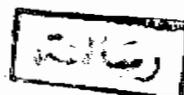


**ACCURACY OF DOPPLER
ECHOCARDIOGRAPHY IN ASSESSMENT
OF THE TRANSMITRAL GRADIENT
WITH SIMULTANEOUS
CATHETERIZATION IN PATIENTS WITH
MITRAL STENOSIS**

Thesis

Submitted in partial fulfillment of the Master Degree in
Cardiology

By



Ayman Mohamed Rizk
M.B.B.Ch.

Supervised by

Prof. Dr. Mahmoud El-Sherbiny
Professor of Cardiology
Faculty of Medicine
Ain Shams University

Prof. Dr. Adel Emam
Consultant of cardiology
National Heart Institute
Imbaba, Cairo

Dr. Mona Abu El-Sood
Assis. Prof. of Cardiology
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
1996



516.12507543

A. M

Acknowledgement

All Thanks to God

I would like to express my deepest gratitude to ***Prof. Dr. Mahmoud El-Sherbiny***, Professor of Cardiology, Ain Shams University and ***Prof. Dr. Adel Emam***, Consultant of Cardiology, National Heart Institute, who honoured me with their kind supervision, continuous learning and fatherly advice in all the stages of this work.

No word can fulfill my feeling of gratitude and respect to ***Dr. Mona Abu El-Sood***, assistant Professor of Cardiology, Ain Shams University, for the great direction and help all through this work.

Finally, I would like to express many thanks and gratitude to all who helped me and participated in the completion of this work especially my colleagues in the National Heart Institute.



Contents

Introduction	1
Aim of the work	3
Review of literature	
- Anatomy of the normal mitral valve	4
- Pathology of rheumatic MS	6
- Pathophysiology of MS	8
- Echocardiographic assessment of MS	16
- Utilization of conventional echo-Doppler in PBMV	29
- PBMV	32
- Assessment of MS during cardiac cath	38
- Complications of PBMV	45
Patients and Methods	52
Results	64
Discussion	85
Summary	92
Conclusion and recommendation	94
References	95
Arabic summary	**

List of tables

- **Table (1):** Mean mitral valve area pre and post PBMV as measured by Doppler echocardiography

- **Table (2):** Mean mitral valve area pre and post PBMV as measured by cardiac catheterization

- **Table (3):** Mean pressure gradient pre and post PBMV as measured by echocardiography.

- **Table (4):** Mean pressure gradient pre and post PBMV as measured by cardiac catheterization.

- **Table (5):** Mean left atrial pressure pre and post PBMV as measured by cardiac catheterization.

- **Table (6):** Mean LVEDP pre and post PBMV as measured by cardiac catheterization.

- **Table (7):** Mean cardiac output pre and post PBMV as measured by cardiac catheterization

- **Table (8):** Correlation between pressure gradient measured by Doppler echocardiography and cardiac catheterization pre and post PBMV.

- **Table (9):** Correlation between mitral valve area measured by Doppler echocardiography and cardiac catheterization pre and post PBMV.

- **Table (10):** Correlation between mitral valve area and pressure gradient measured by echocardiography pre and post PBMV.

- **Table (11):** Correlation between mitral valve area and pressure gradient measured by cardiac catheterization pre and post PBMV.

- **Table (12):** General population and echocardiographic data.

- **Table (13):** Results of cardiac catheterization of all the studied patients.

List of figures

- Fig. (1):*** Sex distribution of the studied patients.
- Fig. (2):*** NYHA class of the studied patients.
- Fig. (3):*** Mean mitral valve area pre and post PBMV as measured by Doppler echocardiography.
- Fig. (4):*** Mean mitral valve area pre and post PBMV as measured by cardiac catheterization.
- Fig. (5):*** Mean pressure gradient pre and post PBMV as measured by Doppler echocardiography.
- Fig. (6):*** Mean pressure gradient pre and post PBMV as measured by cardiac catheterization.
- Fig. (7):*** Mean LA pressure pre and post PBMV as measured by cardiac catheterization.
- Fig. (8):*** Mean LVEDP pre and post PBMV as measured by cardiac catheterization.
- Fig. (9):*** Mean cardiac output pre and post PBMV as measured by cardiac catheterization.
- Fig. (10):*** Correlation between pressure gradient measured by Doppler echocardiography and cardiac cath pre- and post PBMV.
- Fig. (11):*** Correlation between MVA measured by Doppler and cardiac cath pre and post PBMV.

Fig. (12): Correlation between pressure gradient and MVA as measured Doppler echocardiography pre and post PBMV.

Fig.(13): Correlation between pressure gradient and MVA as measured by cardiac cath pre and post PBMV.

Fig. (14): CW Doppler of mitral flow showing MVA by PHT (pre-PBMV)

Fig. (15): CW Doppler of mitral flow showing MVA by PHT (post-PBMV)

Fig. (16): CW Doppler of mitral flow showing mean PG (pre-PBMV)

Fig. (17): CW Doppler of mitral flow showing mean PG (post-PBMV)

Abbreviations

AF: Atrial fibrillation.

AML: Anterior mitral leaflet.

ASD: Atrial septal defect.

COP: Cardiac output.

CW: Continuous wave Doppler.

2-DE: 2-dimensional echocardiography.

ECG: Electrocardiogram.

HR: Heart rate.

LA: Left atrium.

LAA: Left atrial appendage.

LApr: Left atrial pressure.

LV: Left ventricle.

LVEDP: Left ventricular end diastolic pressure.

MVA: Mitral valve area.

NYHA: New York Heart Association.

PBMV: Percutaneous balloon mitral valvuloplasty.

PG: Pressure gradient.

PHT: Pressure half time.

PML: Posterior mitral leaflet.

PW: Pulsed wave.

SD: Standard deviation.

TEE: Transesophageal echocardiography.

TIA: Transient ischemic attacks.

TTE: Transthoracic echocardiography.





Introduction

Accurate measurement of the mean gradient across the mitral valve during diastole and mitral valve area is of paramount importance in the evaluation of the patient with mitral stenosis. The severity of obstruction is reflected by the mean transmitral gradient in the rest state and with exercise. Calculation of the valve area by the Gorlin equation requires accurate knowledge of this transmitral gradient (*Nishimura et al., 1994*).

Simultaneous measurement of left atrial and left ventricular pressure is the most accurate method by which the mean mitral valve gradient can be derived in patients with mitral stenosis. This method requires transseptal catheterization, a procedure with known inherent risks, for direct measurement of left atrial pressure (*Conti and Ross, 1969*).

Nearly 5 decades ago, measurement of the pulmonary wedge pressure was proposed as a mean for indirectly determining left atrial pressure, since then pulmonary capillary wedge pressure has been used in many invasive laboratories for determination of mean transmitral gradient (*Albert, 1989*).

However, investigators have recently cautioned against the use of pulmonary capillary wedge pressure in patients with mitral stenosis and prosthetic mitral valve because a clinically significant overestimation of the true transmitral gradient may result (*Schoenfeld, 1985*).



Doppler echocardiography has been proposed as a non-invasive method for measuring transmitral gradient in patients with mitral stenosis (*Dunn, 1985*).

The initial studies however, compared the Doppler-derived mean gradient with that obtained by cardiac catheterization with use of pulmonary capillary wedge pressure (*Dunn, 1985*). Because of the potential inaccuracies associated with this catheterization method, the true accuracy of Doppler echocardiography has remained unclear (*Housenpud et al., 1983*).

Considerable data demonstrate that the pressure half-time or rate of velocity deceleration can be useful in quantitating the degree of mitral stenosis. The measurement has influenced by the maximum mitral gradient, the presence of mitral regurgitation and aortic regurgitation. Thus, reliance of this relatively simple measurement for quantitating mitral stenosis is being evaluated (*Feigenbaum, 1994*).

