Successful mitral valve repair involving division of bridging tissue in a patient with double orifice mitral valve

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Disclosures: Authors have nothing to disclose with regard to commercial support.

Received for publication Aug 29, 2018; revisions received Oct 16, 2018; accepted for publication Oct 21, 2018; available ahead of print Jan 14, 2019.

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J Thorac Cardiovasc Surg 2019;157:e293-5

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2018.10.141>

▶ Video clip is available online.

Double orifice mitral valve (DOMV) is a rare congenital malformation characterized by a mitral valve with 2 orifices that are separated by an accessory bridge of leaflet tissue. In DOMV, the bridging tissue is a critical structure for maintaining valve competence. Therefore, as a conventional mitral valve repair for DOMV, leaflet plication without division of the bridging tissue has been recommended. However, leaflet plication in both orifices may lead to narrowing of the valve orifices, which has been the limitation of mitral valve repair for DOMV. We describe a successful case of mitral valve repair for DOMV with leaflet plication in both orifices and complete division of the bridging tissue.

CLINICAL SUMMARY

A 20-year-old man with mitral regurgitation and New York Heart Association class II symptoms was referred to our hospital. Echocardiography revealed severe mitral regurgitation from the double orifice mitral valve, left ventricular dilation, and low ejection fraction. On the short axis view, the orifices were divided equally, and severe regurgitation was occurring at each orifice (Figure 1). The aortic valve was bicuspid, but there was no significant regurgitation or stenosis.

We performed on-pump beating-heart mitral valve repair without aortic crossclamping. Through a transseptal approach, the bridging tissue between segments A2 and P2 was observed to separate the mitral orifice into 2 approximately equal segments. Regurgitation from

Equal-sized orifices with significant regurgitation occurring from both.

Central Message

DOMV is a rare congenital malformation with 2 orifices separated by an accessory leaflet tissue bridge. We describe a successful case of mitral valve repair with division of the bridging tissue.

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the anterolateral orifice was due to a cleft between segments P1 and P2, whereas regurgitation from the posteromedial orifice was originating from the posteromedial commissure. Because simple conventional leaflet plication decreases the valve orifice area, we performed complete division of the bridging tissue. The chordae connected to the bridging tissue originated from the anterolateral papillary muscle, so the bridging tissue was carefully divided to preserve those chordae. Then, the major cleft between P1 and P2 and the minor cleft between A1 and A2 were closed using 5-0 monofilament sutures. Commissural edge-to-edge sutures, the so-called magic stitches, were placed at both posteromedial and anterolateral commissures. Finally, a Carpentier-Edwards Physio Ring 28 mm (Edwards Lifesciences, Irvine, Calif) was implanted to ensure a sufficient coaptation surface. Disappearance of mitral valve regurgitation was directly confirmed via an on-pump beating procedure (Figure 2).

Postoperative transthoracic echocardiography demonstrated mild regurgitation without stenosis. Twelve years later, transthoracic echocardiography still demonstrated only mild mitral regurgitation, with a low mean pressure gradient of 1.9 mm Hg through the mitral valve (Video 1). The patient has remained in good health without

FIGURE 1. A, Intraoperative photograph showing the orifices being almost equal in size. B, Preoperative echocardiograph showing significant regurgitation occurring from both orifices.

further symptoms and continues to undergo regular follow-up evaluations.

DISCUSSION

DOMV is usually reported as cardiac malformation associated with atrioventricular septal defects.^{1,2} In most patients, the sizes of the 2 orifices are reported to be unequal and the cause of regurgitation was a cleft in the major orifice, for which cleft closure was performed as part of mitral valve repair.^{1,2}

However, in our patient, the orifices were almost equal in size and significant regurgitation was occurring from both orifices. Therefore, if leaflet plication in both orifices without division of the bridging tissue was performed, the effective valve orifice became too small. To maintain the valve orifice area, division of the bridging tissue was necessary.

According to previous case reports, the bridging tissue should not be divided due to its importance in maintaining the competency of the valve because division of the bridging tissue resulted in severe regurgitation that was not amenable to repair.^{2,3} Unfortunately, to date, no mechanisms of failure have been suggested. The possible

FIGURE 2. A, The mitral valve before ring annuloplasty showing mild residual regurgitation due to decreased leaflet coaptation. B, The mitral valve after ring annuloplasty showing improved regurgitation because of shortening of the anteroposterior diameter and creating a good coaptation surface.

cause of valve regurgitation after bridging tissue division is the lack of a coaptation surface between the anterior and posterior leaflets due to dilation of the anteroposterior diameter of the mitral valve annulus and prolapse of the bridging tissue resection stump. In the present case,

DOMV

- Double orifices : equal in size
- Cause of regurgitation
 - ✓ Cleft between P1 and P2
 - ✓ Posteromedial commissure
- MR : severe
- LV/Dd/Ds : 58.7 mm/43.9 mm
- EF : 49%
- Regurgitation occurring from both orifices

VIDEO 1. Video demonstrating the procedure of the double orifice mitral valve repair and transthoracic echocardiograph taken preoperatively and 12 years after surgery. Video available at: [https://www.jtcvs.org/article/S0022-5223\(18\)32961-1/fulltext](https://www.jtcvs.org/article/S0022-5223(18)32961-1/fulltext).

annuloplasty with remodeling ring fixed the septal-lateral diameter and ensured an adequate coaptation surface. Additionally, the chordae connected to the bridging tissue were preserved and the bridging tissue resection stump was fixed with sutures to prevent prolapse. Considering previous case reports and our present case, when leaflet plication or smaller orifice closure make it difficult to ensure the effective orifice area, and when the leaflet tissue is expected to have enough volume to ensure a sufficient coaptation after proper-sized ring annuloplasty, DOMV can be repaired using our strategy.

CONCLUSIONS

Mitral valve repair involving the division of the bridging tissue and leaflet plication was effective in the

present case of DOMV regurgitation. In cases wherein division of the bridging tissue is necessary, the use of remodeling ring annuloplasty is mandatory to maintain valve competence.

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