Reducing operative mortality in valvular reoperations: The "valve in ring" procedure

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Percutaneous valve therapy is an emerging therapy for aortic valve replacement in patients at high surgical risk.[1] Favorable results have cautiously extended indications to high-risk patients with failing bioprostheses.[2]

Despite proven durability of mitral valve repair, some patients may require a reoperation and may represent a challenging surgical risk. The concept of "valve in ring" could be a solution for such patients, but this has, to our knowledge, been reported only in an experimental setting.[3] We recently encountered a patient with failed mitral valve repair in whom a "valve in ring" procedure was performed.

CLINICAL SUMMARY

An 85-year-old cachectic female patient (1 m 59 cm, 37 kg) came to the emergency department in pulmonary edema (functional class IV). Her medical history included rheumatoid arthritis and colorectal cancer that was resected in 1990. She subsequently underwent chemotherapy and radiotherapy and remained oncologically free of cancer ever since.

In 2007 she underwent thoracoscopic mitral valve repair for grade III central mitral valve regurgitation. A 28-mm Physio I annuloplasty ring (Edwards Lifesciences, Irvine, Calif) was implanted. The left ventricular ejection fraction at that time was 50%. Postoperative recovery was uneventful.

Current cardiac investigations revealed grade III–IV mitral valve regurgitation (Figure 1) and a left ventricular ejection fraction of 20%. No other cardiac abnormalities were diagnosed.

Given the poor general condition of this patient and her high logistic EuroSCORE (82.3%), she was judged to be at too high a risk for reoperation via either sternotomy or thoracoscopy. Therefore, a "valve in ring" solution was proposed as an off-label compassionate-use procedure for which the patient and her family consented.

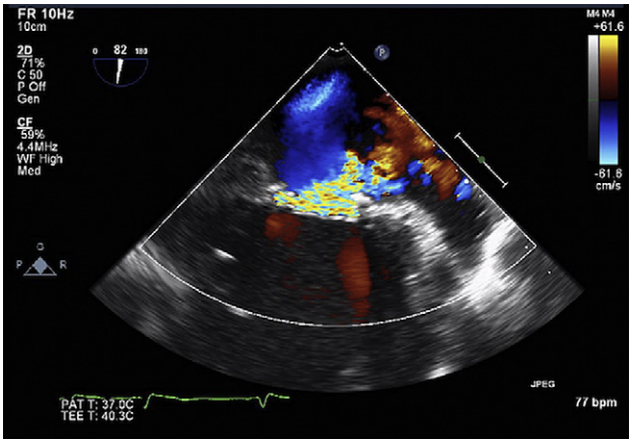

FIGURE 1. Preoperative echocardiogram demonstrating a status-post mitral valve repair with severe mitral valve regurgitation. *TEE,* Transesophageal echocardiogram.

The procedure was performed on June 17, 2010. A small left anterolateral thoracotomy was performed. The patient was given 5000 units of heparin and the activated clotting time was kept above 180 seconds. A bipolar pacemaker wire was placed on the left ventricle.

The apex was punctured and a Terumo stiff wire (Terumo Europe, Leuven, Belgium) was introduced into the left ventricle. A head-hunter catheter (Cook, Inc, Bloomington, Ind) was used to catheterize the left atrium. The Terumo wire was then exchanged for a Amplatz Super Stiff straight tip guidewire (Boston Scientific, Natick, Mass), which was positioned in the upper left pulmonary vein.

No balloon dilatation of the mitral valve was performed. A 26-mm Sapien aortic valve (Edwards Lifesciences) was inversely mounted on the delivery balloon and introduced through the mitral ring. The valve was positioned so that the annuloplasty ring would be in between the inflow and outflow of the Sapien valve.

Under rapid ventricular pacing, the Sapien valve was positioned into the Physio ring. During insufflation, the shape of the Physio ring changed from oval to almost perfectly circular (Figure 2). A very small paravalvular intra-annular leak was noted and treated conservatively.

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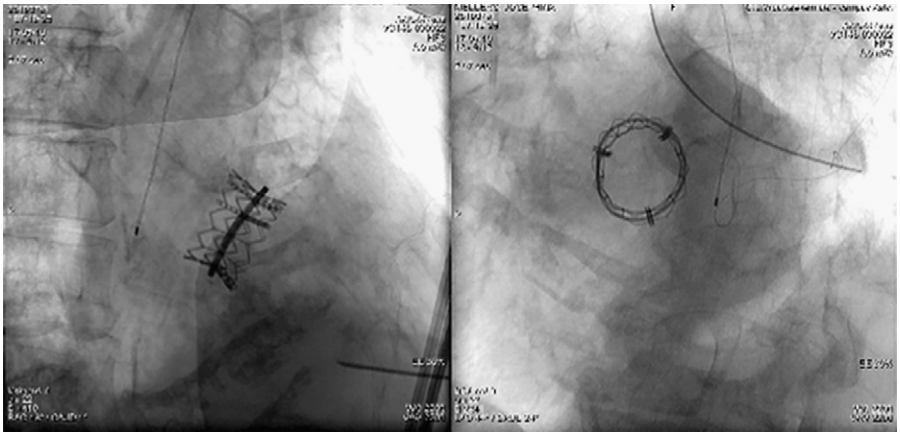

FIGURE 2. Postprocedure fluoroscopic views showing the ''valve in ring.'' Notice the almost circular shape of the mitral ring on the lateral view.

The postoperative course was relatively uneventful. Ambulation was somewhat delayed because of the poor preoperative condition. Hospital length of stay was 12 days.

DISCUSSION

With the aging of the population, an increasing number of patients may come for primary intervention or reoperation. Consequently, the operative risk will markedly increase because of advanced age or comorbidities. Despite our favorable experience in cardiac mitral valve reoperation using the Port-Access method,[4] even in patients with an excessively high EuroSCORE, the operative risk in this patient was judged too high.

Our biggest concern was the oval shape of the Physio I ring versus the circular shape of the Sapien valve. However, experimental work of the Leipzig group[3] had demonstrated the adaptability of the Physio I ring into a circular form at balloon insufflation. Also, their work had demonstrated that a 26-mm Sapien valve would fit into a 28-mm Physio I ring. Our clinical experience confirmed their experimental findings.

We believe that the ''valve in ring'' concept will play an increasing role in the future in reducing the reoperative mortality in patients with failed mitral valve repair. However, patients with implanted rings larger than 28 mm remain a matter of concern. On the basis of experimental work,[3] a larger size percutaneous valve would be needed in such a situation. We therefore hope that larger percutaneous valves will be developed to cope with these challenging situations.

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