

The effect of prolonged Intraaortic balloon pump (IABP) support on right ventricular function in end-stage heart failure

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Introduction: Right Ventricular (RV) function has prognostic implications in end-stage heart failure (ESHF) patients. RV failure following Left Ventricular Assist Device (LVAD) implantation increases morbidity and mortality. Achieving optimal RV function before LVAD implantation is of paramount importance.

Purpose: Purpose was to investigate the effect of Intra-aortic Balloon Pump (IABP) on RV function optimization in patients with bi-ventricular ESHF.

Methods: ESHF patients with poor RV function, presenting with acutely decompensated heart failure resistant to inotropes/vasopressors, thus requiring IABP for stabilization, were prospectively enrolled. Serum biochemistry, echocardiography and invasive hemodynamics were applied and eligibility for LVAD according to RV function was determined on the basis of pre-specified criteria (Right atrium Pressure (RAP) <12mmHg, Pulmonary Artery Pulsatility index (PAPi) >1.85, RAP/Pulmonary Capillary Wedge Pressure (PCWP) <0.67, RV strain <-14%). LV and RV tissue was harvested during LVAD or bi-ventricular mechanical circulatory implantation or at the time of heart transplantation. Fibrosis of the myocardial tissue was quantified.

Results: Sixteen patients aged 38±14 years were enrolled. Duration of

IABP support was 62±50 (3–180) days. Three patients deteriorated requiring additional mechanical circulatory support. Two patients were stabilized without RV function improvement. In the remaining 11 patients, RV improved and fulfilled LVAD eligibility criteria (IABP responders); RA and RA/PCWP decreased from 18±6 to 10±4mmHg (p=0.0001) and from 0.60±0.19 to 0.42±0.11 (p=0.011) respectively. PAPi and RV strain improved from 1.46±0.65 to 3.20±0.58 (p=0.0001) and from -12.9±3.4% to -18.7±1.7% (p=0.0001) respectively. Significantly lower baseline NT-proBNP and total bilirubin values were observed in the responders group. Six patients finally received LVAD and none suffered RV failure post-operatively (the remaining 5 were successfully transplanted). RV fibrosis correlated with post-IABP NTproBNP (r=0.91, p=0.001), total bilirubin (r=0.79, p=0.011), RAP (r=0.78, p=0.014), PAPi (r=-0.69, p=0.040), RAP/PCWP (r=0.74, p=0.022) and LV fibrosis (r=0.77, p=0.016), but not with baseline (pre-IABP) parameters.

Conclusions: Prolonged IABP support contributes to partial RV function recovery in patients with ESHF and bi-ventricular failure, thus leading to eligibility for LVAD implantation. RV fibrosis may predict RV response to IABP and post-IABP eligibility for LVAD.