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CLINICAL RESEARCH

Pre-Operative Left Ventricular Torsion, QRS Width/CRT, and Post-Mitral Surgery Outcomes in Patients With Nonischemic, Chronic, Severe Secondary Mitral Regurgitation

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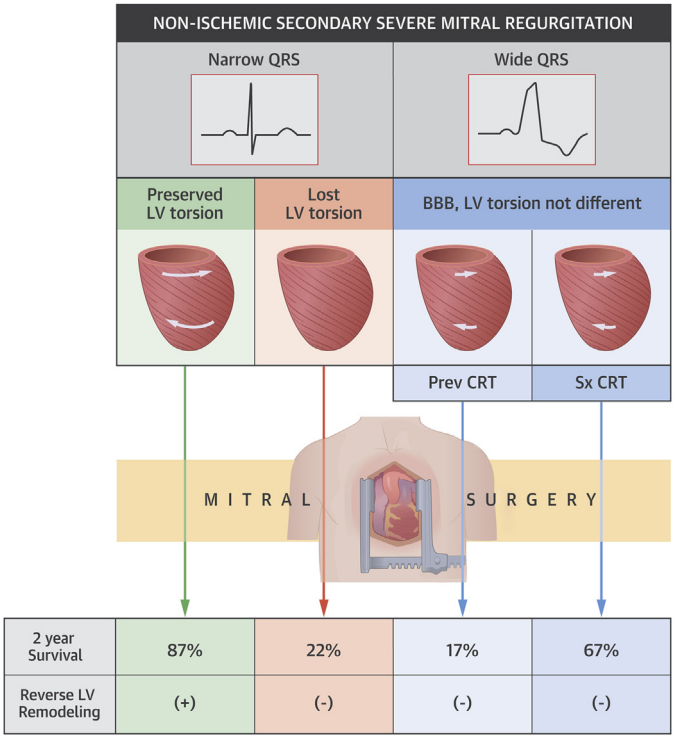
VISUAL ABSTRACT



Notomi, Y. et al. J Am Coll Cardiol Basic Trans Science. 2016;1(4):193–202.

HIGHLIGHTS

- Determining which patients with NICSMR will benefit from MS is a clinical dilemma.
- LV torsion (which is a shear strain, not volume strain such as ejection fraction and originates in LV myocardial architectures) may reveal the myopathic conditions and reflect intra-LV electrical conduction.
- The LV torsional profile predicted post-MS outcomes in NICSMR patients with a narrow QRS but not in those with a wide QRS.
- The findings may help to resolve the clinical dilemma and identify appropriate candidates for mitral surgery (and other resources) in patients with NICSMR.

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SUMMARY

The selection of appropriate candidates for mitral surgery among symptomatic patients with nonischemic, chronic, secondary severe mitral regurgitation (NICSMR) remains a clinical challenge. We studied 50 consecutive symptomatic NICSMR patients for a median follow-up of 2.5 years after mitral surgery and concluded that the pre-operative 2-dimensional speckle tracking echocardiography-derived left ventricular torsional profile and QRS width/cardiac resynchronization therapy are potentially important prognostic indicators for post-surgery survival and reverse remodeling. (J Am Coll Cardiol Basic Trans Science 2016;1:193–202)

In 2008, U.S. guidelines (1) stated, "Determining the surgical candidacy of the symptomatic patient with mitral regurgitation (MR) and far-advanced left ventricular (LV) dysfunction is a common clinical dilemma." Even today, as stated in the current U.S. guidelines published in 2014 (2), mitral surgery for severely symptomatic patients with nonischemic, chronic, severe secondary mitral regurgitation (NICSMR) is a Class IIb recommendation with Level of Evidence (LOE): B. Because the primary cause of this condition is cardiomyopathy, "restoration of mitral valve competence is not by itself curative; thus, the best therapy for chronic *secondary* MR is much less clear than it is for chronic *primary* MR" (2). The guidelines additionally stated, "Prognosis is poor for both ischemic and nonischemic MR, but ischemic MR lends itself to the possibility of revascularization and potential improvement in LV function if CAD has led to large areas of hibernating viable myocardium" (2). This statement suggests that the prognosis of NICSMR after mitral surgery (in which some patients improve, whereas others die) depends more on the effectiveness of volume unloading as a result of the surgery, that is, the "reverse remodeling viability" (3) of the compromised LV myocardium.

Strategies for risk stratification by applying viability indexes beyond LV size and ejection fraction may play a critical role in enabling patients and attending physicians to understand the risk, prognosis, and available resources (i.e., guideline-directed medical therapy [GDMT], transcatheter mitral valve repair system, mitral surgery, ventricular assistance device [VAD]/transplantation, or palliative care). Most previous reports (4–9) on mitral surgery for dilated poor LV function, however, have neither focused on NICSMR (mostly ischemic etiology) nor reflected the results of recent advancements, such as cardiac resynchronization therapy (CRT), which is a Class I recommendation with a Level of Evidence: A (2) for NICSMR patients with appropriate indications (10). As a result, patients are offered CRT before mitral surgery or receive a CRT system at the time of mitral surgery. The characteristics and prognosis of these patients also remain unclear.

Left ventricular torsion (LV-Tor), which originates in the myocardial architecture and conduction system, may be a sensitive indicator of cardiomyopathy and disturbances of intra-LV conduction. LV-Tor may therefore be considered a viability index, as suggested by "force-dependent" LV strain (11). In contrast, right ventricular pacing and biventricular pacing generally result in decreases in LV-Tor (12); it has therefore also been suggested that LV torsional mechanics is not an essential component of LV function in left bundle branch block (LBBB) or during CRT (13).

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Therefore, we investigated whether pre-operative LV-Tor and QRS width/CRT use can predict post-operative survival and LV reverse remodeling in patients with NICSMR and can ultimately identify an optimal clinical approach to identifying the appropriate treatment in patients with NICSMR.

ABBREVIATIONS AND ACRONYMS

CRT = cardiac resynchronization therapy
EDV = end-diastolic volume
EF = ejection fraction
ESD = end-systolic dimension
GDMT = guideline-directed medical therapy
LBBB = left bundle branch block
LV = left ventricle/ventricular
NICSMR = nonischemic chronic secondary mitral regurgitation

METHODS

STUDY DESIGN. From September 2006 to August 2012, 50 consecutive patients with NICSMR who were scheduled for mitral surgery at the Hayama Heart Center, Kanagawa, Japan, were included in this observational study, which was approved by the local ethics committee. NICSMR stands for *nonischemic,* chronic, severe secondary mitral regurgitation. The term *nonischemic* in this study refers to idiopathic cardiomyopathy, as defined by the World Health Organization/International Society and Federation of Cardiology Task Force (14,15). All patients included were in an advanced symptomatic state (New York