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ECHOTOMOGRAPHY IN ARTERIOVENOUS FISTULAE

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Summary

We employed Echotomography (by 2.25–5MHz probes) as a quick procedure to measure the vessel diameter at definite points to detect aneurysms and their evolution, to evaluate the arteriovenous fistula (AVF) characteristics, to detect haematoma, thrombi, and collateral vessels. Echotomography is a non-invasive technique which may be performed repetitively even immediately after AVF surgery. It was most valuable in the examination of proximal AVF and internal shunts (autologous venous and bovine carotid grafts). Echotomography has proved to be accurate in studying the initial morphological and functional evaluation and follow-up of AVF.

Introduction

Vascular access pathology is a constantly increasing problem because of the extension of haemodialysis to high-risk patients. Local and/or general problems of arteriovenous fistulae (AVF) may lead to obliteration with loss of available vessels.

Early diagnosis of AVF thrombosis may allow thrombolytic or surgical treatment with good results. At present, the diagnosis of obstruction to flow is essentially limited to the clinical evaluation. Morphological and functional studies of AVF are rarely performed because the available methods (radiology and scintigraphy) employ contrast media or radioisotopic tracers. Contrast media may cause local and/or systemic reactions, while radioisotopic techniques cannot show minute details. Moreover, neither can be used repetitively.

Methods

Echotomography with probes 2.25–5.0MHz was used. Two Toshiba sono-layers with real-time linear probes were employed in our investigation, together

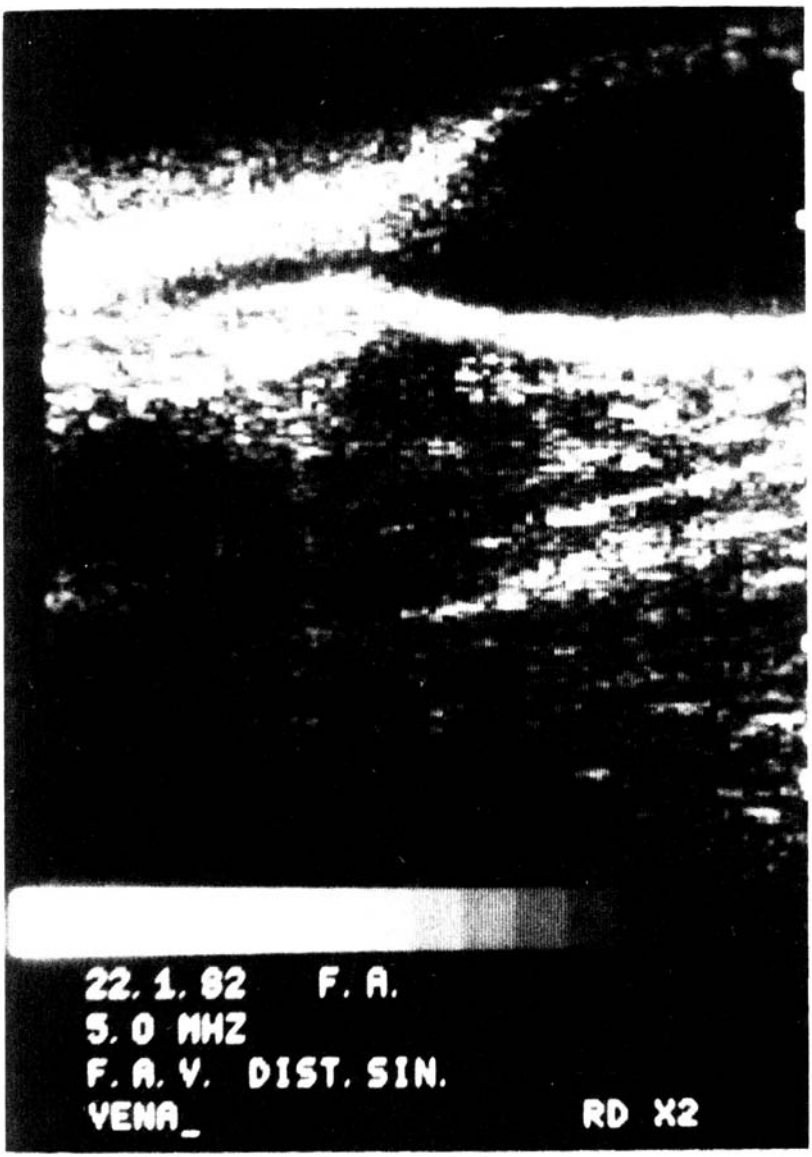

Figure 1. See text

Figure 2. See text

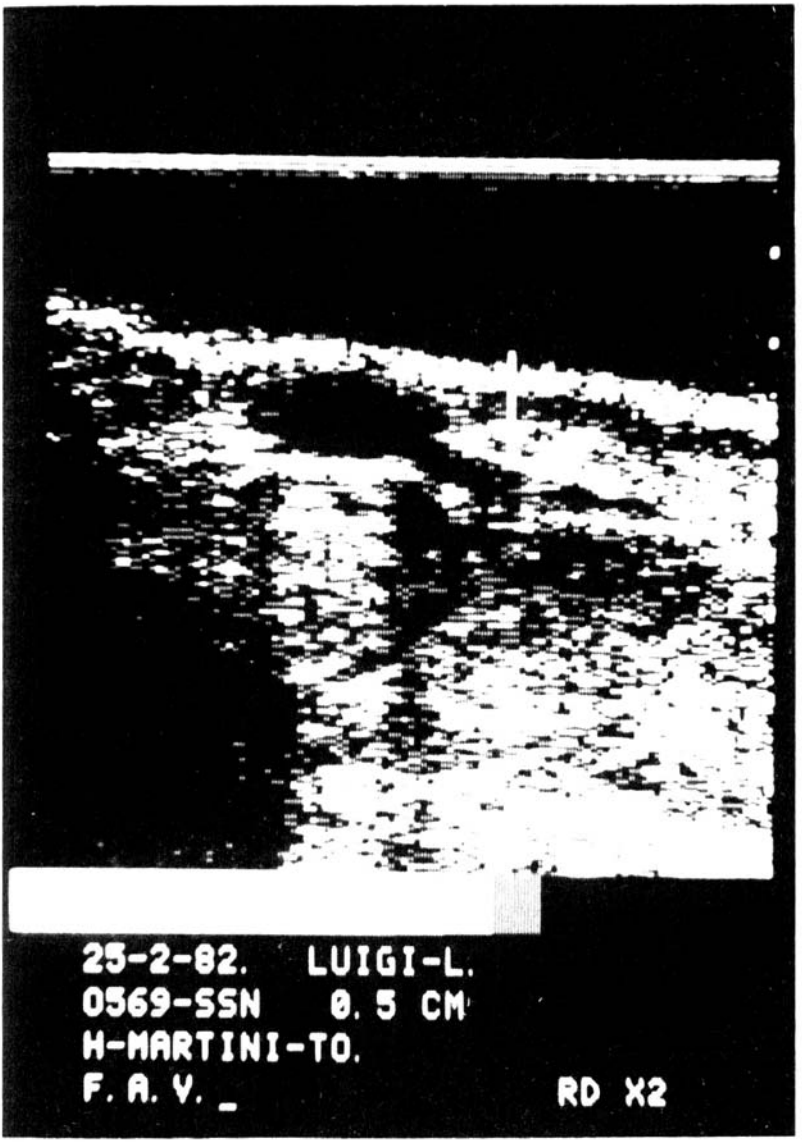

Figure 3. See text

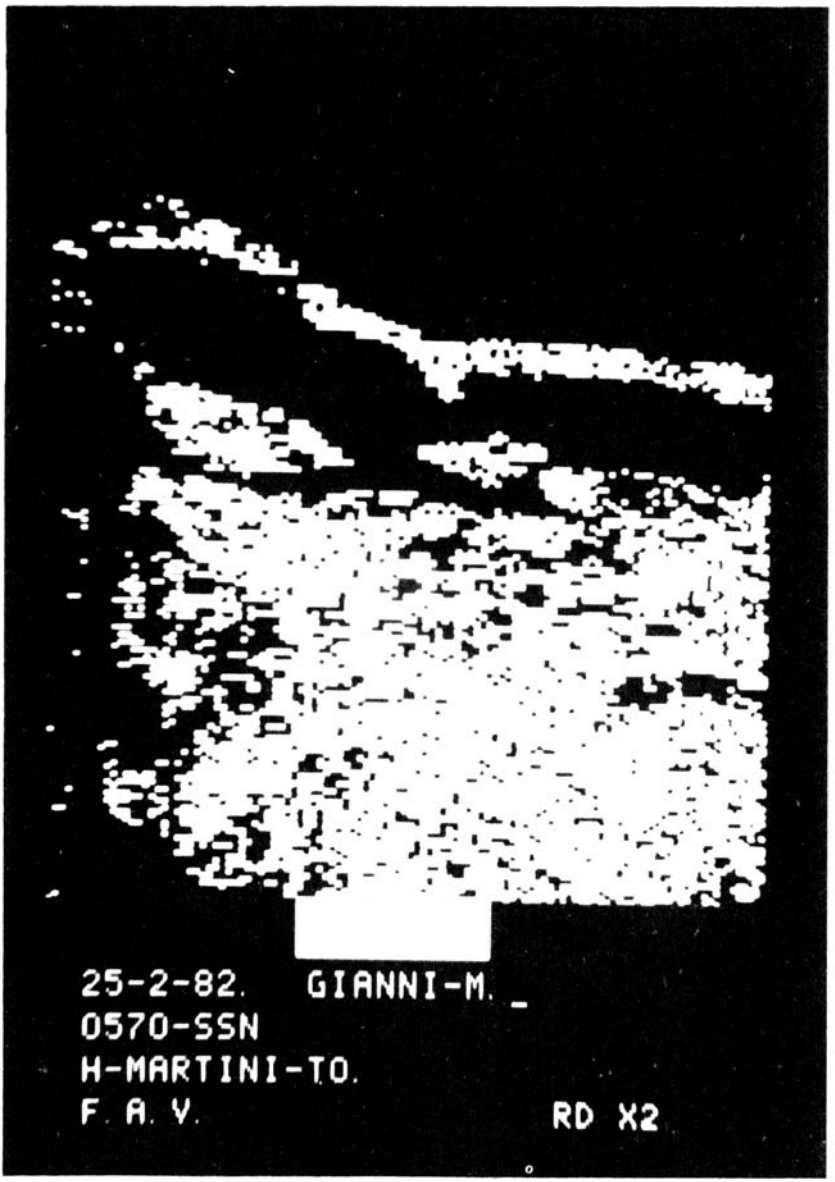

Figure 4. See text

with compound scans with manual localised probes. Our sonolayers were provided with digital scan-converter and grey-scale. The use of manual probes allows better definition of the image and the visualisation of larger areas. The use of real-time probes allows the visualisation of the vascular pulsation.

The upper limb of the patient was dipped in a basin filled with moderately warm water to avoid any vessel modification or artifact due to the pressure of the probe on the skin and the superficial site of the AVF. Dipping of the limb in water allows the orientation of the probe in various planes, according to the vessel direction, even if tortuous.

This procedure is non-invasive, does not require any contrast media nor X-rays and so it may be repeated whenever necessary, even immediately after AVF surgery. Moreover, it can be rapidly and easily used and is inexpensive.

Such a method allows measurement of the vessel diameter, detection of aneurysms and their evolution and follow-up, evaluation of the AVF wall characteristics, and to delineate haematoma, thrombi and collateral vessels.

Results

The echotomographic study was carried out over a year and was performed on 57 patients with AVF in the upper limb. The following are some of the most significant findings which were detected in the course of the study.

Figure 1 illustrates a three year old distal AVF between the radial artery and the cephalic vein (end-to-end anastomosis), in which can be observed an arterialised tract of vein of normal calibre followed by a large aneurysmal dilatation.

Figure 2 (parallel scan of Figure 1). The same venous aneurysm presenting a reduced wall and the radial artery below are shown.

Figure 3 illustrates a five year old distal AVF between the radial artery and the cephalic vein, with side-to-side anastomosis and the nearby distal ligature of the vein. A modest aneurysmal dilatation at the anastomosis level can be easily visualised. The arterialised vein has a 0.5cm diameter.

Figure 4 illustrates a seven year old proximal AVF between the brachial artery and the basilic vein of the upper limb, in which the side-to-side anastomosis and the different calibres of the artery (deep) and the vein (superficial) are perfectly visible. It is also possible to recognise a stenosis of the venous lumen and a little non-surgical fistula, probably due to a dialysis puncture.

Discussion

At present, the results obtained with Echotomography in detecting AVF pathology support the use of such a non-invasive and non-traumatic method as first investigation in the study of vascular access problems in haemodialysis. Echotomography proved to be the most accurate procedure in studying AVF in their initial morphology and functional follow-up.

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