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Prevalence of mitral valve prolapse in healthy adult Nigerians as diagnosed by echocardiography

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Summary

Fifty (male = 24; female = 26; age 49.33 ± 12.16) presumably healthy adult Nigerians were prospectively examined for the presence of mitral valve prolapse (MVP). We performed clinical, electrocardiographic (ECG), M-mode echocardiographic (M-mode echo) and two-dimensional echocardiographic (2-D echo) examinations on these subjects. 2-D echos were obtained from parasternal and apical acoustic windows. Parasternal long axis view obtained when the transducer was perpendicular to the chest wall with both mitral valve leaflets and left atrium recorded was considered optimal for studying mitral valve systolic motion. MVP was defined as late or holosystolic bowing of mitral valve leaflet at least 2mm or 3mm, respectively, below the C-D line at M-mode echo; or, marked systolic extension of one or both mitral valve leaflets cephalad to the plane of mitral annulus into the left atrium. No subject had classical features of Marfan's Syndrome. Of the four subjects with cardiac symptoms, only one had diagnostic MVP. Three subjects had mid-to late systolic click following valsalva manouver. Seven subjects had apical late systolic murmur none of which was louder than grade II/VI. Four of them had combined anterior and posterior leaflet prolapse and one had posterior leaflet prolapse compatible with diagnostic MVP, thus resulting in 10% prevalence rate of MVP in the study population. Two other subjects with late systolic murmur had no echocardiographic evidence of MVP. Three subjects with non-diagnostic mild-to moderate prolapse of the anterior leaflet alone on 2-D echo had no clinical murmur even though two of them complained of palpitations. Seven otherwise normal subjects had holosystolic bowing of mitral valve leaflets on M-mode echo but not on 2-D echo and were thus classified into non-diagnostic MVP group. No subject with MVP had serious arrhythmias on resting ECG. These results indicate that the prevalence of MVP in presumably healthy adult Nigerians was 10%. The use of M-mode echo resulted in over-diagnosis, whereas 2-D echo was more accurate in identifying true anatomical and structural abnormalities of the mitral valve.

Keywords: *Mitral, valve, prolapse, prevalence, Echo.*

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Résumé

Cinquarue (24hommes; 26 femmes, age 49, 33 ± 12, 16) Nigerians adultes supposés en bonne santé ont été examinés pour la presence du deboitement de la valve mitrale (DVM). Nous avons pratiquer l'electro cardigraphic clinique (ECG), m-mode echocardiographique (M-mode echo) et l'echocardiographie en dimension deux (2-D echo) sur les subjets. 2-D echos ont ete obtenues des fenetres parastemales et afoicales accoustiques. La nuine du long ave parasternal etait obtenues lorsque le transducteur etait perpendiculaire a la pointrine avec les familles de la valve mitrale et l'atrium gauche releve etait considere maximale pour etudier le monvemment de la valve mitrale systolique DVM etait defuni comme indinason holosystolique de la feuilles de la valve mitrale au moins 2mm on 3 mm respectivement, en dessous de la ligne C-D a M – mode echo ou, de l'extension systolique de severe un'ou des deux valves mitrales de la pleine de l'aineus mitral dans l'atrium gauche. Aucun sujet n'avait le syndrome classique de Marfan. Des quatres sujets aux symptoms cardiaques, un sent avait le diagnostic DVM . trios sujets avaient un retard de systole provenant de la maneuvre vasulva. Sept sujets ont eu un retard systolique apicale aucun n'etant plus lourd que le grade II/VI. Quatre de leux-ci avaient une deboitement junnele anterieur et postereur alors qu'un sent avait ce deboialement postereur compatible an diagnostique DVM, resultant a 10% du taux de prevalence DVM dans l'etude de la population. Deux sujets avec retard systolique n'avaient aneme evidence echocardiographique de DVM. Trois patients avec anum diagnostique du deboitement modere de la ferille anterieure sentement sur 2-D echo n'avaient aucun probleme clinique, bien que deux d'entre eux se sont plaint de palpitations. Sept patients cependant en bonne sante avaient l'holosystolique des feuilles de la valve mitrale sur M-mode echo, mais non sur 2 – D echo et etaient classes dans le groupe non-diagnostique DVM. Anum patient DVM avait une serense amhytmiase our report ECG.

Ces resultants indiquent que la prevalence de DVM chez les sujets Nigerians supposes en bonne sante etait de 10%. L'usage du M-mode echo a resulte en sur diagnose, alors que 2 – D echo etait plus précis dans l'identification de la uraie anomalie anatomique et structurelle de la valve mitrale.

Introduction

Mitral valve prolapse (MVP) syndrome was first described by Barlow in 1963 [1,2]. Since then, numerous reports [3,4] have documented the association of high-pitched non-ejection clicks and mid-to late systolic murmur with MVP. The syndrome

has been recognized as one of the most prevalent cardiac valvular abnormalities affecting as much as 3-5% [4,5] of the population, and it is more frequent in females than in males [5-7]. There is a dearth of information in this environment about prevalence of MVP.

The mode of clinical presentation of MVP ranges from benign features such as asymptomatic, atypical chest pain, palpitations [8], to more devastating manifestations such as cerebral embolic events and sudden death [7]. Deformities of the thoracic skeleton [9], and electrocradiographic (ECG) abnormalities [10] have also been encountered in patients with MVP.

Two-dimensional echocardiography (2-D echo) is a useful tool for visualizing the anatomy and function of intracardiac structures and it has been proposed as the gold standard for diagnosing MVP [11]. We therefore used 2-D echo to assess the prevalence of MVP in presumably healthy adult Nigerians and we compared this with results obtained using M-mode echocardiography (M-mode echo). We also correlated these findings with specific clinical and ECG features

Methods

Patient selection

Studies were performed on 50 volunteers (male 24, female 26) whose average age was 49.33 ± 12. 16 years who considered themselves to be in good health, without prior diagnosis of cardiac disease. After obtaining informed consent, each subject filled out a medical questionnaire. Specific note was made of presence or absence of symptoms relating to heart disease, major medical problems and family history of heart disease. Only symptoms compatible with heart disease were considered for further analysis by the examining cardiologist. A thorough physical examination of the cardiovascular system was performed. Auscultation of the heart was performed in supine and sitting positions and during the strain phase of valsalva manouver. Stigmata of marfan's syndrome and thoracic skeletal abnormalities were looked for. Standard postero-anterior chest x-ray films were studied in all subjects.

A 12 lead resting ECG was recorded. Echocardiograms were performed using a Phillips sdr 1550 XP ultrasonoscope equipped with 3.0MHZ transducer. All subjects were studied in the 30 degree left lateral decubitus position using the left parasternal, and apical acoustic windows from as many intercostal spaces as possible. Care was taken to ensure the transducer remained perpendioular to the chest wall to prevent false positive and negative results. Attempts were made to record both mitral leaflets simultaneously with the left atrium. The morphology and mobility of the mitral leaflets and annulus were visualized through multiple acoustic windows.

MVP was defined as at least 3mm holosystolic or at least 2mm late systolic posterior motion of the mitral valve leaflets from the C-D line (line connecting valve closure and opening points) [12] on m-mode echo. However, in order to establish the diagnosis of MVP, we chose to employ rigorous 2-D echo criteria, which was marked systolic extension of one or both leaflet tissue cephalad to the plane of mitral annulus into the left atrium [13]. This was adopted in order to avoid over-diagnosis. Qualitative assessment of valvular thickening, redundancy and excessive motion of the leaflets or the annular ring was made.

Results

Clinical data

The study population consisted of fifty subjects (24 men, 26 women), mean age 49.33 ± 12.16 years. None was receiving medical therapy at the time of study. The subjects responded to a medical questionnaire regarding their previous history of heart disease. None had a prior diagnosis of MVP or any heart disease. None gave a history of possible heart problem, rheumatic fever, infective endocarditis and none considered himself to have a heart disease at the time of the study. No subject gave a family history of cardiovascular disease in their first degree relatives. Four subjects gave complaints judged to be compatible with cardiac symptoms. These included palpitations, atypical chest pain and dyspnoea on exertion. One of the subjects with chest pain had combined anterior and posterior MVP while two who had palpitations had mild-to moderate anterior leaflet prolapse. No subject had previously sustained chest trauma. One had been told in the past that his blood pressure was elevated but he had never been treated with antihypertensive medications.

On clinical examination, no subject had the classical features of Marfan's syndrome or the stigmata of connective tissue disease. The only skeletal abnormality observed was one subject with pectus excavatum. The systolic blood pressure was less than 140mmHg and the diastolic blood pressure was less than 90mmHg in all subjects studied. No subject had clinical evidence of cardiomegally. Three subjects had mid-to late systolic click following valsalva manouver. Seven subjects had apical late systolic murmur and none were louder than grade II/VI.

Chest radiography

Standard postero-anterior chest x-ray films were studied in all subjects and all were within normal limits.

Echocardiograms

Most echocardiographic values (Table 1) fell within the normal range according to standard m-mode criteria [14]. There were no signs of left atrial or left ventricular enlargement, and the mitral annular size and motion were normal. The valve leaflets showed evidence of thickening and redundancy in one subject.

Table 1: Echocardiographic measurements in 50 presumably healthy adult nigerians

	MEAN ± SD (mm)
Left ventricle (EDD)	43.7 ± 4.8
Left ventricle (ESD)	24.5 ± 2.5
Right ventricle (DID)	18.0 ± 1.7
Left atrium (ESD)	30.2 ± 3.5
Aaorta (EDD)	28.0 ± 2.6
IVS (ED)	8.5 ± 1.4
LVPW (ED)	7.6 ± 1.5

EDD = *End diastolic diameter*
ESD = *End systolic diameter*
DID = *Diastolic internal diameter*
ED = *End diastolic*
IVS = *Interventricular septum*
LVPW = *Left ventricular posterior wall*

Of the five (10%) subjects with apical late systolic murmur, four had evidence of combined anterior and posterior leaflet prolapse, and one had posterior leaflet prolapse alone using previously described 2-D echo criteria [13]. The five subjects also fulfilled the diagnostic criteria for m-mode echo [12] Two other subjects with late systolic murmur had no echocardiographic evidence of MVP. Three subjects with evidence of mild-to moderate prolapse of anterior leaflet on 2-D echo had no clinical murmur even though two of them complained of palpitations. They were thus classified into the non-diagnostic MVP group. Seven otherwise normal subjects with no symptoms or murmur or any resting ECG abnormalities had at least 3mm holosystolic bowing of the mitral valve on m-mode echo but had normal 2-D echo and these also fell into the non-diagnostic MVP group.

Electrocardiograms

All subjects were in sinus rhythm. Forty-five of the fifty subjects had normal ECG. Two subjects who had no other abnormality both clinically and echocardiographically had occasional ventricular premature beats (vpb) on their ECG records. Two subjects with combined anterior and posterior leaflet prolapse had non-specific s-t segment and t-wave abnormalities in the left precordial leads. One subject with mild-to moderate anterior leaflet prolapse had sinus bradycardia (56 beats per min.) and prolonged p-r (0.24 sec.) interval on resting ECG.

The results of physical examination, ECG and echocardiography are summarized in Table 2.

Table 2: Clinical, electrocardiographic and echocardiographic findings in 50 presumably healthy adult Nigerians

	Subjects n = 50	Percentage
Physical		
Cardiac symptoms	4	8
Non-ejection click	3	6
Mid-to late systolic apical murmur	7	14
Skeletal abnormality		
Marfan's syndrome	0	0
Pectus excavatum	1	2
Electrocardiogram		
Normal	45	90
VPB	2	4
S-T and T-wave abnormalities	2	4
Sinus bradycardia	1	2
Echocardiogram		
Diagnostic MVP	5	10
(combined anterior and posterior	4	8)
(posterior	1	2)
(anterior	-	-)
Non Diagnostic MVP	10	20
(combined anterior and posterior	7	14)
(posterior	-	-)
(anterior	3	6)

Discussion

The design of this study was simple and it afforded us an opportunity to prospectively examine presumably healthy adult Nigerians for MVP. Using rigorous 2-D echo diagnostic criteria [13], we found 5 (10%) cases of MVP in a series of 50 presumably healthy adult Nigerians. Since local data is lacking, we had to compare our results with that obtained outside this environment. The prevalence of MVP as diagnosed by 2-D echo in our study population appears to be much more than 2-4% in previous studies [13,15-17]. The utilization of m-mode echo criteria for diagnosing MVP resulted in a dramatic increase of up to 20% prevalence in our series. This result is comparable with reported prevalence rate of 21% when m-mode was used to diagnose MVP [12]. Diagnosis of MVP by M-mode echo has therefore been faulted due to the likelihood of over-diagnosis. To prevent false positive and false negative results, positioning of the transducer in the appropriate intercostals space perpendicular to the chest wall is extremely important. The best echocardiograms were obtained in the third and fourth intercostals spaces. The spatial resolution of intracardiac structures on 2-D echo reduced artifacts, especially in the long axis and apical four-chamber views. This made it a more sensitive and specific tool for diagnosing MVP compared with M-mode echo.

The absence of mid-systolic click in most of our subjects does not exclude its presence as it may be identified on phonocardiography only after provocation with amyl nitrite inhalation or physiologic manouver [13]. The presence of mid-systolic click and mid-to late systolic murmur alone or in combination at the cardiac apex are widely accepted as diagnostic auscultatory findings characteristic of MVP [18]. Two subjects with apical late-systolic murmur had no echocardiographic evidence of MVP. In the absence of supportive evidence, our results suggest that the finding of late systolic apical murmur should not be regarded as indicative of MVP. Our findings also suggest that some degree of MVP may exist in an individual with normal physical examination. This was evidenced by three subjects who had moderate prolapse of the anterior leaflet without auscultatory signs of MVP. This is in line with reports that have shown that an abnormal echocardiographic systolic motion of the mitral valve could be demonstrated in patients who did not present with typical auscultatory finding of mid-to late systolic murmur [19].

MVP has been associated with lethal arrhythmias [7]. We did not find any subject with serious arrhythmias including VPBs on resting ECG even though this method is limited in the detection of arrhythmias.

A rate of MVP in 10% of study population seems considerably high even though stringent 2-D echo diagnostic criteria were applied. The hospital based study may be responsible for bias in sample selection of study population which may not truly reflect the prevalence rate in the general population. The small sample size may also play a part. An 18% rate of echocardiographic and phonocardiographic documentation of mvp in 100 young women has been reported in a study [12].

We concluded that bedside clinical diagnosis and 2-D echo identifies a significant number of subjects in an otherwise healthy population who have anatomical and structural abnormalities suggestive of MVP. 2-D echo allows a more

accurate diagnosis compared with M-mode echo which tends to over-estimate this abnormality. Further prospective population based study will be required to elucidate the significance and long-term prognosis of this heart abnormality.

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