Transcatheter Tricuspid Valve Intervention
The Next Frontier*

William W. O’Neill, MD, Brian P. O’Neill, MD

The pioneering work of Dr. Alan Cribier(1) in 2002 ushered in a new era for the treatment of valvular heart disease. In the past decade, transcatheter aortic valve replacement (TAVR) has gone from a difficult, moderately successful procedure (2,3) to a widely adopted intervention that rivals surgical AVR (4,5). Because untreated critical aortic stenosis (AS) is such a lethal condition, a survival advantage of TAVR to the medical therapy was accomplished with 1-year follow-up (6).

The success of TAVR has stimulated attempts at transcatheter mitral valve replacement (TMVR) for percutaneous treatment of mitral regurgitation (MR). This has proven to be far more complex than TAVR. The “D” shape of the mitral annulus, the large width of the orifice, and the potential interaction with the aortic outflow tract have been challenging. Currently, first-in-human testing has begun, and this year will bring forth the first moderately sized trials of transcatheter TMVR (7). Alternately, attempts at transcatheter mitral valve repair have occurred. One such device (MitraClip, Abbott Vascular, Santa Rosa, California) recently received U.S. Food and Drug Administration approval (8). Mitral annulus plication with another device (Mitralign, Tewksbury, Massachusetts) is currently being tested in Europe. This device lacks the precise visualization required to place the pledgets in proper anatomic location. The advances in three-dimensional (3D) transesophageal echocardiographic (TEE) imaging may overcome this problem. A recent trial in Europe investigated the use of the Mitralign device for functional MR in 61 patients, and follow-up data are being collected.

Apart from the daunting technical challenges, proof of efficacy for interventions in chronic, moderate, or severe MR is far more difficult than critical AS. Mechanical reduction or elimination of regurgitation alone is insufficient. Mortality trials will need to study hundreds if not thousands of patients and conduct at least 5 years of follow-up to show benefit. Safety endpoints, such as symptom status and heart failure readmissions, are subject to the placebo effect, and skeptics may demand sham procedures with strict double blinding. Despite these challenges, there is such a large pool of high-risk/inoperable patients with severe MR that within 10 years, it is likely that effective transcatheter therapy will emerge. With transcatheter aortic valve intervention proven and mitral valve intervention emerging, attention will soon turn to the third heart valve that malfunctions in adults: the tricuspid valve.

Tricuspid regurgitation (TR) remains an undertreated problem with substantial morbidity. In the United States alone, <1% of patients with moderate or severe TR undergo surgery annually (9). This is despite a 1-year mortality rate of 36.1%, which has been reported in a Veterans Affairs retrospective study of patients with severe TR (10). For those patients who undergo surgery, recurrence of moderate or severe TR can be as high as 60% at 5 years (11). Therefore, it is not surprising that only 16% of patients with isolated severe TR underwent surgery in a recent study (12). Currently, transcatheter interventions for tricuspid valve disease have been restricted primarily to patients with a degenerating bioprosthesis, with mixed results (13,14). The mechanical and clinical challenges of

*Editorials published in the Journal of the American College of Cardiology reflect the views of the authors and do not necessarily represent the views of JACC or the American College of Cardiology.

From the Division of Cardiology, Temple University Heart and Vascular Institute, Philadelphia, Pennsylvania. Dr. W. O’Neill has been issued stock options in Mitralign, value <$10,000; and he is a consultant for Edwards Lifesciences. Dr. B. O’Neill has reported that he has no relationships relevant to the contents of this paper to disclose.
tricuspid intervention for severe TR are as daunting as those of severe MR. First, cardiologists do not attempt to quantify the severity of TR during right heart catheterization. Second, imaging with contrast ventriculography or echocardiography has not been standardized and widely promulgated. Standardized methods of quantifying improvement of TR will be required for testing efficacy of interventions. Finally, isolating the impact of TR in the setting of pulmonary hypertension, atrial fibrillation, and left heart pathology is problematic. Despite these challenges, our aging population, the increasing prevalence of atrial fibrillation, the increase in iatrogenic TR from transvenous pacemaker leads, and the likely increase in life expectancy of patients with effectively treated AS and MR will mandate development of transcatheter therapy. Schofer et al. (15) began this long journey with a first step.

**REFERENCES**


KEY WORDS transcatheter, tricuspid, valve repair