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Severe Left Ventricular Dilatation Secondary to Concomitant Aortic and Mitral Regurgitation: A Case Report and Literature Review

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Abstract **Case Report**

Multiple valvular heart diseases (MVHD) are frequent and present significant challenges in terms of diagnosis and therapeutic management. The combination of aortic and mitral regurgitation represents a common but understudied scenario of multiple valvular heart disease. We herein report the case of a 43-year-old male with severe double-valve regurgitation resulting in severe left ventricular dilatation and dysfunction.

Keywords: Aortic regurgitation, mitral regurgitation, left ventricular dilatation, cardiopulmonary transplantation.

INTRODUCTION

Multiple valvular heart diseases (MVHD) are highly prevalent conditions. The coexistence of mitral regurgitation (MR) and aortic regurgitation (AR) represents a common yet relatively understudied form of MVHD. The coexistence of substantial regurgitation of both the aortic and mitral valves imposes a significant volume and pressure load on the left ventricle. MR is usually secondary to left ventricular dilatation and remodeling caused by aortic regurgitation but can also be primary.

CASE PRESENTATION

A 43-year-old man with no cardiovascular risk factors presented to the cardiology department with worsening dyspnea (New York Heart Association grade III) and paroxysmal nocturnal dyspnea. He had no history of rheumatic fever, systemic inflammatory disease, Marfan-like features, infective endocarditis, or family history of cardiovascular diseases. His symptoms began in 2014 with exertional dyspnea (New York Heart Association grade II), and he was diagnosed with valvular heart disease requiring surgery at that time. Due to patient preference, he declined surgical intervention.

Upon general examination, his pulse rate was 86 beats per minute, his blood pressure was 112/35 mmHg and no Marfan-like features (His height was 169cm, weight 59kg, with a BMI of 20.65 kg/m²).

Cardiac examination showed the point of maximal impulse displaced inferiorly and laterally, a grade 5/6 holosystolic murmur heard at the apex of the heart radiating to the left axilla, an early-diastolic blowing murmur along the left sternal border and an accentuated pulmonary component of the second heart sound. Musset's sign along with jugular vein distention were present.

The electrocardiogram (ECG) showed sinus rhythm with a heart rate of 86 beats/min and left ventricular hypertrophy with a strain pattern (Figure 1).

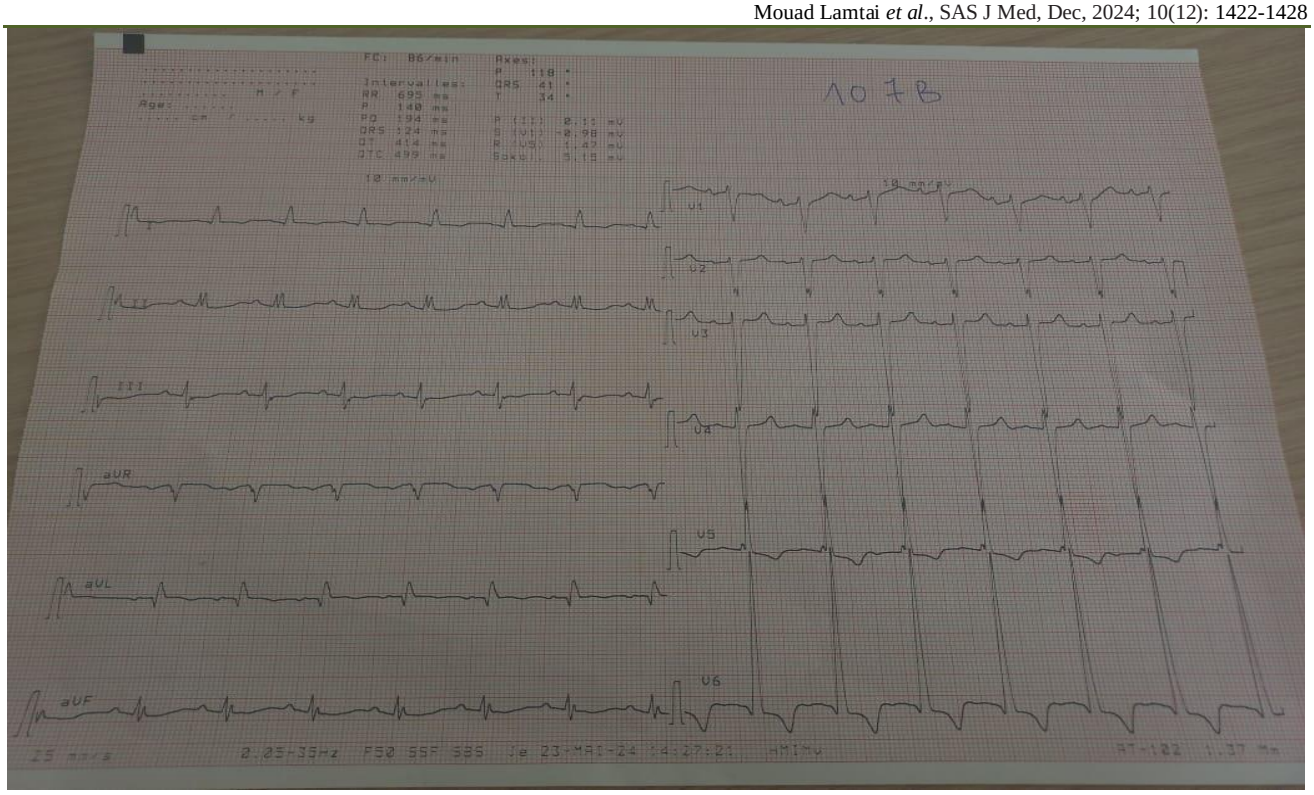

Figure 1: EKG showed sinus rhythm with a heart rate of 86/min and left ventricular hypertrophy with a strain pattern

A chest radiograph showed an enlarged cardiothoracic ratio, straightening of the left border of the cardiac silhouette and an enlarged left atrium (Figure 2).

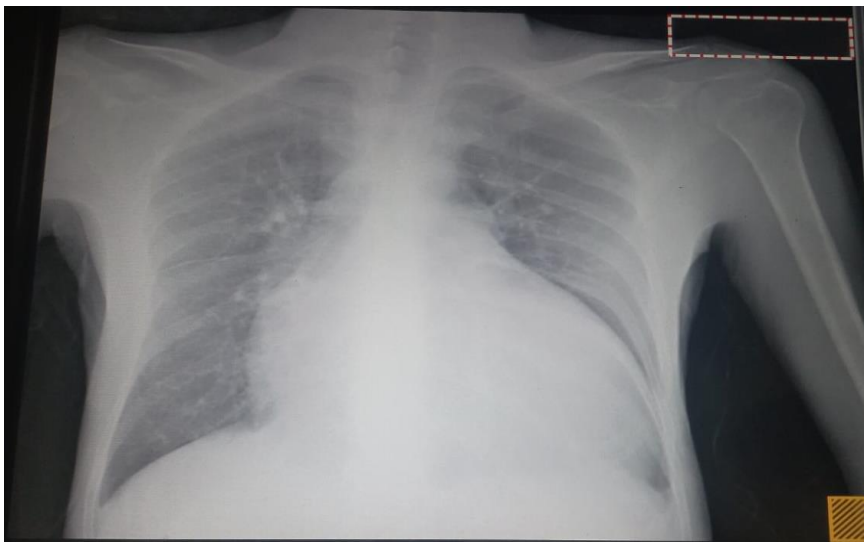

Figure 2: Chest X-ray illustrating an enlarged cardiothoracic ratio, straightening of the left border of the cardiac silhouette and an enlarged left atrium

Echocardiography screening test revealed:

➔**Severe aortic regurgitation (Figure 3)**

- An eccentric aortic regurgitation jet with restriction of left coronary cusp motion
- Effective regurgitant orifice area (EROA) :**0.6 cm^2**
- Regurgitation volume (R.Vol.): **80 ml**
- Aortic roots were normal.

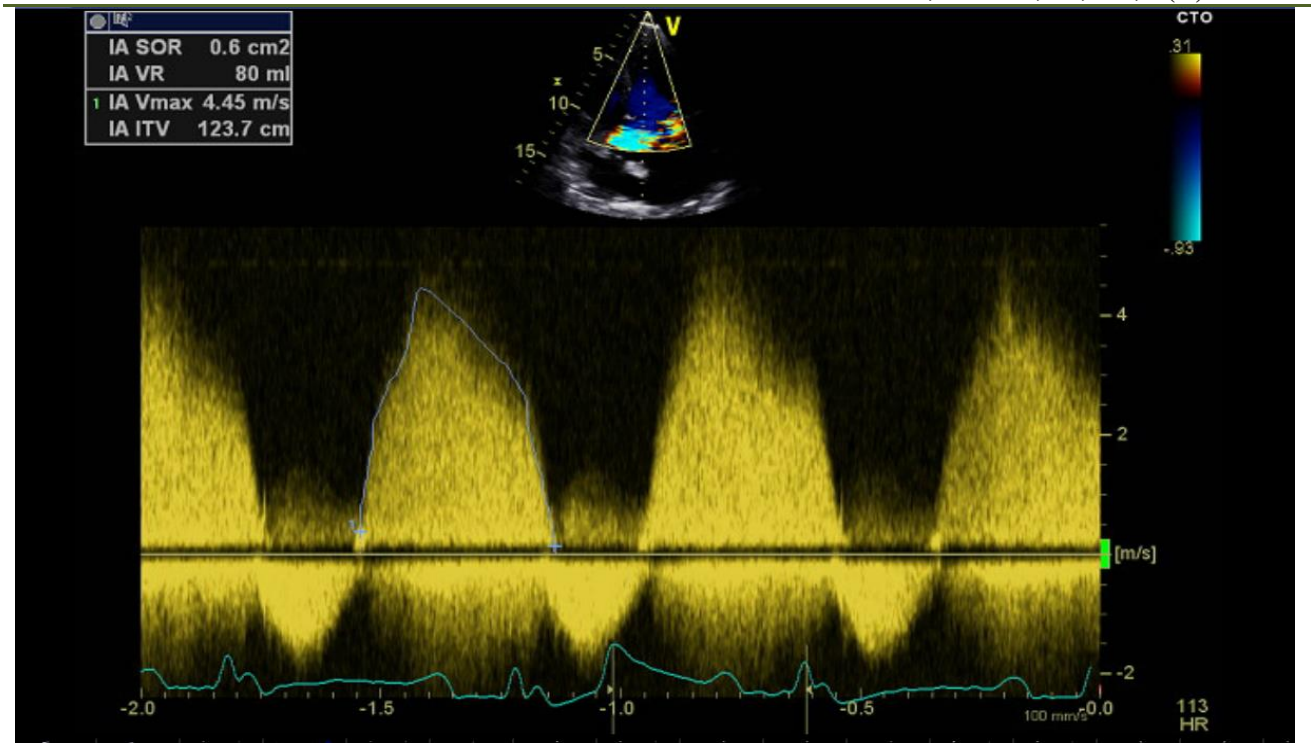

Figure 3 showing severe aortic regurgitation
SOR: Regurgitant orifice area
VR: regurgitation volume

➔Severe mitral regurgitation (Figure 4)

- The leaflets were slightly thicker, with a restriction motion of the posterior valve
- **A shape of a tent** in systole due to severe left ventricular dilatation.
- EROA: **0.4 cm^2** R.Vol.: **56 ml.**

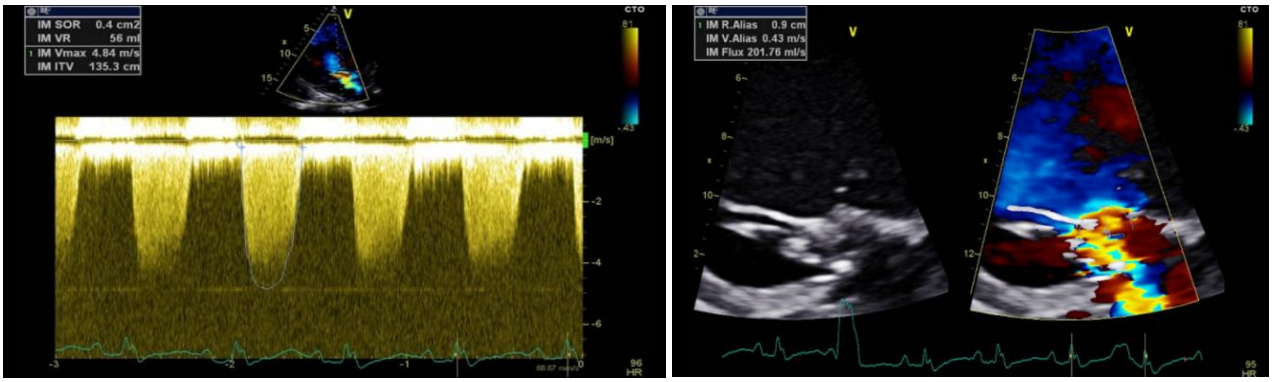

Figure 4: Showing severe mitral regurgitation

➔Moderate tricuspid regurgitation (Figure 5):

- Tricuspid leaflets were normal
- EROA: **0.2 cm^2**, R.Vol: **24 ml**
- Tricuspid annulus: 40 mm

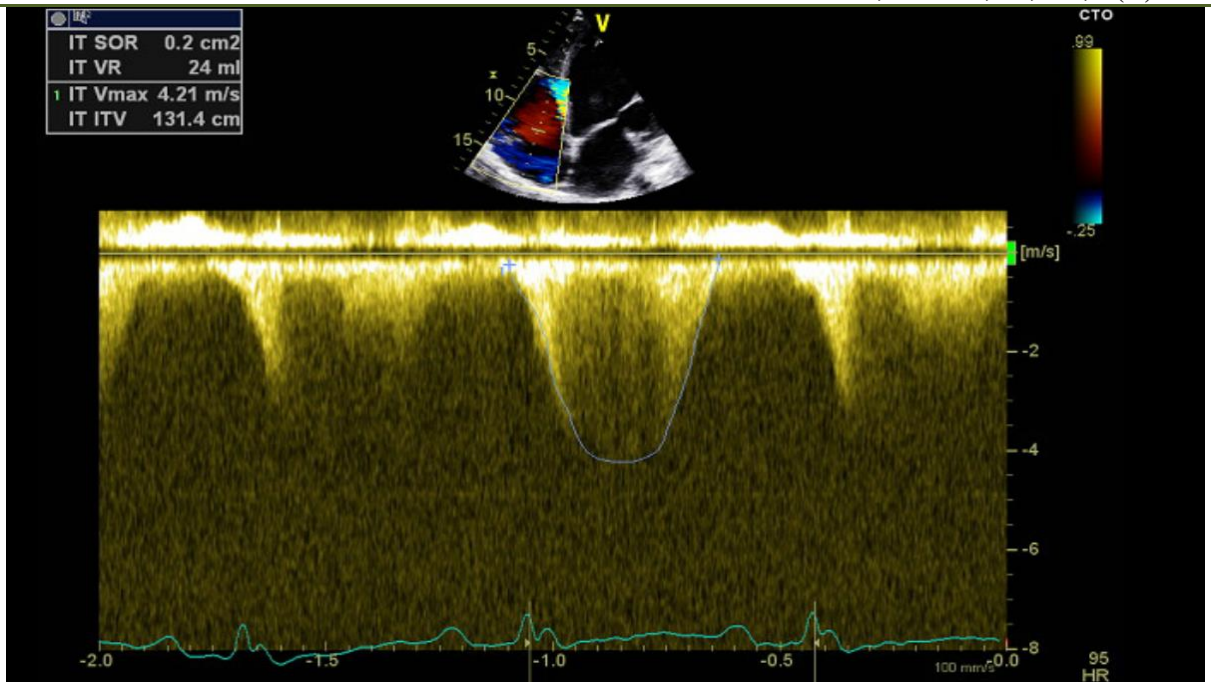

Figure 5: Showing moderate tricuspid regurgitation

➔Sever left ventricular dilatation and dysfunction (Figure 6):

- Left ventricular end-diastolic diameter (LVEDD) (VGd):**90 mm**
- Left ventricular end-systolic diameter (LVESD): **79 mm**
- Diffuse left ventricular hypokinesis and an ejection fraction of **26%.**

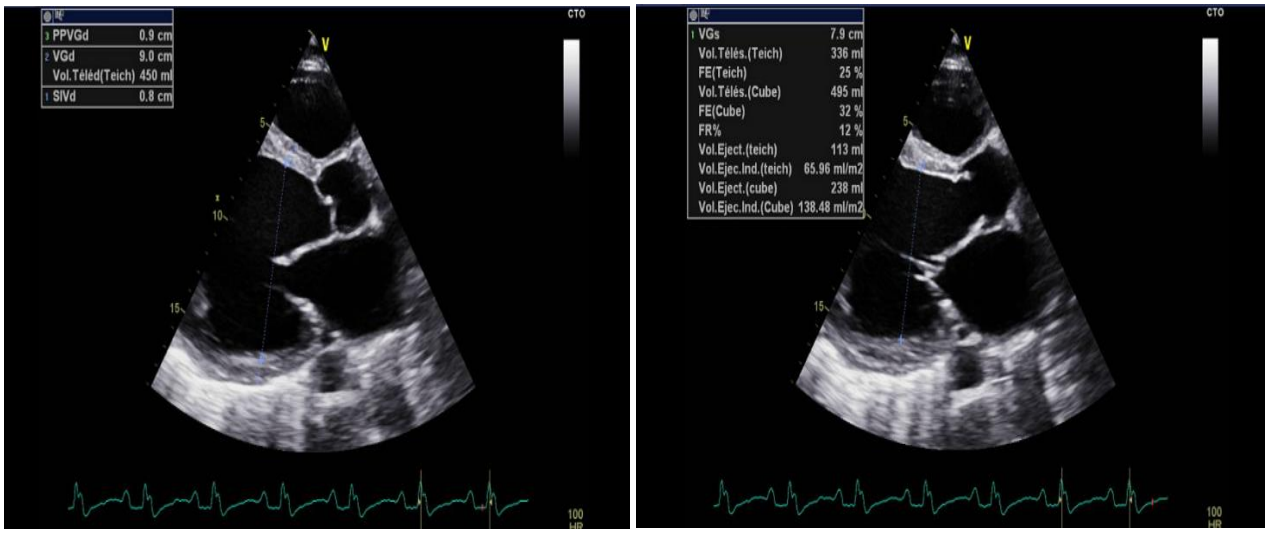

Figure 6: Showing severe left ventricular dilatation

➔Moderate right ventricular dilatation (Figure 7):

- Basal right ventricular diameter: 51 m
- Mid RV diameter: 50 mm
- Preserved right ventricular function: TAPSE: 19 mm; S'tric: 12 cm/s

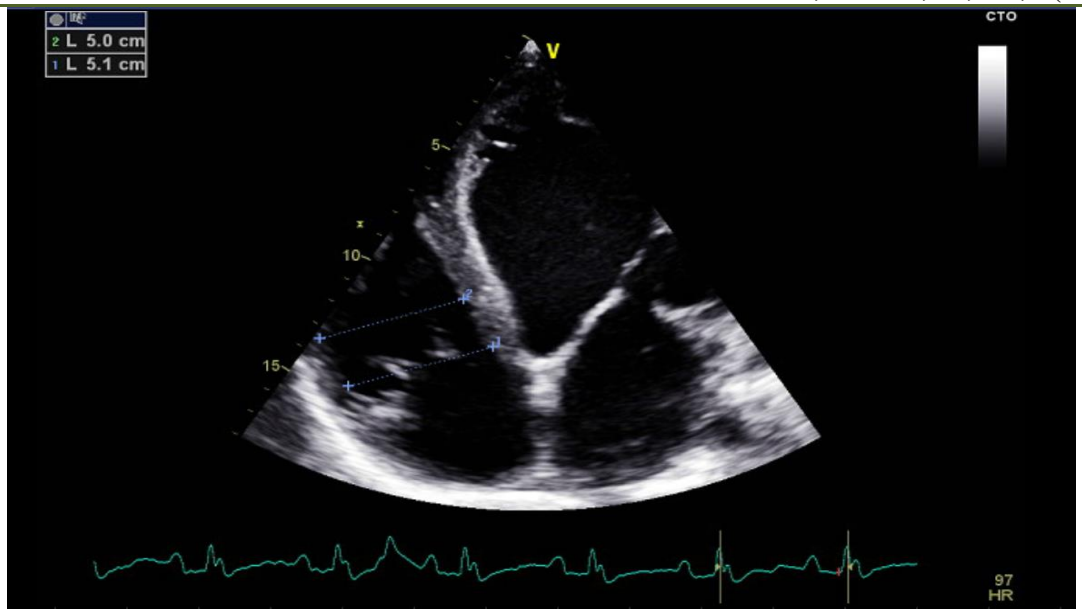

Figure 7: Showing moderate right ventricular dilatation

➔Biatrial Enlargement (Figure 8):

- Right atrium: 19 cm2; Left atrium: 31 cm2

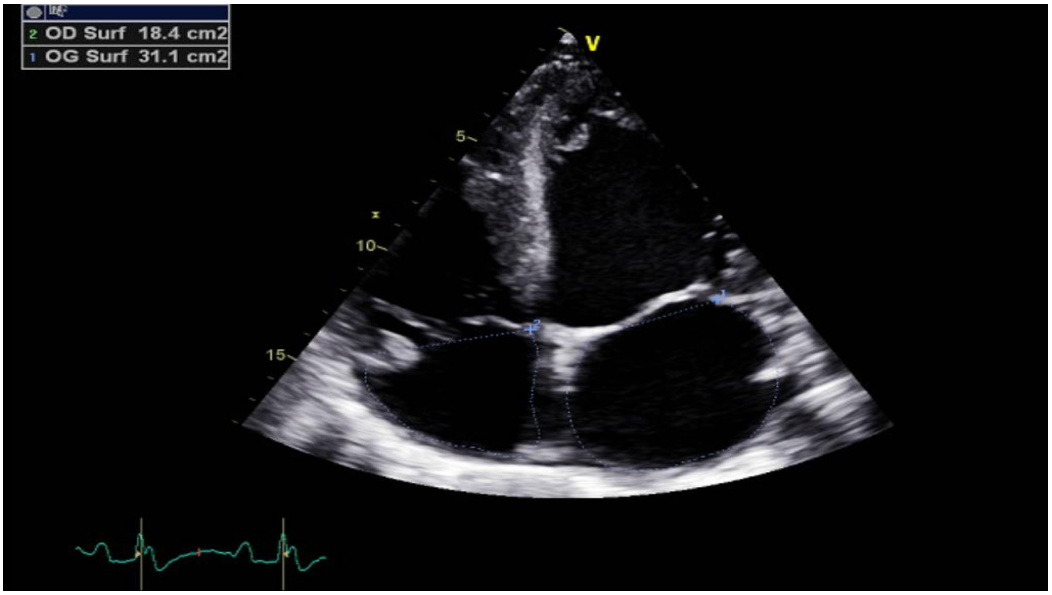

Figure 8: Showing biatrial enlargement
OD: right atrium
OG: left atrium

➔Inferior vena cava:

- Inferior vena cava is dilated (22 cm) with a diminished inspiratory collapse with right arterial pressure of 15 mmHg.

➔Pulmonary artery pressure:

- Peak tricuspid regurgitation velocity: 4.21 m/s

➡ ***PAPS: 85 mmHg***

Given the severe left ventricular dysfunction and pulmonary hypertension, the medical-surgical team has decided to proceed with a cardiopulmonary transplant.

DISCUSSION

While exact prevalence rates can vary, multiple valvular heart disease is relatively common, especially in populations at risk for conditions like rheumatic heart disease and degenerative valve diseases [1].

In cases of combined aortic regurgitation (AR) and mitral regurgitation (MR), the two conditions may

share a common etiology, or the mitral regurgitation could be a consequence of chronic aortic regurgitation.

AR and MR induce an increase in preload to a similar degree, whereas afterload is markedly increased in aortic regurgitation compared to mitral regurgitation [2].

➔ The resulting combination of volume and pressure load further increases wall thickness and left ventricular chamber size [3] and leads to a reduced left ventricular (LV) ejection fraction, which can be worse than that associated with isolated AR or MR [4]. Furthermore, mitral regurgitation (MR) exacerbates the effects of aortic regurgitation (AR) by causing volume and pressure overload in the left atrium and it predisposes patients to atrial fibrillation, pulmonary hypertension, and eventually, right ventricular dilation and dysfunction, leading to secondary tricuspid regurgitation [5].

Valve surgery for isolated or combined aortic regurgitation (AR) and mitral regurgitation (MR) in children and young adults presents a low operative risk, even for severely symptomatic patients but the long-term outcomes remain uncertain, with a significant risk of late morbidity and mortality due to thromboembolism, reoperation for prosthetic or repaired valve dysfunction, and post operative left ventricular dysfunction [4].

In the setting of severe aortic regurgitation and severe secondary mitral regurgitation, double valve replacement is recommended in class IIa indication with level evidence C according to the American Heart Association guidelines for the management of patients with valvular heart disease [6].

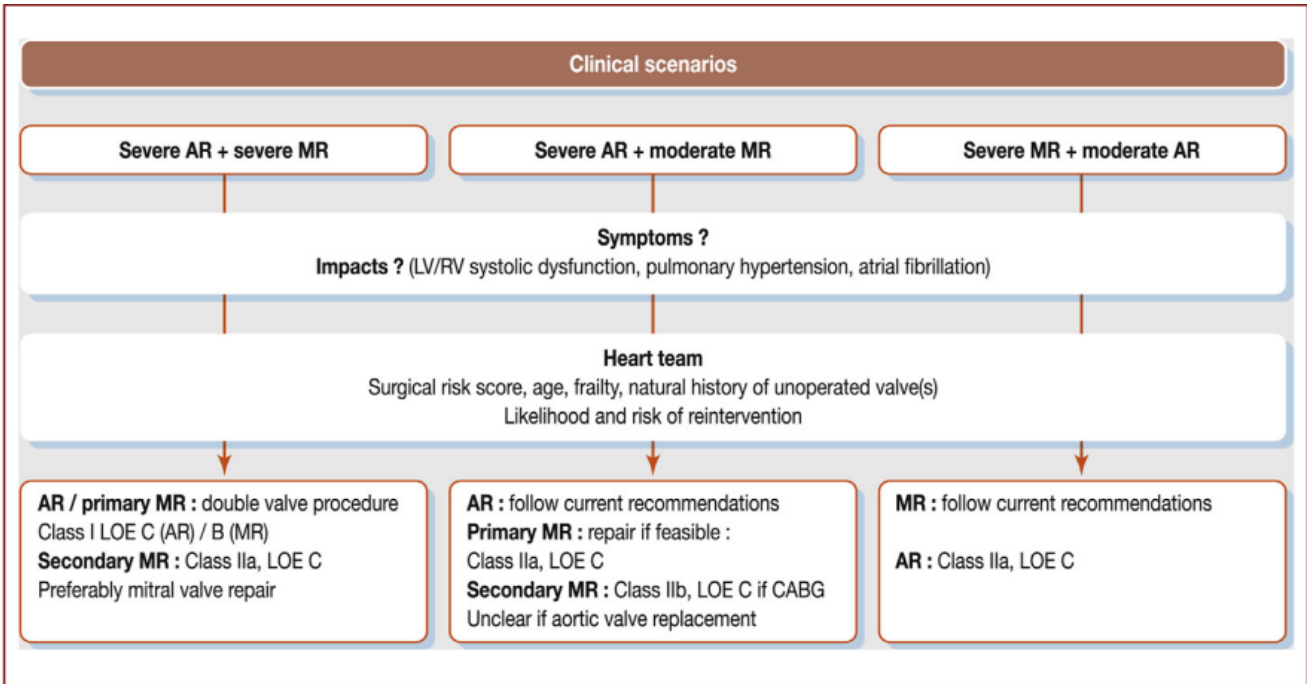

Figure 9: Management strategy according to the severity of aortic regurgitation (AR) and of mitral regurgitation (MR), according to the American Heart Association/American College of Cardiology guidelines for the management of patients with valvular heart disease [6]

Association of aortic regurgitation and functional mitral regurgitation exhibit the largest excess death compared to isolated aortic regurgitation or association of aortic regurgitation and organic mitral regurgitation [7].

CONCLUSION

The coexistence of significant mitral and aortic regurgitation presents a management challenge due to the lack of specific guidelines and limited data to assist in clinical decision-making. The decision whether to perform double valve surgery must take into account the substantially increased operative mortality and post operative left ventricular dysfunction.

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