

Predictors of Long Term Left Ventricular (LV) Function Following Surgical Correction of Mitral Regurgitation (MR).

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Background

- Mitral valve degeneration is the leading cause of mitral regurgitation (MR) in North America.^[4]
- Impairment of mitral valve function causes chronic volume overload that is often masked by the favorable loading conditions in MR and unmasked by mitral valve surgery.^[2]
- Chronic volume overload leads to compensatory ventricular remodeling and myocardial dysfunction which may become irreversible overtime increasing morbidity and mortality.^[1,4]
- Left ventricle systolic function and size has been shown to be strong predictors of long-term cardiac function after surgery.^[1, 2,4]

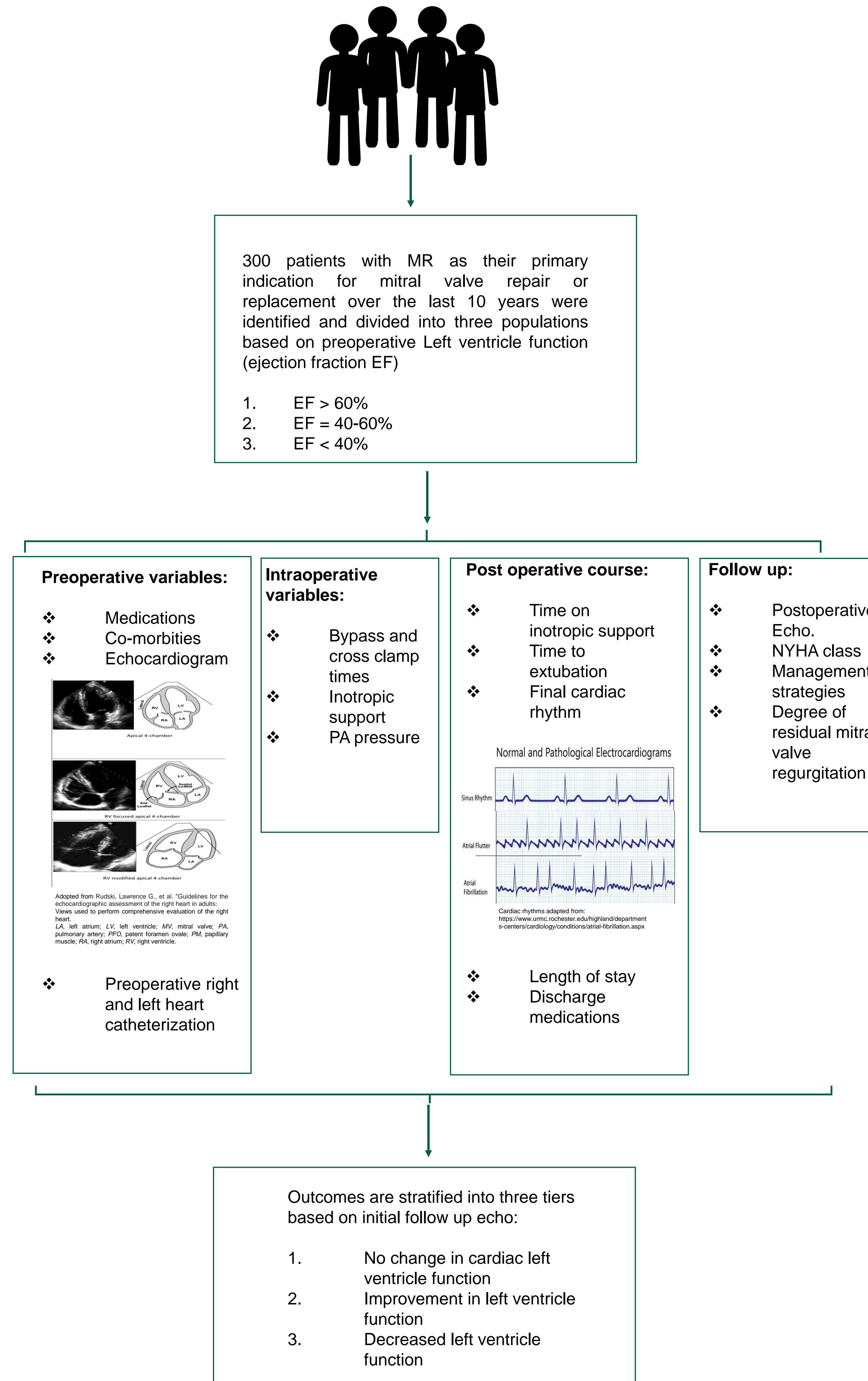
Aims

- Identify comorbid conditions and / or preoperative echocardiographic measurements predictive of long-term impairment or improvement in left ventricle function
- Identify postoperative medical management strategies that are associated with improved left ventricle function

Significance

- There is limited data assessing all the factors involved in long term ventricular function after mitral valve surgery.
- Our study is unique because it includes all surgical techniques for correction of mitral valve regurgitation
- Identifying comorbid conditions, preoperative echocardiographic measurements, and postoperative management strategies predictive of subsequent LV performance could be used to improve the quality of care provide to patients with MR.

Methods



Preliminary data and literature review

TABLE 1. Echocardiographic changes in the early postoperative period

Procedure	Preoperative EF	Postoperative EF	Mean change	Range
Repair	60.5714	57.357	3.2143	(-20,25)
Replacement	61.5625	60.625	0.9375	(-5,10)

Procedure	Variable	Preoperative	Postoperative	Mean change
Repair	LVIDd, mm	55.51	47.60	0.7375
	LVIDs, mm	36.57	34.58	0.118
	LA volume index, ml/m ²	60.52	45.01	13.8
Replacement	LVIDd, mm	46.00	41.75	0.525
	LVIDs, mm	32.00	30.50	-0.125
	LA volume index, ml/m ²	60.500	49.683	9.125

LVIDd, Left ventricular end diastolic dimension, LVIDs, Left ventricular end systolic dimension, EF, ejection fraction.

TABLE 2. Echocardiographic changes in the early postoperative period

Variable	Preoperative*	Postoperative*	Overall change*	P value
LVEF, %	62.9 ± 9.9	53.1 ± 11.3	-8.8 ± 10.7	<.001
LVEDD, mm	69.9 ± 7.6	53.1 ± 7.7	-7.5 ± 7.3	<.001
LVESD, mm	36.9 ± 7.1	36.6 ± 8.2	-0.5 ± 6.5	.26
Left atrial size, mm	52.3 ± 9.2	48.0 ± 8.7	-5.0 ± 7.4	<.001

LVEDD, left ventricular end-diastolic dimension; LVEF, left ventricular ejection fraction; LVESD, left ventricular end-systolic dimension. *Expressed as mean ± standard deviation.

Table adopted from Suri, Rakesh M., et al. "Determinants of early decline in ejection fraction after surgical correction of mitral regurgitation." *The Journal of thoracic and cardiovascular surgery* 136.2 (2008): 442-447.

TABLE 3. Univariate and multivariate predictors of premissal ejection fraction

Variable	Univariate		Multivariate	
	Slope	P value	Slope	P value
Female sex	1.32	.12	NA	NA
MV repair vs MV replacement	4.30	.001	NA	NA
Preoperative atrial fibrillation	-4.61	<.001	-2.12	.05
NYHA class	-2.38	<.001	-1.11	.008
Operation decade, 1980s	-0.91	.44	NA	NA
Age	-0.01	.73	NA	NA
CABG	-1.61	.06	NA	NA
Myocardial infarction	-7.95	<.001	NA	NA
Type of prolapse				
Anterior leaflet vs posterior leaflet	-5.57	<.001	NA	NA
Bileaflet vs posterior leaflet	-0.87	.32	NA	NA
Preoperative EF	0.56	<.001	0.54	<.001
LVEDD (n = 462)	-0.49	<.001	-0.37	<.001*
LVESD (n = 427)	-0.69	<.001	-0.43	<.001*
Left atrial size (n = 517)	-0.22	<.001	-0.16	<.001*

CABG, Coronary artery bypass graft; EF, ejection fraction; LVEDD, left ventricular end-diastolic dimension; LVESD, left ventricular end-systolic dimension; MV, mitral valve; NA, not applicable; NYHA, New York Heart Association. *Model includes echocardiographic parameters after adjustment for clinical factors; not all parameters are in the model at the same time.

Table adopted from Suri, Rakesh M., et al. "Determinants of early decline in ejection fraction after surgical correction of mitral regurgitation." *The Journal of thoracic and cardiovascular surgery* 136.2 (2008): 442-447.

Conclusions

- Postoperative decrease in left ventricular ejection fraction, left ventricular end-diastolic dimension (LVIDd) and left atrial volume index was noted (Table 1). This is consistent with findings from other studies (Table 2)^[5].
- The mean decreases in left ventricular ejection fraction in patients who had mitral valve repair was different from the mean decrease in patients who had mitral valve replacement (Table 1). This is inconsistent with findings from other studies which noted no difference or improvement in LV function following repair versus replacement^[4,5].
- Findings from related studies suggest that the Independent predictors of a lower postoperative ejection fraction include
 - the presence of preoperative atrial fibrillation, P value 0.05.
 - NYHA class, P value 0.008.
 - preoperative ejection fraction, P value 0.001.
 - larger preoperative left heart dimensions, P value 0.001^[1,2,5].

Future directions

- Ongoing study
- Assess differences between MV repair and replacement
- Larger and more diverse population
- Potentially expand study to include data from more providers and hospitals
- Compare to findings in the literature.

References

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