Thamar University Journal of Natural & Applied Sciences ISSN: 2073-0764
2016 A(**6**) 11-19

TUJNAS

Prevalence of Mitral Valve Prolapse and Its Adverse Sequelae in Healthy Adult Yemenis

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ABSTRACT

Background: Mitral valve prolapse is a common cardiac disease with frequent complications.
Objectives: To study the prevalence of mitral valve prolapse in healthy Yemenis associated with the prevalence of its adverse sequelae.
Methods: We performed echocardiography for 1164 healthy Yemeni individuals: 615 women and 549 men (mean age ± SD 45.7 ± 10 years).Classical mitral valve prolapse was defined as a superior displacement of mitral valve leaflets at least 2 mm with a maximal leaflets thickness of at least 5 mm during diastasis. On the other hand, nonclassic prolapse was defined as displacement of more than 2 mm with a maximal thickness of less than 5 mm.
Results: 74 subjects (6.3 percent) had mitral valve prolapse, 40 (3.4 percent) had classic prolapse and 34 (2.9 percent) had nonclassic prolapse. None of the patients with prolapse had a history of heart failure nor anyone had atrial fibrillation except one patient (1.3 percent) had cerebrovascular disease and two patients (2.7 percent) had syncope, as compared with unadjusted prevalence of these findings on the individuals without prolapse of 0.0, 0.0, 0.0 and 1.3 percent, respectively. Chest pain, dyspnea and electrocardiographic change frequencies were similar between two groups.
Conclusion: The prevalence of mitral valve prolapse in adult Yemenis was 6.3 percent, which is similar to the results of other studies in different countries but with low prevalence of adverse sequelae in comparison to those studies.
Keywords: Mitral valve Prolapse, Echocardiography, Prevalence.

INTRODUCTION

Mitral valve prolapse (MVP) is a condition characterized by systolic displacement of an abnormally thickened, redundant mitral valve leaflets into

the left atrium during systole[1]. It is a health problem associated with mid–systolic click, late systolic murmur and serious complications such as bacterial endocarditis, severe mitral regurgitation, atrial fibrillation, syncope and stroke[2–7].Echocardiography is considered the ideal non–invasive method for recording the movement of prolapsing mitral valve leaflets. However, the continually changing echocardiographic methods and criteria for diagnosis of MVP for the last three decades disturbed our perfect understanding of this disorder with regard to prevalence, complications rate, ect[8].

During the past decade, new echocardiographic criteria for MVP have been established on the basis of understanding the 3–dimensional structure of mitral valve[9]. patients were defined as having classical prolapse of displacement exceeded 2 mm and maximal thickness was at least 5 mm. Nonclassic prolapse of displacement exceeded 2mm but the maximal thickness was less than 5 mm. Recent studies, that used these criteria, have shed new light on the prevalence and complications of MVP in the general population[10].So that we used this criteria in our present study

Mitral valve prolapse is a common cardiac disorder with prevalence, generally ranging from 5–15 percent in most studies and up to 35 percent in some studies[11–17]. However, previous studies, estimating the high prevalence of mitral valve prolapse, were limited to usage of hospital based individuals or highly selected patients visiting cardiac centers because of mitral valve prolapse and more likely of having clinical complications[18–19].In addition, those studies relied on M–mode or two–dimensional echocardiographic criteria and views that are not specific for the diagnosis of mitral valve prolapse[12,17,20,21].

To the best of our knowledge; however, no Yemeni investigator has evaluated the prevalence of MVP and its potential complications in Yemeni population by using the recently recommended echocardiographic criteria. Therefore, our present study is designed to determine the prevalence of mitral valve prolapse and its clinical adverse sequelae in unselected individuals of outpatient department.

MEHTODS

Study Population

The present study was conducted in Kuwait University Hospital–Sana'a from 2004 to 2008 as a prospective study of 1164 healthy Yemeni individuals: 615 women and 549 men, ranging in age from 18–70 years with (mean age ± SD 45.7 ± 10 years).

Population includes presumably healthy individuals, accompanied the patients who have been referred to Echocardiographic and Abdominal Ultrasonographic Department, were informed about the study. Furthermore, those who agreed to participate in the study and known to be with no specific history of cardiac disease had underwent clinical evaluation and selected for the study.

Echocardiography

Individuals underwent two–dimensional echocardiography through commercially available system (Sonos 5500, Hewlett–Packard) that used a 2.5–MHz transducer. Images were recorded on a videotape with complete parasternal, apical, and subcostal views and color Doppler assessment of valvular regurgitation.

Measurements were performed by a Sony offline cardiac analysis system. The two–dimensional echocardiographic criteria, based on the three–dimensional shape of the annulus and clinical correlation, were used to diagnose mitral valve prolapse in accordiance

with the maximal superior displacement of the mitral valve leaflets during systole, relating to the line connecting the annular–hing points. The thickness of the mitral valve leaflets during diastasis was measured from the leading to the trailing edge of the thickest area of the mid–portion of the leaflets.

Patients were defined as having classical prolapse of displacement exceeded 2 mm and maximal thickness was at least 5 mm. Nonclassic prolapse of displacement exceeded 2 mm but the maximal thickness was less than 5mm.

The degree of mitral regurgitation was assessed as the ratio of the maximal regurgitant jet area to the area of the left atrium and graded as trivial, mild, moderate, or severe on the basis of the ratio of > 0 to 10, > 10 to 20, > 20 to 40, and > 40 percent, respectively.

Clinical Characteristics

Several clinical variables such as age, sex, BSA (square root of product of the weight in kg times the height in cm divided by 3600), and symptoms of chest pain and/or dyspnea were evaluated. World Health Organization definition was recommended for hypertension (as systolic blood pressure of at least 140 mmHg or diastolic blood pressure of at least 90 mmHg on each of two successive readings obtained by the clinical physician or as current use of antihypertensive medication), presence of diabetes mellitus (glucose level of at least 140 mg per deciliter after a 12 hour fast or the use of insulin or an oral hypoglycemic agent, current cigarette smoking, and presence of hypercholesterolemia (defined as a serum cholesterol level of at least 240 mg per deciliter)[24,25].Cerebrovascular disease (defined as stroke or transient ischemic attack). The two groups were compared in regard to the above mentioned variables as well as heart failure, atrial fibrillation and syncope.

The physical examination included measurements of body mass index (the weight in kilograms divided by the square of the height in meters),waist–to–hip ratio, systolic and diastolic blood pressure, and assessment of mitral systolic murmur and mid–systolic click.
Electrocardiographic assessed variables included the presence of atrial and ventricular ectopy, left atrial enlargement (defined as a terminal P–wave force of 1 mm by 1 mm in lead V1), and left ventricular hypertrophy (defined as the presence of increased voltage with a pattern indicating strain)[26].

Statistical analysis

We used statistical software (version 6.11, SAS Institute, Cary, N.C.) in all calculations in our study. The differences of clinical variables between individuals with mitral valve prolapse and those without prolapse were tested with Waldchi–square test for logistic–regression analysis after making the adjustment for age, sex, and body–mass index. Continuous variables (for measurable variables including body mass index, waist to hip ratio) were evaluated by the analysis of covariance.

The difference in age was adjusted for sex. The body mass index and waist–to–hip ratio were adjusted for sex, age and body mass index. Values are given as least–squares means and standard errors. Ultimately, we used all comparisons by comparing all subjects with prolapse to those without prolapse. P–value was two–sided.

RESULTS

Prevalence of Mitral Valve Prolapse

Qualitative analysis revealed that 74 subjects (6.3 percent) had mitral valve prolapse, 40 (3.4 percent) had classical prolapse and 34 (2.9 percent) had nonclassical prolapse.

Table 1: Prevalence of Mitral Valve Prolapse

Type of MVP	All Subjects(N=1164)	Men(N=549)	Women(N=615)
Classical	40(3.4%)	19(1.6%)	21(1.8%)
Non–Classical	34(2.9%)	16(1.4%)	18(1.5%)
Total	74(6.3%)	35(3.0%)	39(3.3%)

Among subjects with classical prolapse, the mean (± SD) maximal leaflets displacement was 3.1± 1.1 mm, the mean thickness of anterior leaflets was 5.0 ± 0.3 mm, and the mean thickness of the posterior leaflets was 5.3 ± 0.4 mm. The corresponding values in the subjects with non–classical prolapse were 2.9 ± 0.7 mm, 3.2 ± 0.4 mm, and 4.0 ± 0.5 mm.

Age and Sex

The range of age for all population was 18–70 years. The distribution of age and sex for the subjects with prolapse was similar to those without prolapse.

The sex adjusted mean (± SE) age of the patient with classic prolapse was 47.6 ± 1.6 years, as compared with a mean age 44.5 ± 1.7 years for those with non–classic prolapse and with 43.08 ± 0.3 years for those without prolapse (P= 0.18).

Table 2 indicates that among 74 subjects with mitral valve prolapse none had a history of heart failure nor atrial fibrillation, but one subject (1.3 percent) had cerebrovascular disease and two subjects (2.7 percent) had syncope, as compared with unadjusted prevalence of these findings on the group without prolapse of 0.0, 0.0, 0.0 and 0.09 percent, respectively.

Table 2: Prevalence of Various Clinical Findings According to the Presence or Absence of Mitral Valve Prolapse

Clinical Findings	Mitral Valve Prolapse (N= 74)	No Mitral Valve Prolapse(N=1090)
Atrial Fibrillation	0	0
Cerebrovascular Disease	1 (1.3%)	0
Syncope	2 (2.7%)	1(0.09%)
Heart Failure	0	0

It has been observed that subjects with classical prolapse had mild regurgitation (on average) in comparison to those with non–classical prolapse who had trace regurgitation.

Doppler study revealed that the mean (± SE) ratio of the jet area to the left atrial area was 14.9 ± 1.5 percent among subjects with classical mitral valve prolapse, 7.8 ± 1.9 percent among subjects with non–classical prolapse, and 2.2 ± 0.7 percent among 60 control subjects without prolapse, ($p < 0.001$).

The prevalence of palpitations, chest pain and dyspnea were similar among the patients with prolapse and those without prolapse as in Table 3.

The prevalence of risk factors for coronary heart disease, including smoking, hypertension, diabetes, and hypercholesterolemia are made clear in Table 3.

Table 3: Prevalence of Various Clinical Characteristics.

Characteristics	Classical MVP(N= 40)	Non–Classical MVP(N=34)	No MVP(N= 1090)	P–value
Chest Pain	4 (10%)	3 (8.8%)	95(8.7%)	N.S
Dyspnea	3 (7.5 %)	3 (8.8%)	80(7.3%)	N.S
Cigarette Smoking	7 (17.5%)	6 (17.6%)	110(10.09%)	N.S
Hypertension	6 (15%)	5 (14.7%)	150(13.8%)	N.S
Diabetes Mellitus	0	0	0	N.S
Hypercholesterolemia	5 (12.5%)	6 (17.6%)	140(12.8%)	N.S

–The P values are for comparing all subjects with MVP and those without prolapse.
–All percentages were adjusted for age, sex, and body mass index.

Physical Findings

Table 4 Show no significant differences between the two groups in systolic or diastolic blood pressure, but subjects with prolapse were significantly lower on the basis of body mass index and waist–to–hip ratio, in addition to having systolic murmur and mid–systolic clicks than those without prolapse.

Table 4: Physical Findings:

Variables	**Classic MVP (N= 40)**	**Non–Classic MVP (N = 34)**	**No MVP (N= 1090)**	**P– values***
Body–mass Index **	23.3 ± 0.3	23.1± 0.1	26.1± 0.2	< 0.001
Waist–to–hip Ratio **	0.8 ± 0.11	0.79 ± 0.01	0.89 ± 0.001	0.007
Systolic Blood Pressure in mmHg ***	120 ± 1.3	120.1.2	123 ± 0.1	N.S
Diastolic Blood Pressure in mmHg	70 ± 0.1	70 ± 0.4	72 ± 0.2	N.S
Systolic Murmur ****	20 (50%)	16 (47%)	45 (4.1%)	< 0.001
Mid–systolic Click****	19 (47.5%)	11 (32%)	3 (0.3%)	< 0.001

* The P–values are for comparison of all subjects with MVP and those without MVP.
** Values were adjusted only for age and sex.
*** Values were adjusted only for age, sex and body–mass index.
**** All percentages were adjusted for age, sex and body–mass index.

E.C.G. Findings

Table 5 revealed that there were no significant differences between the two groups in the prevalence of E.C.G. abnormalities.

Table 5: Electrocardiographic Findings

Variables	**Classic MVP (N= 40)**	**Non–Classic MVP(N=34)**	**No MVP (N= 1090)**	**P–values****
Atrial Ectopy ****	3 (7.9 %)	1 (3.0 %)	15 (1.4%)	< 0.05
Ventricular Ectopy ****	1 (2.5%)	0	0	N.S
LeftAtrial**** Enlargement	0	0	0	N.S
Left Ventricular Enlargement****	0	0	0	N.S

* The P–values are for comparison of all subjects with MVP and those without MVP.
** All percentages were adjusted for age, sex and body–mass index.

DISCUSSION

Mitral valve prolapse has been described as the most common cardiac valvular abnormality in industrialized countries[22]. Previous studies showed large variations of prevalence ranging from 5% up to 35%[11–17], but the subjects had largely been volunteers[12,13,16], some were self–referred and some others were self–selected. In two studies[13,16], subjects were selected from large clinic or hospital practices. Such studies were subject to many contradictions and they did not reflect prevalence in general population. In addition, previous studies used old criteria for diagnosing MVP by M–mode echocardiography or less specific two–dimensional criteria (including displacement of the anterior mitral valve leaflets in the apical four chambers view) to diagnose mitral valve prolapse. But, new criteria as mentioned above has revealed marked reduction in the prevalence of mitral valve prolapse by several recent studies to be on the range of 2–4% in general population studies[27].

Our present study shows a prevalence of mitral valve prolapse by 6.3%, which is between the higher prevalence seen on many previous studies[11,12] and near the lower prevalence revealed by Framingham Heart Study[27], which is considered a community–based study and it is consistent with other studies[13].

Chest pain and dyspnea were similar in the group of subjects with mitral valve prolapse and those without prolapse and that is consistent with previous reports[23,26]. Moreover, as reported previously[11,14,15], in our study, subjects with prolapse were leaner (lower body–mass index and waist–to–hip ratio) than those without prolapse. Subjects with prolapse were more likely to have mitral regurgitation ($P<0.001$) although with mild average regurgitation.

In contrast to previous reports[6], we found that the rate of heart failure, atrial fibrillation were not different among subjects with mitral valve prolapse and those without prolapse. Also the rate of cerebrovascular disease and syncope was slightly significantly higher among the group of mitral valve prolapse. This relatively low prevalence of complications among subjects with prolapsed is consistent with those reported in some previous studies[28]. And this low prevalence and low risk of complications can be explained by the non–selective, non–referral population in our study. In addition, the low sensitivity of clicks and murmurs for prolapse may reflect the relatively mild nature of prolapse in the general population, as compared with referral–based series and as does the absence of significant differences in the prevalence of ventricular ectopy between those with prolapse and those without prolapse. This is consistent with previous findings that serious ventricular arrhythmias and sudden death are more likely in patients with severe mitral regurgitation and left ventricular dysfunctions[22].

Evaluation of the prevalence of mitral valve prolapse in the general population is important to define the magnitude of the condition and provides a basis for determining the validity of proposed associations. It also allows researchers to address whether prolapse occurs more frequently among patients with presumed complications, such as stroke, than it occurs among the general population. In addition, both prevalence and complication rates are important factors in balancing the potential risks and benefits of antibiotic prophylaxis against endocarditis[29].

CONCLUSION

The prevalence of mitral valve prolapse in adult Yemenis was 6.3 percent, which is similar to the results of other studies in different countries but with low prevalence of adverse sequelae in comparison to those studies.

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معدل شيوع تدلي الصمام الميترالي وعواقبه الضارة بين اليمنيين الاصحاء

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ملخص

الخلفية: ان تدلي الصمام الميترالي يعد أحد الامراض القلبية الشائعة وله مضاعفات متعددة.
الهدف: لقد تم اجراء الدراسة الحالية لتحديد معدل انتشار تدلي الصمام الميترالي وكذا معدل انتشار عواقبه الضارة بين اليمنيين الاصحاء.
الطرق: لقد قمنا بإجراء تخطيط صدى القلب ل ١١٦٤ شخصآ: منهم ٦١٥ اناث و٥٤٩ ذكور، تراوحت اعمارهم بين ١٨-٧٠ عام. يعرف تدلي الصمام الميترالي الكلاسيكي بانه يتمثل بإزاحة شفرتي الصمام ٢مم نحو الاذين الايسر وسمك الشفرتين خلال الانبساط البطيني لا يقل عن ٥مم. وعلى نحو اخر يعرف تدلي الصمام الميترالي غير الكلاسيكي بإزاحة شفرتي الصمام الميترالي ٢مم نحو الاذين الايسر ولكن بسمك الشفرتين اقل من ٥ مم.
النتائج: بينت الدراسة ان هناك ٧٤ شخصآ (٦,٣٪) لديهم تدلي في الصمام الميترالي، ٤٠ شخصآ (٣,٤٪) منهم يعانوا من تدلي كلاسيكي و٣٤ شخصآ (٢,٩٪) لديهم تدلي غير كلاسيكي. ولا يوجد من مرضى التدلي الميترالي من لديه تاريخ مرضي لقصور قلبي او رجفان اذيني ما عدى شخص واحد (١,٣٪) لديه تاريخ مرضي لسكته دماغيه ومريضين (٢,٧٪) لديهم تاريخ مرضي لإغماء، مقارنه بمعدل شيوع ما ذكر بين الاشخاص الذين لا يعانون من تدلي الصمام الميترالي ب ٠,٠، ٠,٠، ٠,٠ و١,٣٪ على التوالي. وقد كانت الاعراض المرضية مثل الآم الصدر وضيق التنفس وتغيرات التخطيط الكهربائي للقلب متساوي بين المجموعتين.
الخاتمة: خلصت الدراسة الى ان معدل انتشار تدلي الصمام الميترالي بين اليمنيين هو ٦,٣٪، ويتساوى ذلك مع نتائج لدراسات مماثله في دول مختلفة ولكن بمعدل شيوع اقل للعواقب الضارة مقارنه بتلك الدراسات.
مفتاح الكلمات: تدلي الصمام الميترالي، تخطيط صدى القلب، معدل انتشار.