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DISCREPANCIES BETWEEN VENOGRAPHY AND REAL TIME B MODE ULTRASOUND IMAGING IN THE DIAGNOSIS OF DEEP VEIN THROMBOSIS

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Methods : in this prospective study, real time B Mode ultrasound imaging (USI) was compared to bilateral ascending contrast venography, double blindly, in 430 patients suspected of deep vein thrombosis (DVT) or pulmonary embolism.

A complete scan of the venous system from the inferior vena cava to the calf veins, was performed with a high resolution duplex system (DIASONICS DRF 400) and coupled systematically with a C.W. Doppler examination. The results obtained by USI were thus compared to the venograms performed on a total of 854 legs.

Results : there are corresponding results in 95% of the legs (808/854). If we consider venography as the standard of reference, the sensitivity of USI is 98% (325/333) and the specificity 94% (483/514). Isolated calf vein thrombosis are detected in 91% (84/92) of the legs and proximal DVT in 100% (241/241) in this series whatever the topography and the extension of the thrombosis and whatever the degree of the obstruction of the vein.

Discrepancies found in 46 legs are related to :

- 8 DVT located in the calf (6 in the presumed healthy leg) diagnosed only by venography.
- 27 DVT (18 distal, 9 femoral or iliac) detected only by USI
- 9 doubtful examinations with USI not confirmed by venography
- 2 doubtful venograms with negative USI test.

Comments : Calf vein thrombosis especially located in the soleal sinuses and the gastrocnemius with in most cases the direct image of the thrombus are more often detected by USI provided that the technique and the equipment are appropriate.

The absence of visualisation of venous segments with venography is not specific of venous thrombosis. These veins non affected by the thrombosis are not filled by the contrast medium when located above in occluded ilio-femoral or ilio-caval junction or when they are the site of extrinsic compression. The direct image of the vein and the surrounding structures obtained with USI enhances the diagnostic sensitivity and specificity and provides precision of the exact extension of the thrombosis.

Due to these differences, can venography still be considered as the standard of reference in the diagnosis of DVT and their precise localisation ?

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COMPUTERIZED IMPEDANCE PLETHYSMOGRAPHY, A NEW PLETHYSMOGRAPHIC METHOD TO DETECT DEEP VEIN THROMBOSIS. P. Prandoni (1), M. Vigo (1), M.V. Huisman (2), J. Jonker (3), H.R. Büller (2), J.W. ten Cate (2). Clinica Medica II A and Dept. of Radiology (1), University of Padova, Italy, Div. Hemostasis and Thrombosis (2) Academic Medical Center, Amsterdam and Thrombosis Service (3) Rotterdam, The Netherlands.

Since the clinical diagnosis of deep vein thrombosis (DVT) is unreliable, several invasive and non-invasive methods have been developed recently. Of these, impedance plethysmography (IPG) is a widely employed technique based on measurement of changes in blood volume produced by temporary obstruction. IPG has been shown in large prospective studies in symptomatic patients to be a safe and effective alternative to contrast venography, if used either in combination with 125I-fibrinogen legscanning or serially as a single test. Currently available impedance plethysmographs are limited by several technical and operational problems. Therefore, a new computerized impedance plethysmograph (CIP) was developed, having the following characteristics: portability, battery operated and fully automated. A prospective two-center study in 299 consecutive outpatients was done to compare the efficacy of CIP vs. venography in patients with symptomatic DVT. Using a blind design i.e. care was taken to insure that CIP and venography were performed and interpreted independently. The results in patients without venography proven thrombosis and those with proximal vein thrombosis were subjected to a discriminant analysis producing a line of best discrimination between normal and proximal vein thrombosis. In 14 patients it was not possible to obtain an adequate CIP tracing. 12 patients were not entered because of refusal to undergo venography and 15 patients were excluded from analysis because of poor opacification of the proximal veins. On the basis of discriminant analysis 138 of the CIP results were classified as normal and 120 as abnormal. 175 patients were normal on venography and 83 had proximal thrombosis. The sensitivity of CIP for proximal vein thrombosis was thus 95% while the specificity was 77%. It is concluded that computerized impedance plethysmography is a potentially sensitive method to detect proximal vein thrombosis in patients with clinically suspected deep vein thrombosis.

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RATE OF NORMALIZATION OF ABNORMAL IMPEDANCE PLETHYSMOGRAPHY IN PATIENTS WITH PROVEN DEEP VEIN THROMBOSIS: SIGNIFICANCE IN THE MANAGEMENT OF RECURRENT SYMPTOMS.

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The diagnosis of deep vein thrombosis (DVT) by clinical signs and symptoms is unreliable, but contrast venography is expensive and invasive. Therefore, the use of non-invasive methods to detect DVT have become en vogue, of which impedance plethysmography (IPG), either in combination with $^{125}I$ fibrinogen leg scanning or performed serially as a single test, have been demonstrated to be a safe and effective alternative. Since the principle of IPG is based on the measurement of venous outflow obstruction due to intravascular thrombus and since the aim of anticoagulant treatment is to facilitate recanalisation one might expect a gradual normalisation of IPG in the majority of patients. This information is important for patients presenting with recurrent signs and symptoms. If the IPG has normalized prior to presentation it is possible to separate complaints due to recurrent DVT from post phlebitic syndrome. In this prospective trial we studied 161 consecutive outpatients with abnormal IPG and venography proven DVT three monthly during one year to determine the rate of normalization and to estimate the utility of IPG testing in patients with recurrent symptomatic DVT. The IPG test had normalized in 101 of 151 patients (67%) by three months, in 126 of 148 (85%) after six months, in 133 of 145 (92%) while after one year 139 of 146 (95%) had their IPG normalized. During the one year follow-up 35 of the 161 study patients (23%) returned with recurrent symptoms. Of these 31 had normal IPG tests prior to the visit. In 18 patients IPG remained normal at repeat testing. In 13 patients IPG became again abnormal (venography showed acute on chronic DVT in 10 patients while 3 patients showed no acute DVT). It is concluded that a 95% normalization of IPG occurs and that IPG is useful in the management of recurrent symptoms.

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SEMI-QUANTITATIVE RADIONUCLIDE PHLEBOGRAPHIC (RNP) ASSESSMENT OF DEEP VEIN THROMBOSIS (DVT) AND CHRONIC VENOUS INSUFFICIENCY (CVI).

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A semi-quantitative RNP using $^{99}$Technetium macroaggregated albumin for the evaluation and follow-up of DVT and CVI has been developed. Values were assigned to the deep veins of the calf, knee, tigh and pelvis based upon the localization and the characteristics of the images obtained: stasis, hot spots and collateral circulation. A maximum score of 18 reflected complete thrombosis of all 4 segments. 208 patients (mean age 53.7 years, range 18-92), 161 of whom had a proven risk factor for DVT were studied. $^{99}$Technetium was injected into the dorsal foot vein of 407 limbs with appropriate tourniquets and early and late imaging of the limbs, pelvis and lungs was performed. In 48 patients, 83 limbs, X-ray contrast phlebography (CP) was also done. The mean RNP score was 4.1 units (range 0.4-18) and higher in the left than the right lower limb. It was mostly high in patients with proximal recurrent DVT or in DVT superimposed on CVI. The score was easy to follow and helpful in the assessment of the extent of DVT. It was particularly helpful in 3 instances. 1) Assessment of venous patency following anticoagulant therapy. 2) Estimation of recurrent DVT. 3) Differentiation of recent DVT from venous insufficiency. Overall RNP method had a sensitivity of 87.6%, a specificity of 54% and an accuracy of 64.8%. The sensitivity was similar in above & below-knee thrombi. Yet the specificity was higher in above-knee thrombi. The highest accuracy (87.3%) was observed in pelvic and groin thrombi. The distribution of thrombi on CP was 19% below the knee, 31% above it and 50% both above and below the knee. Pulmonary embolism (PE) was initially observed in 54 patients (26%) with no clinical evidence of DVT and therefore untreated. This high level is most probably related to the high incidence of proximal DVT in the patients. 181 patients were treated with heparin & coumadin and the RNP score was decreased to 3.6 units (range 0.4-8.8). PE occurred during treatment in 11 (6.1%) and recurrent DVT in 16 (8.8%) patients. CVI was observed in 23 patients before treatment and in another 24 patients (13.2%) after treatment. These results indicate that the RNP method is a simple, semi-quantitative and useful technique for the evaluation and follow-up of DVT and CVI. It is most helpful in the assessment of the extent of DVT. It is also a rapid, noninvasive and cost effective technique.