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MITRAL VALVE PROLAPSE IN ZARIA: CLINICAL AND ECHOCARDIOGRAPHIC FEATURES

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ABSTRACT

Background: **Mitral valve prolapse (MVP) symptomatology and presentation are said to be of questionable significance.**
Method: **A prospective study of 10 patients with mitral valve prolapse seen at Ahmadu Bello University Hospital in two years.**
Results: **There were six females and four males. Their ages ranged from 5 to 35 years with a mean of 17.80 +/- 10.24. Four patients were suspected as having MVP before the echocardiographic scan (1/3). Six patients (60%) were found to have associated rheumatic heart disease (RHD). The commonest prolapsing leaflet was the anterior mitral valve leaflet found in 80% of the cases. Eight patients (80%) had classical MVP and the remaining two had non-classical MVP. There were significant difference between those with MVP and RHD compared with those without RHD in cardio-thoracic ratio (CTR) and end diastolic volume (EDV). Three patients who had RHD and MVP, had cardiomegaly clinically and on chest radiography. Hypertension and other disorders associated with MVP did not feature in our patient population.**
Conclusion: **Recent reports have highlighted the past over estimation of the syndrome based on ambiguous criteria and use of M-mode echocardiography. The most recent criteria by Freed have put the prevalence at 2.4 %.**

Key words: Mitral valve, prolapse, features

INTRODUCTION

Mitral valve prolapse is a syndrome of variable presentation.[1] It is also known variously as systolic click syndrome, Barlow's Syndrome, Bellowing mitral valve syndrome and Redundant Cusp syndrome. [2] It affects about 3-4% of adult population and is found in 7% of autopsies in the United States. [1] The clinical presentation is diverse and the condition has been observed in patients of all ages. Larger proportion of the patients with this syndrome is asymptomatic and the outlook of the syndrome in children is excellent, with a large majority remaining asymptomatic for many years. [3,4] Mitral regurgitation might progressively worsen in about 15 percent of the subjects over 10-15-year period, and, the progression is mostly seen in patients with click and murmurs. [5,6] The prevalence of mitral valve prolapse is not known in Nigeria. A

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report from Lagos described 62 patients in 3 years duration. [7] This is a report of 10 cases of MVP from Ahmadu Bello University Teaching Hospital Zaria, Nigeria over a period of two years.

MATERIALS AND METHODS

The study was conducted over two years, January 2000 to December 2001. All patients sent to our echocardiography laboratory for scan and discovered to have MVP whether suspected on clinical evaluation or not were included in the study.

The patients were evaluated clinically, including history taking (bio-data and symptoms on presentation), physical examination and laboratory investigations. The laboratory investigations included full blood count (FBC), electrolyte and urea, electrocardiograph (ECG) and chest x-ray, in addition to echocardiography. The ECG was evaluated for arrhythmias and chamber hypertrophy or enlargement, and chest x-ray was assessed for cardio-thoracic ratio (CTR) and bony abnormalities. Mitral valve prolapse was diagnosed using the criteria proposed by Freed et al in collaboration with the Framingham study. [3] *The criteria include: (i) systolic displacement of the mitral valve leaflet by more than 2 mm into left atrium, superior to the mitral annular plane and a mitral leaflet thickness of 5mm during diastole (classic MVP), (ii) displacement of mitral valve leaflet of more than 2 mm beyond the mitral annular plane and leaflet thickness of less than 5 mm (non classic MVP).* The long parasternal, long apical two and apical four chambers views were used, though apical four-chamber view is said to have high false positivity. [8] In our assessment the patient must have the abnormalities in long parasternal view when the apical four-chamber view is less obvious. The echocardiographic machine used was ALOKA SSD 1700, 2-Dimensional with Doppler and colour flow. The adult patients had 3.5 MHz and children 5.0 MHZ probes used respectively. Echocardiographic evaluation included structural and functional assessment. The left ventricular (LV) function and wall thickness were measured. These included septal thickness in diastole (IVSd) and systole (IVSs), left ventricular internal diameter in diastole (LVIDd) and systole LVIDs, left ventricular posterior wall thickness in diastole (LVPWd and systole LVPWs. Other echocardiographic measurements included left atrial diameter (LA), aortic root diameter (AR), end diastolic volume (EDV), end systolic volume (ESV), ejection fraction (EF) and fractional shortening (FS). The Doppler measurements included E and A wave velocities, E/A ratio and deceleration time (DT). The normal echocardiographic values were according Braunwald. [9]

The data was reported as mean $\pm$ standard deviation (SD) in the case of quantitative data and percentages in non-quantitative data. Student t-test was applied to aortic root (AR), left atrial diameter (LA), EDV, ESV, EF and FS between patients with MVP and rheumatic heart and non-rheumatic. The aortic root diameter and left atrial diameter ratio was calculated on MVP patients without evidence RHD and those with RHD and the difference between the two groups compared.

RESULTS

There were 10 patients who were diagnosed to have mitral valve prolapse, out of which 4 (more than 1/3) were suspected to have MVP before echocardiographic scan. There were 7

females and 4 males and female/male ratio of 1.5:1. Their ages ranged from 5 to 35 years with a mean of 17.80± 10.24. The ages of the male patients ranged between 5 and 30 years with a mean of 17.8 ± 9.7. The ages of female ranged between 7 and 35 years with a mean of 17.83 ± 11.48. Seven patients were suspected to have rheumatic three congenital heart diseases respectively before the echocardiographic scan

The commonest symptom on presentation were nonspecific chest pain in all patients, palpitations in 70% and 50% of patients had shortness of breathe on exertion. The commonest clinical signs were mid-systolic murmur in all patients and click in 4/10 patients. Six patients showed evidence of rheumatic heart disease in association to MVP. Four patients had ciinical and radiographic evidence of cardiomegaly. Two patients had overt symptoms of cardiac failure. The patients with evidences of cardiomegaly and symptoms of cardiac failure also had rheumatic heart disease.

Their packed cell volume (PCV) ranged from 37% to 42% with a mean of 38.41± 5.0. Their serum urea and electrolyte were normal and ECG showed sinus tachycardia in 50% of patients who had MVP and RHD.

Three patients had evidence of left ventricular hypertrophy on ECG using Sokolow Lyon criteria. [10]. None of the patients exhibited any form of malignant arrhythmias, though 24-hour holter monitoring would have been appropriate which was not used on this group of patients.

The chest showed no bony cage or dorsal spine abnormalities. The patients' CTR ranged between 0.48 and 0.54 with a mean of 0.51 ± 0.02. The patients with associated RHD had a larger mean CTR (0.52 +/- 0.03) where as the patients without RHD had a smaller CTR of 0.50 +/- 0.01. The difference in CTR between the two groups was statistically significant ($t = 66.7$, $p < 0.0001$).

Echocardiography findings revealed four patients with enlarged left atrial (LA) diameter, with two having RHD in association. The LA diameter ranged between 2.8 and 6.8, with a mean of 4.04 ± 1.29cm. There was no significant difference in LA diameter between MVP with RHD and MVP without rheumatic process. The aortic root to LA diameters ratio ranged between 0.32 and 0.91, with a mean of 0.68 +/- 0.20. The patients with MVP and RHD had a mean of 0.65 +/- 0.22 and those without rheumatic process had AR/LA ratio of 0.72 +/- 0.18. The difference between the two groups was not statistically significant ($t = 0.46$, $p < 0.1$). The septal thickness, LV internal diameter in diastole and systole, LVPW, EF and FS are presented in Table 1. All the patients had normal EF and FS except two with depressed EF (43.0% and 45.6%), and, who also had RHD. The EDV and ESV are presented in Table 1. All the patients had normal EDV and ESV except one with EDV of 255mls who also had RHD. Eight patients (80%) had the anterior mitral valve leaflet prolapse and the remaining two it was the posterior mitral valve leaflet (See Fig. 1). All the patients had mitral regurgitation, which ranged from grade 2/4 to 3/4, and six of the patients had a pulmonary regurgitation. Eight patients (80%) had classical MVP and two had non-classical MVP and these two also had RHD. The patients with RHD had more severe mitral regurgitation. Figure 2, shows a colour flow with the regurgitant jet curving under the non-prolapsing valve leaflet (posterior mitral valve leaflet).

The Doppler pattern (tracing) across the mitral inflow area showed a normal tracing. The E wave ranged from 0.56 to 1.45 m/s with a mean of 0.64 ± 0.07. The A wave ranged from 0.36 to0.81 m/s with a mean of 0.45 ± 0.06. The

E/A ratio ranged from 1.29 to 1.75, with a mean of 1.42 ± 0.08. Only two patients (all with associated RHD) had E/A ratios of 1.55 and 1.75 that were more than the normal value (≤ 1.50). The deceleration time values were also within normal limit. The values ranged from 96 to 132 ms, with a mean of 115.78 ± 12.63. Table 2, shows the comparison (student t test) of some echocardiographic parameters (LA, AR, EDV, ESV, EF, FS, E and A waves and E/A ratio) between patients wit associated RHD and those that had "idiopathic" MVP. There were significant difference in CTR and EDV between patients with MVP and RHD and those without rheumatic heart disease.

Table 1: Echocardiographic features of mitral valve prolapse in 10 patients

Feature	Range	Mean (+/- SD)
IVSd	0.5 – 12cm	0.92 ± 0.23
IVSs	0.7 – 1.3cm	1.06 ± 0.21
LVIDd	3.8 – 7.0cm	4.88 ± 0.2
LVIDs	2.5 – 4.1cm	3.23 ± 0.41
LVPWs	0.6 – 1.1cm	0. 91 ± 0.17
LVPWd	0.5 – 1.0cm	0.78 ± 0.16
EDV	54.8 – 255mls	116.08 ± 53.00
ESV	18 – 66mls	40.81 ± 17.27
SV	25 – 89mls	63.76 ± 18. 34
EF	43.0 – 79.4%	63.32 ± 11.29
FS	19.6 – 44.3%	32.21 ± 7.89
LA	2.8 – 6.8cm	4.04 ± 1.29
AR	2.1 – 3.2cm	2.58 +/- 0.36

NB IVSs/d = Septal thickness in systole(s) and diastole (d); LVIDs/d left ventricular internal diameter in systole(s) and diastole (d); LVPWs/d left ventricular posterior wall in systole (s), diastole (d); EDV- End diastolic volume, ESV - End systolic volume; EF- Ejection fraction, FS - Fractional shortening; SV - Stroke volume, LA - Left atrium, AR – Aortic root

Table 2: Comparison between MVP with RHD and non-RHD

Features	MVP with RHD	Non-RHD MVP	t-test	P value
Left atrium	4.33 +/- 1.43	3.60 +/- 1.07	0.88	P<0.1
Aortic root	2.48 +/- 0.30	2.83 +/- 0.31	1.59	P<0.1
Ejection fraction	62.38 +/- 10.31	64.73 +/- 14.18	0.25	P<0.1
Fractional shortening	33.05 +/- 8.33	30.95 +/- 8.24	0.34	P<0.1
Cardio-thoracic ratio	0.52 +/- 0.03	0.50 +/- 0.01	66.7	P<0.0001*
End diastolic volume	135. 83 +/- 59.69	86.93 +/- 28.83	1.6	P<0.1
End systolic volume	49.33 +/- 16.54	28.03 +/- 8.73	2.4	P<0.05*
E/A ratio	1.46 +/- 0.16	1.44 +/- 0.07	0.25	P < 0.1
E wave	0.79 +/- 0.33	0.62 +/- 0.06	1.13	P < 0.1
A Wave	0.53 +/- 0.15	0.43 +/- 06	1.33	P < 0.1

*statistically significant P value

Figure 1: Shows an apical four-chamber view, anterior mitral valve (AMV) leaflet prolapsing under the posterior mitral valve leaflet (PMV). LA = left atrium, LV = left ventricle and PM = papillary muscle

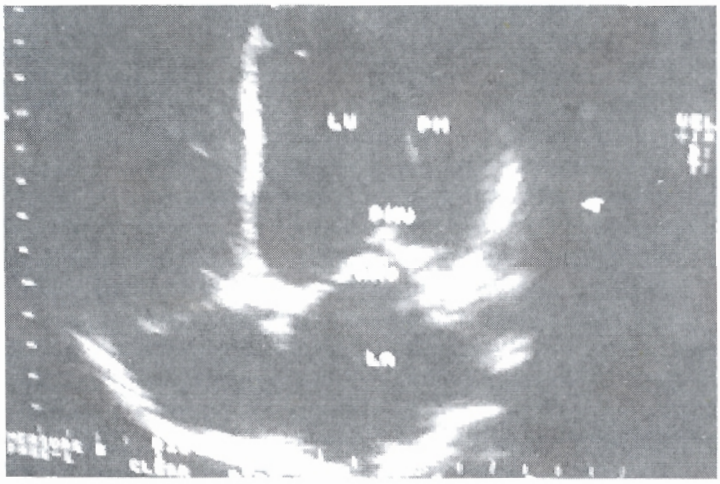
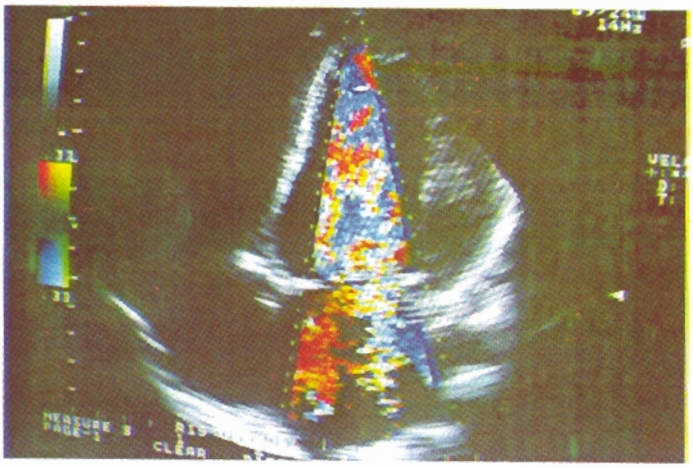


Figure 2: Shows an apical four-chamber view with a regurgitant jet directed under the posterior mitral valve leaflet



DISCUSSION

Mitral valve prolapse is a common but variable clinical syndrome resulting from different structural abnormalities of the mitral valve apparatus. [11] Because of the ambiguity of echocardiographic criteria in the past and the use of M-mode echocardiography, MVP was over-diagnosed. [12] The prevalence has now been put at 2.4% using the new criteria. [12] The ages of our group of patients were lower than those patients reported from Lagos. [7] The male and female ratio was in favour of female, which is similar to the report the United States, whereas

the report from Lagos showed an equal ratio. [7] Recent reports seemed to dispute the female preponderance. [1] The presenting symptomatology were mainly non-specific chest pain, palpitations and shortness of breath which is similar to that reported from Lagos. [7] The symptomatology and significance of MVP is said to be controversial. [6] It was also stated that chest pain might not be more common in patients with MVP than in the general population; that it might be attributed to myofascial syndrome, hyperventilation, coronary artery spasm, Syndromes X, esophageal dysmotility or gastro-esophageal reflux. [1,13] Stress test abnormalities and Single proton Emission Computed Tomographic myocardial perfusion images, which are not readily available with us, were found to be no more likely in MVP patients than the general population. [14,15] Three patients presented with cardiomegaly both clinically and on radiography. These patients, in addition, had rheumatic heart disease. Chest radiograph is usually indicated in patients with other associated diseases like RHD and it might reveal enlarged LA, increased pulmonary artery size (indicative of MR) and dorsal spine straightening and a narrow anterior posterior diameter. [1] Seven patients had a pre-echocardiographic assessment of rheumatic heart disease out of which six were confirmed to have the disease. Four patients had the classical systolic click before the mid-systolic murmur at the apex. In the Lagos report, only 8% of patients had the systolic click. [7] The reliance of a systolic click on clinical auscultation could have made us missed five patients. It is well known, that, systolic clicks and murmur do vary with positioning of the patient and Valsalva maneuver. [1] Many disease conditions, which may be congenital or acquired, are known to be associated with mitral valve prolapse. [1, 15, 16] Majority of our patients had rheumatic heart disease as the cardiac disorder associated with MVP. Talabi and George reported similar association between RHD and MVP. [16] Additionally hypertension was also said to be associated with MVP in the same report and that of Falase et al and Oke et al. [17,7] The commonest prolapsing valve leaflet was the anterior mitral valve in our series. This was similar to the reports from Lagos and that of Richard et al. [7,18] We have not been fortunate to see a patient with hypertension who had MVP even though hypertensive patients constitute nearly half of the patients we scan in our Echocardiography Laboratory. In our group of patients the idiopathic MVP subgroup had good LV function, when compared with the patients with RHD out of which two had dilated heart and depressed EF. Good LV function was also a finding in the reports from Lagos and the US. [7,1] MVP on its own could be a benign condition for years. [6] The mean aortic root and left diameters; were normal and the AR/LA ratio was within normal limits in general and the subgroups of MVP with RHD and those without RHD.

All the patients had mitral regurgitation that ranged from grade 2/4 to 3/4. The regurgitation was worse when there is associated RHD. It was reported that only 5% of the patients with idiopathic MVP would develop severe mitral regurgitation over a lifetime. [12] There was no difference between the aortic root and LA diameter when non RHD MVP was compared to MVP with RHD. Life threatening or malignant arrhythmias were not reported. The inability to do a 24-hour holter monitoring might have played a major role in this finding. Life threatening arrhythmias have been reported in patients with MVP, and some even had sudden death. [19,20] Most recent reports have disputed the fact that these patients stand a

higher risk of stroke and, sudden death when compared to the general population. [3,12]

In conclusion, during a 2 year period, 10 cases of MVP were seen and more than half these were associated with rheumatic heart disease. Hypertension seemed not to have featured in our patients; and none had chest or dorsal spine anomalies. We assumed that the non-rheumatic MVP subgroup had idiopathic MVP.

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