Plethysmographic findings in deep venous thrombosis.

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Accurate diagnosis of acute deep venous thrombosis (DVT), particularly proximal is important as treatment should be administered immediately, in order to prevent progression of the thrombus and/or pulmonary embolism (PE). Currently duplex ultrasound and/or computed tomography venography (CTV), are the gold standard examinations providing anatomical information regarding the presence and degree of obstruction. However, duplex ultrasound is not ideal for imaging pathology above the inguinal ligament. Furthermore, CTV is invasive. Therefore, other non-invasive tests may have a place.

Plethysmographic techniques have been used for this purpose since the 1950’s. These included impedance plethysmography (IPG),\(^1\) strain-gauge-plethysmography (SGP),\(^2\) photo-plethysmography (PPG) or light reflection rheography (LRR)\(^3\) and air-plethysmography (APG).\(^4,5\)

The DVT plethysmography diagnosis is based on the out-flow curve following sudden release of a thigh cuff inflated at a certain pressure. In acute DVT\(^4\) an out-flow fraction (OF) with superficial occlusion of the GSV at the knee < 28% in combination with a venous volume (VV) of < 50 mL, identified all patients with acute proximal DVT. For past DVT only the < 28% criterion is useful.\(^5\)

Using a thigh compression cuff at 80 mmHg and following sudden release it was shown that thigh compression significantly improves the venous return in patients after DVT and normals. Refluxing legs after DVT have significantly greater venous volume changes than legs without reflux.\(^6\)

Following an acute DVT the leg veins may: a. remain obstructed, b. re-canalis, c. present with reflux or d. have a combination of the above. The venous filling index (VFI) of APG confirms the presence of reflux and quantifies it in mL/s.\(^7\)

In a study where venous filling time (VFT) using APG was compared to venous reflux time/duration (RT) measured simultaneously with duplex on the same patients the correlation was excellent \((r = 0.933)\).\(^8\)
The venous filling index (VFI) of APG provides a global measurement of venous filling after an elevation to dependency manoeuver. It is responsive to treatments on reflux. However, the venous drainage index (VDI) after a dependency to elevation manoeuvre has never been investigated. The recently introduced venous drainage index (VDI) may help in the detection of obstruction and its quantification.

References:


MCQ:
1. Air-plethysmography (APG) may be helpful in the diagnosis of:
   a. Acute DVT
   b. Past DVT
c. Deep venous reflux  
d. Iliac occlusion  
e. All of the above  
Answer: e

2. The Venous Drainage Index (VDI) is a promising test in the assessment of venous obstruction using:  
a. Air-plethysmography (APG)  
b. Photo-plethysmography (PPG)  
c. Strain-Gauge plethysmography (SGP)  
d. Impedance plethysmography  
e. Food volumetry  
Answer: a