Successful mitral repair for central bridge double-orifice mitral valve via right mini-thoracotomy

Kazuki Hisatomi, MD, PhD, Shunsuke Taguchi, MD, Ichiro Matsumaru, MD, PhD, Takashi Miura, MD, PhD, Kiyoyuki Eishi, MD, PhD

PII: S2666-2507(24)00149-4
DOI: https://doi.org/10.1016/j.xjtc.2024.03.020
Reference: XJTC 1661

To appear in: JTCVS Techniques

Received Date: 2 March 2024
Revised Date: 28 March 2024
Accepted Date: 29 March 2024

Please cite this article as: Hisatomi K, Taguchi S, Matsumaru I, Miura T, Eishi K, Successful mitral repair for central bridge double-orifice mitral valve via right mini-thoracotomy, JTCVS Techniques (2024), doi: https://doi.org/10.1016/j.xjtc.2024.03.020.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Copyright © 2024 The Authors. Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery
Successful mitral repair for central bridge double-orifice mitral valve via right mini-thoracotomy

Authors
Kazuki Hisatomi, MD, PhD,a Shunsuke Taguchi, MD,a Ichiro Matsumaru, MD, PhD,a Takashi Miura, MD, PhD,a Kiyoyuki Eishi, MD, PhDb

Institution and Affiliation
aDepartment of Cardiovascular Surgery, Nagasaki University, Nagasaki, Japan
bDepartment of Cardiovascular Surgery, Hakujyuji Hospital, Fukuoka, Japan

Disclosure Statement
The authors have nothing to disclose.

Funding Statement
No funding was provided for this study.

IRB approval
IRB approval was not required.

Consent statement
The patient provided informed written consent to publish this case report and accompanying images.
Mitral repair for MR associated with central bridge DOMV.

Mitral repair for complex MR from DOMV is considered challenging. This case report provides a noteworthy example of successful repair using the same techniques as for degenerative MR.
Double-orifice mitral valve (DOMV) is a rare congenital mitral valve disease. Some patients with DOMV develop acquired mitral regurgitation (MR). Many surgeons consider complex MR associated with DOMV unsuitable for repair. However, we present a successful case of minimally invasive mitral repair for MR associated with DOMV. IRB approval was not required; the patient provided informed written consent to publish this case report and accompanying images.

Case report

A 21-year-old woman presenting with MR and New York Heart Association class II exertional dyspnea was referred to our hospital. Echocardiography revealed severe MR from DOMV with a central bridge and a billowing posterior leaflet with prolapse at the medial scallop (P3) with torn chordae. The orifices were divided approximately equally. The annular diameter was 30mm in the apical 4-chamber view. The severe regurgitation jet originating from the P3 site was directed toward the lateral side (Figure 1).

The operation was performed through a right mini-thoracotomy approach via the fourth intercostal space. Cardiopulmonary bypass was established through right femoral artery perfusion and venous drainage via the right internal jugular and right femoral veins. After aortic cross-clamping, the mitral valve was exposed through a right-sided
left atriotomy under cardiac arrest. Upon inspection, the mitral valve was found to have two orifices separated into approximately equal segments by a fibrous bridge between segments A2 and P2. Prolapsed P3 with torn chordae was observed on the posteromedial orifice. Myxomatous changes were observed at A2, A3, P2, and P3 (Figure 2). Mitral repair was performed without dividing the fibrous bridge through triangular resection and suture of P3 using 5-0 monofilament sutures, and neo-chord reconstruction of the torn chordae using 4-0 expanded polytetrafluoroethylene suture. The suture was passed through the head of the posteromedial papillary muscle. Lastly, annuloplasty was performed with a 32 mm Cosgrove-Edwards annuloplasty ring (Edwards Lifesciences, Irvine, CA). The size of the annuloplasty ring was selected based on the area of the anterior leaflet and the distance between the bilateral fibrous trigones (Video 1). Intraoperative transesophageal echocardiography (TEE) demonstrated successful repair with no regurgitation or mitral stenosis (MS). The patient has remained well for six years post-repair, with recent echocardiography indicating no MR or MS.

**Discussion**

DOMV is a rare malformation, with a prevalence of 0.05% as an isolated disease and 1% when coexisting with other congenital heart diseases, such as atrioventricular...
In most patients, the sizes of the two orifices are unequal and regurgitation originates from a cleft in the major orifice or accessory orifice itself, for which cleft closure is widely performed as part of mitral repair. The central bridge type and duplicate mitral valves in our case remain uncommon. Moreover, our case presented a complex lesion of a billowing leaflet with prolapse with torn chordae.

Mitral repair for complex MR associated with DOMV is technically challenging. In cases of extensive or complicated mitral defects, valve replacement is often mandatory. Mitral repair is preferable, especially for younger patients, as in our case. However, there is limited data available regarding mitral repair for complex MR associated with DOMV.

In this case, a combination of triangular resection and neo-chord reconstruction techniques was successfully performed. The principle involves restoring the coaptation area through triangular resection of excess tissue and re-establishing the coaptation line through neo-chord reconstruction, the same as for degenerative mitral disease. We considered the etiology of this case as repairable using techniques based on this principle. Preoperative real-time three-dimensional TEE proved valuable in understanding the mechanism of MR and the morphology of the mitral valve. Mitral repair was accomplished without dividing the fibrous bridge. In line with a previous
report\textsuperscript{1}, we opted not to divide the bridging tissue due to its importance in maintaining the valve component. However, it is worth nothing that a case of successful mitral repair by dividing the bridging tissue has been reported.\textsuperscript{3}

\textbf{Conclusion}

We suggest that common mitral repair techniques remain reliable and durable, even for central bridge DOMV regurgitation. It is essential to evaluate lesions to determine the extent of the resection, and the indication of neo-chord reconstruction in each case.

\textbf{References}


Figure 1. Preoperative TEE demonstrating prolapsed P3 with torn chordae (white arrow) and fibrous bridge (red asterisk). Color Doppler imaging demonstrating regurgitation jet originating from P3 site.

Figure 2. Intraoperative image showing myxomatous change of mitral leaflet and prolapsed P3 with torn chordae (black arrow). The orifices were separated by bridging tissue (black asterisk).

Video Legend

Video 1. Minimally invasive mitral repair for MR associated with central bridge DOMV.