A New Look at Venous Hemodynamics: Measuring Reflux and Outflow Obstruction

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Disclosures: None

Historical Perspective
1. Hemodynamic testing was routine practice (AVP, PPG, Strain-gauge, APG) until the advent of duplex
2. Subsequently, routine haemodynamic measurements were abandoned in favor duplex
3. Since then we repeatedly hear the statement: “there is a poor correlation between hemodynamic measurements and clinical severity of CVD”

Questions to be Answered
1. What is the relationship between hemodynamic measurements (changes in volume, pressure and flow) and severity of chronic venous disease?
2. What is the significance of such a relationship.

Chronic Venous Insufficiency
Result of:
- Reflux (ml/sec)
- Obstruction (resistance: mmHg/ml/min)
  or both: Reflux and Obstruction

Air-plethysmography
Measures reflux (ml/sec)
Measures outflow resistance (mmHg/ml/min)
Simultaneous Pressure and Volume Measurements

26 Limbs with CVD

Nicolaides et al, Int Angiol 2014;33:275-81

Simultaneous Pressure and Volume Recordings

\[ R = \frac{P}{Q} \]

\( \text{mmHg/ml/min} \)

Labropoulos et al, Arch Surg 1997;132:46-51

The Role of Venous Outflow Obstruction in Patients With Chronic Venous Dysfunction

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Objective: To quantify the functional venous outflow obstruction in diabetic feet and assess its cumulative effect.

Design: A prospective, randomized, controlled trial.

Setting: A vascular laboratory in a hospital setting.

Patient: A group of patients with diabetic foot ulcers and a control group of patients without ulcers.

Changes were noted in 30% of patients and ulceration in 20% of patients. The results of all tests showed no evidence of obstruction in control subjects. In most cases, patients with unobstructed veins, results similar to those in control subjects were observed. In 10 cases, patients, 10 ulcers were performed and compared with the findings of the control group. The TTOV results agreed with the reduction of PD and TOF seen in the control group. In group 2, 20% of the limbs with obstruction presented the peripheral veins that became varicose in the limbs.
Multivariable Regression

- Dependent Variable: VCSS
- Both VFI and R were independent predictors of VCSS (P < 0.001)

Predicted VCSS (or HI) = 0.33 + (VFI x 0.44) + (R x 158)

Conclusions

1. There is a high correlation between the combined measurements of reflux and resistance (estimated VCSS or HI), and observed VCSS (r = 0.86)
2. The statement: "there is a poor correlation between haemodynamic measurements and clinical severity of CVD" should be modified to: "there is a poor correlation between duplex measurements and clinical severity of CVD"