Physiologic left ventricular reconstruction: Shape, function, and time recaptured

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The surgical goal of recapturing normality is emphasized by Cirillo and colleagues¹ in their report of time analysis of physiologic left ventricular (LV) reconstruction, as his database on surgical ventricular restoration shows 0% hospital mortality and no worsening heart failure symptoms 7.9 years post operatively in patients with ischemic cardiomyopathy. The power of this study lies in addressing normality, recognizing its disruption by disease, and then rebuilding the normal ventricular ellipse.

STRENGTHS

Anatomy is the highlight. The objective is to restore the helical framework, which becomes spherical with heart failure.^{2,3} The Fontan suture is not done, but a resulting conical form is demonstrated. Attaining this shape sets the stage for placing a longitudinal suture line using a narrow patch extending from the apex to the septum (just beneath the aortic valve). The terminal upper point may contain either normal muscle or scar tissue (which may end in the lower septum).⁴ Restoration of form, not merely disease exclusion, has become a surgical goal. Isomura and associates⁵ demonstrated the importance of rebuilding shape versus simply reducing LV size, reporting an 86% 8-year survival rate in patients with hearts of the same size as in the study of Cirillo and colleagues,¹ and an overall long-term survival of 72% versus 61% with a “shape” yardstick.

The second strength is restoring ventricular function, as measured by returning cardiac torsion... with one helical arm rotating clockwise (base) and the other counterclockwise (apex). Finally, the role of time is addressed. Surgical reconstruction changes anatomy, but adequate time is needed to rebuild the previously stretched collagen of a spherical heart, whose matrix metalloproteinase half-life is >120 days.⁶

Cirillo's results by returning normal shape differed from the flawed STICH trial, where the pre operative spherical shape was unchanged.⁷ They concluded that LV reconstruction is not different from CABG, yet lowered LV volume falls 19% (vs 51% here).⁸ Consequently, STICH deprived

(Upper) Normal helix, with oblique fiber angles.
(Lower) Failing heart, with transverse fibers.

Central Message

Successful long-term reconstruction of a failing dilated heart by recapturing normal helical form and torsion function, and showing time-related improvement. Rebuilding form is a surgical guidepost.

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many patients of a sound procedure because of its improper patient selection and inadequate surgical expertise.⁹

WEAKNESSES

First, a role for a wider patch should be considered when LV reconstruction is done before remote muscle is stretched, for example, early after myocardial infarction. This would avoid producing a restrictive LV size when excluding the scar. Second, inclusion of the sphericity index (ventricular length/width) would document a spherical chamber preoperatively, and confirm postoperative physiologic reconstruction. Finally, all recovery occurs at the apex, because the base rotates only marginally. Where are comparative normal base values, and what was the mitral annulus width? Could this imply that the base should be narrowed by an annular ring?

OVERALL IMPRESSION

This splendid study emphasizes our responsibility for rebuilding normal anatomy and function. These endpoints require an understanding of the guideposts of normality. The mechanics of the twisting motion for torsion call for LV rebuilding that restores the natural form and prevents intraoperative muscular injury from inadequate cardiac protection. When achieved, these vital form and function endpoints are reproducible, and cannot be offset by the

flawed prospective randomized STICH Trial, which reports noncredible data.

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