MITRAL VALVE REPAIR WITH REVASCULARIZATION STRATEGY VERSUS REVASCULARIZATION ALONE IN ISCHEMIC CARDIOMYOPATHY WITH MILD TO MODERATE MITRAL REGURGE

A protocol submitted
for partial fulfilment of
MD degree in Cardiothoracic Surgery.

BY:
Ahmed M. Murtada Afifi
M.B.B.Ch. MSc
Cairo University

Under Supervision of:

Prof. Dr. Gamal Sami Sayed Mohamed
Professor of Cardiothoracic Surgery
University of Ain Shams

Prof. Dr. Ashraf Abdallah El Sebaei
Professor of Cardiothoracic Surgery
University of Ain Shams

Dr. Osama Abbas AbdelHameed
Lecturer of Cardiothoracic Surgery
University of Ain Shams

Dr. Hamdy AbdelWareth Sengab
Lecturer of Cardiothoracic Surgery
University of Ain Shams

UNIVERSITY OF AIN SHAMS
FACULTY OF MEDICINE
2009

INTRODUCTION

Ischemic mitral regurgitation is mitral insufficiency caused by myocardial infarction.[1] It is a common complication of a completed myocardial infarction prevalent in up to 20% of cases following more frequently an inferior MI rather than an antero-septal one.[2] IMR always follows myocardial infarction. It is therefore a disease of the myocardium that disturbs mitral valvular function. The leaflets and subvalvular apparatus are by definition normal[3] distinguishing it from other causes of MR associated with coronary artery disease in which no cause and effect relationship exists.

There are different mechanisms by which IMR occurs. It may present suddenly with MI and papillary muscle dysfunction or rupture; usually the postero-medial one. It can more commonly be chronic where there is loss of leaflet coaptation late after an established MI. This could be due annular dilatation or to global LV dilatation leading to displacement of the papillary muscles with consequent increase of tethering forces both leading to incomplete coaptation of mitral leaflets as well as local malfunction of the LV wall adjacent to a single papillary muscle.[4] Ischemic heart disease patients with IMR have a worse survival than patients without IMR. A higher degree of IMR worsens further long term survival.[5]

Decision to perform surgery on the incompetent valve is taxing with a higher risk of post operative complications. Surgery is considered according to the grade of mitral incompetence. Grades 3/4 and 4/4 generally require mitral valve surgery in addition to coronary artery bypass grafting for better surgical outcomes and prognosis. The debate regarding surgical indications for MV surgery is still open for less severe lesions.[6] Some surgeons found no difference between isolated coronary artery bypass grafting (CABG) and CABG associated to MV surgery.[7] Other studies evidence a better outcome with MV surgery, even in the case of moderate (2/4) IMR.[8]

Some anterior infarctions are tolerated without severe loss of function initially, but progress to severe ventricular dysfunction later on with IMR and heart failure. Even on the best available therapy the 5-year survival for infarction-induced heart failure can be as low as 50%.[9] Recent studies suggest that a transmural myocardial infarction makes the surrounding normally perfused myocardium myopathic. Whether this process is reversible remains to be seen, but unimpressive results with LV volume reduction and LV aneurysm operations strongly suggest that it is not.[10] [11] [12] It is proposed that early interventions attenuate LV dilatation before LV remodeling occurs and improves survival by restraining infarct expansion and stabilizing LV geometry thus preventing the progress of ischemic mitral regurgitation and improving survival.[13]

Aim of the work:

1. to compare mortality and morbidity in the different strategies for tackling a large LV with mild to moderate mitral regurgitation.

2. to evaluate the influence of factors including concomitant surgical procedures, clinical and hemodynamic parameters on surgical outcomes.

3. to evaluate improvement in LV function, LV size and mitral valve status postoperatively and one month after recovery.

PATIENTS AND METHODS:

A prospective study where 60 patients with mild to moderate IMR and coronary artery disease with above normal left ventricular dimensions undergoing surgery will be chosen. First group of patients will undergo CABG alone while the other will have mitral repair in addition to CABG.

Results will be collected:

- *Preoperatively* in the form of:
    - Age, sex, clinical symptoms and signs, EURO score (standard and logistic) and preexisting comorbidities
    - Laboratory tests (CBC, Liver functions and Kidney functions)
    - Trans thoracic echocardigraphy including mitral valve analysis, size and dynamic properties of the LV (including LV end diastolic dimension, LV ejection fraction)

- Coronary angiography in addition to any previous surgery or PCI, coexisting cardiac lesions and arrhythmias will be noted.

- *Intraoperatively* in the form of:
  - Type of procedure
  - Operative time, bypass and cross clamp time (type of myocardial preservation will be cold antegrade cardioplegia)
  - Technique of mitral repair
  - Intraoperative TOE findings
  - In-theatre mortality
  - Inotropic support and need for IABP
- *Postoperatively*
  - *Immediate* in the form of :
    - ICU stay, postoperative complications (including: bleeding, MI, arrhythmias, low cardiac output and renal failure)
    - Hospital stay
    - Mortality
    - Predischarge echocardiography
  - *Follow up:* 4 to 6 weeks
    - for progress of symptoms
    - Transthoracic echocardiography: LV end diastolic dimension, LV ejection fraction, Wall motion abnormality and mitral valve status.

RESULTS:

All results will be tabulated, graphed and statistically analyzed.

1 Tcheng JE, Jackman JD Jr, Nelson CL, et al: **Outcome of patients sustaining acute ischemic mitral regurgitation during myocardial infarction.** *Ann Int Med* 1992; 117:18

2 Kumanohoso T, Otsuji Y, Yoshifuku S, Matsukida S, koriyama C, Kisanuki A, Minagoe S, Levine RA, Tei C. **Mechanism of higher incidence of ischemic mitral regurgitation in patients with inferior myocardial infarction: quantitative analysis of left ventricular and mitral valve geometry in 103 patients with prior myocardial infarction.** *J Thorac Cardiovasc Surg* 2003;125:135–143

3 Robert C. Gorman/ Joseph H. Gorman, III/ L. Henry Edmunds, Jr **Ischemic Mitral Regurgitation** Cohn LH, Edmunds LH Jr, eds. *Cardiac Surgery in the Adult.* New York: McGraw-Hill, 2003:751-769.

4 Kwan J, Shiota T, Agler DA, Popovic ZB, Qin JX, Gillionov MA, Stewart WJ, Cosgrove DM, McCarthy PM, Thomas JD. **Geometric differences of the mitral apparatus between ischemic and dilated cardiomyopathy with significant mitral regurgitation real-time three-dimensional echocardiography study.** *Circulation* 2003;107:1135–1140.

5 Ling LH, Enriquez-Sarano M, Seward JB, Orszulak TA, Schaff HV, Bailey KR, Tajik AJ, Frye RL. **Early surgery in patients with mitral regurgitation due to flail leaflets; a long-term outcome study.** *Circulation* 1997;96:1819–1825.[

6 Duarte IG, Shen Y, MacDonald MJ, Jones EL, Craver JM, Guyton RA. **Treatment of moderate mitral regurgitation and coronary disease by coronary bypass alone: late results.** *Ann Thorac Surg* 1999;68:426–430.

7 Harris KM, Sundt TM, Aeppli D, Sharma R, Barzilai B. **Can late survival of patients with moderate ischemic mitral regurgitation be impacted by intervention on the valve?** *Ann Thorac Surg* 2002;74:1468–1475

8 Ryden T, Bech-Hanssen O, Brandrup-Wognsen G, Nilsson F, Svensson S, Jeppsson A. **The importance of grade 2 ischemic mitral regurgitation in coronary artery bypass grafting.** *Eur J Cardiothorac Surg* 2001;20:276–281.

9 Robert C. Gorman/ Joseph H. Gorman, III/ L. Henry Edmunds, Jr **Ischemic Mitral Regurgitation** Cohn LH, Edmunds LH Jr, eds. *Cardiac Surgery in the Adult.* New York: McGraw-Hill, 2003:751-769.

10 Guccione JM, Moonly SM, Moustakidis P, et al: **Mechanism underlying mechanical dysfunction in the border zone of left ventricular aneurysm: a finite element model study.** *Ann Thorac Surg* 2001; 71:654.

11 Moainie SL, Gorman JH 3rd, Guy TS, et al: **An ovine model of postinfarction dilated cardiomyopathy.** *Ann Thorac Surg* 2002; 74:753.

12 Jackson BM, Gorman JH 3rd, Moainie S, et al: **Extension of borderzone myocardium in postinfarction dilated cardiomyopathy.** J *Am Coll Cardiol* 2002; 40:1160

13 Moainie SL, Guy TS, Gorman JH 3rd, et al: **Infarct restraint attenuates remodeling and reduces chronic ischemic mitral regurgitation following postero-lateral infarction.** *Ann Thorac Surg* 2002; 74:444

MITRAL VALVE REPAIR WITH REVASCULARIZATION STRATEGY VERSUS REVASCULARIZATION ALONE IN ISCHEMIC CARDIOMYOPATHY WITH MILD TO MODERATE MITRAL REGURGE

Thesis submitted
for partial fulfilment of
MD degree in Cardiothoracic Surgery.

BY:
Ahmed M. Murtada Afifi
MBBCh. MSc.
Cairo University

Under Supervision of:

Prof. Dr. Gamal Sami Sayed Mohamed
Professor of Cardiothoracic Surgery
University of Ain Shams

Prof. Dr. Ashraf Abdallah El Sebaei
Professor of Cardiothoracic Surgery
University of Ain Shams

Dr. Osama Abbas AbdelHameed
Associate Professor of Cardiothoracic Surgery
University of Ain Shams

Dr. Hamdy AbdelWareth Singab
Lecturer of Cardiothoracic Surgery
University of Ain Shams

UNIVERSITY OF AIN SHAMS
FACULTY OF MEDICINE
2011

PROTOCOL

MITRAL VALVE REPAIR WITH REVASCULARIZATION STRATEGY VERSUS REVASCULARIZATION ALONE IN ISCHEMIC CARDIOMYOPATHY WITH MILD TO MODERATE MITRAL REGURGE

A protocol submitted
for partial fulfilment of
MD degree in Cardiothoracic Surgery.

BY:
Ahmed M. Murtada Afifi
M.B.B.Ch. MSc
Cairo University

Under Supervision of:

Prof. Dr. Gamal Sami Sayed Mohamed
Professor of Cardiothoracic Surgery
University of Ain Shams

Prof. Dr. Ashraf Abdallah El Sebaei
Professor of Cardiothoracic Surgery
University of Ain Shams

Dr. Osama Abbas AbdelHameed
Lecturer of Cardiothoracic Surgery
University of Ain Shams

Dr. Hamdy AbdelWareth Sengab
Lecturer of Cardiothoracic Surgery
University of Ain Shams

UNIVERSITY OF AIN SHAMS
FACULTY OF MEDICINE
2009

INTRODUCTION

Ischemic mitral regurgitation is mitral insufficiency caused by myocardial infarction.[1] It is a common complication of a completed myocardial infarction prevalent in up to 20% of cases following more frequently an inferior MI rather than an antero-septal one.[2] IMR always follows myocardial infarction. It is therefore a disease of the myocardium that disturbs mitral valvular function. The leaflets and subvalvular apparatus are by definition normal[3] distinguishing it from other causes of MR associated with coronary artery disease in which no cause and effect relationship exists.

There are different mechanisms by which IMR occurs. It may present suddenly with MI and papillary muscle dysfunction or rupture; usually the postero-medial one. It can more commonly be chronic where there is loss of leaflet coaptation late after an established MI. This could be due annular dilatation or to global LV dilatation leading to displacement of the papillary muscles with consequent increase of tethering forces both leading to incomplete coaptation of mitral leaflets as well as local malfunction of the LV wall adjacent to a single papillary muscle.[4] Ischemic heart disease patients with IMR have a worse survival than patients without IMR. A higher degree of IMR worsens further long term survival.[5]

Decision to perform surgery on the incompetent valve is taxing with a higher risk of post operative complications. Surgery is considered according to the grade of mitral incompetence. Grades 3/4 and 4/4 generally require mitral valve surgery in addition to coronary artery bypass grafting for better surgical outcomes and prognosis. The debate regarding surgical indications for MV surgery is still open for less severe lesions.[6] Some surgeons found no difference between isolated coronary artery bypass grafting (CABG) and CABG associated to MV surgery.[7] Other studies evidence a better outcome with MV surgery, even in the case of moderate (2/4) IMR.[8]

Some anterior infarctions are tolerated without severe loss of function initially, but progress to severe ventricular dysfunction later on with IMR and heart failure. Even on the best available therapy the 5-year survival for infarction-induced heart failure can be as low as 50%.[9] Recent studies suggest that a transmural myocardial infarction makes the surrounding normally perfused myocardium myopathic. Whether this process is reversible remains to be seen, but unimpressive results with LV volume reduction and LV aneurysm operations strongly suggest that it is not.[10] [11] [12] It is proposed that early interventions attenuate LV dilatation before LV remodeling occurs and improves survival by restraining infarct expansion and stabilizing LV geometry thus preventing the progress of ischemic mitral regurgitation and improving survival.[13]

Aim of the work:

1. to compare mortality and morbidity in the different strategies for tackling a large LV with mild to moderate mitral regurgitation.

2. to evaluate the influence of factors including concomitant surgical procedures, clinical and hemodynamic parameters on surgical outcomes.

3. to evaluate improvement in LV function, LV size and mitral valve status postoperatively and one month after recovery.

PATIENTS AND METHODS:

A prospective study where 60 patients with mild to moderate IMR and coronary artery disease with above normal left ventricular dimensions undergoing surgery will be chosen. First group of patients will undergo CABG alone while the other will have mitral repair in addition to CABG.

Results will be collected:

- *Preoperatively* in the form of:
    - Age, sex, clinical symptoms and signs, EURO score (standard and logistic) and preexisting comorbidities
    - Laboratory tests (CBC, Liver functions and Kidney functions)
    - Trans thoracic echocardigraphy including mitral valve analysis, size and dynamic properties of the LV (including LV end diastolic dimension, LV ejection fraction)

- Coronary angiography in addition to any previous surgery or PCI, coexisting cardiac lesions and arrhythmias will be noted.

- *Intraoperatively* in the form of:
  - Type of procedure
  - Operative time, bypass and cross clamp time (type of myocardial preservation will be cold antegrade cardioplegia)
  - Technique of mitral repair
  - Intraoperative TOE findings
  - In-theatre mortality
  - Inotropic support and need for IABP
- *Postoperatively*
  - *Immediate* in the form of :
    - ICU stay, postoperative complications (including: bleeding, MI, arrhythmias, low cardiac output and renal failure)
    - Hospital stay
    - Mortality
    - Predischarge echocardiography
  - *Follow up:* 4 to 6 weeks
    - for progress of symptoms
    - Transthoracic echocardiography: LV end diastolic dimension, LV ejection fraction, Wall motion abnormality and mitral valve status.

RESULTS:

All results will be tabulated, graphed and statistically analyzed.

1 Tcheng JE, Jackman JD Jr, Nelson CL, et al: **Outcome of patients sustaining acute ischemic mitral regurgitation during myocardial infarction.** *Ann Int Med* 1992; 117:18

2 Kumanohoso T, Otsuji Y, Yoshifuku S, Matsukida S, koriyama C, Kisanuki A, Minagoe S, Levine RA, Tei C. **Mechanism of higher incidence of ischemic mitral regurgitation in patients with inferior myocardial infarction: quantitative analysis of left ventricular and mitral valve geometry in 103 patients with prior myocardial infarction.** *J Thorac Cardiovasc Surg* 2003;125:135–143

3 Robert C. Gorman/ Joseph H. Gorman, III/ L. Henry Edmunds, Jr **Ischemic Mitral Regurgitation** Cohn LH, Edmunds LH Jr, eds. *Cardiac Surgery in the Adult.* New York: McGraw-Hill, 2003:751-769.

4 Kwan J, Shiota T, Agler DA, Popovic ZB, Qin JX, Gillionov MA, Stewart WJ, Cosgrove DM, McCarthy PM, Thomas JD. **Geometric differences of the mitral apparatus between ischemic and dilated cardiomyopathy with significant mitral regurgitation real-time three-dimensional echocardiography study.** *Circulation* 2003;107:1135–1140.

5 Ling LH, Enriquez-Sarano M, Seward JB, Orszulak TA, Schaff HV, Bailey KR, Tajik AJ, Frye RL. **Early surgery in patients with mitral regurgitation due to flail leaflets; a long-term outcome study.** *Circulation* 1997;96:1819–1825.[

6 Duarte IG, Shen Y, MacDonald MJ, Jones EL, Craver JM, Guyton RA. **Treatment of moderate mitral regurgitation and coronary disease by coronary bypass alone: late results.** *Ann Thorac Surg* 1999;68:426–430.

7 Harris KM, Sundt TM, Aeppli D, Sharma R, Barzilai B. **Can late survival of patients with moderate ischemic mitral regurgitation be impacted by intervention on the valve?** *Ann Thorac Surg* 2002;74:1468–1475

8 Ryden T, Bech-Hanssen O, Brandrup-Wognsen G, Nilsson F, Svensson S, Jeppsson A. **The importance of grade 2 ischemic mitral regurgitation in coronary artery bypass grafting.** *Eur J Cardiothorac Surg* 2001;20:276–281.

9 Robert C. Gorman/ Joseph H. Gorman, III/ L. Henry Edmunds, Jr **Ischemic Mitral Regurgitation** Cohn LH, Edmunds LH Jr, eds. *Cardiac Surgery in the Adult.* New York: McGraw-Hill, 2003:751-769.