arterial oxygen tension measurement is normal (above 90 mm Hg), it is unlikely that pulmonary embolism is present. If phlebography shows the deep veins of the legs to be of normal patency, pulmonary embolism is also unlikely. Indeed, if the impedance measurement is normal in these suspected patients, our experience indicates a 90 per cent probability that pulmonary embolism does not exist. However, if the arterial oxygen tension is low or the deep veins are obstructed, perfusion lung scanning should be performed to confirm the presence of an embolism.

In this clinical setting, the impedance measurement is specific for detecting thrombosis in the deep

veins, where pulmonary emboli originate. Therefore, this test has far greater diagnostic value than the arterial oxygen tension measurement. In our group of patients, angiography confirmed the presence of pulmonary embolism in 90 per cent of those whose impedance phlebograms indicated deep vein obstruction.

Most patients should have angiographic confirmation of pulmonary emboli, particularly if some form of surgical intervention is contemplated. And in the vast majority of patients, intravenous heparin therapy should be continued, provided that anticoagulation is not contraindicated.

In the future, heparin will probably be replaced by thrombolytic agents. Because such compounds are superior to heparin in rapidity of action and completeness of clot resolution, they are likely to become the preferred drugs for treatment of pulmonary embolism. However, since the thrombolytic agents are not yet available for general use, heparin remains the drug of choice. □

Practice Procedures Detecting Pulmonary Embolism

Perfusion lung scanning and selective pulmonary angiography are the definitive diagnostic procedures to confirm or rule out pulmonary embolism, but in many situations, they are not immediately available. When pulmonary embolism is suspected, the following diagnostic sequence is a practical means of prompt diagnosis and successful management:

- Give a "covering dose" of 7,500 to 10,000 units of heparin intravenously.
- Obtain routine chest x-ray and ECG.
- Measure arterial oxygen tension. When tension is normal (90 mm Hg or higher), pulmonary embolism is unlikely.
- Assess deep veins for thrombi by contrast phlebography or impedance phlebography. If the impedance measurement is normal, the probability is 90 percent that there is no pulmonary embolism.
- Perform perfusion lung scanning if arterial tension is reduced or deep veins are obstructed.
- Confirm the presence of pulmonary emboli by angiography.
- Continue intravenous heparin therapy in patients with confirmed pulmonary emboli, unless anticoagulation is contraindicated.