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Commentary: No pain no gain—what is the best retraining pathway for patients with corrected transposition?

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Since Yacoub's first description of pulmonary artery (PA) banding to (re-)train the systemic left ventricle (LV)—and Mee's extension nearly a decade later to patients with corrected transposition (ccTGA)—surgeons have struggled to elucidate the best determinants of “switchability” for the untrained LV.^{2,3} Some have advocated for a loose band (50% of systemic pressure) to allow for growth and potentially limit edema/fibrosis, others to “band until you can band no more,” targeting values closer to 75% to 90% of systemic pressure with or without an additional volume load.^{4,5} Yet, although the traditional use of LV mass as a surrogate of operability is intuitively attractive, there remains some unpredictability as to which retrained ventricles are at risk for late failure.⁶ In this issue of the *Journal*, Mainwaring and colleagues⁷ report an observed relationship between LV mass and pressure that suggests a distinction between “normal” and “pathologic” hypertrophy during retraining. While they did not demonstrate the accuracy of such mass and volume “fractions” to predict later success or failure with the double switch, their data indicate that some (10%) patients will exhibit exaggerated hypertrophy in response to pressure load, implying fundamental myocardial abnormalities that could preclude later anatomic repair.

As congenital surgeons are keenly aware, perfect calibration of a PA band intraoperatively is a misnomer; variability in physiologic baseline, pulmonary vascular resistance, and depth of anesthesia all can conspire against exacting placement and thus the process often conforms to a Goldilocks

The Goldilocks Principle, reflecting postulates of exercise recovery (here for long-distance running).¹

CENTRAL MESSAGE

Better characterization of the relationship between changes in LV mass and pressure for patients with corrected transposition who undergo pulmonary artery banding may help determine optimal candidacy for double-switch procedure.

paradox: inevitably, the band is either too tight or too loose. Unsurprisingly, only half of the cohort escaped with only one PA band procedure (12 had two, 3 had three). Interestingly, even for those who followed a “predictable” retraining pathway with regard to LV pressure accrual, their gain in LV mass was less than would be seen for patients who did not require retraining, and indeed those who began with greater LV/right ventricular pressure ratios and LV mass more often achieved successful retraining.

Yet, these data were observational and were not used to determine candidacy for double switch.⁶ Still unclear is (1) the relationship of age and tricuspid valve anatomy to the training process and (2) what threshold values for LV mass best reflect “optimal” training.⁸ The Goldilocks principle would submit that some amount of PA banding may be “just right” for those with ccTGA; the question remains how to avoid over- or undershooting the target, and how to identify those for whom banding may represent ideal long-term palliation or, as important, those for whom (re) training will be futile (and potentially harmful). Had Goldilocks only a porridge thermometer—or better predictive parameters of chair strain and bed comfort—she might have avoided her drive toward empiricism.^{9,10} Similarly, we must applaud the authors for their pursuit of more accurate predictors of the “just right” pressure/mass/candidates for

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double switch. Mass and volume fractions may themselves simply represent surrogates that aid in discriminating among the heterogeneous anatomic substrates that constitute ccTGA for whom any further characterization and refinement in this domain is welcome.

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