CLINICAL AND ECHOCARDIOGRAPHIC FEATURES OF MITRAL VALVE PROLAPSE PATIENTS IN A LOCAL POPULATION

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ABSTRACT

Mitral valve prolapse (MVP) is a commonly diagnosed condition with varied clinical presentations but local data is lacking. In our study, we reviewed 98 patients (54 males, 44 females) with echocardiographic mitral valve prolapse diagnosed between 1991 and 1993 to study the clinical profile and echocardiographic features of patients with this condition in our local population.

The mean and median age at presentation/detection were 42 years and 38 years respectively. The majority of the patients were asymptomatic (59%); the rest presented with palpitations (21%), congestive heart failure (4%) and infective endocarditis (5%). On clinical examination, 64 patients had mitral regurgitation (13 patients had both mitral regurgitation murmur and a systolic click), while one or more systolic clicks were heard in another 32 patients. Six patients also had associated Marfan syndrome.

2D echo revealed isolated anterior and posterior leaflet involvement in 55 and 19 patients respectively. Another 24 patients had involvement of both leaflets. Mitral regurgitation was detected on colour Doppler study in 78 patients. Nine patients had associated tricuspid valve prolapse. Of the 98 patients, 8 patients developed flail mitral valve. Four were detected at presentation/diagnosis, while the other 4 were diagnosed incidentally on routine follow-up 2D echo. Of these 8 patients, one developed cardiac failure.

The patients had been on follow-up for a mean period of 9 months. During this period, mitral regurgitation progressed in 3 patients resulting in valve surgery. Only 20 patients had arrhythmias detected on ambulatory ECG monitoring, most of them were frequent atrial and ventricular premature beats. No patient was found to have haemodynamically significant arrhythmia.

In summary, most patients with MVP had anterior mitral valve leaflet prolapse and mitral regurgitation. Although most patients with MVP are asymptomatic or have minor symptoms, it is associated wtih significant morbidity (14 patients).

Keywords: *echocardiography, mitral valve prolapse*

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INTRODUCTION

Mitral valve prolapse (MVP) has been described as the most frequently diagnosed valvular cardiac abnormality with a reported prevalence of between 5% to 15% in the general population[1-4]. It is a heterogenous condition with varied clinical presentations. The clinical findings in MVP have been well described in the literature[5]. Despite the inconsistency in methods and criteria for the diagnosis of MVP, two-dimensional echocardiograph (2D echo) remains an ideal technique for visualising the morphology and motion of the mitral valve leaflets and annulus in multiple planes and therefore, for the diagnosis of MVP.

It is generally agreed that there are subgroups of patients with MVP who are at higher risk for infective endocarditis and other complications - men who are older than 45, presence of systolic murmur and thickened, redundant mitral leaflets[6].

However, local data on this common condition is lacking. This study was undertaken to review the clinical profile and echocardiographic features of MVP in our local population.

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METHODS

Patient population

This was a retrospective analysis of 98 patients with echocardiographic MVP diagnosed in our non-invasive laboratory between 1991 and 1993. To identify patients with MVP, the computer records of all 5,000 patients (inpatients and outpatients) studied in the non-invasive laboratory of National University Hospital between 1991 and 1993 were searched. Clinical data and 2D echo video recordings of the identified patients were then reviewed.

ECHOCARDIOGRAPHIC ASSESSMENT

Instrumentation

A Hewlett - Packard Sonos 1000 echocardiographic machine with a 2.5 MHZ transducer (Hewlett - Packard, Andoner, Mass) was used to perform the studies. M-mode and real-time 2D echocardiographic studies in all standard views were done. Continuous wave Doppler, pulsed Doppler and colour flow imaging modalities were also performed. All study information were recorded on super-VHS tapes.

Diagnosis of MVP

MVP was diagnosed according to criteria proposed by Harvey Feigenbaum[7] (Table I, Fig 1). Redundancy of the mitral leaflets was assessed by measuring the thickness of the leaflet on the M-mode echocardiogram during diastole at the mid-point of the E-F slope. A thickened leaflet was defined as one in which either leaflet had a thickness of 5 mm or more[8].

Mitral regurgitation was defined as the presence of holosystolic (or nearly holosystolic) high velocity turbulent flow

Table I – Echocardiographic criteria for the diagnosis of MVP

Major criteria
1. Late systolic posterior displacement of mitral leaflet on M-mode
2. Bulging of mitral leaflet into left atrium in parasternal long axis view
3. Thickened and redundant leaflet
Minor criteria
1. Holosystolic posterior prolapse on M-mode
2. Bowing of mitral leaflets into left atrium in apical 2-chamber view
3. Late systolic mitral regurgitation on Doppler study

* Any of the major criteria should be sufficient to make the diagnosis. One or two minor criteria without a major sign would be questionable.

Fig 1 – Parasternal long axis view of a patient with posterior mitral valve prolapse.

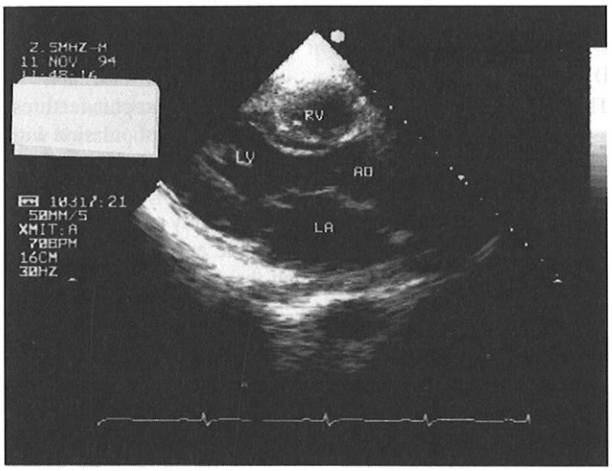


Table II – Assessment of severity of mitral regurgitation by colour Doppler with orthogonal planes.

*RJA/LAA(%)	Severity
<20	mild
20-40	moderate
>40	severe

* Regurgitation jet area (RJA) (maximum or average from three planes) is expressed as a percentage of the left atrial area (LAA) obtained in the same plane as the maximum regurgitation area.

within the left atrium. Severity of mitral regurgitation as defined by F Helmcke[9] was used (Table II). Three groups of patients were so identified: mild, moderate and severe mitral regurgitation.

Clinical data

The clinical data of all identified patients were retrospectively reviewed. Clinical data were obtained from hospital inpatients' and outpatients' notes. Data on complications were presented as the prevalence of a given clinical event at some point in the patient's clinical course, not necessarily after the index echocardiography.

RESULTS

Our study cohort comprised 98 patients (54 males, 44 females) with echocardiographic MVP diagnosed within the study period. The mean age and median age at presentation / detection were 42 and 38 years respectively (range=19 to 83 years) (Table III).

Table III – Patients' characteristics

Number	98
Mean age (± 1 SD)	42 ± 17
Sex	54 males, 44 females
Presentation	
Asymptomatic	59
Palpitations	21
Atypical chest pain	21
Congestive heart failure	4
Infective endocarditis	5

Table IV – Clinical findings

	No.
• Cardiac auscultations	
Systolic click	13
Mitral regurgitation (MR)	64
Systolic click + MR	13
Neither click nor MR	8
• Associated condition	
Marfan Syndrome	6

The majority of our patients were asymptomatic and were identified incidentally when they were referred for echocardiography for diverse reasons, including evaluation of murmur, stroke and pre-operative evaluation. The rest presented with palpitation, atypical chest pain, congestive heart failure and infective endocarditis.

Physical Findings (Table IV)

The primary physical finding was a mid to late systolic murmur. Sixty-four of the 98 patients (65%) had such a murmur. In 13 patients (13%), the murmur was accompanied by a non-ejection systolic click. In another 13 (13%), only a non-ejection systolic click was heard without any murmur. The remaining 8 patients had no clinical sign of MVP and were detected incidentally on echocardiography when they were evaluated for possible other cardiac problems. Six patients (6%) had Marfan syndrome.

Echocardiographic features (Table V)

2Decho revealed isolated anterior and posterior mitral leaflet involvement in 55 and 19 patients respectively. Another 24 patients had involvement of both leaflets. Most of the involved leaflets were non-redundant (77 patients or 78% of patients). Nine patients had associated tricuspid valve prolapse.

Mitral regurgitation (MR) was detected on colour Doppler in 78 patients (79%). Most patients had only mild MR (43%).

Table V – Echocardiographic features

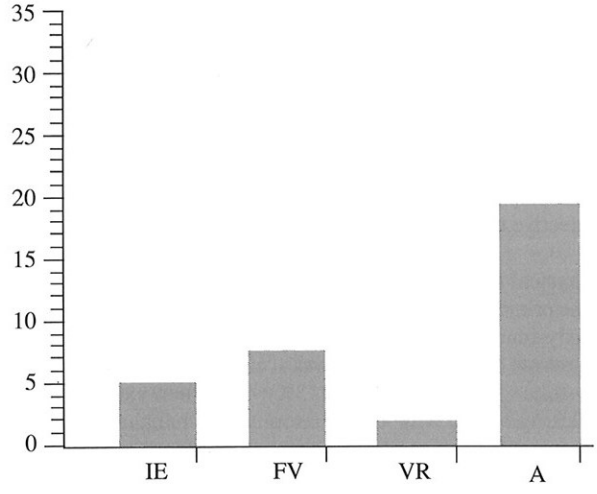
	No.
• Leaflet involvement	
Anterior	55
Posterior	19
Both	24
• Leaflet morphology	
Myxomatous	21
Non-myxomatous	77
• Associated valve prolapse	
Tricuspid valve prolapse	9
Aortic valve prolapse	0
• Mitral regurgitation	78
Mild	43
Moderate	18
Severe	17
• Flail Valve	8 (4 at presentation)

Complications

The patients had a mean follow-up period of 9 months (1 to 35 months). Complications related to MVP were as shown in Fig 2. Five patients presented with infective endocarditis and MVP was diagnosed during evaluation of infective endocarditis. Eight patients developed flail mitral valve (Fig 3), 4 of whom were detected at presentation / diagnosis, while the other 4 were diagnosed incidentally on routine follow-up 2Decho. Of these 8 patients, only one developed cardiac failure.

During the follow-up period, mitral regurgitation (Fig 4) progressed in 3 patients resulting in valve surgery. Only 20 patients had arrhythmias detected on ambulatory ECG monitoring, most of them were frequent atrial and ventricular premature beats. Two patients were discovered to have atrial fibrillation while one other patient had supraventricular tachycardia. No patient was found to have a haemodynamically significant arrhythmia.

Fig 2 – Follow up and complications



IE = Infective endocarditis FV = Flail valve
VR = Valve replacement A = Arrhythmias

Mean period of follow up is 9 months (1 to 35)
Arrhythmias (2 patients had AF and 1 had SVT)

Fig 3 – A 50-year-old Chinese male with a past history of mitral valve prolapse presented with acute left ventricular failure. This parasternal long axis view shows a flail posterior mitral leaflet.

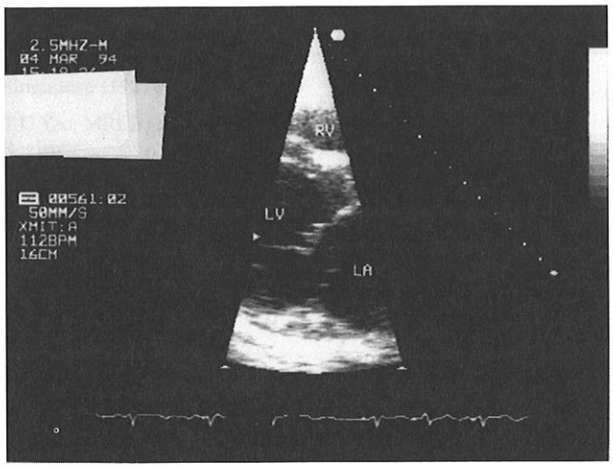
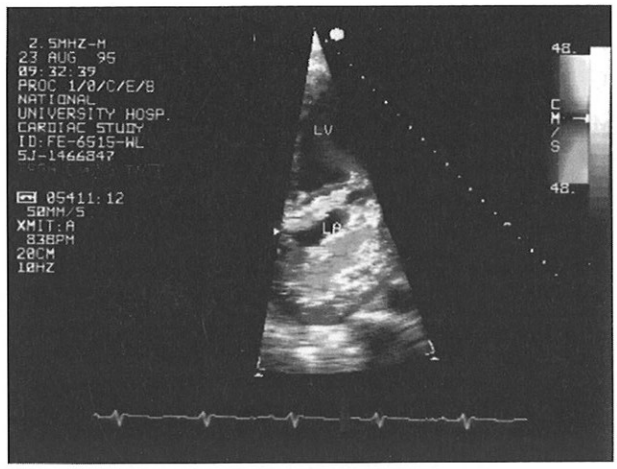


Fig 4 – A 40-year-old Chinese male with a past history of mitral valve prolapse presented with progressive shortness of breath. This apical 4 chamber view shows severe mitral regurgitation.



DISCUSSION

This study examined the clinical and echocardiographic features, as well as the medium term prognosis in a local population with echocardiographically documented MVP. While MVP has been implicated in several cardiac syndromes, ranging from non-specific symptom of atypical chest pain, anxiety and palpitation[5], most of our patients were asymptomatic and the diagnosis of MVP was made incidentally when they presented for cardiac evaluation for various reasons.

The presence of non-ejection systolic click(s) with or without a late systolic murmur constituted the auscultation criteria for diagnosis of MVP in most studies[5,10]. Most of our patients had a systolic murmur (65%), whereas only 26% had an associated non-ejection click. This is quite similar to the findings of Nishimura et al[8] and Andrea Marks et al[6]. Various connective tissue disorders including Marfan Syndrome has been shown to be associated with MVP[11]. We found associated Marfan Syndrome in 6 of our patients with MVP.

In a major study of the floppy mitral valve at autopsy, Davies et al[12] found isolated posterior and anterior mitral leaflet involvement in 67% and 10% respectively. Both leaflets were involved in another 23% of patients. In our study, however, isolated anterior mitral leaflet involvement was found in more than half of our patients, whereas isolated posterior leaflet involvement only constituted 19%. The exact reason for the difference is not clear but it could be related to racial differences.

Although MVP is generally regarded as a benign condition with good prognosis, previous reports of the occurrence of severe complications suggest that its prognosis may not be as benign as is generally believed. The mean duration of follow-up in our group of 98 patients was 9 months (range 1 to 35 months). During this period, none of our patients died, probably because of the low mortality associated with this condition. However, we found significant morbidity in 14 of our patients. Five of our patients presented with infective endocarditis, 3 of which were complicated by the development of a flail mitral valve secondary to ruptured chordae tendinae.

Progressive mitral regurgitation requiring mitral valve operation was a definite complication of MVP in this study. During the follow-up period, mitral regurgitation progressed in 3 patients, resulting in valve surgery. This is slightly lower than that in previous studies[6,8]. Previous studies show that most

patients who required operations were men and the majority had ruptured chordae tendinae, a finding that may account for their progressive deterioration. Indeed, all 3 patients who had valve surgery were males but only one had ruptured chordae tendinae. Eight of our patients developed flail mitral valve due to ruptured chordae. Four of these were identified at presentation while the other four on subsequent follow-up. Surprisingly, other than the one patient with progressive mitral regurgitation requiring valve replacement, most of these patients tolerated the flail mitral valve reasonably well.

Both supraventricular and ventricular arrhythmias have been shown to be associated with MVP. Only 20 patients in our study had arrhythmias detected on ambulatory ECG monitoring, most of them were frequent atrial and ventricular premature beats. No patients had haemodynamically significant arrhythmia.

We included events occurring before the incident echocardiography was performed based on the assumption that MVP diagnosed on index echocardiography was present when the complications occurred and was probably causative. It is possible that some patients may have had complications that were treated at other hospitals and thus were lost to follow-up at our hospital. This would result in an underestimation of the prevalence of complications.

In summary, most patients with MVP in the local population had anterior mitral valve prolapse and mitral regurgitation. Although most of them were asymptomatic and generally had a benign course, it is associated with significant morbidity in 14 patients.

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