

IMAGES IN INTERVENTION

Reduction of Para-Ring Regurgitation After Transcatheter Mitral Valve Replacement Into a Failed Mitral Annuloplasty Ring



Konstantinos Toutouzas, MD, PhD,^a Vasilis Lozos, MD,^b George Oikonomou, MD,^a Constantina Aggeli, MD, PhD,^a George Latsios, MD, PhD,^a Maria Drakopoulou, MD, PhD,^a Andreas Synetos, MD, PhD,^a George Trantalis, MD,^a Konstantinos Stathogiannis, MD,^a Konstantinos Triantafyllou, MD,^b Dimitris Tousoulis, MD, PhD^a

Trascatheter valve-in-ring procedure has shown in a number of small case series to be feasible, safe, and able to offer short-term clinical and hemodynamic improvement in selected high-risk patients after failed surgical mitral annuloplasty ring repair (1).

Hereby, we report a case of a 70-year-old man who was admitted due to progressively increasing dyspnea (New York Heart Association functional class III). The patient had a background of severe degenerative mitral regurgitation secondary to ruptured tendinous cord of the anterior mitral leaflet, for which he underwent complex mitral valve reconstruction including annuloplasty with a 25-mm circular flexible Duran ring (Medtronic, Minneapolis, Minnesota), implantation of the ruptured tendinous cord into the anterior papillary muscle, and placement of new synthetic chordae tendineae. At the same time, he received a prosthetic metallic aortic valve (ATS Open Pivot Heart Valve 25 mm, ATS Medical, Inc. Minneapolis, Minnesota) due to severe aortic insufficiency. On admission he was found to have normocytic anemia (hemoglobin = 7.1 g/dl) accompanied by elevated

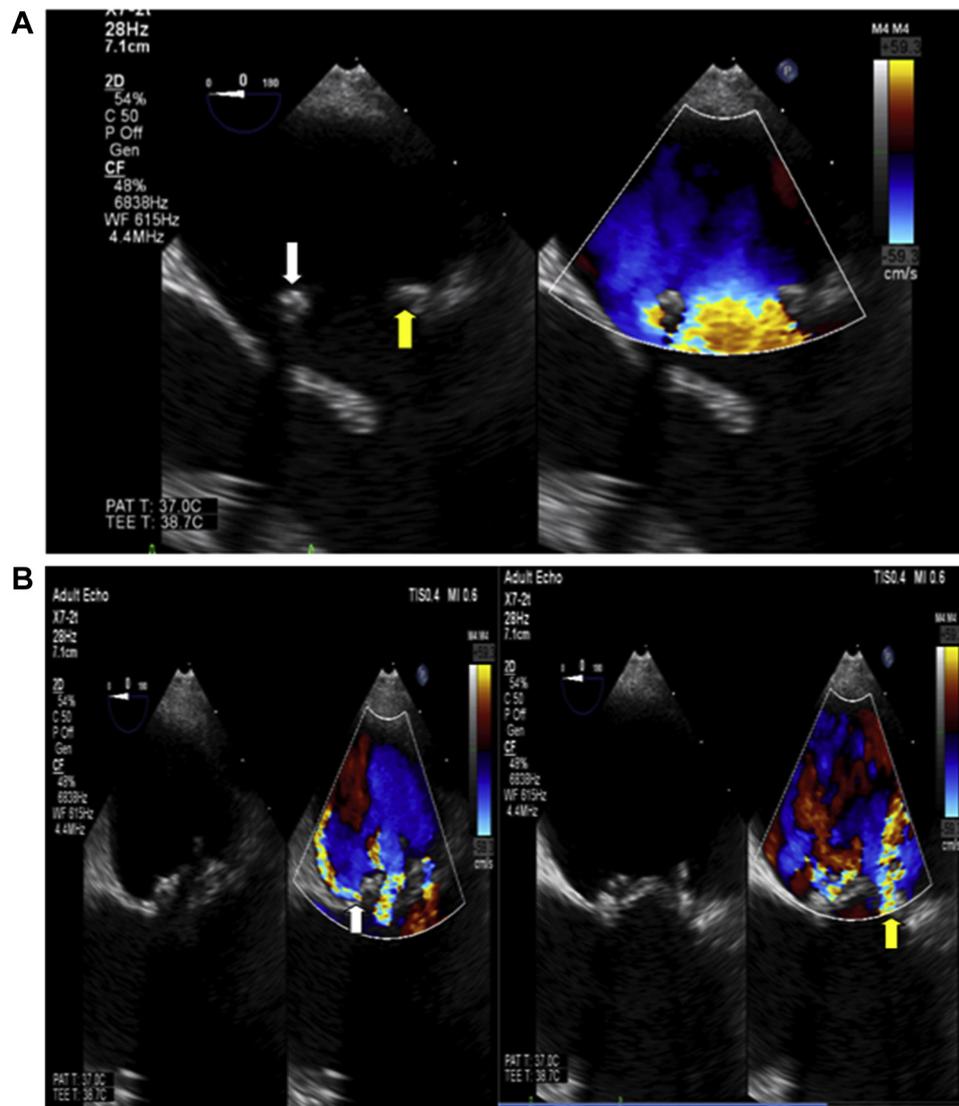
indirect bilirubin and Lactate dehydrogenase levels, suggestive of hemolytic anemia.

Transthoracic echocardiography and transesophageal echocardiography (TEE) studies revealed moderate to severe para-ring intravalvular mitral regurgitation due to partial dehiscence of the annuloplasty ring in the anterior mitral annulus (Figures 1A to 1C, Online Videos 1 and 2) and severe transvalvular mitral regurgitation due to malcoaptation of the valve leaflets (Figure 1B, Online Video 1). Due to the high surgical risk of the patient and the favorable characteristics of the annuloplasty ring (flexible with circular geometry), the Heart Team decided to proceed to a transcatheter valve-in-ring procedure. In case of inefficacious sealing, decision was made to implant an Amplatzer occluder device (St. Jude Medical, St. Paul, Minnesota) in the perivalvular space of ring dehiscence.

The patient underwent a transapical approach under fluoroscopic and TEE guidance. A 29-mm SAPIEN XT prosthesis was mounted upside down on a Novaflex catheter (Edwards Lifesciences, Irvine, California) in the retrograde orientation. Then, the SAPIEN XT valve was successfully placed within the

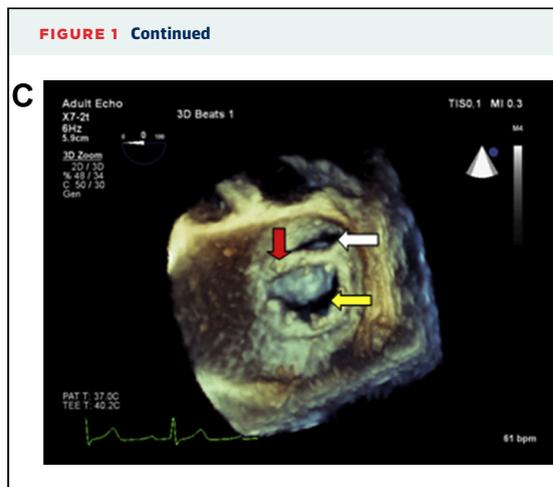
From the ^aFirst Department of Cardiology, Hippokraton Hospital, University of Athens, Athens, Greece; and the ^bDepartment of Cardiothoracic Surgery, Hippokraton Hospital, University of Athens, Athens, Greece. Dr. Toutouzas has served as a proctor for the Medtronic CoreValve. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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FIGURE 1 Para-Ring Intravalvular Regurgitation Due to Partial Mitral Annuloplasty Ring Dehiscence

(A) Two-dimensional transesophageal echocardiography (TEE) midesophageal view at 0° during diastole. Partial dehiscence of the annuloplasty ring from the anterior mitral annulus (dehiscent ring: **white arrow**; native annulus: **yellow arrow**) (Online Video 1). **(B)** TEE image during ventricular systole. Two different jets are visible: an eccentric jet of moderate to severe para-ring regurgitation in the anterior direction between the annuloplasty ring and the native mitral annulus (**white arrow**) and a jet of severe transvalvular mitral regurgitation due to malcoaptation of the valve leaflets (**yellow arrow**) (Online Video 1). **(C)** A 3-dimensional TEE image view of the mitral valve from the left atrium. Two orifices are visible: the orifice of the prosthetic ring (**yellow arrow**) and the orifice between the ring and the anterior mitral annulus at the site of annular dehiscence (**white arrow**). The stitches can still be viewed (**red arrow**) (Online Video 2).

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Duran ring (Figure 2A). The positioning was carefully checked by fluoroscopy and TEE and optimized by slow balloon inflation under rapid ventricular pacing. Attempts were made to place the prosthesis one-third in the left atrium and two-thirds in the left ventricle so as to cover the annuloplasty ring with the basal skirt of

the SAPIEN valve to reduce the risk of periprosthetic leak and at the same time avoid obstructing the left ventricular outflow tract (LVOT) in the presence of a mechanical aortic valve (Figure 2B).

The prosthetic mitral valve was in situ and well seated within the mitral ring, while it was functioning properly with only mild perivalvular regurgitation (Figure 3A, Online Video 3). The deformability of the flexible Duran ring made it possible to obtain a more circular configuration allowing for good application of the prosthesis (Figure 3B, Online Video 4). Furthermore, effective reduction of the para-ring leak was achieved at the leaflet level by proper sealing of the native anterior mitral leaflet around the prosthesis (Figure 3B). Mean gradient of the prosthetic mitral valve was 6 mm Hg and there were no signs of dynamic LVOT obstruction.

The patient's dyspnea had substantially improved and signs of hemolysis had resolved during hospitalization. He was discharged at day 5 after an uneventful recovery period and at 1 month follow-up the patient was experiencing only mild symptoms during his ordinary physical activity (New York Heart Association functional class II) with no

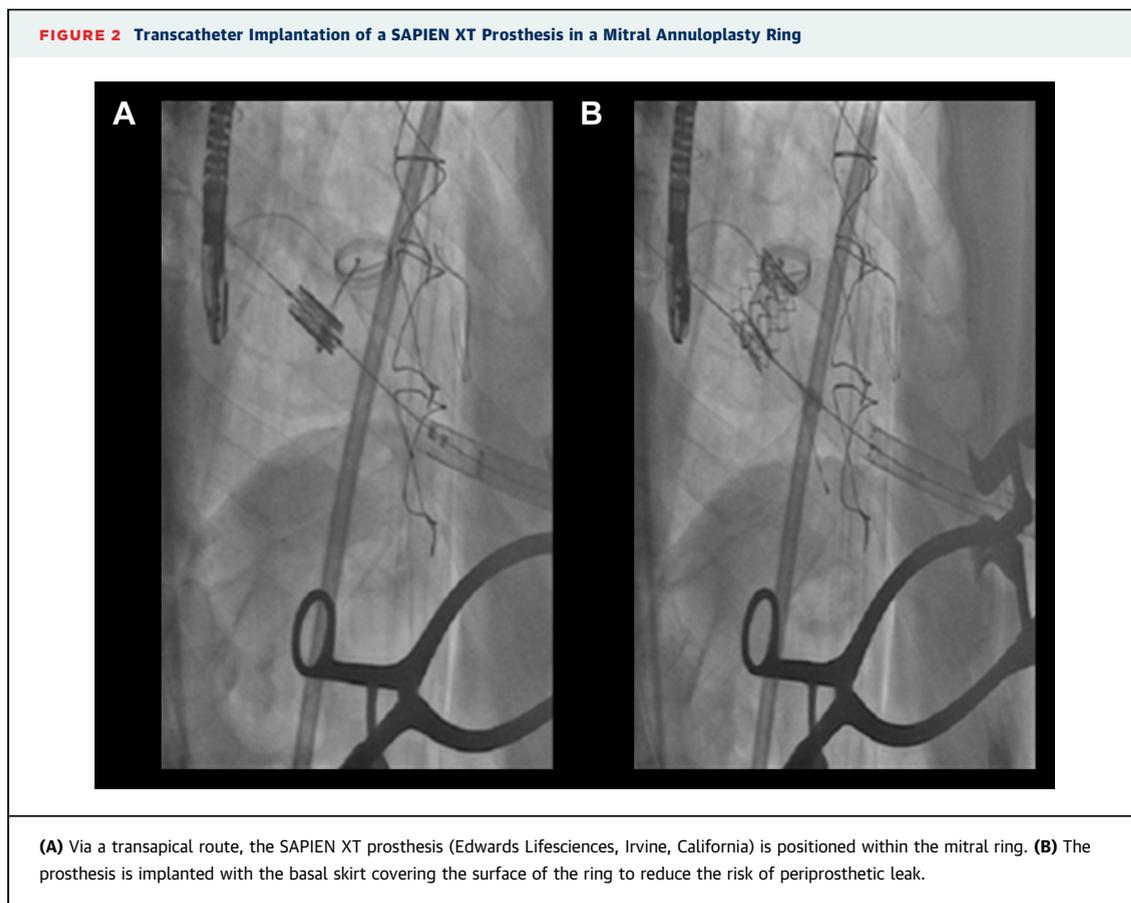
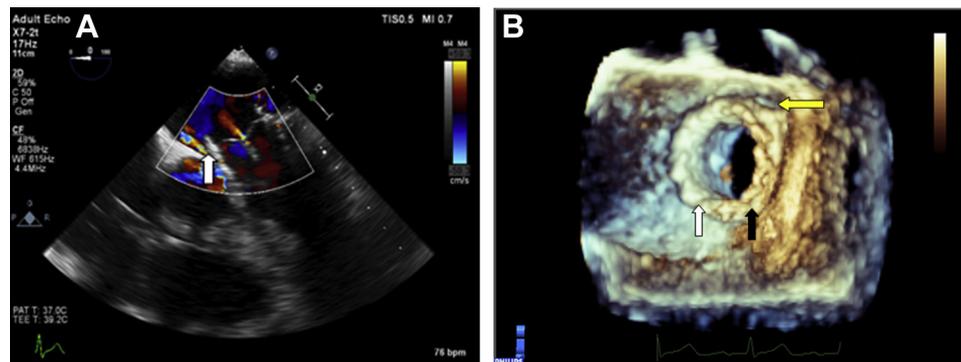
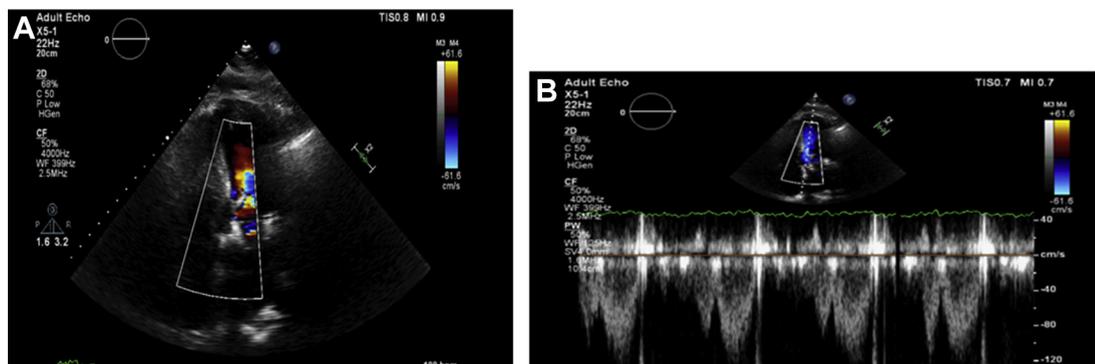


FIGURE 3 Early Post-Operative Outcome: Effective Sealing of the Area of Ring Dehiscence and Reduction of the Para-Ring Regurgitation

(A) Two-dimensional transesophageal echocardiography image post-implantation (Online Video 3). The prosthetic mitral valve was in situ and well seated within the mitral ring, while it was functioning properly with only mild to mild-moderate perivulvar regurgitation (white arrow). (B) Three-dimensional transesophageal echocardiography image post-implantation (Online Video 4). Deformation of the flexible Duran ring (black arrow), which tends to become more circular allowing a good application of the prosthesis (white arrow). Furthermore, the native anterior mitral leaflet mechanism contributes to the significantly reduced size of the detached ring area (yellow arrow).

FIGURE 4 30-Day Outcome: Good Function of the Bioprosthesis With No LVOT Obstruction

(A) Thirty-day follow-up transthoracic echocardiography 5-chamber view. Good function of the prosthesis with no transvalvular and mild-to-moderate periprosthetic regurgitation. (B) Thirty-day follow-up transthoracic echocardiography 5-chamber view. Assessment of the left ventricular outflow tract gradient indicating no obstruction.

recurrence of hemolysis. Furthermore, at 30-day follow-up, transthoracic echocardiography demonstrated good function of the SAPIEN valve, with no obstruction of the LVOT (Figures 4A and 4B).

ADDRESS FOR CORRESPONDENCE: Dr. Konstantinos Toutouzas, 24 Karaoli and Dimitrioustr, 15562, Hologargos, Athens, Greece. E-mail: ktoutouz@gmail.com.

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KEY WORDS failed surgical mitral valve repair, ring dehiscence, transcatheter mitral valve replacement

APPENDIX For supplemental videos, please see the online version of this paper.