Catheter-directed therapies impact on intermediate-high- and high-risk pulmonary embolism patients

A. Grazina¹, B. Lacerda Teixeira¹, L. Almeida Morais¹, A. Fiarresga¹, R. Ramos¹, L. Sousa¹, J. Reis¹, A. Galrinho¹, A. Santana¹,  
H. Teles Antunes¹, D. Cacela¹, R. Cruz Ferreira¹

¹Hospital de Santa Marta, Lisbon, Portugal

Funding Acknowledgements: None.

Introduction: Intermediate-high- and high-risk pulmonary embolism (PE) patients treated with anticoagulation alone are associated with a considerable risk of circulatory collapse, death, or long-term pulmonary hypertension. Pulmonary Embolism Response Teams (PERT) have been created to deliver PE patients a better care. Catheter Directed Therapies (CDT), with mechanical thrombolysis and/or local fibrinolysis allow faster reperfusion and hemodynamic improvement without the systemic hemorrhagic effects of systemic fibrinolysis. The clinical evidence of its benefits is lacking.

Objectives: This analysis aims to describe the hemodynamics, morphological and perfusion improvement in intermediate-high- and high-risk acute PE patients submitted to CDT.

Methods: Prospective registry of consecutive intermediate-high- and high-risk PE patients submitted to CDT (mechanical thrombolysis with Penumbra® aspiration system and/or intrapulmonary local fibrinolysis with alteplase) in a single tertiary center. A multiparametric follow-up protocol was designed to evaluate echocardiographic, CT-scan, pulmonary angiogram, and right heart catheterization data at admission and at 3 months after CDT. The paired samples t-Test was used for the analysis of the variables.

Results: 26 PE patients (42.3% male, mean age 59 years old) were submitted to CDT (19% combined Penumbra and local fibrinolysis, 12% isolated Penumbra and 69% isolated local fibrinolysis). Baseline characteristics, laboratorial, imaging and procedure data are summarized in the figure 1. No major bleeding was seen during or after the procedure. 1 pulmonary artery dissection and 1 Penumbra bur partial avulsion occurred, both with conservative treatment with good result. 3 patients died during the follow-up (1 for oncologic disease, 1 for septic shock and 1 after discharge with undetermined cause). Of the remaining, 18 patients completed the 3-month follow-up protocol. At 3 months, a significant improvement was seen in the patients’ hemodynamics with 3.3mmHg mean drop of RA pressure (p 0.007), 16.1mmHg mean drop of systolic PA pressure (p <0.001), 8.0mmHg mean drop of mean PA pressure (p <0.001), 1.4L/min and 0.7L/min/m2 mean increases in cardiac output and index (p 0.003, p 0.001), and a tendency to a 0.8 Wood units decrease in the pulmonary vascular resistance (p 0.093). It was also seen an improvement in the perfusion defects with a mean drop of 7.9 points in the modified Miller index (p <0.001) and an improvement in the RV function with a mean decrease of 0.5 in the RV/LV ratio by CT-scan (p <0.001), a mean increase of 5.6mm in TAPSE (p <0.001) and a decrease of median NT-proBNP levels in 2866pg/ml (p <0.001).

Conclusions: In patients with intermediate-high- and high-risk PE, the use of CDT with mechanical thrombolysis and/or local fibrinolysis is safe and associated with improvement in hemodynamics, RV function and perfusion defects.
<table>
<thead>
<tr>
<th><strong>Baseline characteristics (n = 26)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years old (mean±SD)</td>
</tr>
<tr>
<td>Gender (male)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Clinical and laboratorial findings (n= 26)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Syncope at presentation</td>
</tr>
<tr>
<td>Dyspnea at presentation</td>
</tr>
<tr>
<td>Days from symptoms onset - median (IQR)</td>
</tr>
<tr>
<td>Systolic arterial pressure - mean±SD</td>
</tr>
<tr>
<td>Heart rate - mean±SD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Imaging findings – initial work-up (n = 26)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Central PE in angio-CT scan</td>
</tr>
<tr>
<td>RV/LV ratio angio-CT scan - mean±SD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Procedure data (n = 26)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Penumbra plus intrapulmonary fibrinolysis</td>
</tr>
<tr>
<td>Isolated Penumbra</td>
</tr>
<tr>
<td>Isolated intrapulmonary fibrinolysis</td>
</tr>
<tr>
<td>Any procedure complication</td>
</tr>
<tr>
<td>Cardiogenic shock</td>
</tr>
<tr>
<td>Major bleeding</td>
</tr>
</tbody>
</table>

**Table 1.** baseline characteristics
Table 2. Results