

Transcatheter Mitral Valve Repair: Is there a Future?

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Mitral regurgitation (MR) is a common disease in developed countries, affecting an estimated 9.3% of the population aged ≥ 75 years.¹ Although surgical valve repair or replacement is currently the “gold standard” treatment for severe symptomatic MR, almost one-half of the patients are denied surgery.² These are usually older patients with moderate left ventricular dysfunction and several non-cardiac co-morbidities. The aim of transcatheter mitral valve repair is to provide a treatment that is at least as effective as conventional valve surgery, and is associated with less morbidity and mortality.³ Currently an important number of devices are under evaluation, and can be categorized according to the treatment strategy.⁴⁻²²

1) *Edge-to-edge techniques*

Creation of a double orifice mitral valve (Alfieri procedure) using:

- A clip device – **MitraClip** (Evalve, Inc., Menlo Park, California), EVEREST I + II trials.⁴⁻⁶
- A stitch device – **MOBIUS** (Edwards Lifesciences Corp., Irvine, California), no longer in clinical trial.^{7,8}

2) *Direct annuloplasty techniques*

Remodeling of the annulus of the mitral valve by:

- Suture-based techniques – **Percutaneous Suture Annuloplasty** (Mitralign, Inc., Tewksbury, Massachusetts) – **AccuCinch** (Guided Delivery Systems, Santa Clara, California).^{9,10}
- Application of radiofrequency energy – **QuantumCor Endovascular Device** (Quantum-Cor, San Clemente, California)¹¹

3) *Indirect annuloplasty techniques*

Remodeling of the mitral valvular complex by:

- Trans-ventricular devices – **iCoapsys** (Myocor, Maple Grove, Minnesota)^{12,13} (no longer in clinical trial)
- Trans-atrial devices – **Percutaneous Septal Sinus Shortening (PS3) system** (Ample Medical, Foster City, California)^{14,15}

4) *Coronary sinus annuloplasty techniques*

Remodeling of the annulus of the mitral valve by devices implanted in the coronary sinus:

- **Percutaneous Mitral Annuloplasty (PTMA) device** (Viacor Inc., Wilmington, Massachusetts), PTOLEMY 1 + 2 trials.¹⁶⁻¹⁹
- **CARILLON** Mitral Contour System (Cardiac Dimensions Inc., Kirkland, Wash-

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ington), AMADEUS + TITAN trials.^{20,21}

- **MONARC System** (Edwards Lifesciences Corp., Irvine, California), EVOLUTION 1 trial.²²

5) Transcatheter Mitral Valve Implantation – hybrid techniques

- **Endovalve** (Endovalve Inc., Princeton, NJ) (minimally invasive surgery)
- **Lutter Mitral Valve** (trans-apical)²³
- **CardiaQ** (CardiaQ Valve Technologies, Inc., Winchester, MA) (trans-femoral)
- **MiCardia** (Micardia Inc., Irvine, CA) (Dynaplasty shape memory technology – DYANA Study)

Currently, the device with the most clinical experience is the MitraClip, which is also CE approved.⁴⁻⁶ The implantation technique is quite demanding since a trans-septal puncture is needed. The results of the EVEREST II trial are expected in the second quarter of 2010. Coronary sinus annuloplasty techniques have emerged, mainly because they are technically simpler.¹⁶⁻²² However, the response rate is only around 60% and the treatment is applicable to a minority of patients, due to anatomic considerations (e.g. proximity of the coronary sinus with the mitral annulus and the circumflex coronary artery).

The complexity of the mitral valve apparatus and the multifactorial pathophysiology of MR have led to a slower than anticipated progress for transcatheter mitral valve therapies. However, in the era of less invasive interventions, and given the increasing clinical demand in an ageing population, it is a matter of time when transcatheter mitral valve repair will expand and become a routine procedure.

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