

Only Elongated Chordae Tendineae is Important Entity of MVP Syndrome

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Abstract

Back ground

Mitral valve prolapse [MVP]is the most common valvular abnormalities . Echocardiographically MVP classified to two types, classical MVP ,more commonly occur in male after age of 40 years and usually associated with complications and non-classical MVP, usually in young female and usually benign , but commonly associated with autonomic dysfunction [MVP syndrome].

Method

2676 patients (1985 female Vs. 691 male), their age between 12—81 year, were referred for ECHO study because of clinical suspicion of MVP, 2-D Color-Doppler ECHO study in left parasternal long axis view was done for them in addition to 12-lead ECG, patients were triage as group 1. classical MVP [define as more than 2mm displacement of mitral valve leaflet in to left atrium in addition to leaflet thickness 5mm or more] 2. Non-classical MVP [2 mm or more displacement with leaflet thickness less than 5mm.] 3. This group show no displacement with normal thickness of leaflet but show only elongated and fluttering chordae tendinae labeled as only elongated chordae group and group 4 which show completely normal ECHO [labeled as non-prolapsing MVP syndrome],this group was excluded from the study.

Result

283 patients [31.58%] have classical MVP [122 female vs. 151 male], 315 patients [35.1%] show non-classical MVP [236 female vs.79 male] while 298 patients [33.25%] show only elongated chordae [216 female vs. 82 male]. While 1780 patients [66.51%] have normal ECHO [non prolapsing MVP syndrome.

Mitral regurgitation [MR] occur in 203 patients of classical MVP [71.73%] (36 female vs. 167 male) while 132 patients (42%) [89 female vs.43 male] of non-classical MVP have MR and only 6 patients (2%) [5 female vs. 1 male] with only elongated chordae show MR.

Conclusion

Most patients with clinical suspicion of MVP have no evidence of prolapsed by ECHO study, those with ECHO finding may show either classical or non—classical MVP. Significant number of patients show only elongated chordae tendinae without prolapsed. So elongated chordate can consider as important cause of MVP syndrome.

Introduction

The mitral valve prolapsed [MVP] occurs when one or both of mitral valve leaflet prolapsed in to left atrium superior to the mitral valve annular plane during systole. It has been given many names including the systolic click-murmur syndrome, Barlow syndrome, billowing mitral cusp syndrome, myxomatous mitral valve syndrome, floppy valve syndrome, and redundant cusp syndrome.^{2,3} It is a variable clinical syndrome that results from diverse pathogenic mechanisms of one or more portions of the mitral valve apparatus, valve leaflets, chordae tendinea, papillary muscle, and valve annulus. The MVP is one of the most prevalent cardiac valvular abnormalities. Using standardized echocardiographic diagnostic criteria, a community-based study showed that MVP occurs in 2.4 percent of the population.^{4,5} In the 1970s and 1980s MVP was overdiagnosed because of the absence of rigorous with reported prevalence of 5—15%. Subsequently, Levene et al and other investigators reported that the two-dimensional ECHO-characterization of prolapsed , especially on long parasternal long-axis view ,are most specific for diagnosis of MVP ,use of these criteria prevent over diagnosis.^{6,7}

It is usually benign condition but may associated with serious complications like mitral regurgitation [MR] which may lead to heart failure ,infective endocarditis, rupture chordae tendineae with severe acute heart failure ,neurological complication like ischemic stroke or sudden cardiac death^{8,9,10}. The complications risk increase in patients with holosystolic murmur, enlarged left atrium or ventricle, redundant ,thickened mitral leaflets and usually occur in male after age of 50 year¹¹. MVP is the most common cause of isolated MR requiring surgical treatment in the United States¹²and the most common cardiac condition predisposing patients to infective endocarditis¹³.

MVP can be classified clinically as ,¹⁴

type1 mitral valve prolapsed[MVP syndrome] usually occur in young age group 20-40 years ,more common in female ,low body habits and low BMI ,associated with low blood pressure, orthostatic hypotension and palpitations. Auscultation reveal non -ejection Click or Click –systolic murmur. On ECHO there are thin leaflets with systolic displacement, usually associated with benign course.

Type 2. myxomatous mitral valve disease usually occur in older age (40-70 yr),predominantly in male ,a long

systolic murmur with or without click on auscultation, thickened, redundant valve with mitral regurgitation on ECHO, with high possibility of progression and complications

Type 3. secondary MVP it is associated with Marfan syndrome, thyrotoxicosis, rheumatic or ischemic heart disease, it is also occurred in association with atrial septal defect and as part of hypertrophic cardiomyopathy.¹⁵

Most frequently, MVP occurs as a primary condition that is not associated with other diseases and can be familial or nonfamilial. Familial MVP is transmitted as an autosomal trait, and several chromosomal loci have been identified.¹⁶

Most patients with MVP are asymptomatic and remain so for life, symptoms may be related to one of the following.

1. Symptoms related to autonomic dysfunction-- mitral valve prolapsed syndrome is a constellation of non-specific symptoms that cannot be attributed to a valvular dysfunction. The syndrome is benign and thought to be secondary to autonomic dysfunction. Commonly described symptoms include palpitation, atypical chest pain, dyspnea, fatigue, orthostatic hypotension and neuropsychiatric complaints, anxiety, panic attacks, asthenia, and syncope or near syncope. These symptoms usually occur in type 1 [MVP syndrome].

2. Symptoms related to progression of mitral regurgitation like dyspnea, orthopnea, fatigue and paroxysmal nocturnal dyspnea (PND) these symptoms usually occur in myxomatous MVP i.e. type 2.

3. Rarely symptoms related to complications of MVP as ischemic stroke or endocarditis.

General physical signs that may be associated with MVP include low body weight, scoliosis or kyphosis, pectus excavatum, hyper mobility of joints and evidence of Marfan syndrome like high arch palate, thin tall width-arm span greater than height.

The most important finding is a non-ejection systolic click.⁵ with or without mid-late systolic murmur which is aggravated by Valsalva maneuvers or standing position and decrease by supine position. The clicks are believed to be produced by sudden tensing of the elongated chordae tendineae and of the relapsing leaflet, however many patients with echo criteria of MVP have no auscultatory findings. There is considerable variability of the physical findings in the MVP syndrome. Some patients exhibit both a midsystolic click and a mid-to-late systolic murmur; others present with only one of these two findings; still others have only a click on one occasion and only a murmur on another, both on a third examination, and no abnormality at all on a fourth.

Echocardiography plays an essential role in the diagnosis of MVP and has been instrumental in the delineation of this syndrome.⁵ Use of the left parasternal long-axis view reduce the over diagnosis.^{6,7} Freed et al described ECHO criteria for MVP as classic versus non-classic⁷

Classical MVP the parasternal long-axis view show more than 2 mm superior displacement of the mitral valve leaflet into left atrium during systole with leaflet thickness of at least 5mm

Non-classical MVP displacement is more than 2mm with maximal leaflet thickness less than 5mm.

Other echo findings that should be considered are leaflet thickening, redundancy, annular dilatation and chordae elongation.

The ECG most commonly is normal but may show biphasic or inverted T-waves in leads II, III and AVF and occasionally supraventricular or ventricular premature beats.

Patient and method

In cross sectional prospective study 2676 patients referring to ECHO unit in AL-Karama- teaching hospital – Wasit –Iraq or consult or refer to our private cardiac clinic in Wasit governorate – Iraq(1985 female Vs 691 male) ,their ages range from 12 yr --- 81 yr ,these patients were refer from different regional hospitals ,primary health care unit or different private clinics in Wasit governorate and nearby governorates from January. 2010---march 2015 .they were referred with clinical suspicion of MVP , having either auscultatory findings like systolic click or systolic murmur or both , or having symptom contributed to MVP syndrome as palpitation, chest pain [typical or atypical] breathlessness anxiety or panic state ,arrhythmias ,fatigue ,orthostatic hypotension ,syncope or presyncopal attacks or neurological symptoms like ischemic stroke. Two-dimensional Color-Doppler ECHO study was done for them in addition to 12-lead ECG.

Using standardized ECHO criteria for diagnosis of MVP we triage our patients to the following categories

1. Classical MVP the left parasternal long axis view show more than 2- mm superior displacement of mitral valve to left atrium during systole in addition to leaflet thickening equal or more than 5 mm

2. Non-classic MVP superior systolic displacement of mitral valve leaflet of more than 2-mm into left atrium with leaflet thickness less than 5mm.

These above 2 types may or may not associate with other echo findings like annular dilatation, redundancy or elongated chordae.

3. Some of these patient show neither systolic displacement of mitral leaflet into left atrium nor increase thickness of mitral valve leaflet ,but show only elongated chordae tendinea ,labeled in our study as [only elongated chordae] group.

All other patients that not fulfill above criteria were excluded from the study. and as they have clinical feature of MVP syndrome[autonomic dysfunction] with normal ECHO finding ,they are labeled in our study as Non-

prolapsing MVP syndrome.

RESULT

Of 2676 patients referred with clinical suspicion of MVP only 598 patients fulfill the ECHO criteria of MVP [22.34%] (375 female Vs 223 male) , and only 896 pt fulfill one or more ECHO criteria of MVP or only elongated chordate [33.48%] ,(584 female Vs 312 male) ,the later group are included in our study ,,the others that have clinical suspicion of MVP with neither ECHO findings of MVP nor elongated chordae tendineae [labeled in our study as non-prolapsing MVP syndrome] constitute 1780 patients [66.51%] are excluded from the study and it is interesting field for further researches .

283 [31,58%] of these patients that included in our study have [classical MVP i.e. .type one. [122 female vs. 151 male with maximum age distribution between 40—60 years as show in table 1.

Age gender	12—20 years	21--30	31--40	41--50	51--60	61--70	Above 70	total	%
female	15	39	26	21	15	6	0	122	
male	3	8	21	51	59	18	1	161	
Total	18	47	47	72	74	24	1	283	

Table 1. age and gender distribution in classical MVP

315 pt. [35.1 %] show non-classical MVP type 2 [236 female vs. 79 male] with maximum age distribution from 20—40 years as shown in table 2

Age/gender	12-20	21-30	31-40	41-50	51-60	61-70	Above 70	total	%
female	56	85	72	16	5	2	0	236	
male	14	21	17	15	8	4	0	79	
total	70	106	89	31	13	6	0	315	

Table 2. Age and gender distribution in Non—classical MVP

While 298 pt. [33.25] show only elongated chordate type 3 [216 female vs. 82 male] with maximum age of 20—40 year as show in table 3

Age/gender	12-20	21-30	31-40	41-50	51-60	61-70	Above 70	total	%
female	48	72	51	21	17	3	4	216	
male	19	23	20	6	7	5	2	82	
total	67	95	71	27	24	8	6	298	

Table 3. Age and gender distribution in only elongated chordae group

So classical MVP occur more common in older male while non-classical and elongated chordate occur more commonly in young female

203 pt with Classical MVP [71.73%] have mitral regurgitation [MR] which could be severe and may require intervention (167male Vs 36 female), 132 pt. [42%] of Non- Classical MVP associated with MR ,(89 female Vs 43 male) while only 6 patients with only elongated chordate has trivial MR , (2%) { 5 female Vs 1 male}.so MR occurs more commonly and more severe in group 1 and less in group 2 and very rare in only elongated chordae.

Group type	total	Frequency of MR			%
		Female	male	total	
Classical MVP	283	36	167	203	71.73
Non-classical MVP	316	89	43	132	42
Only elongated chordae	289	5	1	6	2

Table 4. Frequency of mitral regurgitation in various three groups

43 patients [15.19%] with Classical MVP associated with tricuspid valve prolapse versus 4 patients [1.26%]for atypical while no pt with elongated chordate associated with tricuspid valve prolapsed ,this is compatible with international figures ¹² . ,no one was associated with aortic valve prolapsed ,while 4 patients (3 in Classical 1 in Non- Classical group) have mild aortic regurgitation .

56 pt.[20 %] with classical MVP demonstrate autonomic manifestation s [MVP syndrome] mostly in 20-30years group predominately in female (48 female Vs 8 male) versus 196 pt [62.22%]with atypical MVP(134 female Vs 62 male) while 159 pt [53.35%] , (121 female Vs 38 male) with elongated chordate show these symptom with vast majority in 20-30 year female group for both last two types.

group	Total number	Frequency of autonomic dysfunction			%
		Female	male	total	
Classical MVP	283	48	8	56	20
Non-classical MVP	315	134	62	196	62.22
Only elongated chordae	298	121	38	159	53.35

Table 5. Frequency of autonomic manifestations in various three groups

226 pt.[79.85 %] with classical MVP have systolic murmur [mid, late or pan-systolic] on physical examination while 102 pt. [42.86 %] have systolic click , only 54 patients (19.08%) have both .

151 pt. with atypical mvp [47.93%] have audible systolic murmur while 213 pt [67.61%] have audible systolic click ,while 118 pt.[37%] have both murmur and click

Only 12 pt.[4%] with elongated chordate have systolic murmur which could be functional ,,while 196 pt. [66%] have audible systolic click.

Discussion

MVP syndrome is diverse etiology so has diverse presentation. It could be congenitally inheritable condition that manifested in young age group specially in females with neuropsychological feature in addition to palpitation, syncope, dizziness, asthenia and postural hypotension,, all these manifestations are not related to hemodynamic effect of MVP .

Chest pain, palpitation, arrhythmias and non specific ECG changes can explain by stretching of chordae with resultant ischemia of papillary muscle.

Other manifestations like syncope ,postural hypotension, asthenia and other neuro –psychiatric manifestations of mvp cannot explain by ischemia of papillary muscle ,,it could be explain by stretching of chordate and papillary muscle which lead to elaboration of hormonal materials like catecholamine or other substances which may cause neuro-psychiatric symptoms , sweating, palpitation,, arrhythmias, postural hypotension and failure to gain weight. This can explain nearly absence of neuro-psychiatric symptom and autonomic disturbances in myxomatous changes in middle age patients with mvp that usually associated with mitral leaflet thickening with displacement of mitral valve leaflet without elongation of chordate. These patients are more prone to develop ischemic stroke due to thickening and ulceration of chordate rather than elongation, these thickened chordate cause less stretching to papillary muscles so less elaboration of catecholamine consequently less autonomic symptoms, and also less non specific ECG findings in Classical MVP in comparison with Non-Classical MVP or Only Elongated chordae. for the same explanation , the last two conditions are less likely to cause stroke in young patients with MVP.

other explanation is that patients with MVP syndrome have hypersensitivity to catecholamine which lead to exaggerated response to its effect leading to signs and symptom of mvp syndrome [autonomic manifestations] which may or may not affect mitral valve leaflet or chordae ,if they are involved so leads to mvp syndrome , if not it will lead to clinically suspicious cases with normal mitral valve [non- prolapsing MVP syndrome in our study , this may explain the improvement of symptoms and even the degree of prolapse by using B-blockers. This hypersensitivity of catecholamine receptors may be caused by some hormonal disturbances which may be improved with times , this may explain the improvement of symptoms and valve prolapse with time ,while deterioration and progression of valve prolapse in pt with degenerative [type 2] MVP in which the pathogenesis is not due to hypersensitivity to catecholamine, or elaboration of these or similar materials but due to degenerative processes of mitral valve ,this also explain the very low probability of autonomic and neuropsychiatric symptoms in later group.

The occurrence of mitral regurgitation more commonly in type 2 MVP due to myxomatous degeneration of the leaflet with progressive degeneration of annulus, leaflet and chordate that progress to mitral regurgitation and left ventricular dilatation and dysfunctions,, while mitral regurgitation occur less commonly in type 1 MVP and if it occur usually mild or moderate with no further progress in most patients.

Conclusion

Most patients with clinical suspicion of MVP have normal ECHO finding , their symptoms may be due to neuron-hormonal disturbances or due to hypersensitivity of catecholamine receptors [non prolapsing MVP syndrome or autonomic syndrome].

Some patients have both autonomic –neuropsychiatric symptoms and ECHO finding of MVP [MVP syndrome],,, others have ECHO finding of MVP without autonomic –psychoneurotic symptoms [degenerative MVP] ,, still other group show autonomic—psychoneurotic symptoms , with only elongated chordae without ECHO criteria of MVP [only elongated chordae syndrome or fluttering chordae].

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