Transapical simultaneous edge-to-edge neochord repair: A new way to manage bileaflet prolapse?

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Central Message

Simultaneous transcatheter edge-to-edge and neochord repair may potentially be a more effective strategy to repair bileaflet mitral valve prolapse with real-time adjustment to optimize outcomes.

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An attractive feature of transcatheter mitral repair technologies, is the ability to adjust the repair and reduce mitral regurgitation (MR) in real time under transesophageal echocardiographic guidance. MitraClip (Abbott Structural Heart, Santa Clara, Calif), the only FDA approved transcatheter technology that can be used to perform edge-to-edge repair for primary MR, can be limited by its ability to tackle such challenging pathologies as significant prolapse or flail segments, leaving significant residual MR.¹ Transapical neochordal replacement is another novel, off-pump mitral repair for primary MR that has had promising early results.² Longer term outcomes in more complex pathologies, such as anterior or bileaflet prolapse, may be less durable, as shown in the European NeoChord registry.³

The challenge of repairing bileaflet prolapse is to identify a reference chord or leaflet segment to adjust the chordal length to correct the prolapse. In transapical mitral repair with the NeoChord device (NeoChord Inc, St Louis Park, Minn), as described by Colli and colleagues⁴ in this issue of the *Journal*, optimal chordal tensioning is the key to success in this procedure. This requires meticulous fine adjustment of individual chords under transesophageal echocardiographic guidance to eliminate the prolapsing segments while bringing the leaflet down into the left ventricle to maximize leaflet coaptation. In bileaflet prolapse, simultaneous individual tensioning of the neochords attached to both anterior and posterior leaflets can be difficult because of the large number of chords involved. By adding an edge-to-edge technique to the NeoChord device repair, all the chords can now be simultaneously adjusted as a single unit to fix the bileaflet prolapse and optimize leaflet coaptation, with all the deployed neochords converging to one focal point at the apex.

The reported technique is a creative opportunity to address the individual limitations of the transcatheter

edge-to-edge and chordal replacement techniques by using the 2 platforms as adjunctive therapies. In MitraClip repair, the technology relies on leaflet coaptation to reduce the MR but lacks chordal support. In NeoChord device repair, the technology relies on sufficient leaflet length and over-tensioning of the neochords to maximize leaflet coaptation. Combining both techniques together during NeoChord device repair may improve the outcomes of either stand-alone procedure in challenging pathologies such as Barlow disease. As we have learned in surgical mitral repair, surgeons use multiple techniques to reconstruct the mitral valve. A multimodality transcatheter approach may therefore reproduce proven surgical principles of open mitral valve repair while benefiting from real-time assessment of repair efficacy.

Not all bileaflet pathologies may be suitable, however, because creating a double-orifice valve may risk mitral stenosis. The affected leaflet segments would also need to be symmetric (eg, A2/P2 or A3/P3 prolapse/flail) for this combined edge-to-edge NeoChord device repair to work. Nonetheless, the combined technique demonstrated by Colli and colleagues⁴ may improve on the reparability of more complex pathologies with the NeoChord device while offering the benefit of a less invasive but more physiologic method of repairing the mitral valve. As patient advocates, surgeons must embrace innovative technology with cautious

enthusiasm, understanding that long-term durability and outcomes comparable to proven open surgical results must be achieved.

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