

Improvement of Cardiac Output after Balloon Pulmonary Angioplasty Depends on Preoperative Right Ventricular Function in inoperable Chronic Thromboembolic Pulmonary Hypertension.

Yu Taniguchi MD, Noriaki Emoto MD PhD, Kazuhiko Nakayama MD PhD, Kazuya Miyagawa MD PhD, Hiroto Kinutani MD, Toshiro Shinke MD PhD, Ken-ich Hirata MD PhD,

Division of Cardiovascular Medicine, Department of Internal Medicine, Kobe University Graduate School of Medicine, Kobe, Japan

Background: The efficacy of balloon pulmonary angioplasty (BPA) for non-operable chronic thromboembolic pulmonary hypertension (CTEPH) patients has been reported. Although, hemodynamic parameters, such as mean pulmonary artery pressure (mean PAP) and pulmonary vascular resistance (PVR) dramatically improved, cardiac output (CO) did not improve in some cases just after BPA. The aim of this study was to assess the relationship between right ventricular (RV) function and CO response.

Methods: Thirty-two non-operable CTEPH patients underwent BPA. We evaluated hemodynamics with Swan-Ganz catheter before BPA, 1 week (acute phase) and 1 year (chronic phase) after BPA. RV function was also evaluated with Tau, Vmax, dP/dt obtained from analysis of RV pressure curve, right ventricular index of myocardial performance (RIMP), and tricuspid annular plane systolic excursion (TAPSE) from echocardiography.

Results: Mean PAP and PVR significantly improved in all cases (38.9 ± 7.1 to 21.1 ± 5.7 mmHg; $p < 0.001$, 761 ± 333 to 285 ± 137 dyne/s/cm⁻⁵; $p < 0.001$, respectively). There was one case in-hospital death related to systemic infection. CO improved in 21 patients (Responders: 3.62 ± 0.72 to 4.67 ± 1.11 l/min, $p < 0.001$), whereas CO did not improve in 10 patients (Non-responders: 3.78 ± 0.63 to 3.48 ± 0.56 l/min, $p = 0.06$) at acute phase. Although there was no significant difference in baseline hemodynamics, preoperative RV systolic function (RV Vmax, TAPSE, RIMP) and diastolic function (RV Tau) of responders was significantly superior to those of non-responders (Table). Improved CO of responders was maintained at chronic phase (4.67 ± 1.11 to 4.67 ± 1.18 l/min, $p = 0.53$). However, CO of non-responders showed gradual improvement after 1 year follow-up (3.47 ± 0.56 to 3.87 ± 0.64 l/min, $p = 0.04$).

Conclusion: BPA could decrease RV afterload such as mPAP and PVR. The improvement of CO in the acute phase highly depended on preoperative systolic and diastolic RV function. However, CO of non-responders showed gradual improvement in the chronic phase.

			CO responder (n=21)	CO non-responder (n=10)	P value
RV pressure curve	RV tau		38.9 ± 10.8	66.2 ± 20.5	< 0.001
	RV Vmax (sec ⁻¹)		1.51 ± 0.70	0.96 ± 0.31	0.03
	RV dP/dt (mmHg/s)		617 ± 302	425 ± 102	0.06
Echocardiography	TAPSE (mm)		21.6 ± 3.2	17.9 ± 4.3	0.02
	RIMP		48.3 ± 8.2	63.7 ± 18.7	0.006