MITRAL REGURGITATION ACCELERATES LEFT VENTRICULAR REMODELING AFTER POSTERO-LATERAL MYOCARDIAL INFARCTION

*Soleimani M [5], **Khazalpour M** [5], Cheng, G [1,5], Zhang Z [1,5], Acevedo-Bolton G [4,5], Saloner DA [4,5], Wallace AW [3,5], Guccione JM [1,2,5], Ge L [1,2,5], Ratcliffe MB [1,2,5]*

Departments of Surgery [1], Bioengineering[2], Anesthesia[3], and Radiology[4], University of California, San Francisco, CA and the Veterans Affairs Medical Center[5], San Francisco, CA

Ischemic Mitral Regurgitation

Introduction

- **Chronic ischemic mitral regurgitation (CIMR: MR) affects 1.2 to 2.1 million patients in the US, with more than 400,000 patients having moderate-to-severe MR. [1]**
- **These numbers are expected to progressively increase as the population rapidly ages and more patients survive acute MI. [1]**
- **CIMR of 2+ severity discovered at cardiac catheterization for symptomatic coronary artery disease has a 1-year mortality of approximately 17%. [2]**
- **The one-year mortality for 3+ and 4+ CIMR is approximately 40%. [2]**
- ***Thus this disorder represents a substantial disease burden.***

1. Gorman, R.C., J.H. Gorman, 3rd, and L.H. Edmunds, Jr, Ischemic mitral regurgitation in cardiac surgery in the adult, in Cardiac Surgery in the adult, L.H. Cohn and L.H. Edmunds, Jr., Editors. 2003, McGraw-Hill: New York. p. 1751-70.
2. Hickey, M.S., L.R. Smith, L.H. Muhlbaier, et al., Current prognosis of ischemic mitral regurgitation. Implications for future management. Circulation, 1988. 78(3 Pt 2): p. 151-9.

Ischemic Mitral Regurgitation

Background

- **The effect of moderate CIMR on left ventricular (LV) remodeling after postero-lateral myocardial infarction (MI) is especially controversial.** [3]
- **Thus it remains open to question if surgical repair for moderate CMIR has a favorable effect on LV remodeling.**
- **Currently a NIH sponsored clinical trial of CABG or CABG + mitral repair in patients with moderate CIMR is underway.** [4]
- **We tested the hypothesis that moderate MR accelerates LV remodeling after postero-lateral MI.**

3. Guy, T.S., 4th, S.L. Moainie, J.H. Gorman, 3rd, et al., Prevention of ischemic mitral regurgitation does not influence the outcome of remodeling after posterolateral myocardial infarction. J Am Coll Cardiol, 2004. 43(3): p. 377-83.
4. Gardner, T.J. and P.T. O'Gara, The Cardiothoracic Surgery Network: randomized clinical trials in the operating room. J Thorac Cardiovasc Surg, 2010. 139(4): p. 830-4..

Ischemic Mitral Regurgitation

Methods

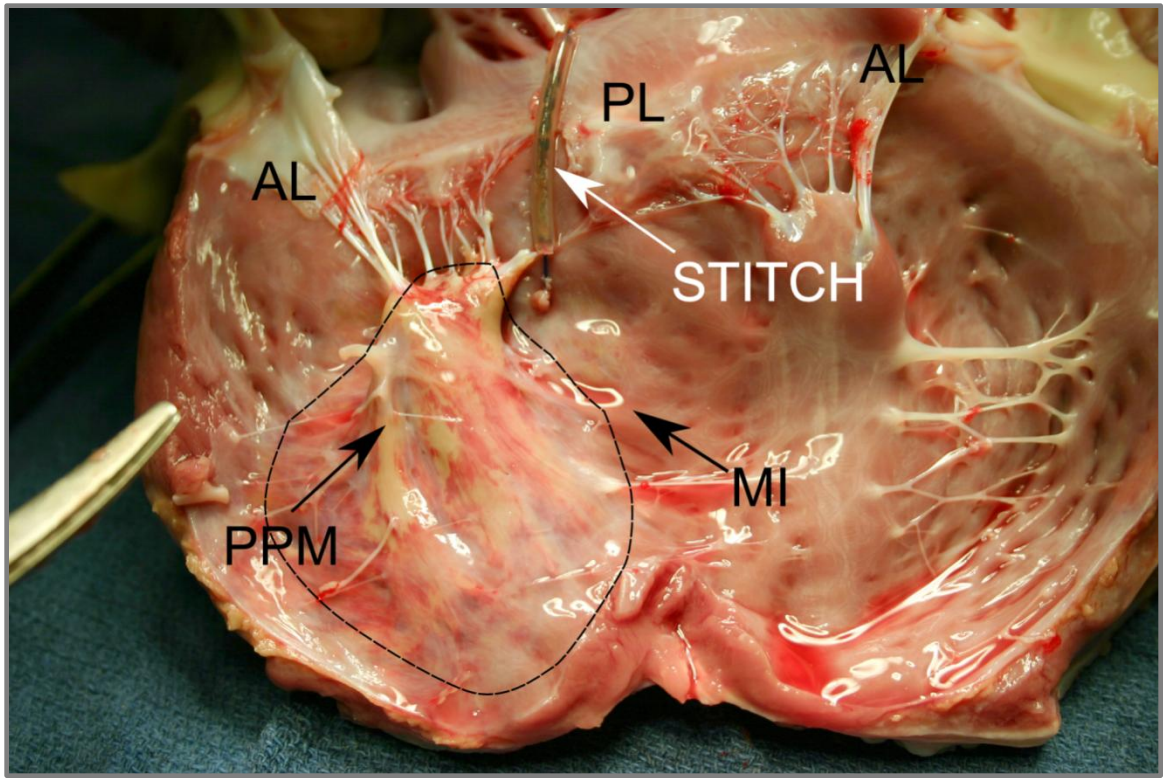
- **An established sheep model of CIMR was used (MI). [5]**
- **We were concerned that the amount of MR after postero-lateral MI in the sheep was only mild. [6]**
- **Thus, a second group of animals underwent standard postero-lateral MI + tethering of the posterior mitral leaflet with a mitral stitch (MI + STITCH).**

5. Llaneras, M.R., M.L. Nance, J.T. Streicher, et al., Large animal model of ischemic mitral regurgitation. Ann Thorac Surg, 1994. 57(2): p. 432-9.
6. Liel-Cohen, N., J.L. Guerrero, Y. Otsuji, et al., Design of a new surgical approach for ventricular remodeling to relieve ischemic mitral regurgitation: insights from 3-dimensional echocardiography. Circulation, 2000. 101(23): p. 2756-63.

Ischemic Mitral Regurgitation

Methods

- **MI + Stitch procedure.**

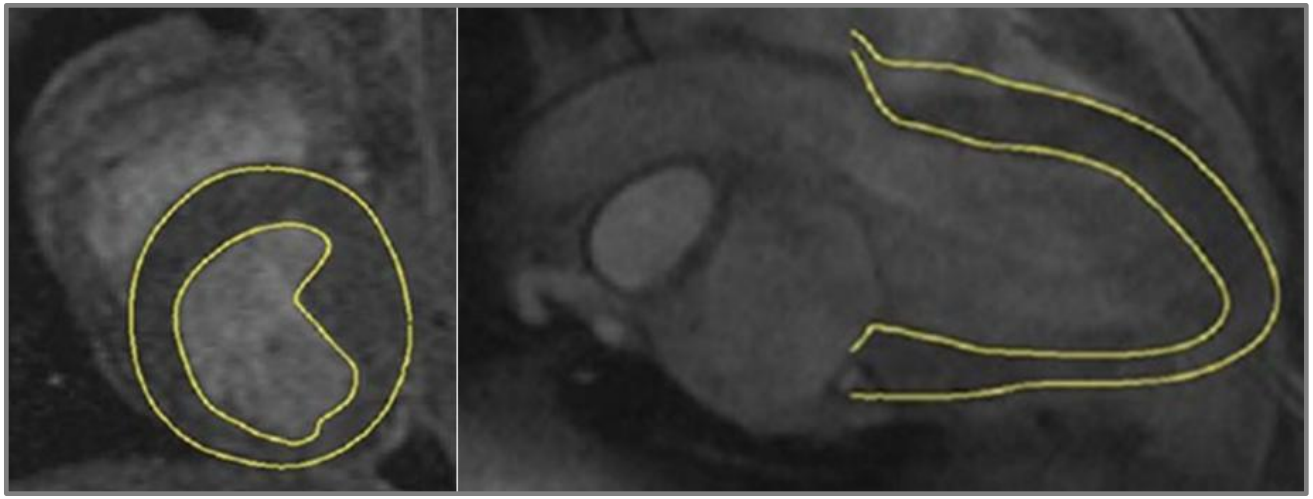


  - The purpose of the STITCH was to increase the amount of MR without significantly altering the pathophysiology of CIMR.

Ischemic Mitral Regurgitation

Methods

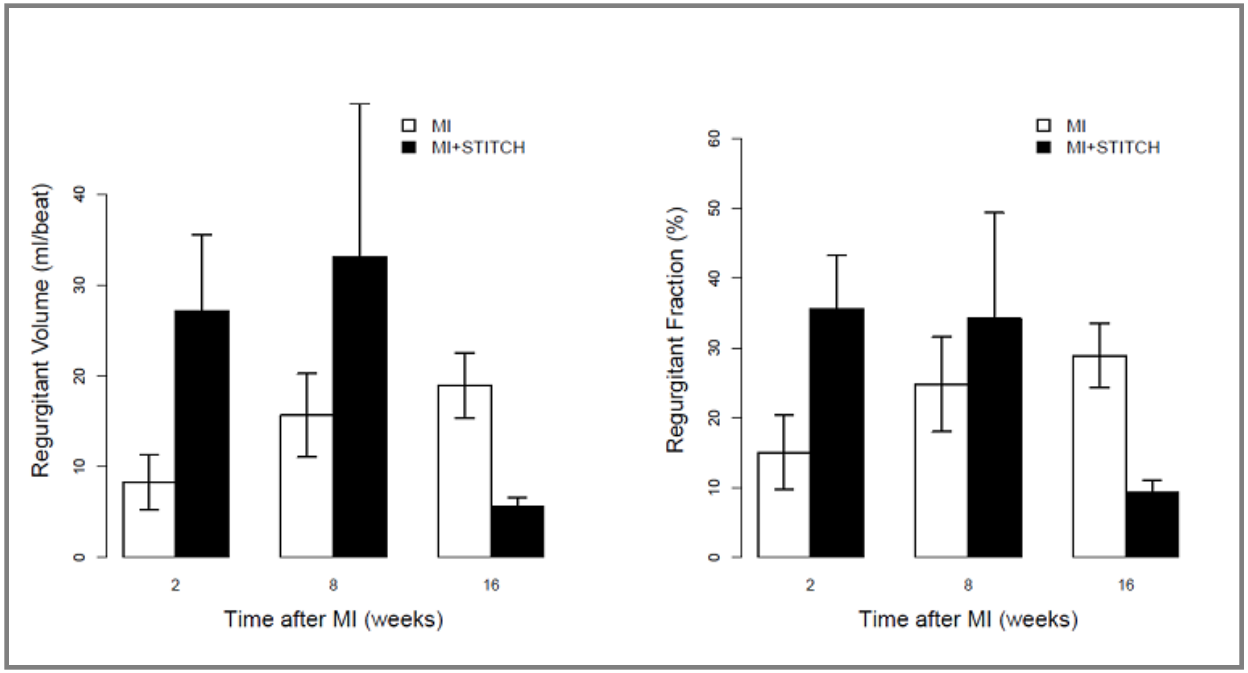
- **Cardiac magnetic resonance imaging (MRI) was used to more accurately measure LV and regurgitant volumes.**
- **Sheep underwent MRI 2 weeks before and 2, 8 and 16 weeks after MI.**
- **Short- and long-axis images were contoured using custom software.**
- **Regurgitant volume was calculated as the difference between RV and LV stroke volumes**



Ischemic Mitral Regurgitation

Results

- **Changes in RegurgVolume (A) and RegurgFraction (B) over time in the MI and MI+STITCH groups.**

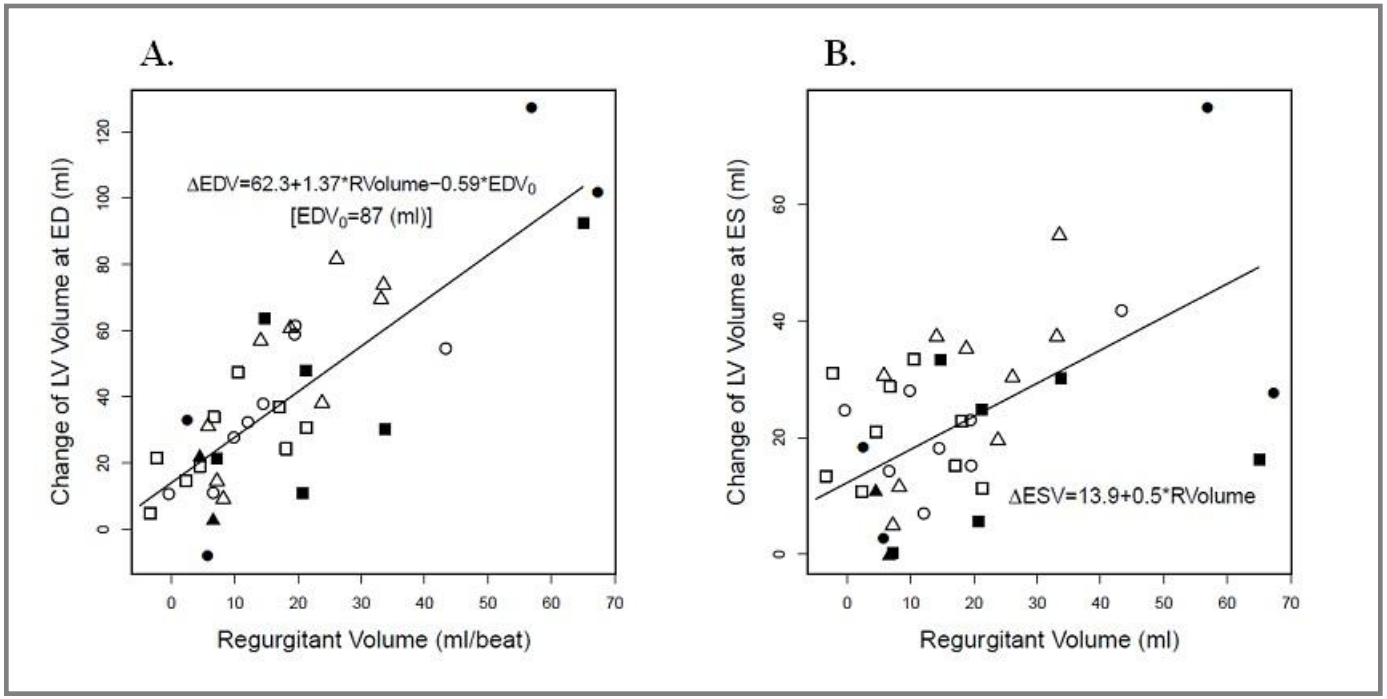


– Because of the wide range in RegurgVolume in both groups, the two groups were not statistically different (p=NS). However, on average, RegurgVolume was larger in the MI + STITCH group.

Ischemic Mitral Regurgitation

Results

- **Relationships between regurgitant volume and LV vol. at end-diastole (ED) (A) and LV vol. at end-systole (ES) (B)**

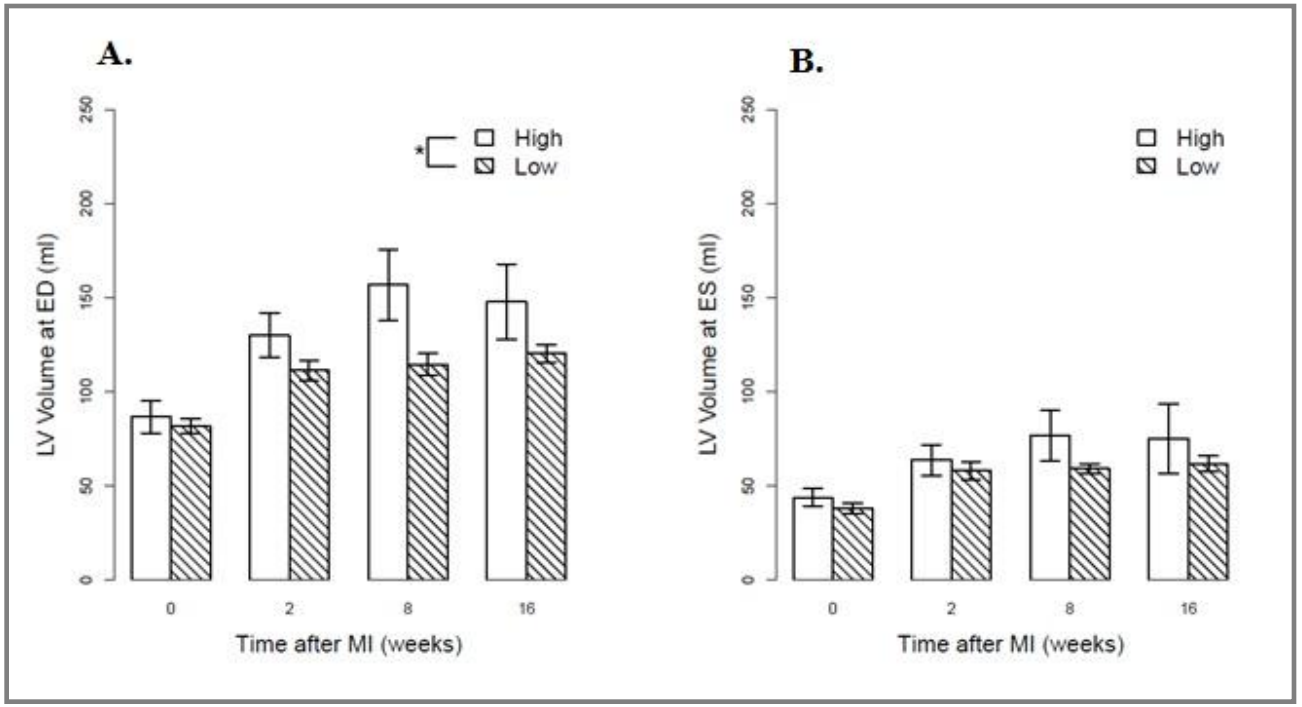


  - **Linear mixed-effects model regression analysis showed that LV Volume at ED and ES were highly correlated with RegurgVolume ($p<0.0001$ and $p<0.001$ respectively). Linear regression analysis showed the multiple to be 0.77 for the change of LV EDV and 0.23 for the change of LV ESV**

Ischemic Mitral Regurgitation

Results

- **Relationships between time after MI and LV volume at end-diastole (A) and LV volume at end-systole (B). *: p < 0.05 between High and Low mitral regurgitation groups.**



  - **LV volume at ED in the two groups was significantly different (Both time and High vs Low effects p<0.05). However, LV volume at ES was similar (p=NS).**

Ischemic Mitral Regurgitation

Conclusion

- **The amount of MR after postero-lateral MI was increased to the moderate level with the STITCH procedure.**
- **We found that moderate mitral regurgitation accelerates LV remodeling after postero-lateral MI.**
- **Further studies are needed to determine whether mitral valve repair is able to slow or reverse remodeling associated with moderate CIMR.**

University of California
San Francisco

advancing health worldwide™