

EDITORIAL

Percutaneous Mitral Valve Repair: is There a Future?

Alec Vahanian, MD

Hôpital Bichat, Paris, France

ABSTRACT

KEY WORDS: *mitral regurgitation; mitral valve repair; percutaneous mitral valve repair; Alfieri stitch; mitral annuloplasty*

Percutaneous mitral valve repair was introduced a few years ago for patients with symptomatic severe mitral regurgitation and can use two different approaches. The first approach is the edge-to-edge technique, which creates a double mitral valve orifice. The second approach is mitral annuloplasty, which is achieved by introducing a constraining device in the coronary sinus located in the vicinity of the mitral annulus. Preliminary results of percutaneous mitral valve repair are encouraging and show the feasibility of these techniques, which though should be carefully evaluated in comparison with surgery and standard contemporary medical treatment.

The scope of percutaneous cardiac therapy has expanded from percutaneous coronary and peripheral intervention to percutaneous valve intervention, first used in the mid eighties. Today mitral regurgitation represents the second most important native valve disease in Europe (30%) as shown by the Euro Heart Survey.¹⁻³

When patients present with symptoms, or when there are objective signs of poor tolerance in patients without symptoms, surgery should be performed using as often as possible surgical mitral valve repair, as this treatment has shown safety, efficacy and good long-term results. However, real life observation, once again from the Euro Heart Survey, has shown that mitral valve repair is performed only 50% of the time. This shortfall is mostly due to a lack of expertise in performing the procedure. Finally, observations from the Euro Heart Survey also stress the fact that half of the patients, despite the presence of severe symptoms and severe mitral regurgitation, are not considered for surgery by their practising physicians.³ Thus, there is a niche for treatment other than surgery for high-risk patients or those denied surgery.

Percutaneous mitral valve repair was introduced only a few years ago and can use two different approaches.⁴⁻¹² The first approach is the edge-to-edge technique, which creates a double mitral valve orifice replicating the surgical intervention pioneered by Professor Alfieri.⁴ This technique is very demanding since it requires transseptal catheterisation and sophisticated collaboration between the echocardiographer and interventionist to catch the valve at the appropriate moment and location. Preliminary clinical results obtained in over 100 patients suggest that in expert hands the feasibility of the technique is high (80-90%) and the degree of mitral regurgitation can be reduced to mild in two-thirds of cases. In addition, the risk is low, once again, in experienced

Correspondence to:
Alec Vahanian, MD
Professor of Cardiology
Hôpital Bichat, Paris, France
E-mail: alec.vahanian@bch.ap-hop-paris.fr

centres. In patients where the procedure was successful, two-thirds of the cases remained event-free after three years. Thus these data, even if only preliminary, are encouraging.

The second possible approach is mitral annuloplasty, which is achieved by introducing a constraining device in the coronary sinus located in the vicinity of the mitral annulus.^{7,8,10} The rationale here is that ring annuloplasty is almost always combined with other procedures during surgical interventions on the mitral valve. More than ten devices have been designed and three are currently being studied. They share common technical features: distal fixation and proximal fixation in the coronary sinus and a bridge between these two fixing elements. Here the procedure is easier since it only requires a catheterisation of the coronary sinus. Preliminary results from the EVOLUTION study in 60 patients show here again high feasibility (90%) and good safety profiles since almost 80% of the patients experienced no complications within 90 days. Very preliminary efficacy data suggest a reduction in the degree of regurgitation.

Clearly at the present stage these two approaches do not yet reach the standard of the multiple surgical techniques that make the success of surgical mitral valve repair. The annuloplasty technique could be potentially used in patients with functional mitral regurgitation, while the edge-to-edge technique could be used in selected patients with degenerative mitral regurgitation.

The potential clinical indications of the new percutaneous techniques are represented by the vast group of patients with contraindications or judged to be at very high risk for surgery. Before considering extending the application of these techniques to other patients, trials should be performed in order to answer 3 major questions: how much are we ready to lose in terms of efficacy by going percutaneously as opposed to surgically? Secondly, how much are we ready to risk in patients who have not yet reached surgical indication? And finally, will the performance of this percutaneous intervention compromise subsequent treatment possibilities? Many devices are currently being studied or are at the experimental stage: suture based direct annuloplasty, percutaneous mitral valve replacement, or transpericardial left ventricular remodelling.

In **conclusion**, the first steps of percutaneous mitral valve repair have been taken in almost 300 patients and show the feasibility of this technique suggesting also a reduction in the degree of mitral regurgitation. Today, we are at the stage of evaluation and the research should be carefully evaluated in comparison with surgery and standard contemporary medical treatment including cardiac resynchronisation. Trials such as EVEREST II, EVOLUTION II, and AMADEUS are underway. The development of these new techniques will require close collaboration among engineers, interventionalists, imag-

ing specialists, and surgeons.

REFERENCES

1. Vahanian A, Baumgartner H, Bax J, et al; Task Force on the Management of Valvular Heart Disease of the ESC; ESC Committee for Practice Guidelines. Guidelines on the management of valvular heart disease: The Task Force on the Management of Valvular Heart Disease of the ESC. *Eur Heart J* 2007;28:230-268.
2. Iung B, Baron G, Tornos P, Gohlke-Börwolf C, Butchart EG, Vahanian A. Valvular heart disease in the community: a European experience. *Curr Probl Cardiol* 2007;32:609-661.
3. Mirabel M, Iung B, Baron G, et al. What are the characteristics of patients with severe, symptomatic, mitral regurgitation who are denied surgery? *Eur Heart J* 2007;28:1358-1365.
4. Alfieri O, Maisano F, De Bonis M, et al. The double-orifice technique in mitral valve repair: a simple solution for complex problems. *J Thorac Cardiovasc Surg* 2001;122:674-681.
5. Feldman T, Wasserman HS, Herrmann HC, et al. Percutaneous mitral valve repair using the edge-to-edge technique: six-month results of the EVEREST Phase I Clinical Trial. *J Am Coll Cardiol* 2005;46:2134-2140.
6. Feldman T, Wasserman HS, Herrmann HC, et al. Edge-to-edge mitral valve repair using the Evalve MitraClip: one year results of the EVEREST phase I clinical trial. *Am J Cardiol* 2005;96(suppl 7A):49H.
7. Byrne MJ, Kaye DM, Mathis M, et al. Percutaneous mitral annular reduction provides continued benefit in an ovine model of dilated cardiomyopathy. *Circulation* 2004;110:3088-3092.
8. Webb JG, Harnek J, Munt BI, et al. Percutaneous transvenous mitral annuloplasty: initial human experience with device implantation in the coronary sinus. *Circulation* 2006;113:851-855.
9. Burr LH, Kravenbuhl C, Sutton MS. The mitral plication suture: a new technique of mitral valve repair. *J Thorac Cardiovasc Surg* 1977;73:589-595.
10. Pedersen WR, Block PC, Feldman TE. The iCoapsys Repair System for the percutaneous treatment of functional mitral insufficiency. *Eurointervention* 2006;1(suppl A):A44-A48.
11. Feldman T. Percutaneous valve repair and replacement: challenges encountered, challenges met, challenges ahead. *Circulation* 2006;113:771-773.
12. Vassiliades TA Jr, Block PC, Cohn LH, et al. The clinical development of percutaneous heart valve technology: an interdisciplinary position statement—The Society of Thoracic Surgeons (STS), The American Association for Thoracic Surgery (AATS), The American College of Cardiology (ACC), and The Society of Cardiovascular Angiography and Intervention (SCAI). *Cathet Cardiovasc Diagn* 2005;65:73-79, *Ann Thorac Surg* 2005;79:1812-1818, *J Am Coll Cardiol* 2005;49:1554-1560, *J Cardiovasc Thor Surg* 2005;129:970-976.