

# Evaluation of Left Atrial and Ventricular Function at Rest and Post-exercise by Speckle Tracking in Patients with Mild Mitral Stenosis

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## Abstract

Rheumatic mitral stenosis is a leading cause of morbidity in developing countries. Symptomatic patients with mitral valve area  $>1.5$  cm<sup>2</sup> comprises a gray zone in management. Exercise stress testing is recommended in these patients with symptoms discordant with the severity of the stenosis. Left atrial strain analysis with speckle tracking imaging emerges as a promising technique for the evaluation of haemodynamics better. The aim of our study is to examine the left atrial and ventricular function both during rest and just after exercise by speckle tracking imaging in patients with mild rheumatic mitral stenosis and ascertain early hemodynamic deterioration. We included 46 patients with mild mitral stenosis (mitral valve area  $>1.5$  cm<sup>2</sup>). The patients were evaluated with comprehensive 2D and Doppler echocardiography during rest, before the exercise stress test. Left atrial and ventricular peak systolic strain values were calculated by using a software program. Exercise stress test was then performed by using treadmill with standard Bruce protocol. Immediately after the termination of the test, the echocardiographic examination was repeated. Both mean trans-mitral gradient and systolic pulmonary artery pressure values were higher following exercise ( $p < 0.001$ ,  $p = 0.001$ , respectively). Exercise did not cause a significant change in left atrial and ventricular peak systolic strain value ( $p = 0.708$ ,  $p = 0.854$ ). A negative significant correlation was found between the mean trans-mitral gradient and peak systolic left atrial strain following exercise. In patients with mitral valve area  $>1.5$  cm<sup>2</sup>, exercise stress test did not cause a significant change in left atrial and ventricular peak systolic strain.

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### ABSTRACT

### Introduction

Rheumatic mitral stenosis is a leading cause of morbidity in developing countries. It has adverse hemodynamic effects on both pulmonary circulation and left atrium that may not be completely determined by conventional transthoracic echocardiographic techniques. Symptomatic patients with mitral valve area  $>1.5$  cm<sup>2</sup> comprises a gray zone in management. Therefore, exercise stress testing is recommended in these patients with symptoms discordant with the severity of the stenosis. Left atrial strain analysis with speckle tracking imaging emerges as a promising technique for the evaluation of these hemodynamic effects better. Despite the well-known fact that the left ventricle is spared from the deleterious hemodynamic effects of mitral stenosis, some new research has recently revealed that it might actually be associated with sub-clinical left ventricle dysfunction. The aim of our study is to examine the left atrial and ventricular function both during

rest and just after exercise by speckle tracking imaging in patients with mild rheumatic mitral stenosis and ascertain early hemodynamic deterioration.

## Methods

We included 46 patients with mild mitral stenosis (mitral valve area  $>1.5 \text{ cm}^2$ ) between January 2015-January 2016. The patients were evaluated with comprehensive 2D and Doppler echocardiography during rest, before the exercise stress test. Left atrial and ventricular peak systolic strain values were calculated by using a software program (Figure 1&2). Exercise stress test was then performed by using treadmill with standard Bruce protocol. All of the patients completed the test successfully and reached the 85% of age predicted maximal heart rate. Immediately after the termination of the test, the echocardiographic examination was repeated.

## Results

Both mean trans-mitral gradient and systolic pulmonary artery pressure values were found to be significantly higher following exercise ( $p<0.001$ ,  $p=0.001$ , respectively). Exercise did not cause a significant change in left atrial and ventricular peak systolic strain value ( $p=0.708$ ,  $p=0.854$ ) (Table 1). A negative significant correlation was found between the mean trans-mitral gradient and peak systolic left atrial strain following exercise ( $p=0.039$ ,  $r=-0.361$ ).

## Conclusion

In patients with mitral valve area  $>1.5 \text{ cm}^2$ , exercise stress test did not cause a significant change in left atrial and ventricular peak systolic strain.

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