A Novel Non-Invasive Technology to Assess Right Atrial Pressure. A Report from SICA-HF


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Background & Aims

Increased jugular venous pressure (JVP) reflects increased hydrostatic pressure in the right atrium (RA) and is a fundamental clinical sign in heart failure. Clinical assessment is often difficult and can be very subjective. We aimed at evaluating agreement amongst different doctors during their specialist training in assessing JVP and how novel invasive technologies could identify volume overload amongst patients with a spectrum of severity of heart failure and in control subjects without important myocardial or valve disease.

Methods - 1

Consecutive out-patients with heart failure and controls enrolled in the "Studies Investigating Co-morbidities Aggravating Heart Failure" (SICA-HF) were assessed.

With the patient semi-recumbent at 45°, the internal jugular vein pressure (JVP) was assessed by 3 doctors at different stages of training and clinically estimated as not raised/unremarkable (0), borderline/marginally raised (1), elevated (2).

Methods 2

With the patient reclining with head elevated at 45°, the internal jugular vein (IJV) is identified and then JVP dimension and its changes measured continuously by M-mode ultrasound using a linear high frequency probe (10 MHz) at rest and during a Valsalva manoeuvre. The ratio between maximum JVP diameter and diameter at rest was calculated (JVD ratio).

JVD changes and JVD ratio in different patients with HF are shown in the figure above (on the left side, for a patient in the lowest NT-proBNP quartile and on the right side for a patient in the highest NT-proBNP quartile).

Methods - 3

Using near-infrared spectroscopy (NIRS), the right atrial pressure is estimated over the external jugular vein (Venus 1000, Mespere LifeSciences Inc., Canada).

Results 1 – Clinical JVP Assessment

Statistical agreement for JVP measured on a 0, 1, 2 scale by different physician was higher between the senior grades (right) and weaker between junior grades (left).

Results 2 – Echocardiographic Characteristics

Table 1: Characteristics of patients by diagnosis.

Conclusions

In out-patients with chronic HF, measurement of RA pressures using a novel non-invasive device was strongly related both to an echocardiographic measures right ventricular overload and to NT-proBNP.

This contrasts with poor agreement amongst clinicians in estimating JVP.

Conflict of interest: none declared.

Table: Characteristics of patients by diagnosis.

List of abbreviations used: SBP - systolic blood pressure; diastolic blood pressure: LVEDV - left ventricular end diastolic volume; LVEF - left ventricular ejection fraction; LAVI - left atrial volume index; TAPSE - Tricuspid Annular Plane Echocardiographic Excursion; TR gradient - Trans-Tricuspid systolic gradient; IVC inferior vena cava: M: Mitral Regurgitation; TR: Tricuspid Regurgitation.

JVD ratio and RA pressures strongly correlated with other echocardiographic measures of right ventricle (RV) overload and NT-proBNP plasma levels.