Transapical off-pump Neochord implantation on bileaflet prolapse to treat severe mitral regurgitation

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Abstract

A 74-year old lady was admitted for the presence of a symptomatic severe mitral regurgitation (MR) due to bileaflet prolapse. The patient refused any surgical conventional procedure because of severe arthrosis and osteoporosis documented by previous fractures requiring knee and hip replacements, and was sent directly to us for transapical off-pump mitral valve repair with Neochord implantation (TOP-MINI procedure). The TOP-MINI procedure was performed under general anaesthesia and transoesophageal echocardiographic guidance. Four Neochordae were implanted on the posterior leaflet and two on the anterior leaflet in order to correct a residual anterior prolapse that was not seen at preoperative screening. After 11 months of follow-up, the patient presented with recurrence of symptomatic moderate MR due to rupture of one of two neochordae implanted on the anterior leaflet and new onset of atrial fibrillation. The patient underwent uneventful mitral valve replacement.

Keywords: Mitral regurgitation • Transapical mitral valve repair

CASE DESCRIPTION

A 74-year old lady came to our attention for the presence of a symptomatic severe MR. TOE showed a posterior leaflet prolapse (eccentric holosystolic jet) with a preserved ventricular function (Left ventricular ejection fraction 70%, Left ventricular end diastolic volume indexed 59 ml/m², annular dimensions: antero-posterior 28 mm, latero-lateral 36 mm) (Fig. 1, Video 1).

The patient was admitted in NYHA functional class III. Her medical history was significant for drug-resistant systolic hypertension with a previous crisis that required hospital admissions, and diabetes. The Logistic EuroSCORE estimated risk and the STS score were 3.25 and 1.70%, respectively. The patient refused any surgical conventional procedure because of a severe arthrosis and osteoporosis documented by previous fractures requiring knee and hip replacements. Owing to the presence of general physical and psychological frailty of the patient, we proposed to her a TOP-MINI procedure, evidencing the limitation on long-term follow-up.

We present here the case report of a patient with severe MR due to bileaflet MV disease treated with the TOP-MINI procedure.
At the 9-month follow-up, she presented with mild residual MR. At 11 months, she presented with recurrence of moderate MR that together with an LV restrictive pattern and new onset of atrial fibrillation made her symptomatic and with difficult pharmacological management. For this reason, she underwent MV replacement with a 33-mm porcine bioprosthesis (SJM Epic, MN, USA). Intraoperative findings showed that all the chordae on the posterior leaflet were in place and completely endothelialized; of the two chordae on the anterior leaflet, only one was left in place; the second one was attached at the apex but its insertion on the leaflet was torn. The neochords were easily identified because, despite the fact that they were completely endothelialized, they were very straight and paired differently from native short and fan-shaped chordae.

This case demonstrates the technical feasibility of the implantation of neochordae on both mitral leaflets using the TOP-MINI procedure. This approach was associated with a significant reduction of MR that was maintained for almost 1 year, suggesting that this therapeutic option is technically feasible and could be considered also in selected patients with bileaflet disease after future evaluations. The late recurrence of moderate MR due to flail of the anterior leaflet taught us that we should implant at least four chordae on the anterior leaflet in order to distribute adequately the tension that each neochord should manage. It is important to underline that the anterior leaflet normally covers two thirds of the entire MV orifice with consequent high forces to support compared with the posterior leaflet.
The transapical access is more postero-lateral than for TAVI. The need of this special access is based on the anatomy of the MV apparatus that is more ‘posterior’ with respect to the aortic valve. The neochords need to be aligned as much as possible to the native chord in order to diminish any type of excessive tension that could lead to leaflet tear. The need of this access is also required in order to simplify the ventricular navigation of the device and the crossing of the MV, diminishing the risk of interference with the sub-valvular apparatus.

It is also important to underline that the lack of an annuloplasty ring has to be addressed with future long-term follow-ups, in particular in patients with initial LV dilatation; for this reason, we have to highlight that the greatest benefits of the TOP-MINI procedure were seen when performed at an early stage of the degenerative disease, i.e. when the pathology was limited to the leaflets.

In conclusion, this case report demonstrates that transapical off-pump neochord implantation to treat bileaflet prolapse is technically feasible but it needs future refinements in order to improve long-term durability and reproducibility. At this moment, the present technique should be applied only in selected cases.

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REFERENCES