The use of esmolol to treat systolic anterior motion of the mitral valve after mitral valve repair

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Systolic anterior motion of the mitral valve causing left ventricular outflow tract obstruction is common after mitral valve repair, but only rarely necessitates immediate additional surgical intervention. Although multiple surgical techniques have been proposed to prevent systolic anterior motion [1], it remains a problem after mitral valve repair. The degree of systolic anterior motion extends along a continuous spectrum from minor chordal-only systolic anterior motion to its most severe form with permanent left ventricular outflow tract obstruction and moderate-to-severe mitral regurgitation.

The management of systolic anterior motion in the operative room remains controversial. Even if some authors advocate immediate surgical correction [2], most patients with systolic anterior motion can be successfully managed with medical treatment [3] (increasing systemic vascular resistance, augmenting intravascular volume and administering

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β-blockade), and rarely systolic anterior motion leads to early mitral valve repair failure necessitating revision or valve replacement.

A mid-oesophageal four-chamber transoesophageal echocardiographic view is shown of a patient who has just been weaned from cardiopulmonary bypass (CPB) after mitral repair (Fig. 1). The problem we faced was how to differentiate between transient (haemodynamic) and permanent (anatomic) systolic anterior motion. Being a referral centre for mitral surgery, with more than 400 mitral repairs per year[4], we have developed the ‘esmolol test’. Here, 100 mg of esmolol is injected as a bolus through the central venous catheter. A rapid regression of systolic anterior motion is observed.

The potential for systolic anterior motion is provided by anatomic factors such as the presence of redundant anterior leaflet tissue, increased posterior leaflet height, prominent interventricular septum, narrow aortic-mitral angle and a too small annuloplasty ring[5]. Systolic anterior motion may be exaggerated by haemodynamic factors such as hypovolaemia, vasodilation, increased inotropy and increased heart rate. The haemodynamic factors can be considered reversible, while the anatomic factors are relatively fixed and may not regress.

Decreased systemic vascular resistance, inotropic support, increased sympathetic tone and tachycardia with decreased diastolic left ventricular filling time are common haemodynamic conditions that present after separation from CPB. Conventional measures to resolve systolic anterior motion and left ventricular outflow tract obstruction such as intravascular volume expansion, termination of inotropic agents and increasing afterload could require time and may be unsuccessful.

Rapid injection of an esmolol bolus can quickly resolve the systolic anterior motion and left ventricular outflow tract obstruction if it is the result of haemodynamic factors, alleviating hyperdynamic left ventricular conditions and their contribution to dynamic left ventricular outflow tract obstruction and helping to identify the few patients who require immediate additional surgical intervention.

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