A 59-year-old woman comes to your office for evaluation of her heart murmur. During the last several months, she has tired more easily and has had less energy. Recreational activities, such as lap swimming, have become difficult because she is easily winded. She denies chest pain, foot swelling, and nocturnal dyspnea.

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**HISTORY**
The patient had rheumatic fever at age 10 and has had a loud heart murmur ever since. She had no cardiac complications during her 3 pregnancies. Prophylactic antibiotic and warfarin therapy have been effective; she has never had endocarditis, thromboembolism, or bleeding. She has had yearly examinations, including echocardiograms that have always shown her heart function to be "better than normal."

**PHYSICAL EXAMINATION**
The patient appears well and is afebrile. Heart rate is 84 beats per minute and blood pressure, 138/82 mm Hg. No conjunctival petechiae, obvious inflammation of the pharynx, or neck vein distention is noted. Chest is clear. The point of maximal impulse is slightly displaced laterally and prominent. Rhythm is regular, with a loud, crisp S1 and normal S2; no S3 gallop is heard, but a grade 3 holosystolic blowing murmur is detected at the apex, with radiation to the axillae. No diastolic murmurs are discerned. No pedal edema or splinter nail hemorrhages are present.

**LABORATORY AND IMAGING RESULTS**
The hemogram and chemistry panel are normal. INR is 3. A chest radiograph shows a prominent left ventricle (LV) but no evidence of congestive heart failure (CHF). An echocardiogram reveals a thickened LV with an endsystolic dimension of 45 mm and an ejection fraction (EF) of 55%; moderate mitral regurgitation (MR); and a very small mitral stenosis gradient.

Which of the following is the most appropriate next step? A. Refer the patient to a cardiac surgeon for mitral valve repair if possible and valve replacement if needed.  
B. Monitor echocardiographically at more frequent intervals (every 6 months); refer to a cardiac surgeon when EF falls below 30%.  
C. Initiate vasodilator therapy.  
D. Initiate parenteral antibiotics for treatment of atypical endocarditis, and order a transesophageal echocardiogram (TEE).  
CORRECT ANSWER: A  
This patient has both clinical and echocardiographic evidence of chronic MR. More than half the cases of MR seen in surgical series in the United States are the result of mitral valve prolapse; rheumatic valve disease and endocarditis are less common causes.¹ In this patient, MR stems from rheumatic fever during childhood. She exhibits the typical holosystolic apical heart murmur that radiates to the axillae. The echocardiogram confirms that MR is the cause of the murmur. Interpreting the echocardiographic evidence. The patient has been followed up carefully with yearly echocardiograms- probably because of the impressiveness of her murmur. Echocardiography reveals 2 findings that suggest further intervention is now indicated. First, although her EF had been greater than normal for many years, it is now only normal. The loading conditions in compensated MR favor LV ejection: they increase preload and often decrease afterload. This markedly enhances LV emptying, which results in greater than normal EF values-frequently 70% or more. Thus, normalization of the EF implies a decrease in muscle function, which has been linked to poor outcomes.
Second, the end-systolic dimension of the LV has increased. The ability of the LV muscle to contract is measured echocardiographically by the end-systolic dimension. Studies have shown that morbidity and mortality are increased with dimensions of 45 mm or greater.\(^2\) Thus, this patient displays the 2 echocardiographic findings that are cause for concern in those with MR: normalization of EF and end-systolic LV dimension of at least 45 mm.

**Significance of the clinical evidence.** Although the echocardiographic findings alone would be reason to evaluate the patient for surgery, the worsening of CHF symptoms is another, independent mortality risk factor that warrants consideration of surgical repair. Thus, there are both clinical and echocardiographic grounds for surgery (choice A).

In patients with MR, repair of the valve is preferable to replacement. The superiority of repair reflects the importance of the mitral valve apparatus (chordae tendineae and papillary muscles) to proper postoperative LV function and EF.\(^3\)

More frequent echocardiographic monitoring and referral for surgery when the EF falls below 30% (choice B) is far too conservative an approach; moreover, it exposes the patient to markedly increased surgical and overall mortality. In patients whose mitral valve is repairable, an EF of 60% or less is a criterion for repair. However, even if the valve is not repairable (as can occur in patients with a history of rheumatic fever), the likely outcome of surgery becomes prohibitively poor once the EF reaches 30% or less. The object of following patients with MR carefully is to enable intervention before serious, irreversible LV dysfunction occurs.

Studies of various medical therapies for MR have been disappointing. No medical therapies—including vasodilators (choice C) that reduce afterload and, thus, theoretically facilitate LV emptying and improve EF—have been shown to reduce the need for surgery, permit postponement of surgery, or improve overall outcome.\(^4\)

Finally, although this patient has a history of rheumatic fever and is at risk for endocarditis, she has been diligent in complying with prophylaxis. She has no symptoms or physical stigmata of endocarditis, and the echocardiogram does not show vegetation on the valve. Although a TEE (choice D) might reveal vegetations overlooked on a standard echocardiogram, the clinical evidence points to MR as the cause of her symptoms. Thus, there is little need for a TEE.

**References: REFERENCES:**


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