Echocardiographic investigation of chronic pulmonary hypertension and right ventricle systolic performance using the right ventricular outflow tract spectral Doppler signal

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Introduction

Two-dimensional and Doppler echocardiography is an essential non-invasive tool for the evaluation and management of patients with chronic pulmonary hypertension (cPHT). Clinicians commonly use these non-invasive procedures to assess pulmonary artery systolic pressure (PASP) and right ventricular (RV) dysfunction. This study focused on evaluating the correlation between new measures of RV ejection [time to onset, time to peak, and the duration of the right ventricular outflow tract (RVOT) spectral signal] to the more commonly considered techniques mentioned beforehand.

Objective

The aim of this study was to show that measures of RV ejection [time to onset, time to peak and the duration of the right ventricle outflow tract (RVOT) spectral signal] can be used in evaluating the severity and extent of PH and RV dysfunction in patients with cPHT.

Materials and methods

Studied Population:

- **Group I**: 30 Healthy volunteers, age 45–18.
- **Group II**: 30 Patients with documented cPHT of various etiologies, age 47–18, PASP > 35mmHg

<table>
<thead>
<tr>
<th>Exclusion Criteria (group II)</th>
<th>Inclusion Criteria (group I)</th>
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<tbody>
<tr>
<td>Mechanical Valve</td>
<td>Normal biventricular function</td>
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<tr>
<td>Pacemaker – Right Ventricle</td>
<td>No pulmonary hypertension</td>
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<tr>
<td>Defibrillator wire – Right Ventricle</td>
<td>None of the exclusion criteria</td>
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<tr>
<td>Cardiac transplant</td>
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<tr>
<td>Intra-cardiac shunt</td>
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<tr>
<td>Complex congenital heart disease</td>
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<tr>
<td>Intra-ventricular conduction delay or block</td>
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<tr>
<td>Cardiac Surgery</td>
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</tbody>
</table>

Table II Clinical entities responsible for cPHT in the studies population

| Echocardiographic pulmonary hypertension | 30 |
| Cardiomyopathy                        | 8  |
| Pulmonary Disease                      | 5  |
| Rheumatologic diseases                 | 4  |
| Systemic sclerosis                     | 2  |
| Other                                   | 1  |

Echocardiographic assessment:

Hewlett-Packard Agilent Sonos 5500

- Pulsed Doppler performed across the pulmonic valve, parasternal short-axis view to measure: RVOT [time to onset, time to peak, total duration]

- Markers of RV systolic performance:
  - RV end-systolic and end-diastolic areas to calculate RV fractional area change
  - PASP

Statistical Analysis:

- SPSS 13
- Non-parametric test Mann-Whitney
- Correlation: Spearman’s Rho

Results

1. Right ventricular outflow tract spectral Doppler signal analysis

   - Variations of the mean time to onset of the RVOT in Group I and Group II
   - Variations of the mean time to peak of the RVOT in Group I and Group II

2. Right ventricular fractional area change and PASP analysis

   - Variations of the RVFAC mean in Group I and Group II
   - Variations of the PASP mean in Group I and Group II

3. Correlation analysis PASP and RVFAC

Conclusions

- Measuring RVOT spectral signal can be a useful tool in evaluating the severity of pulmonary hypertension and RV dysfunction.
- Measuring time to onset, time to peak and the duration of the RVOT spectral signal can prove useful in the absence of the tricuspid regurgitation jet, or when RV function is hard to assess due to the complicated anatomy of the RV.

Future Prospective

- To determine the clinical application and practicality in evaluating patients with cPHT on a day to day basis using these variables.

References