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Severe mitral regurgitation treated by ventricular septal myectomy

F.S. Silva[1], Â.L. Nobre[2]

[1]Department of Anesthesiology; [2]Department of Cardiothoracic Surgery, Hospital de Santa Maria, Lisboa

A 73 - year - old woman with a previous diagnosis of hypertrophic obstructive cardiomyopathy (HOCM) and severe mitral regurgitation was scheduled for transaortic septal myectomy (Morrow procedure) and mitral reconstruction/replacement.

After anesthesia induction, a transesophageal echocardiography (TEE) was performed in order to assess the extent and site of myectomy required and to clarify the mechanism of the mitral regurgitation (MR).

TEE confirmed subaortic left ventricular outflow tract (LVOT) obstruction (peak velocity 6,5 m/sec, mean gradient of 80 mmHg) (*Figure 1*).

Asymmetric left ventricular hypertrophy involving the interventricular septum (19 mm at end diastole) and systolic anterior motion (SAM) of the mitral valve with septal contact (at a distance of 2 cm from the aortic valve) were also evidenced. TEE pointed SAM as the likely cause of MR (*Figure 2*).

The MR jet was posteriorly directed and apart from thickened leaflets and mild mitral annulus calcification no other anomaly was found (no signs of myxomatous degeneration or leaflet elongation).

Although SAM was initially described in patients with septal and ventricular hypertrophic cardiomyopathy, it occurs much more frequently in other situations (for example after mitral valve annuloplasty). In HOCM, SAM is caused by drag forces or by Venturi phenomenon through an outflow tract narrowed by ventricular septal hypertrophy. The mitral valve is pulled towards the interventricular septum causing contact and LVOT obstruction. Forward motion of the anterior mitral leaflet may result in an interleaflet gap through which MR is produced (*Figure 2*).

Typically, the jet is laterally or posteriorly directed into the left atrium.

Dynamic LVOT obstruction results in marked turbulence detected by color Doppler and increased flow velocity across the LVOT revealed by continuous wave Doppler. The Doppler spectrum has a characteristic late-peaking, dagger-shaped appearance, which is evidence of the dynamic nature of the gradient that develops toward mid- and end-systole (*Figure 1*).

On the contrary, in fixed obstructions the gradient occurs early in systole, at the time of maximal volumetric flow.

In this case the surgical plan was modified according to the TEE findings: mitral sur-

Corresponding author:
Fernanda Santos Silva
Azinhaga das Galhardas, 181, 3°A
1600-470 Lisboa, Portugal
e.mail: fernandassilva25@gmail.com

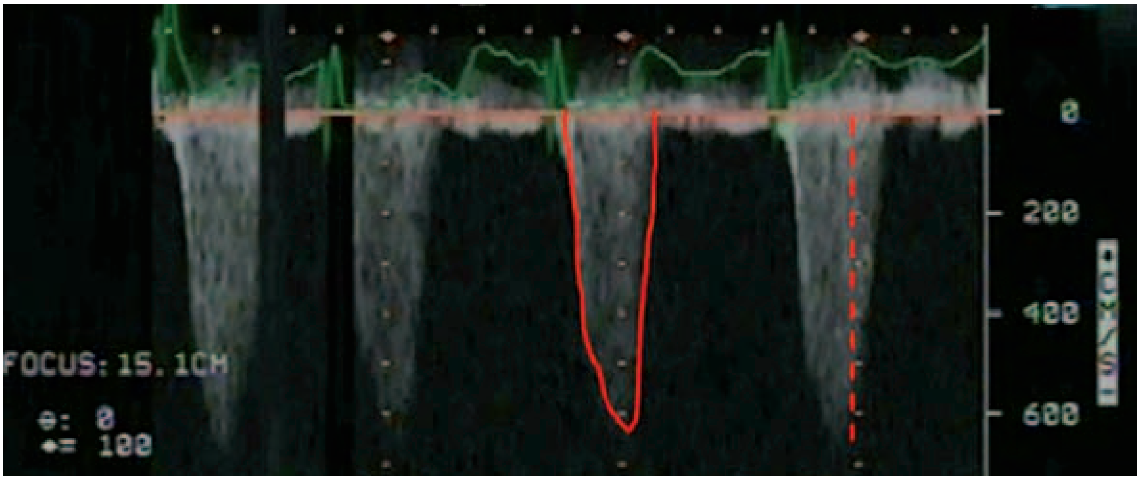

Figure 1 - *Quantification of high velocities across left ventricular outflow tract by Continuous Wave Doppler in the transgastric long-axis view (peak velocity approximately 6,5 m/sec).*
The velocity envelope (red contour) is characteristic of dynamic left ventricular outflow tract obstruction: dagger-shaped and late-peaking (peak velocity is recorded in late systole - see relation with the QRS shown by the red dashed line).

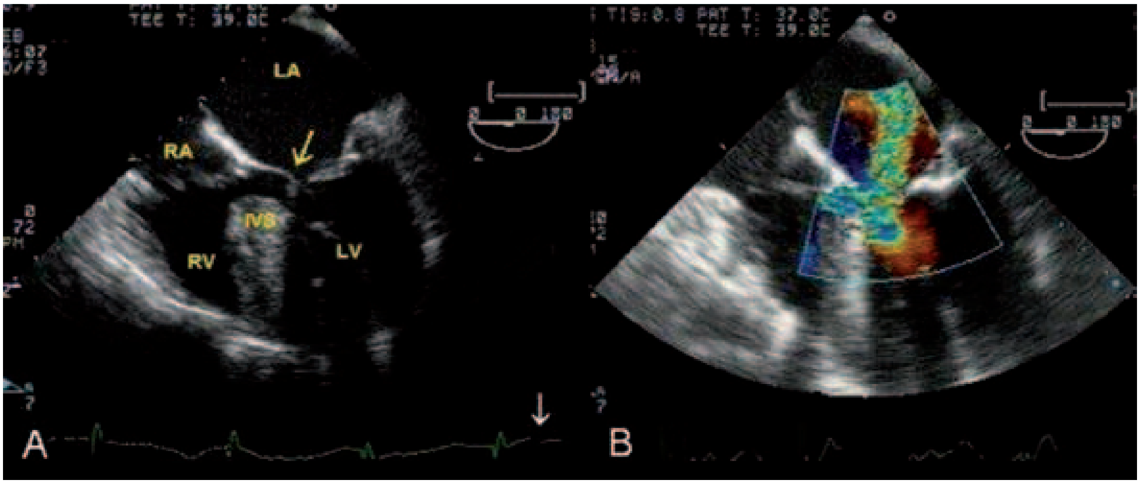

Figure 2 - *Preoperative transesophageal echocardiography images. (Midesophageal four chamber view).*
(LA = left atrium; LV = left ventricle; RA = right atrium; RV = right ventricle; IVS = interventricular septum)
A) Systolic anterior motion: during systole (note the white arrow in the ECG trace) the anterior mitral leaflet can be seen kinked at the mid portion, bended into the left ventricular outflow tract (yellow arrow), causing left ventricular outflow tract obstruction. There is also loss of mitral leaflets coaptation.
B) Through the resultant interleaflet gap a jet of severe mitral regurgitation is evidenced by color Doppler. Also note the intense subaortic aliasing due to the greatly increased velocity across the left ventricular outflow tract.

gery was canceled and only the Morrow procedure was performed. Septal resection was taken along 3 cm (must extend distally at least 1 cm beyond the level of mitral-septal contact) and less than 1 cm deep (after the resection the septum should be at least 1 cm thick). After coming off bypass, intraoperative TEE revealed that septal myectomy normalized LVOT pressure gradients while abolishing SAM and MR (*Figure 3*).

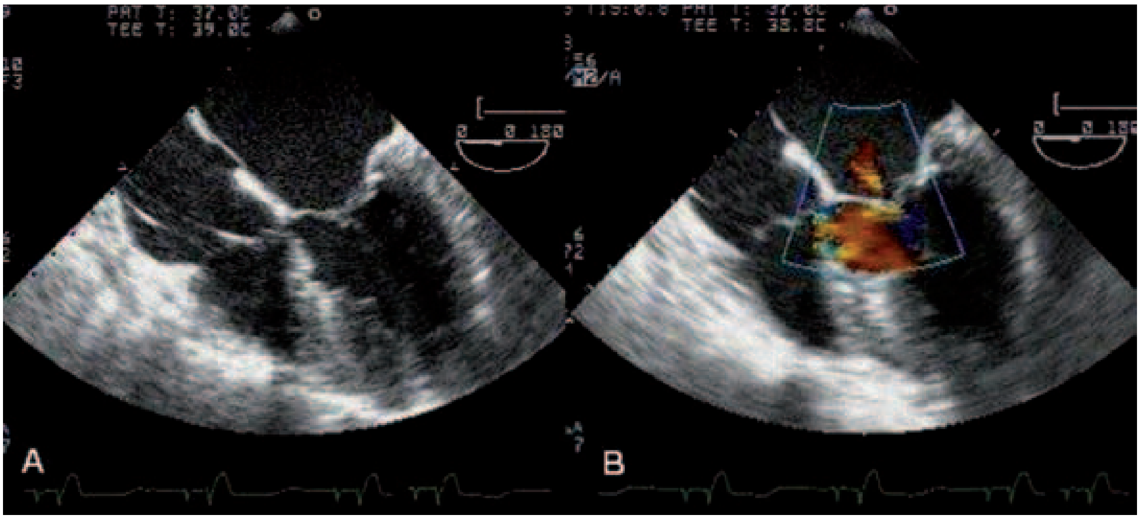

Figure 3 - *Transesophageal echocardiography images after bypass. (Midesophageal four chamber view).* (A) Absence of systolic anterior motion. (B) Absence of mitral regurgitation (only a trivial jet of mitral regurgitation was recorded).

The use of TEE in Morrow procedure has been shown to be essential in intraoperative decision-making and is therefore strongly recommended. TEE allows prediction of which patients will require a mitral valve procedure (those with morphological valve abnormality) and helps the surgeon decide on the extent and depth of the myectomy (1-3). After bypass, TEE is useful to assure adequate muscle resection, to exclude residual MR and assess potential complications of myectomy, including ventricular septal defect.

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