

Prevalence and Severity of Mitral Valve Regurgitation in Patients with Systolic Left Ventricular Dysfunction

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Abstract

Background: Functional mitral regurgitation may develop in patients with congestive heart failure due to left ventricular systolic dysfunction, which is common, costly and lethal syndrome. Echo-Doppler is an extremely sensitive tool for the detection of mitral regurgitation.

Objective: To determine the prevalence and severity of functional mitral regurgitation in patients with left ventricular systolic dysfunction using echocardiography.

Setting : Al-Hussain Hospital echocardiography clinic in Karbala city.

Methods: One hundred sixty patients were divided into two groups: Group A: constituted of 80 consecutive patients who had a left ventricular ejection fraction $\leq 40\%$ and group B: constituted of 80 consecutive patients who had a left ventricular ejection fraction $\geq 40\%$. The study patients underwent standard echocardiogram. Severity of mitral regurgitation was graded as mild, moderate and severe.

Results: In patients with left ventricular systolic dysfunction (group A), mitral regurgitation was more common. It was mild in 22.5%, moderate in 52.5% and severe in 21.25%.

Conclusion: The majority of patients with left ventricular systolic dysfunction had mitral regurgitation. Echo-Doppler should be included in the evaluation of these patients.

الخلاصة

الخلفية: يعد عجز القلب الاحتقاني مرضا قاتلا وهو شائع ومكلف وينتج عن القصور الانقباضي للبطين القلبي الأيسر ويؤدي ذلك أحيانا إلى ارتجاع الصمام الإكليلي الوظيفي. ويعتبر فحص صدى القلب (الايكو) فحصا شديدا حساسية لاكتشاف الارتجاع.
هدف البحث: تحديد مدى انتشار وشدة ارتجاع الصمام الإكليلي الوظيفي في المرضى المصابين بالقصور الانقباضي للبطين القلبي الأيسر باستخدام فحص صدى القلب (الايكو).

المكان: مستشفى الحسين العام في مدينة كربلاء المقدسة.
الطرق: اشتملت الدراسة على إجراء فحص صدى القلب (الايكو) على 160 مريضا قسموا على مجموعتين: المجموعة أ تكونت من 80 مريضا عندهم "جزء القذف" $\geq 40\%$ و المجموعة ب تكونت من 80 مريضا عندهم "جزء القذف" $\leq 40\%$. قسم ارتجاع الصمام الإكليلي الى ثلاثة درجات من حيث الشدة وهي البسيط والمتوسط والشديد.

النتائج: كانت نسبة انتشار ارتجاع الصمام الإكليلي في المجموعة أ (المصابين بالقصور الانقباضي للبطين القلبي الأيسر) أكثر من المجموعة ب وكانت الشدة بسيطة في 22,5% ومتوسطة في 52,5% وشديدة في 21,25% في المجموعة أ.
الاستنتاج: يؤدي القصور الانقباضي للبطين القلبي الأيسر إلى ارتجاع الصمام الإكليلي الوظيفي في اغلب المرضى. يجب استخدام فحص صدى القلب (الايكو) في تقويم هؤلاء المرضى.

Introduction

Congestive heart failure (CHF) is a common, costly and lethal syndrome¹. As many as 25% of patients has advanced disease² with limited treatment strategies. Mitral regurgitation (MR) may develop in patients with severe systolic dysfunction and left ventricular dilatation without organic mitral valve disease (i.e., functional MR). MR causes left-sided chamber dilatation and worsens neuroendocrine activation³. The degree of MR in CHF is associated with local left ventricular (LV) remodeling resulting in tethering of mitral leaflets⁴. This serves as the main mechanism, although mitral annular dilation or leaflet abnormalities may coexist. The volume overload imposed by MR may cause inflammatory and other cytokine activation^{5,6}. It causes LV, left atrial, and mitral annular dilatation. This may lead to further worsening of MR and cause atrial fibrillation³. Dilatation of the left ventricle will lead to a stretch of the mitral valve annulus. If the annulus dilates to the point where complete leaflet coaptation is not possible, a leak will result usually producing a central jet of MR. A wall motion abnormality affecting the anterolateral or posteromedial left ventricular walls with or without direct papillary muscle involvement may also have an effect on mitral valve competency.

As murmur intensity correlates poorly with the degree of MR of ischemic or functional origins⁷ cardiologists use echo-Doppler grading of regurgitation severity in conjunction with patient symptoms and signs and occasionally invasive haemodynamic information to make decisions on the need for and timing of mitral valve surgery⁸. Echo-Doppler is an extremely sensitive tool for the detection of MR⁸. As echocardiography is the most widely available cardiac imaging modality, it is the technique which is routinely used to assess patients with suspected or known MR. If

MR is discovered on an echocardiographic examination it is extremely important to make an assessment of severity as this will be required to guide the patient's subsequent management.⁸

This study was designed to determine the prevalence and severity of functional MR in patients with left ventricular systolic dysfunction, and to define the role of echocardiography in the evaluation of these patients.

Patients and Methods

Study Population

One hundred sixty patients from Al-Hussain Hospital echocardiographic clinic were enrolled between June 2006 and August 2007. Demographic data, presence of comorbidities, and physical examination data including jugular venous pressure, presence of abnormal heart sounds, and the presence of MR murmur were entered into the study database. We excluded patients with inadequate or incomplete echocardiograms, and patients with organic mitral valve disease (mitral stenosis, mitral prolapse, rheumatic or degenerative MR) that was identified at echocardiography.

Patients were divided into two groups:

Group A: constituted of 80 consecutive patients who had a left ventricular (LV) ejection fraction (EF) \leq 40%.

Group B: constituted of 80 consecutive patients who had a left ventricular (LV) ejection fraction (EF) \geq 40%.

Echocardiographic Data

The study patients underwent standard echocardiogram using Philips EnVisor C machine (Philips medical systems, USA).

EF was estimated visually and by Teicholtz formula⁹ at the time of the examination. Severity of MR was graded as mild, moderate and severe using the grading system described by Helmcke¹⁰ by indexing the regurgitation jet area to the left atrial size which encompass approximately <20%, 20-

40%, and >40% of the left atrial area , respectively.

Statistical Analysis

Comparison between the two groups was done using the chi square (χ^2)` test for statistical analysis of data(Microsoft Excel 2x2 chi square). P value equal or less than 0.05 was considered the level of significance.

Results

In group A, 80 patients were studied. Age range between 21-81 years with a mean age of 51 \pm 30years. Male/ female ratio was1.9. Ejection fraction range between20-40%. Mean ejection fraction was 30 \pm 10.

In group B, 80 patients were studied. Age range between 20-80 years with a mean age of 50 \pm 30 years . Male/ female ratio was1.2 .Ejection fraction range between42-70%.Mean ejection fraction was 56 \pm 14.

Table-1 shows the distribution of patients in both groups according to age groups. Thirty five percent of patients in group A were

between 60-69 years old. Patients above 50 years constituted 77.5% of all patients in this group. Ninety percent of patients in group A were above 40.

Table-2compares between current study and similar studies regarding mean age, LVEF and sex.

Table-3 shows the frequency of different grades of MR in both groups. Only three patients in group A (3.75%) do not have MR in comparison with 60(75%) of patients in group B (*P* value \leq 0.0001). There was no statistically significant difference in the incidence of mild MR between the two groups(*P* value =0.699),whereas there was a statistically significant difference in the incidence of moderate and severe MR between the two groups (*P* value \leq 0.0001).

As shown in figure 1, the majority of patients in group A have MR that was mild in 22.5%, moderate in52.5% and severe in 21.25%.

Table 1. the distribution of patients in both groups according to age groups

Age group(year)	Group A	Group B
20-29	3(3.75%)	7(8.75%)
30-39	5(6.25%)	11(13.75%)
40-49	10(12.5%)	18(22.5%)
50-59	18(22.5%)	20(25%)
60-69	28(35%)	17(21.25%)
70-79	12(15%)	6(7.5%)
80-89	4(5%)	1(1.25%)
Total	80(100%)	80(100%)

Table 2. comparison between current study and similar studies regarding mean age, LVEF and sex

	Robbins et al ¹¹ (hospitalized)	Robbins et al ¹¹ (outpatients)	Varadara-jan et al ¹³	Koelling et al ¹⁴	Current study
Mean age (y)	69 \pm 15	59 \pm 15	65 \pm 15	61.7 \pm 14.7	51 \pm 30
LVEF (%)	26 \pm 8	29 \pm 9	21 \pm 12	20 \pm 5	30 \pm 10
Sex (% female)	41	35	46	32.3	34

Table 3. Frequency of different grades of MR in patients with LV dysfunction and control

Grade of MR	Group A	Group B	<i>P</i> value
none	3(3.75%)	60(75%)	\leq 0.0001
mild	18(22.5%)	16(20%)	0.699
moderate	42(52.5%)	4(5%)	\leq 0.0001
severe	17(21.25%)	0(0%)	\leq 0.0001
total	80(100%)	80(100%)	

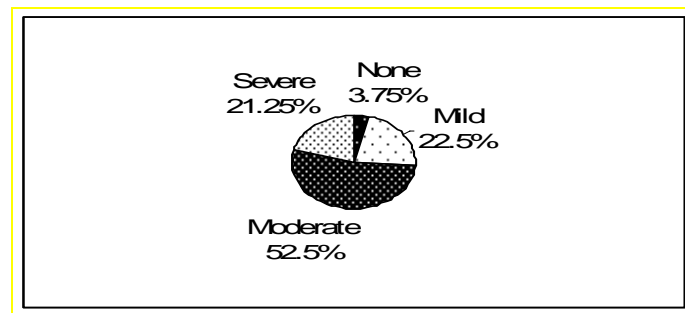


Figure1-Prevalence of different grades of MR in patients with LV dysfunction

Discussion

Table-1 showed that about 1 of 3 patients with LVSD were between 60-69 years old and that 3 of 4 were above 50. Nine of ten patients were above 40 years old.

As shown in table-2, LVSD occurred in our study at younger age than other studies. EF was slightly higher in our studies than other studies. Further studies are needed to determine the causes of these differences. Sex ratio was close to other studies.

Our study shows that MR is common and present in the majority of patients with LVSD. As shown in figure 1, MR was mild in 22.5%, moderate in 52.5% and severe in 21.25%. Only 3.75% of patients do not have MR.

In comparison, Robbins et al¹¹ showed that in hospitalized patients who had a LV ejection fraction $\leq 40\%$, 26% had no to mild MR, 42% had moderate MR, and 32% had severe MR. While in the outpatient group, 55% had no to mild MR, 32% had moderate MR, and 13% had severe MR. Batel et al¹² concluded that in patients with advanced CHF, MR was severe in 4.3%, moderate-severe in 12.5%, moderate in 21.9%, mild-moderate in 11.8%, mild in 39.1%, and absent or present as only a trace in 10.4%. In other study conducted by Varadarajan et al¹³, MR was present in 94% of patients with heart failure, being mild in 44%, moderate in 22%, moderate to severe in 15%, and severe in 14%. Koelling et al¹⁴ found that in patients with LVEF $\leq 35\%$, 18.9% were found to have severe MR,

29.7% had moderate MR and 51.3% had none-mild MR.

In this study, the results were comparable to those of Robbins et al¹¹ (hospitalized patients) and more than those of Koelling et al¹⁴ in number and severity. Possible explanations for this difference is the use of more sensitive echo machine, late medical counseling, and poor compliance to medical treatment.

Echocardiography has become indispensable in the evaluation of patients with CHF. Previous studies have shown that MR is associated with advanced CHF and left ventricular dilation. Our study shows that MR is a common complicating element in patients with LVSD. This finding provides justification for the inclusion of color Doppler echocardiography in the evaluation of patients with LVSD.

Conclusion and Recommendations

The study proved that moderate to severe (but not mild) MR is significantly more common in patients with LVSD. As echo-Doppler is an extremely sensitive tool for the detection of MR, it should be included in the evaluation of patients with LVSD patients because early detection of severe MR may facilitate its surgical correction with possibly improved symptoms, morbidity, and mortality. Further studies are needed to determine the prognostic value of each grade of MR.

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