

Residual Pulmonary Hypertension after Pulmonary Thromboendarterectomy and its Effects on Functional Status

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Background

Pulmonary thromboendarterectomy (PTE) is the gold standard treatment for chronic thromboembolic pulmonary hypertension (CTEPH). While PTEs are associated with improved long-term survival, residual pulmonary hypertension (PH) can negate that effect. Little is known about residual PH and its effects on functional status.

Research Objectives

We sought to evaluate the effects of residual PH on six-minute walk distances and New York Heart Association functional class.

Methods

- CTEPH institutional database including 152 PTE patients.
- Demographics, hemodynamics, echocardiography, and 6MWD recorded preoperatively and postoperatively at 1 month, 3 months, and 1 year.
- Analysis using R (ANOVA, Kruskal-Wallis, Pairwise Wilcoxon).

Table 1: Preoperative Patient Characteristics

Characteristic	Quartile 1 (<20 mmHg) n = 34	Quartile 2 (20-25.9 mm Hg) n = 32	Quartile 3 (26-37.9 mm Hg) n = 34	Quartile 4 (≥38 mm Hg) n = 31	p
Age, yrs	46 [37, 60]	55 [45, 66]	56 [48, 68]	62 [53, 65]	0.01
% Female	61.8% (21)	59.4% (19)	61.8% (21)	48.4% (15)	0.66
% NYHA III/IV	70.6% (24)	80.0% (24)	75.8% (25)	80.6% (25)	0.75
BMI, kg/m ²	28.6 [25.2, 31.9]	31.4 [28.9, 35.8]	29.4 [25.9, 35.9]	31.9 [28.6, 38.7]	0.04
Hemodynamics					
mPAP, mm Hg	37 [25, 44]	45 [31, 50]	44 [37, 53]	48 [43, 57]	<0.001
CO, L/min	4.9 [4.1, 5.6]	4.8 [4.0, 5.4]	5.2 [4.2, 5.9]	4.5 [3.6, 5.4]	0.50
PVR, Wu	5.7 [2.9, 8.8]	5 [3.5, 10.1]	5.4 [3.9, 7.2]	7.1 [5.7, 10.2]	0.04

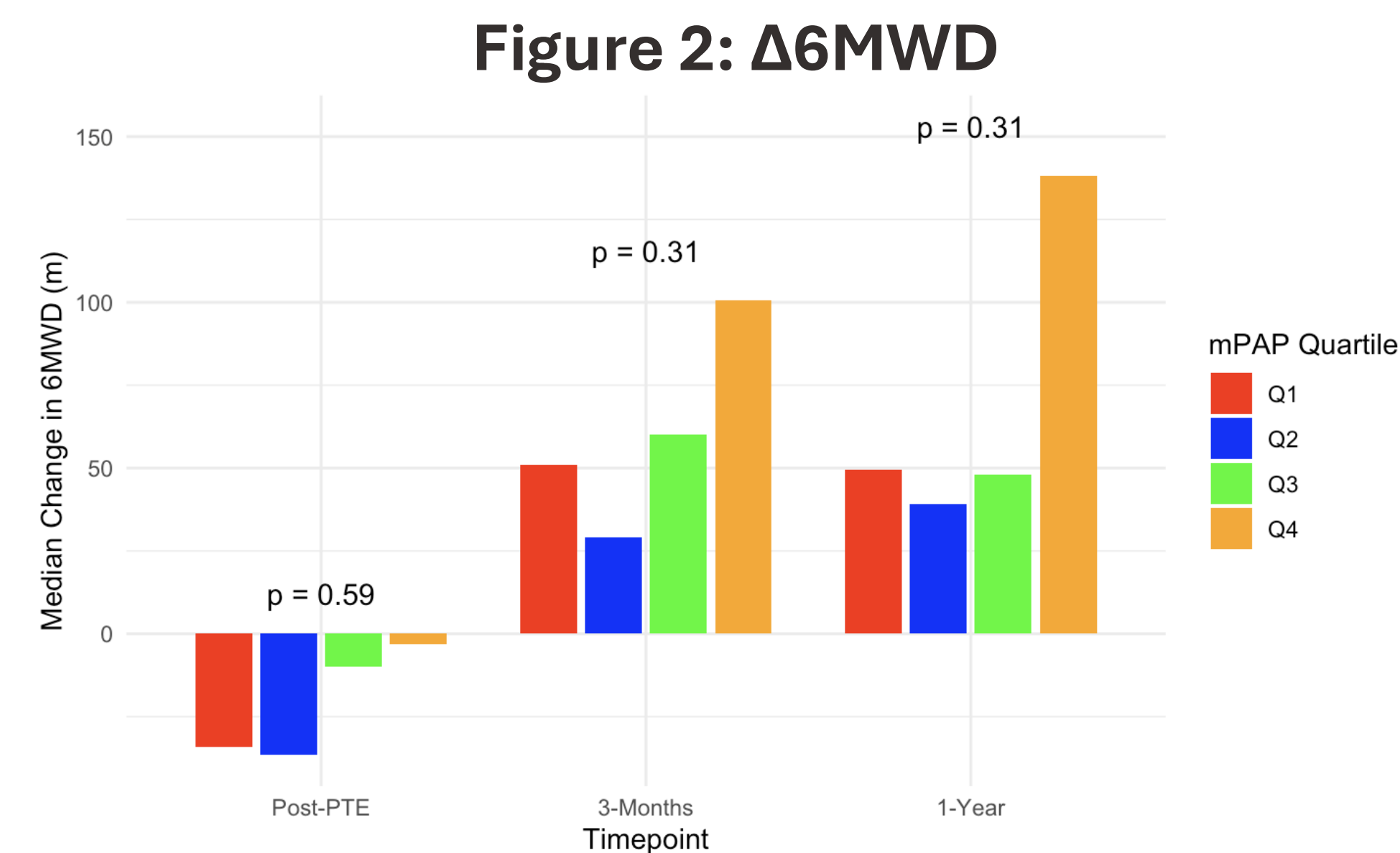
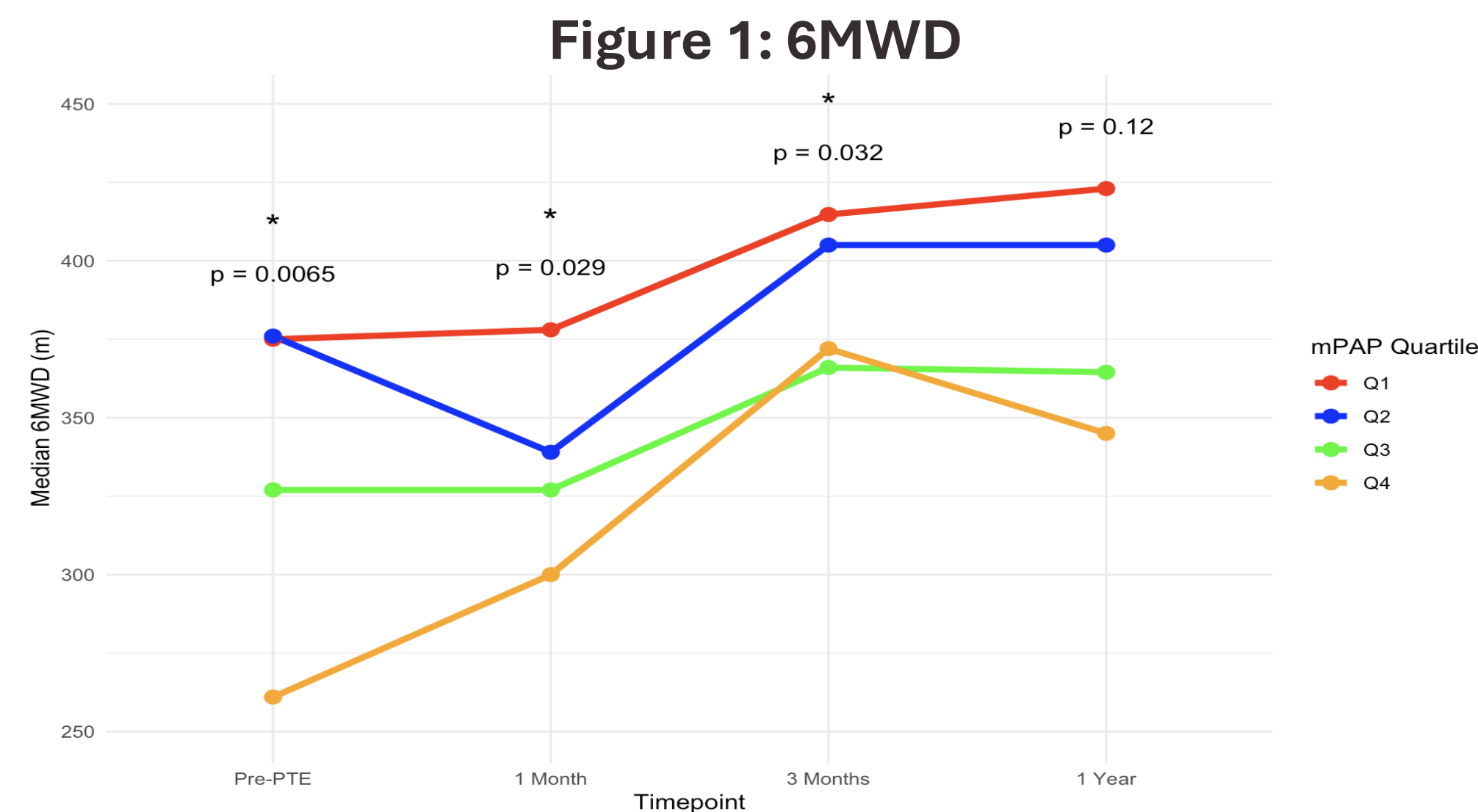


Table 2: 3-Month Postoperative Patient Characteristics

Characteristic	Quartile 1 (<20 mm Hg) n = 34	Quartile 2 (20-25.9 mm Hg) n = 32	Quartile 3 (26-37.9 mm Hg) n = 34	Quartile 4 (≥38 mm Hg) n = 31	p
mPAP, mm Hg (n)	18 [16, 20]	23 [22, 25]	32 [29, 35]	45 [40, 50]	<0.001
CO, L/min (n)	4.9 [4.3, 5.7]	5.5 [4.7, 6]	5.5 [4.2, 6.5]	5.4 [4.4, 5.9]	0.27
PVR, Wu (n)	2.1 [1.5, 2.4]	2.6 [2.0, 3.1]	3.5 [2.5, 4.9]	5.7 [4.1, 8.5]	<0.001
ΔmPAP, mm Hg (n)	-19 [-27, -6]	-20.5 [-27.2, -8.2]	-10 [-22, -3]	-2 [-12.5, 6]	<0.001
ΔCO, L/min (n)	0.3 [-0.3, 0.7]	0.8 [-0.1, 1.3]	0.6 [-0.5, 1.7]	0.6 [-0.5, 1.5]	0.51
ΔPVR, Wu (n)	-3.1 [-6, -1.2]	-2.6 [-7.2, -1.2]	-1.4 [-4.3, 0]	-2 [-4.7, 0.1]	0.12
3-month % NYHA III/IV	17.2% (5/29)	16.1% (5/31)	25.8% (8/31)	26.7% (8/30)	0.65
ΔNYHA ≤ -1 (Post-Pre)	69% (20/29)	72.4% (21/29)	63.3% (19/30)	66.7% (20/30)	0.85
>30 m 6MWD Increase	57.9% (11/19)	47.1% (8/17)	63.2% (12/19)	72.2% (13/18)	0.49

Results

- 131 patients with hemodynamic data were divided into four quartiles based on residual mPAP at 3 months.
- The true 6MWD varied by quartile; however, at time points pre-PTE, 1-month post-PTE, and 3-months post-PTE, the *change* in 6MWD from pre-PTE was statistically similar.
- There was no difference in percent of patients with NYHA class III or IV symptoms pre-PTE or post-PTE at 3 months.
- The median decrease in NYHA class was 1 class.

Limitations

The data included is from a single institution, which limits generalizability. As a CTEPH referral center, some patients undergo PTE and return home, limiting follow-up data.

Conclusion

Those with more severe residual PH had worse functional status in terms of 6MWD; however, the degree of improvement was similar after PTE regardless of severity of residual PH. There were no differences in NYHA class distribution or 6MWD after PTE, suggesting that symptomatic recovery may not correlate linearly with follow-up pulmonary pressures.