Isolated mitral valve prolapsus does not affect left ventricular function

Insights from tissue-Doppler echocardiography

Kenan Demir¹, Fatih Koc², İlknur Can¹, Mehmet Akif Vatankulu³, Mehmet Yazıcı¹, Mehmet Siddik Ülgen⁴

ABSTRACT

Aim: Idiopathic mitral valve prolapsus (MVP) is characterized by myxomatous degeneration of mitral valve. The most common determinant of cardiovascular mortality in patients with MVP is left ventricular (LV) dysfunction. Therefore we aimed to evaluate LV functions of cases with isolated MVP by tissue Doppler echocardiography (TDE).

Method: Twenty five patients with MVP (mean age, 31±12 years) were enrolled the study as MVP group. Control group was consisted 20 age and sex matched patients (mean age, 34±9 years) were enrolled to this study. LV functions were detected by using conventional echocardiography and TDE. Myocardial peak systolic (Sm), early (Em) and late (Am) diastolic filling velocities, Em/Am, isovolumetric contraction time (ICT), isovolumetric relaxation time (IRT) and ejection time (ET) were obtained in the basal segments of the inferior-septal and lateral wall. Myocardial performance index (MPI) was calculated.

Result: Mild degree mitral regurgitation was present in 10 (40%) of patients with MVP, and moderate degree mitral regurgitation was present in 2 (8%) of patients. No difference was found between the two groups with regard to diastolic parameters. TDE-derivated MPI values were similar in all segments in two groups. There was significant difference between the two groups with regard to LV mean Sm and lateral wall Sm (11.6±2.8 vs. 9.4±1.0, p=0.001; 13.0±3.9 vs. 9.2±2.3, p=0.001 respectively).

Conclusion: Isolated MVP without significant mitral regurgitation does not affect LV diastolic functions and MPI. However, Sm of lateral wall and LV mean was higher in patients with MVP than patients without MVP.

Key words: Mitral valve prolapse, tissue Doppler echocardiography, myocardial performance index
Anahtar kelimeler: hastaların lateral duvar Sm ve LV ortalama Sm'si MVP'si olmayanlara göre daha yüksekti.

Sonuç:
13.0±3.9 vs. 9.2±2.3, p=0.001 sırasıyla).

Diastolik parametreler açısından 2 grup arasında fark bulunmadı. TDE'den hesaplanan MPI değerleri iki grupta tüm segmentlerde ölçülüyor. Miyokardiyal performans indeksi (MPI) hesaplandığı görülmüştü. Metrik relaksasyon zamanı (IRT) ve ejeksiyon zamanı (ET) ölçümleri inferior-septal ve lateral duvarın bazal segmentlerinden ölçüldü. Miyokardiyal performans indeksi (MPI) hesaplandığı görülmüştü.

Amaç: 20 hastadan oluşturuldu (ortalama yaş, 34±9). LV fonksiyonları konvansiyonel ekokardiyografi ve TDE ile incelemeli. Miyokardiyal zirve sistolik (Sm), erken (Em) ve geç (Am) diastolik dalamanın hızları, Em/Am, isovolumetrik kontraksiyon zamanı (ICT), isovolumetrik relaxasyon zamanı (IRT) ve ejeksiyon zamanı (ET) ölçümleri inferior-septal ve lateral duvarın bazal segmentlerinden ölçüldü. Miyokardiyal performans indeksi (MPI) hesaplandığı görülmüştü.

Bu çalışmada, MVP'in hastaların lateral duvar hafif derecede mitral yetmezlik, 2'inde (10%) orta derecede mitral yetmezlik varlıdı. Statistiksel parametreler acısından 2 grup arasında fark bulunmadı. TDE'den hesaplanan MPI değerleri iki grupta tüm segmentlerde benzerdi. LV ve duvar Sm'lerin (11.6±2.8 vs. 9.4±1.0, p=0.001; 3.0±1.1 vs. 2.2±1.3, p=0.001) başarıyla ölçüldü. 

Sonuç: Beşinin mitral yetmezliği olan MVP ile LV soğuk diastolik fonksiyonu ve MVP'yi etkileme. Fakat, MVP'yi hastaların lateral duvar Sm ve LV ortalaması Sm'te MVP'si olmayanlara göre daha yüksek olmaya anlatılabilir. Mitral kapak prolapsusu, dokunun doppler ekokardiyografi, miyokardiyal performans indeks

**INTRODUCTION**

Idiopatik mitral valvul prolapsusu (MVP) karakterize olunuyor, mitral ve shows a heterogen range of clinical course from asymptomatic to severe morbidity and mortality (1). Although MVP prevalence is high in earlier echocardiographic studies, the current echocardiographic diagnostic criteria are taken into consideration the prevalence of it in the population is 1-2.5% (1,2). Baseline clinical and echocardio graphic parameter, are strong predictors of outcome and are essential for clinical management. The most common determinant of cardiovascular mortality in patients with MVP is left ventricular (LV) ejection fraction (EF) lower than 50% (3). Although LV dysfunction is detected in most of the transthoracic echocardiographic, radionuclide ventriculographic and dobutamine stress echocardiographic studies done to evaluate LV function in cases with MVP, inconsistent results are present (4-7).

**MATERIALS AND METHODS**

**Study Population**

Twenty five consecutive patients (11 male; mean age, 34±12 years) who admitted to cardiology clinic with symptoms of fatigue, palpitation, dyspnea on exertion and atypical chest pain, and who had MVP in echocardiographic examination were enrolled to this study. Echocardiographically, mitral valve prolapse is defined as systolic displacement (>2.0 mm) of one or both mitral leaflets into the left atrium in the long axis annular plane (2). Age and sex matched 20 individuals (8 male; mean age, 34±9 years) were taken as control group. Subjects with blood pressure >140/90 mmHg, any personal history of systemic disease which may affect the cardiovascular system, unexplained chest pain, diabetes mellitus and renal failure, hypo/hyperthyroidism, abnormal ECG changes, rheumatic valvular heart disease, congenital heart disease, cases receiving medicines affecting myocardial functions such as beta blockers and Ca++ channel blockers were excluded from the study. All patients and controls underwent conventional and pulse wave TDE evaluation.

**Echocardiography**

Transthoracic echocardiographic assessment was performed in the left lateral decubitus position, using ATL-5000 standard ultrasonic machine (Advance Technology Laboratories, Bothell, Washington) with a 2-3.5 MHz transducer. Images were obtained in the standard tomographic views of the LV (parasternal long and short axis and apical four chamber, two-chamber, and long-axis views). Mitral inflow velocities were recorded by using conventional pulsed-wave Doppler echocardiography, positioning a sample volume at the level of the mitral leaflet tips in the apical four-chamber view. The peak early diastolic velocity (E), peak late diastolic velocity (A), E/A ratio, isovolumetric relaxation time (IRT), and E-wave deceleration time (EDT) were measured on line. Recordings were performed at the end of normal expiration in order to eliminate the effects of respiration on the parameters studied. Left ventricular diameters and wall thicknesses were measured from the two-dimensional targeted M-mode echocardiographic tracings in the parasternal long axis, according to the criteria of the American Society of Echocardiography (9). The LV end-diastolic and end-systolic volumes at rest were computed from two- and four-chamber views, using a modified Simpson's method, and the LV EF was calculated.

The echocardiograph machine was used to acquire co-
Left ventricular function in MVP

Table 2. Tissue Doppler Echocardiography Parameters in MVP and Controls

<table>
<thead>
<tr>
<th></th>
<th>MVP(n=25)</th>
<th>Control(n=20)</th>
<th>p value</th>
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<tbody>
<tr>
<td>Lateral Wall</td>
<td></td>
<td></td>
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<tr>
<td>Sm (cm/s)</td>
<td>13.0±3.9</td>
<td>9.2±2.3</td>
<td>0.001</td>
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<tr>
<td>Em (cm/s)</td>
<td>11.7±5.1</td>
<td>16.3±3.2</td>
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</tr>
<tr>
<td>Am (cm/s)</td>
<td>11.1±2.6</td>
<td>11.5±1.8</td>
<td>ns</td>
</tr>
<tr>
<td>Em/Am</td>
<td>1.4±0.1</td>
<td>0.47±0.1</td>
<td></td>
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<tr>
<td>MPI (ms)</td>
<td>0.45±0.3</td>
<td>0.48±0.4</td>
<td></td>
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<tr>
<td>Inferior Septal Wall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sm (cm/s)</td>
<td>10.2±2.3</td>
<td>9.6±1.2</td>
<td></td>
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<tr>
<td>Em (cm/s)</td>
<td>13.2±3.2</td>
<td>11.5±2.4</td>
<td></td>
</tr>
<tr>
<td>Am (cm/s)</td>
<td>11.8±4.3</td>
<td>11.6±2.2</td>
<td></td>
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<tr>
<td>Em/Am</td>
<td>1.41±0.4</td>
<td>1.22±0.2</td>
<td></td>
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<tr>
<td>MPI (ms)</td>
<td>0.48±0.1</td>
<td>0.49±0.1</td>
<td></td>
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<tr>
<td>LV mean</td>
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</tr>
<tr>
<td>Sm (cm/s)</td>
<td>11.6±2.8</td>
<td>9.4±1.0</td>
<td>0.001</td>
</tr>
<tr>
<td>Em (cm/s)</td>
<td>15.3±3.8</td>
<td>13.9±2.3</td>
<td></td>
</tr>
<tr>
<td>Am (cm/s)</td>
<td>11.5±2.7</td>
<td>11.5±1.4</td>
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<tr>
<td>Em/Am</td>
<td>1.41±0.4</td>
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<td>MPI (ms)</td>
<td>0.48±0.4</td>
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Statistical analysis

All statistics were calculated by the SPSS software 11.0 for Windows (SPSS, Inc). Descriptive data are expressed as a mean value ± SD. Student's t test was used for comparisons between parametric continuous variables and Mann Whitney U test was used for comparisons between non parametric continuous variables. Chi-square test was used for the comparison of the categorical variables. A value of P <.05 was considered significant.

RESULTS

Patients Characteristics and Conventional Echocardiography

Statistically significant differences in demographic and clinical characteristics between the two groups were not observed (Table 1). Baseline physical examination revealed midystolic click during auscultation in 9 (36%) cases and chest pain was present in 16 (64%) cases and palpitation was present in 18 (72%) patients. Echocardiographic examination demonstrated mild degree mitral regurgitation was present in 10 (40%) of subjects with MVP, and moderate degree mitral regurgitation was present in 2 (8%) of subjects. Severe mitral regurgitation was not found in the MVP group. Mean leaflet thickness and amount of sloping of the mitral valve was 5.5±0.5 mm and 3.4±0.8 mm in the MVP group respectively. No statistically significant difference was found regarding the systolic and diastolic function, as measured by means of the conventional 2D echocardiographic EF, fractional shortening (FS) and Doppler derived E, A, E/A, EDT and IRT between the two groups (Table 1).

Tissue Doppler Echocardiography

No difference was detected between two groups with regard to parameters such as Em, Am, Em/Am and MPI derived from base of inferior-septal and lateral wall. Also while no difference was found in Sm of MVP and control group derived from basal segment of inferior septum (10.2±2.3 vs. 9.6±1.2, P >0.05), Sm values derived from of lateral wall was significantly higher in MVP group than controls (13.0±3.9 vs. 9.2±2.3, P <0.001). When the mean values of LV septal and lateral wall of two groups were compared, no difference was detected in mean Em, Am, Em/Am and mean MPI value of MVP and control groups. But LV mean Sm value was significantly higher in MVP (11.9±2.7 vs. 9.5±1.1 cm/s, P <0.001). But in their study, diastolic functions (Em/Am) were lower than controls (1.3±0.4 vs 2.0±0.4, P <0.001). The difference in diastolic functions of both studies may be explained by relatively lower age of subjects in our study (31±12 vs 45±13). Increased myocardial systolic velocity in MVP patients might be due to concomitant mitral regurgitation. But in reality, the relation between the mitral regurgitation and myocardial systolic velocity have not been demonstrated in both, in effort or resting in the trials (19). Increase in the LV lateral wall Sm in our patients may be related to autonomic status. In previous studies it was shown that in cases with MVP especially in symptomatic cases, sympathetic activity increases (20). Catheliculinergic functions were increases whereas vagal response was found as decreased. Zdrojevski et al. (21) reported an increased plasma renin activity in MVP patients compared to control group. Also Pedersen et al. (22) obtained positive correlation between MVP grade and plasma renin activity in dogs.

In conclusion, isolated MVP without severe mitral regurgitation does not affect LV diastolic functions and LV MPI but may cause limited increase in systolic functions. Furthermore, our study is the first study assessing LV systolic and diastolic functions in MVP patients. So LV MPI was similar in MVP patients compared to control group. However the result of this study should be supported by studies with large number of cases.

REFERENCES

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Left ventricular function in MVP


