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Exercise right heart catheterization before and after balloon pulmonary angioplasty in inoperable patients with chronic thromboembolic pulmonary hypertension

Authors:
C Liebetrau1, S Kriechbaum2, A Rieth2, HA Ghofrani1, M Haas2, A Rolf2, CW Hamm2, S Guth1, E Mayer1, CB Wiedenroth1, 1Kerckhoff Heart and Thorax Center - Bad Nauheim - Germany, 2Kerckhoff Heart and Thorax Center, Department of Cardiology - Bad Nauheim - Germany,

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Background: Balloon pulmonary angioplasty (BPA) is an evolving treatment option for inoperable patients with chronic thromboembolic pulmonary hypertension (CTEPH). The main indicator for success is improvement in pulmonary hemodynamics, but outcome data are heterogeneous.

Purpose: The aim of the present study was to evaluate pulmonary hemodynamics not only at rest, but also during exercise before and 6 months after BPA.

Methods: We report a prospective series of 64 consecutive patients with inoperable CTEPH who were treated interventionally with BPA. All patients underwent standardized assessment prior to the first BPA and 6 months after the last intervention. Assessment included WHO FC, Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR), 6-minute walking distance (6MWD), serum levels of the N-terminal fragment of pro-brain natriuretic peptide (NT-proBNP), and exercise RHC.

Results: The mean number of sessions per patient was 5.6 (± 1.3) and the mean number of pulmonary segments targeted in all interventions was 11 (± 3). BPA treatment led to improvements in pulmonary hemodynamics and exercise capacity (6MWD: 416 ± 94 m vs. 463 ± 96 m; p<0.0001) except for CO and CI during RHC at rest; these parameters showed improvements only during exercise RHC. MPAP at rest showed a reduction from 41 ± 9 to 31 ± 9 mmHg (p<0.0001) and PVR at rest decreased from 6.8 ± 2.3 WU to 4.3 ± 1.9 WU (p<0.0001). Further decreases were observed for systolic pulmonary arterial pressure, TPG, PVR, and TPR. Cardiac output (7.0 ± 2.0 L/min vs. 8.3 ± 2.0 L/min; p<0.0001) and cardiac index during exercise RHC (3.8 ± 1.1 L/min/m2 vs. 4.4 ± 1.1 L/min/m2; p<0.0001) improved significantly. Median NT-proBNP concentrations decreased from 741 ng/L (IQR 192-1425 ng/L) to 139 ng/L (IQR 60-266 ng/L) during BPA treatment (p<0.0001). Results from the CAMPHOR questionnaire showed significant improvements in symptoms (11 ± 5.8 vs. 5.5 ± 4.9, p <0.0001), activity limitations (9.2 ±5.6 vs. 5.2 ±4.5, p<0.0001), and quality of life (6.4 ± 5.7 vs. 3.5 ± 3.7, p<0.0001).

Conclusion: Significant improvements in pulmonary hemodynamics at rest and during exercise were observed 6 months after BPA. Exercise right heart catheterization offers a more discriminating evaluation of the changes in pulmonary hemodynamics after BPA.