Myocardial biomarkers in obese patients undergoing pulmonary thromboendarterectomy using hypothermia as the sigle cardioprotective strategy

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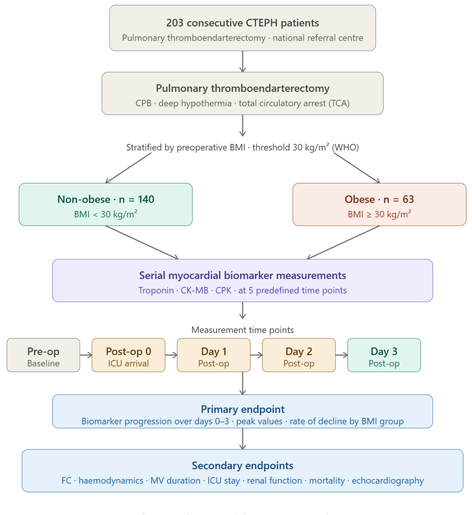
Introduction

- CTEPH is potentially curable, and pulmonary thromboendarterectomy (PTE) represents the gold-standard curative surgical treatment for eligible patients. The procedure is performed under cardiopulmonary bypass (CPB) with deep hypothermia and intermittent periods of total circulatory arrest (TCA), a combination that allows complete surgical access to the pulmonary arterial tree but simultaneously imposes a substantial and well-recognised physiological burden on the myocardium.
- Myocardial injury following cardiac surgery under cardiopulmonary bypass is a well-established phenomenon, reflected by the universal elevation of circulating cardiac biomarkers in the postoperative period.
- Obesity represents a clinically relevant and increasingly prevalent comorbidity in patients referred for PTE. Obesity — defined by a body mass index of 30 kg/m² or greater in accordance with the World Health Organisation classification —The aim of this study was therefore to compare the postoperative kinetics of troponin, CK-MB, and CPK between obese and non-obese patients undergoing PTE for CTEPH, using serial measurements at five predefined time points spanning the first 62–64 hours after surgery.

Methods



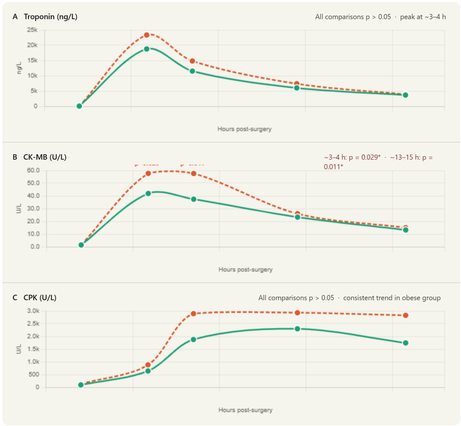
t-test / Mann–Whitney U · chi-square / Fisher's exact · repeated measures · p < 0.05

Results

Total patients	CK-MB peak — obese	CK-MB day 1 — obese	Troponin peak — obese
203	57.7 U/L vs 41.9 · p = 0.029*	57.6 U/L vs 37.4 · p = 0.011*	23 352 vs 18 771 ng/L · p = 0.137

Postoperative myocardial biomarker kinetics — non-obese vs obese

Non-obese · BMI < 30 kg/m² (n = 140) Obese · BMI ≥ 30 kg/m² (n = 63) * p < 0.05 · Welch's t-test · values = means



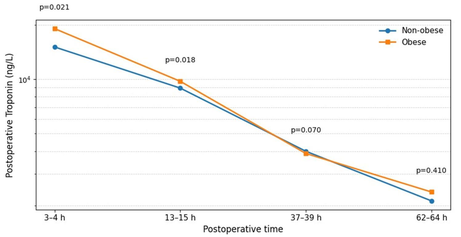
Time points: pre-op (baseline) · ~3–4 h (ICU arrival) · ~13–15 h · ~37–39 h · ~62–64 h post-surgery

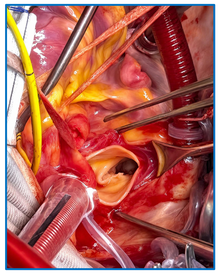
Discussion

The principal finding is that obese patients demonstrated significantly higher CK-MB levels at ICU arrival (3–4 hours post-surgery; p = 0.029) and at approximately 13–15 hours postoperatively (p = 0.011), with convergence of biomarker levels between groups occurring by 37–39 hours. Troponin and CPK showed a consistent numerical trend toward higher values in the obese group across all time points, without reaching statistical significance. These findings suggest that obesity is associated with a more pronounced and more sustained early myocardial injury response following PTE, within a defined and clinically actionable time window. Although troponin differences between groups did not reach statistical significance at any time point, the numerical pattern is clinically noteworthy. Obese patients showed mean immediate postoperative troponin of 23 352 ng/L compared with 18 771 ng/L in non-obese patients — a difference of approximately 25% at the point of peak elevation. The absence of statistical significance is most plausibly explained by the exceptionally high variance of troponin measurements in this surgical context, where individual peak values range from several hundred to 50 000 ng/L or more, rendering mean-based comparisons insensitive. It is likely that a non-parametric analysis using median values — which were 19 050 versus 15 080 ng/L at the immediate postoperative time point — would better capture the central tendency of this distribution and may reveal statistically significant differences with adequate statistical power. This represents an important methodological consideration for future analyses and for the interpretation of the current findings.

Conclusions

- In this single-centre cohort of 203 consecutive CTEPH patients undergoing pulmonary thromboendarterectomy, obesity was associated with significantly higher CK-MB levels at ICU arrival and at 13–15 hours postoperatively, with convergence between groups by 37–39 hours.
- Troponin and CPK showed a consistent but non-significant trend toward higher values in the obese group. The characteristic plateau of CK-MB in obese patients during the first 15 postoperative hours — in contrast to the early decline observed in non-obese patients — identifies a clinically actionable monitoring window in which intensified biomarker surveillance may be warranted.
- These findings contribute to the characterization of obesity as a modifier of the myocardial injury response to PTE and support the development of BMI-stratified perioperative monitoring protocols in this surgical population.





Right pulmonary artery branch arteriotomy demonstrating exposure of the endarterectomy plane.

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