Venography

PULMONARY embolism is a major cause of morbidity and mortality in patients after surgery, in debilitated patients, and in childbirth. Nearly all pulmonary emboli arise from thrombi in the leg veins, and the difficulties in the clinical recognition of venous thrombosis have been emphasized repeatedly. Clinical evaluation detects less than one half of the cases of venous thrombosis, and in one report only 5% of patients with fatal pulmonary emboli had clinical evidence of leg-vein thrombosis. A number of procedures for the diagnosis of this condition have been advocated, of which four have recently received the most attention. These are venography, radioactive fibrinogen uptake, impedance plethysmography, and Doppler ultrasonic technic. Of these four only venography provides direct evidence for the presence of a thrombus by demonstration of a filling defect within the vein. The radiolabeled fibrinogen test permits inference of a thrombosis by a localized accumulation of radioactivity in the limb, but cannot detect preformed thrombi. Impedance plethysmography takes advantage of the fact that normally the venous volume of the leg changes with respiration, and these changes are diminished if thrombi are present in the veins. Finally, the Doppler technic detects blood flow in the leg veins, and is useful in diagnosis since thrombosis may cause abnormal flow.

The advantages of direct demonstration of thrombi in veins are obvious, and a priori one would expect the greatest sensitivity from such a diagnostic approach. In pulmonary embolism, an analogous clinical situation, the importance of direct demonstration of emboli has been emphasized in studies utilizing pulmonary arteriography, and the pulmonary arteriogram has been chosen as the basis for inclusion in the urokinase-pulmonary embolism trial conducted under the auspices of the National Heart and Lung Institute. Venography has been shown to detect an equal or greater number of thrombi in comparison with radiolabeled fibrinogen accumulation, impedance plethysmography, and Doppler technics.

Unfortunately, venography has not been widely utilized, largely because of technical problems and questions of interpretation. However, there now seems to be sufficient experience with different technics to permit meaningful comparisons to be made, and some general agreement has emerged with regard to questions of technic and interpretation. The goal of venography is visualization of all the major veins of the leg, with particular emphasis on the tibial and soleal veins of the calf. These are the sites of origin of most venous thrombi in the leg, and have been the most difficult to opacify in their entirety.

Recently a workshop on venography was sponsored by the Thrombosis Advisory Committee of the National Heart and Lung Institute, with Drs. Stanford Wessler and Sol Sherry as co-chairmen. At this workshop the technics of DeWeese and Rogoff, Bergvall, Nicolaides et al., and Rabinov and Paulin were discussed in detail. The objective of complete filling of the venous tree was most nearly attained by the technic of Rabinov and Paulin, whereas that of Nicolaides et al. places emphasis on filling of the soleal veins. Rabinov and Paulin use the semiprivate position with the leg relaxed, bearing no weight, and without tourniquets. Essentially complete visualization of the venous system of the leg is achieved by utilizing relatively large volumes of contrast medium to fill the veins of the leg, and by exercise of the leg and, if necessary, the Valsalva maneuver to fill the femoral and iliac veins. Other methods for filling the deep calf veins involve use of a tourniquet around the ankle or tourniquets on the ankle and thigh, and an Ace bandage between.

It was agreed at this conference that a positive diagnosis of venous thrombosis can be made if there is a consistently demonstrable filling defect, preferably surrounded by a layer of contrast medium, seen in at least two projections in a well-opacified vein. Nonfilling of the vein is not acceptable as conclusive evidence of thrombosis, nor are other ancillary findings, such as disordered flow patterns, or abnormal collateral veins. However, such findings may be considered suggestive of deep vein thrombosis, and might be sufficient for diagnosis in

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the proper clinical setting. If possible, when such abnormalities are encountered the study should be repeated with variations in technic designed to permit more detailed study of the involved veins.

The disadvantages of venography are that it requires modern and costly radiographic equipment, and may cause some discomfort for the patient, as well as involving modest radiation exposure. Complications appear to be limited to problems arising from occasional extravasation of contrast medium into the subcutaneous tissue at the injection site, infection where a cutdown is required, and, rarely, serious allergic reactions to the contrast media. Because the contrast media are irritating to the intima of the veins, care must be taken to empty the leg veins fully after the procedure, but postvenography phlebitis is an unusual event.

Venography of the lower extremities appears to be a useful and reliable procedure for the diagnosis of venous thrombosis, and should be used to establish the presence of such thrombi when they are suspected in patients without clinical findings sufficient to establish the diagnosis. A negative venogram, when properly performed, essentially rules out deep venous thrombosis of the lower extremities.

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References
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