Authors have nothing to disclose with regard to commercial support.

SMALL RINGS AND EDGE-TO-EDGE TECHNIQUE ELEVATE TRANSMITRAL GRADIENTS IN MITRAL VALVE REPAIR

To the Editor:

We read with great interest the article by Ma and colleagues¹ about elevated gradient after mitral valve repair and the effect of surgical technique and relevance of postoperative atrial fibrillation. Elevated transmitral gradient may cause not only delayed atrial fibrillation but also all other complications associated with pure mitral stenosis, such as left atrial enlargement, thromboembolism, secondary pulmonary hypertension, and delayed right heart failure. In the article of Ma and colleagues,¹ the elevated pressure gradient after mitral annuloplasty was due to 2 main surgical problems: the use of small, complete, semirigid rings and the addition of edge-to-edge (E-to-E) repair after ring annuloplasty. Ma and colleagues¹ used complete rings sized no larger than 32 mm (real ring area $<5.0 \text{ cm}^2$) in more than 90% of patients who underwent mitral annuloplasty, with rings no larger than 30 mm (real ring area $<4.0 \text{ cm}^2$) used in more than 40%. After ring annuloplasty, the valve areas measured by echocardiography in the working heart are always significantly less (50%-60%) than the actual ring areas. The use of such small, complete, semirigid rings may cause prosthesis-patient mismatch (mean transmitral gradient $>5 \text{ mm Hg}$). Mitral valve repair should not only eliminate valve regurgitation at systole but also make transmitral pressure gradient zero or low at diastole. In adults with an average height of 1.66 m, the length of the anterior annulus (of the anterior leaflet) is $32 \pm 1.3 \text{ mm}$.² For adults, the appropriate average ring size is 32 mm (ring area, 5.0 cm^2). Small rings sized less than 30 mm may cause prosthesis-patient mismatch and high transmitral gradients.³

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Inappropriate combination of the E-to-E repair and ring annuloplasty may elevate valve gradient. Especially, the E-to-E procedure performed to remove residual valve regurgitation after annuloplasty with a ring of relatively small size increases the transmitral gradients. The E-to-E procedure is mostly used for Barlow disease with prolapse of redundant anterior leaflet.⁴ It prevents the elevation of the anterior leaflet above the level of the posterior leaflet, producing a double-orifice mitral valve.⁴ Ma and colleagues¹ performed the E-to-E procedure with ring annuloplasty in 11% of patients ($n = 44$). They did not describe why the E-to-E procedure was performed, and they did not use rings of sufficient size for the E-to-E procedure. To obtain a total valve area of more than 2.5 cm^2 with the addition of the E-to-E procedure, the mean size of the complete rings needs to be 36 mm.⁵ The reduced valve area in ring annuloplasty is further reduced 30% to 50% by the E-to-E procedure. Moreover, the valve area measured in the working heart is even less than the actual ring area. When the E-to-E procedure is combined with annuloplasty that uses complete rings sized no larger than 32 mm (actual ring area $<5.0 \text{ cm}^2$), the possibility of mitral stenosis being seen on postoperative echocardiography is very high. Some surgeons argue that, if each orifice is smaller than 2 cm in diameter, the E-to-E procedure should be abandoned.⁴ The E-to-E technique associated with ring annuloplasty should be performed carefully to prevent postoperative moderate or even severe mitral stenosis.

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<https://doi.org/10.1016/j.jtcvs.2019.05.052>