Right ventricular function assessed by the Pulmonary Artery Pulsatility Index in the immediate postoperative period after durable LVAD implantation: Predictors and association with short term outcome.

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INTRODUCTION

- The number of Left Ventricular Assist Device (LVAD) implantations for long-term cardiac support increases.
- Right ventricular failure after LVAD implantation is frequent but difficult to predict and associated with important morbidity and mortality.
- A pulmonary artery pulsatility index (PAPi), defined as [(PAPs – PAPd) / CVP], less than 1,5 is an indicator of severe RV dysfunction (RVD).
- We studied predictors and effects on short-term outcome of early RVD after LVAD implantation.

METHODS

- Prospective observational single center study, including all consecutive adult patients undergoing LVAD implantation (HeartMate 3, Abbott®) between 7/2022 and 03/2024 at University Hospitals Leuven.
- Characteristics of patients with PAPi below or above 1,5 on postoperative day 1 (POD-1) were compared using Wilcoxon Rank Sums, Chi Square or Fisher's Exact tests.

HeartMate 3, Abbott®

	All Patients N=43	PAPi < 1,5 *(RVD)* POD-1 (n=21)	PAPi ≥ 1,5 *(no RVD)* POD-1 (n=22)	P-value
Baseline Characteristics				
Age (y)	61(49-67)	58(46-63)	66(59-69)	**0,01**
Sex (M)	38(88%)	18(86%)	20(91%)	0,66
TAPSE (mm)	15(10-18)	15(10-18)	14(11-18)	0,94
mPAP (mmHg)	39(28-42)	35(22-40)	40(30-44)	0,19
PCWP (mmHg)	28(17-32)	26(16-30)	30(20-36)	0,19
CVP (mmHg)	12(9-18)	11(9-16)	14(8-20)	0,47
PAPi	2,2(1,7-2,7)	2,2(2-2,3)	2,4(1,3-3,4)	0,84
CVP/PCWP	0,5(0,4-0,7)	0,5(0,3-0,7)	0,5(0,4-0,7)	0,81
RVSWI (g/m/beat/m²)	7,5(5,9-12,7)	7,5(5,8-13)	7,6(6,0-13,1)	0,92
INTERMACS profile 1-3 4-7	 12(28%) 31(72%)	 8(38%) 13(62%)	 4(18%) 18(82%)	0,19
Indication ICMP NICMP	 24(56%) 19(44%)	 10(48%) 11(52%)	 14(64%) 8(36%)	0,36
Intraoperative				
Duration Surgery (min)	214(168-249)	218(177-327)	194(166-233)	0,11
CPB Time (min)	60(50-83)	69(54-98)	56(48-69)	**0,03**
Concomitant Surgery*	6(14%)	6(29%)	0(0%)	**0,01**
Transfusion RBC (U)	0(0-4)	1(0-4)	0(0-3)	0,20
Transfusion FFP (U)	0(0-2)	0(0-4)	0(0-0)	**0,02**
Transfusion PC (U)	0(0-1)	1(0-2)	0(0-0)	**0,04**
ICU POD-1: Hemodynamics				
CVP (mmHg)	10(7-13)	12(10-15)	8(6-10)	**< 0,01**
PAPi	1,6(1-2,3)	1,0(0,7-1,1)	2,3(1,8-3,7)	**< 0,01**
RVSWI (g/m/beat/m²)	4,0(2,3-5,2)	2,7(2,0-4,3)	4,7(3,8-6,7)	**< 0,01**
Outcome				
ICU LOS (d)	9(5-19)	12(6-25)	7(5-14)	*0,11*
IMV (d)	2(1-7)	4(1-11)	1(1-6)	*0,13*
Hospital LOS (d)	25(16-46)	29(19-50)	25(15-39)	0,41
Hospital Mortality	6(14%)	4(19%)	2(9%)	0,41

*Concomitant surgery: Park's stitch (n=2), aortic valve replacement (n=1), mitral valve repair (n=1), intra-atrial clot removal and closure of left atrial appendage (n=1), intraventricular clot removal (n=1)

Table 1: Baseline characteristics and outcome (p-value <0,05 = significant)

RESULTS

- N= 43, median 61 years old, majority male.
- 21 patients (49%) developed early RVD according to PAPi criteria. Baseline characteristics and possible predictors of RVD shown in Table 1.
- Patients with early postoperative RVD were younger (58(46-63) vs 66(59-69) years, p=0,01).
- *Pre*operative pulmonary vascular resistance and RV function, assessed by TAPSE, PAPi and CVP/PCWP, did not differ between groups.
- *Intra*operative factors such as cardiopulmonary bypass time (69(54-98) vs 56(48-69) min, p=0,03), need for concomitant surgery (6(29%) vs 0(0%), p=0,01) and transfusion requirements were significantly associated with early RVD.
- There was a non-significant trend towards longer ICU stay (12(6-25) vs 7(5-14) days, p=0,11) and duration of mechanical ventilation (4(1-11) vs 1(1-6) d, p=0,13) in the RVD group.

CONCLUSIONS

- **Severe early RVD after LVAD implantation, defined by a PAPi < 1,5, is frequent.**
- **Intraoperative factors such as cardiopulmonary bypass time, need for concomitant surgery and transfusion of blood products were strongly associated with early RVD, in contrast to preoperative factors, including RV function.**
- **We noted an adverse, however non-significant, trend of early RVD on short-term outcomes.**