TRANSESOPHAGEAL ECHOCARDIOGRAPHY FOR MITRAL VALVE REPAIR SURGERY

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INTRODUCTION

Mitral valve repair has become the procedure of choice for most diseases of the mitral valve as it preserves both the valvular and subvalvular apparatus. In contrast to mitral valve replacement surgery, patients undergoing mitral valve repair have lower in-hospital mortality and length of stay and improved long-term survival.

Several factors have contributed to the evolution of new techniques for mitral valvuloplasty, including changing patient demographics and increased use of intraoperative transesophageal echocardiography (IOE).1-3 Demographically, there are fewer patients with rheumatic disease and more patients with mitral valve disorders that are amenable to repair, such as primary mitral valve degenerative disease or mitral regurgitation (MR} resulting from coronary artery disease. Concurrently, improved diagnostics by physicians skilled in using IOE have increased the potential candidates for mitral valve repair-for example, patients whose mitral valve disease can be diagnosed at the time of coronary artery bypass surgery. Information derived from IOE data can help determine the cause and severity of the mitral valve disease, assess the feasibility of performing a repair, and determine the success of the repair or if further intervention is needed. Medical causes of postoperative MR (systolic anterior motion of the anterior mitral leaflet or the chordae) must be ruled out in advance.4-6

MITRAL REGURGITATION AND IOE

Mitral regurgitation can resulc from abnormalities of any of the four components of the mitral valve: the annular ring, valve leaflets, chordae tendinae and papillary muscles. IOE provides information on both the structure and function of all four components using standard 2D views. Quantitative evaluation using color flow Doppler can determine the severity of MR based on jet area (cm^2), vena contracta (cm), regurgicant fraction (%), regurgitanc volume (ml), or regurgitant orifice area (cm^2). Ocher IOE findings that may help determine chronicity and/or severi$_{ry}$ of MR include reversal of flow through the pulmonary veins, enlarged lefc atrium, pulmonary vascularure size and systolic pressure estimate, and right and left ventricular chamber sizes.

The annular structure is described in terms of size (normal or dilated), calcification, and disjunction (separation between the atrial wall-mitral junction and the ventricular attachment). An ideal candidace for repair would have a dilated annulus without severe calcificacion (Figure 1). Mitral

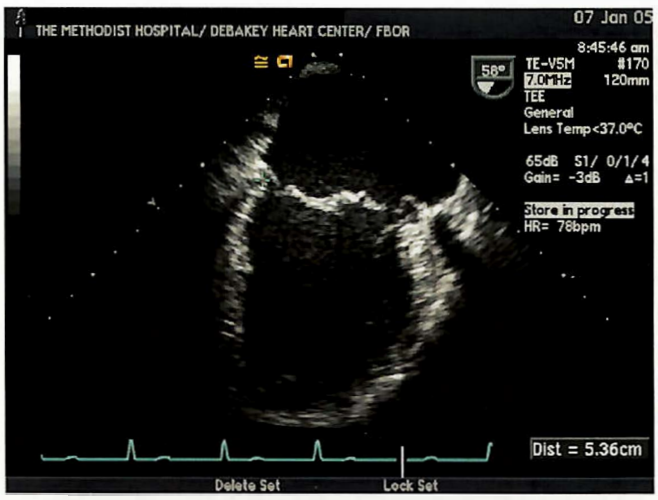

Figure 1. Midesophageal two-chamber view demonstrating mitral annular dilation without severe calcification

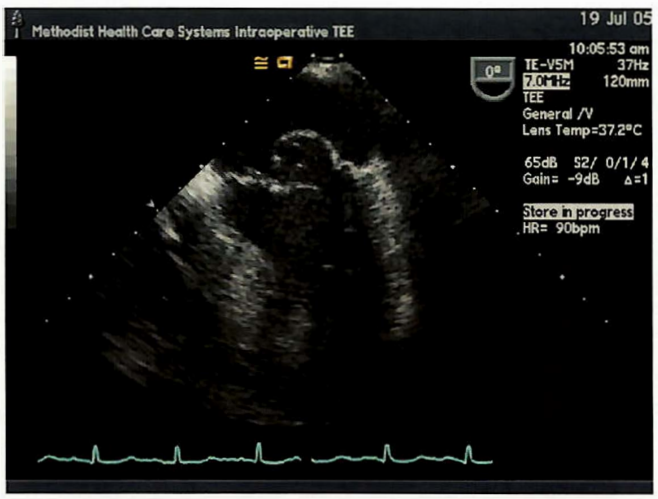

Figure 2. Midesophageal four-chamber view during systole revealing dilated mitral annulus and flail P2 and P3 segments of the mitral valve posterior leaflet with ruptured chordae tendinae

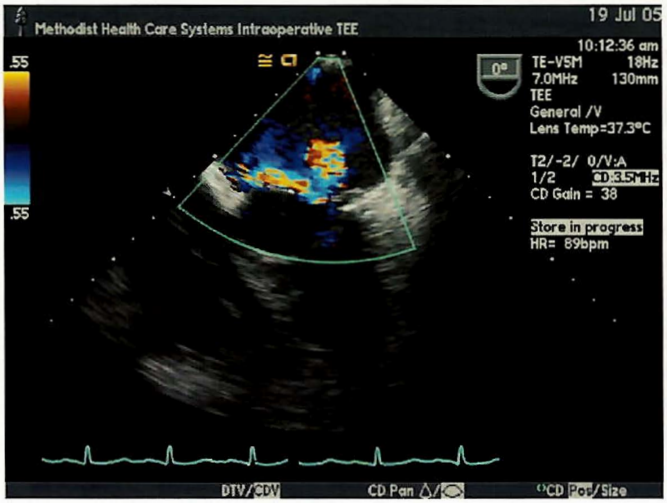

Figure 3. Midesophageal four-chamber view on same patient with color flow Doppler during systole revealing significant mitral regurgitation

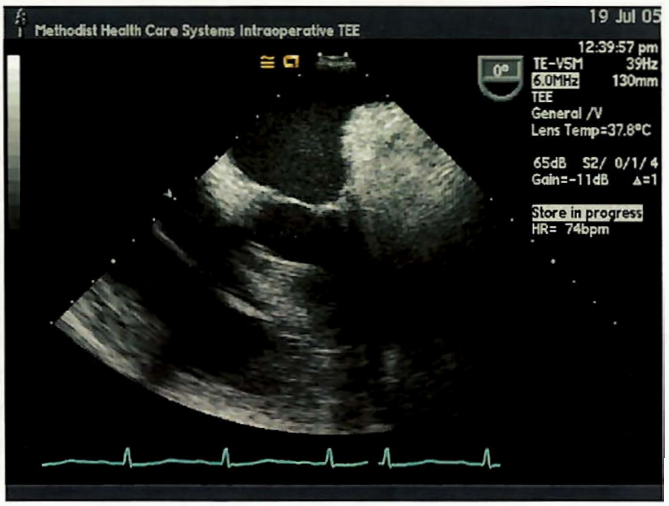

Figure 4. Midesophageal four-chamber view during systole demonstrating postoperative result of above patient with normal coaptation of anterior and posterior leaflets and systolic annular reduction

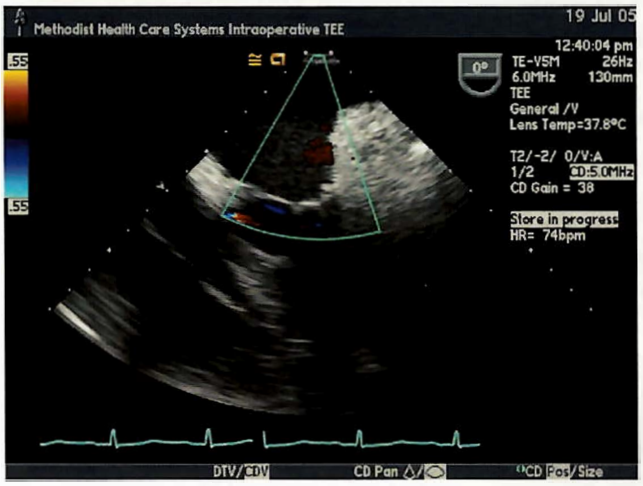

Figure 5. Midesophageal four-chamber view with color flow Doppler during systole demonstrating resolution of mitral regurgitation

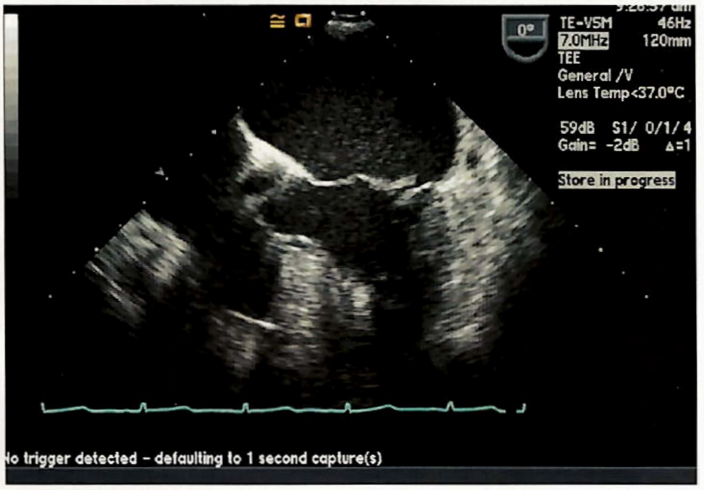

Figure 6. Midesophageal five-chamber view in systole revealing dilated mitral annulus and flail A1, A2 segments of anterior leaflet mitral valve

annular calcification usually occurs in the elderly, more commonly in females, and may cause loss of annular flexibility and MR. When annular dilatation is the sole cause for regurgitation, an annuloplasty ring placed to reduce the orifice size may be the only treatmem needed to improve leaflet coaptation.

Most commonly, however, MR arises from primary leaflet dysfunction that causes excessive or restricted leaflet motion. All three scallops of the anterior and posterior leaflets should be identified. Valve leaflet structure is described as normal or thickened and/or elongated, and whether or not there are associated masses or defects. Valve leaflet function is described as normal or having excessive or restricted leaflet motion. It can result from connective tissue diseases {myxomarous mitral valve), rheumatic fever, bacterial endocarditis and congenital malformations. M_{yx}omatous mitral valve degeneration is most common, usually manifested as posterior mirral leaflet thickening with excessive motion, either prolapse or flail. Congenital diseases causing MR include cleft amerior mitral leaflet associated with primum atrial septa! defects and lengthening of the anterior leaflet associated with Marfan syndrome. Figures 2-9 demonstrate pre- and postoperative IOE findings of patients with posterior or anterior leaflet dysfunctions corrected by mitral valve repair.[7]

Elongated or ruptured chordae tendinae can result in ineffective leaflet coaptation with excessive leaflet motion including flail. Papillary muscle d_{ys}function from ischemia or infarction can result in ineffective tethering of the leaflets and restricted leaflet motion. In general, the MR jet is directed away from the affected leaflet with excessive

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Surgical techniques to correct leaflet dysfunction and chordal abnormalities have evolved to include posterior or anterior leaflet resection and Gor-Tex chordal replacements, both performed along with ring annuloplasty. Residual M R should be evaluated to determine if surgical or medical intervention is needed (Figures 10, 11).

CONCLUSION

Indications for mitral valve repair surgery are expanding as new techniques are developed and as older, more medically compromised patients are being considered for these procedures compared co previous decades. Miera! valve disease once thought co be treated only by replacement can now be created with valvuloplasty, with lower mortality and shorter hospital stays. Careful interpretation of I O E in these patients is important to help achieve optimal results.

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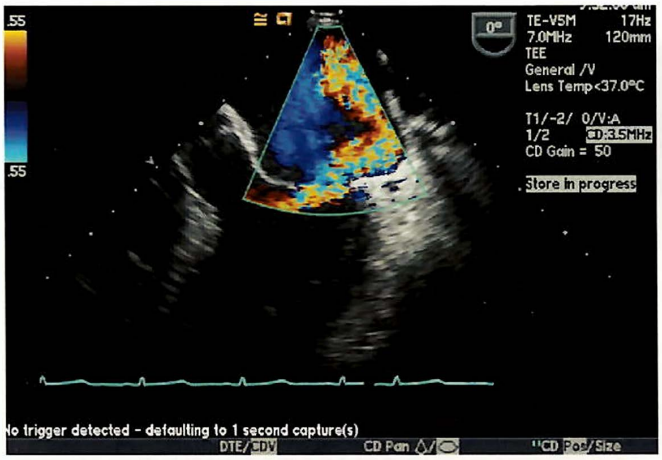

Figure 7. Midesophageal five-chamber view in systole with color flow Doppler demonstrating significant mitral regurgitation

Figure 8. Midesophageal four-chamber view of above patient demonstrating postoperative result with normal capture of anterior and posterior leaflets and systolic annular reduction

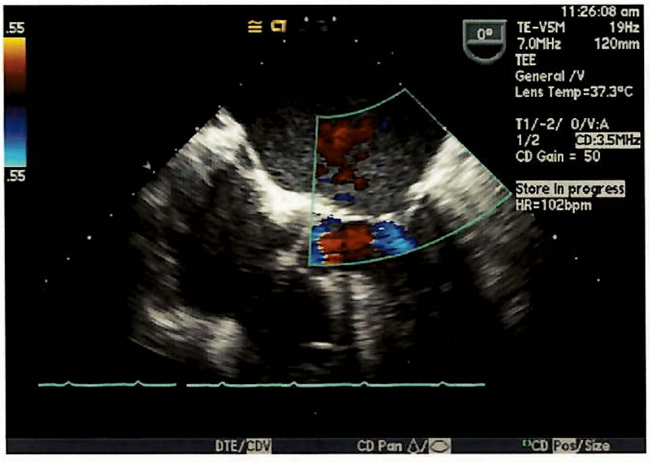

Figure 9. Midesophageal four-chamber view postoperative result with color flow Doppler revealing no mitral regurgitation

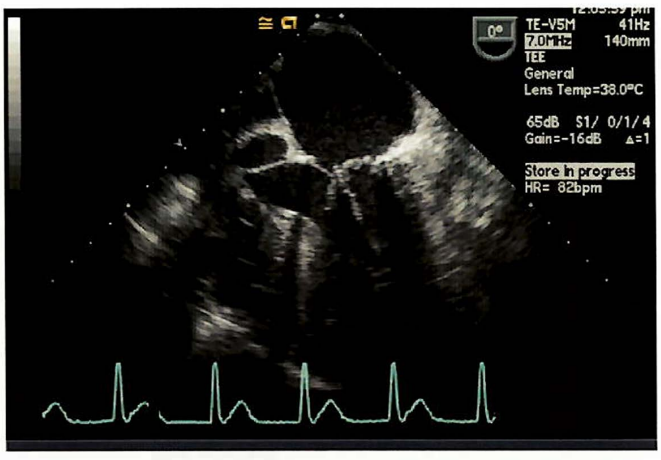

Figure 10. Midesophageal five-chamber view revealing systolic anterior motion of the mitral anterior leaflet at the chordal level, causing obstruction of the left ventricular outflow tract

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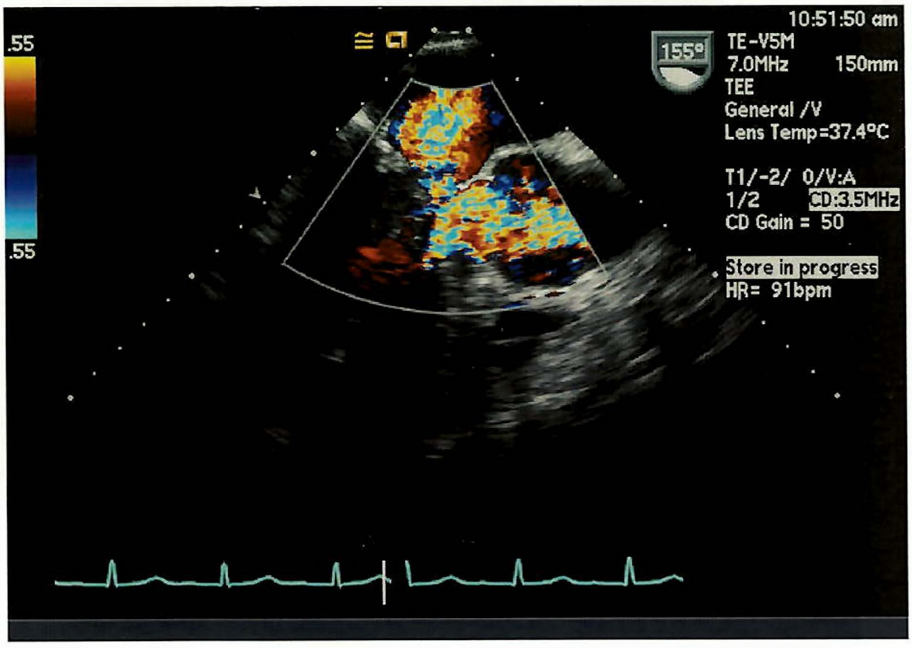

Figure 11. Midesophageal LAX view with color flow Doppler to show mitral regurgitation and left ventricular outflow tract obstruction, both occurring during systole.