Abstract

Non invasive diagnostic methods include functional tests, morphofunctional tests and imaging. Functional tests include pressure measurement and volume measurement. Morphofunctional tests are given by duplex scan, which is also used successfully during treatment. Imaging methods are mainly computed tomography (CT) and magnetic resonance (MR).

Introduction

The aim of a correct diagnosis is to define the type, the localization, and the hemodynamic alterations of a pathology. Two other important advantages of a correct diagnosis are the possibility of guiding the therapy and sampling numerical data useful for follow-up.

Diagnostic tools can be divided into three categories: 1) functional tests; 2) morphofunctional tests; and 3) imaging.

Functional Tests

Functional tests are useful for physiological measurements and evaluation of the hemodynamics of a whole limb. Usually they give quantitative measures which are very important for the follow-up of the patients.

The most important measurements are pressure measurements obtained by the use of continuous wave (CW) Doppler and plethysmographic devices and volume measurements, which are very important in the evaluation of venous diseases.

Hand held CW Doppler devices can give qualitative data during physical examination of the type of arterial flow and the presence and length of venous refluxes.

Morphofunctional Tests

Morphofunctional tests are represented by duplex scanning, which is the main non invasive examination method for congenital vascular malformations.

Duplex scanning allows a segmental examination of the vascular tree in axial and transverse planes. The blood flow alterations are located with precision and important numerical data can be obtained from the Doppler curve: blood flow determination; pulsatility index, resistance index and reflux time.

The ultrasound image is able to localize extratruncular malformations in surrounding tissues and to detect the infiltration of bones, nerves and joints.

Real time sonography is effective for detecting functional impairments in skeletal muscles (Fig. 16.1).

Real time color Doppler investigation is often important in detecting the hemodynamics of arteriovenous AV shunts (Fig. 16.2).

High flow vessels in bones can be detected using transcranial settings (Figs. 16.3, 16.4).

In venous malformations it is very important to detect segmental and long refluxes in the deep and superficial vein systems (Fig. 16.5). The lateral side of the lower limb should be investigated in all patients in order to detect a marginal vein and to study its course.

An emerging problem is represented by nerve compression and infiltration caused by the vascular malformation itself and related tissue pathology such as phlebitis and tissue scarring secondary to treatments (Fig. 16.6).
Fig. 16.1. Structural alteration of muscle localized at the left thigh secondary to vein infiltration, demonstrated by ultrasound

Fig. 16.2. AV shunts demonstrated by color Doppler

Fig. 16.3. Diffuse intra and extraosseous AV shunts (note arrow and the peak frequency ratio (PFR) value in the duplex scan)

Fig. 16.4. Demonstration of an intratibial high flow malformation by color Doppler equipment set for transcranial examination

Fig. 16.5. Venous valve incompetence

Fig. 16.6. Phleboliths demonstrated by ultrasound