

## EDITORIAL

# Transcatheter Aortic Valve Implantation (TAVI)

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Calcific aortic stenosis (AS) is a common and one of the serious forms of valvular heart disease especially in an elderly. Studies denote that patient with severe symptomatic AS typically survive less than 3 years.<sup>1</sup> In such patients, intervention with surgical aortic valve replacement (SAVR) may increase survival. However, in some patients SAVR is associated with a high operative risk and medical management is considered appropriate. In this aspect, evolution of a novel and modern technique called Transcatheter aortic valve implantation (TAVI) or Transcatheter aortic valve replacement (TAVR) to avoid the risk of surgery. This procedure has been used since 2002 by a great interventionist Alain Cribie till today for the treatment of patients with severe AS who are unsuitable for SAVR.<sup>2</sup>

Recent data suggest that TAVI can also be adopted in intermediate risk patients with competitive results when compared with surgery.<sup>3</sup> Multiple RCT (Randomized controlled trial) established that TAVI is superior to medical therapy in high-risk patients, and non-inferior to SAVR in high- and intermediate-risk patients at follow-up extending to 5 years. The more recent PARTNER 3 and Evolut Low Risk trials demonstrate that TAVI is non-inferior to SAVR in low-risk patients at 2-year follow-up.<sup>4</sup> Rates of vascular complications, pacemaker implantation, and paravalvular regurgitation are consistently higher after TAVI, whereas severe bleeding, acute kidney injury, and new-onset AF are more frequent after SAVR. Most patients undergoing TAVI have a swift recovery, short hospital stay, and rapidly return to normal activities.<sup>5</sup>

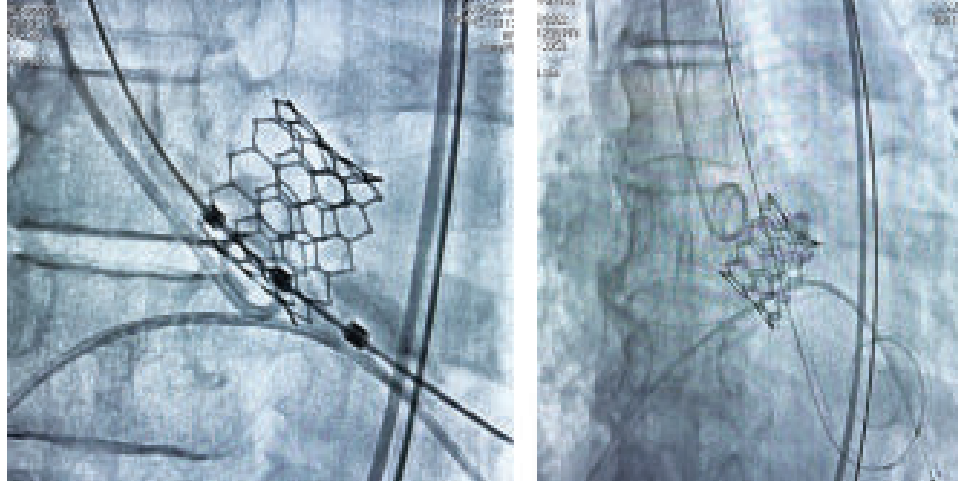
Compared with standard medical therapy, including the use of balloon aortic valvuloplasty (BAV), mortality in 1 year has significantly improved (50.7–30.7%), hospitalizations have reduced and functional capacity has improved but the use of TAVR can significantly improve the symptoms as well as survival in this group of patients. For this reason, the rate of TAVI has risen enormously in recent years.<sup>6</sup> Due to the high safety profile of current device generation, TAVI has emerged as a qualified alternative to surgical aortic valve replacement (SAVR) in patients with classic aortic stenosis and intermediate

surgical risk, severe bicuspid aortic valve stenosis, and isolated pure aortic stenosis. Moderate aortic stenosis, with and without concomitant heart failure with reduced ejection fraction, are under investigation in randomized controlled clinical trials from which we will gain exciting insights on the best timing of TAVI to protect the left ventricle from further functional deterioration due to increasing AS.<sup>7</sup>

Transcatheter deployment of an aortic bioprosthetic valve required either a balloon-expandable or a self-expandable delivery concept. Two types of devices have been considered the main determinators in transcatheter aortic valve replacement (TAVR) for many years: balloon-expandable transcatheter heart valves (BE-THV) and self-expandable transcatheter heart valves (SE-THV). Both types of devices have been refined continuously to improve ease of use and decrease peri-procedural complications, and both technologies have been associated with favorable short- and long-term outcomes when compared with surgical aortic valve replacement in randomized clinical trials. Very recently, current-generation BE-THV (SAPIEN 3, Edwards Lifesciences) and SE-THV (Evolut, Medtronic) have been approved by the US Food and Drug Administration for selected low-risk patients with severe symptomatic aortic stenosis.

In the recent past, two registry-based analysis carried out by Van Belle et al. and Deharo et al. showed that BE-THV is more preferable in terms of paravalvular regurgitation (PVR), permanent pacemaker implantation, rehospitalization for heart failure and mortality than SE-THV despite having some limitation like operators' familiarity with the device and anatomical and clinical suitability of the patient.<sup>8</sup>

A multidisciplinary team approach should be considered for appropriate indications and contraindications before TAVI. According to the European guidelines some absolute and relative contraindications of this procedure has been defined. Absolute contraindications include the absence of a Heart Team and no cardiac surgery on-site, appropriateness of TAVI not confirmed by the Heart Team, estimated life expectancy <1 year, comorbidity suggesting lack of improvement of quality of life, inadequate annulus



**Fig.-1: Implanted Transcatheter Aortic Valve**

size (<18 mm, >29 mm), active endocarditis, short distance between the annulus and the coronary ostium, and plaques with mobile thrombi in the ascending aorta. Relative contraindications include inadequate vascular access for transfemoral or subclavian approach (such patients could be treated from the transapical approach), haemodynamic instability, and severe LV dysfunction.<sup>9</sup>

A group of expert doctors of different disciplines consists of an interventional cardiologist specially trained in TAVR, a cardiac surgeon, an echocardiographic imaging specialist, skilled nurses and a cardiac anesthesiologist is needed for the TAVR procedure as well as follow up care. Cardiac electrophysiologists, neurologists, nephrologists and vascular surgeons must be readily available if complications from the procedure arise.<sup>10</sup>

Standard TAVI workup includes clinical assessment, surgical and frailty risk scoring, blood investigations, echocardiography, pulmonary function tests, computed tomography (CT) angiography for accurate measurement of the aortic annulus for determination of valve size, for visualization of the vascular anatomy and determination of the approach to be taken. Patients sent to the cardiac catheterisation laboratory (CCL) for TAVI workup require a systematic and thorough approach. This can include iliofemoral angiography, aortography, aortic valve crossing, haemodynamic evaluation, coronary angiography and right heart catheterisation.<sup>10,11,12</sup>

The procedure is ideally done in a hybrid room with both operating room and cath lab capabilities. The procedure is done under direct visualization with fluoroscopy and occasionally transesophageal echocardiogram (TEE) guidance. The most preferred and least invasive approach

is the transfemoral approach. If not feasible, an alternate often more invasive method may need to be used (subclavian, apical, trans-aortic).<sup>13</sup>

Now a days, though TAVI is the gold standard therapeutic option for management of symptomatic severe aortic stenosis with high surgical risk, yet high cost of this valve prosthesis is one of the main challenges to widespread use and to get the expected benefits of this procedure in developing countries particularly in Bangladesh. Precise preprocedural screening for suitability, operators' expertise is very much crucial for procedural success and better long-term outcomes.

**Professor SM Mustafa Zaman**

Professor, Department of Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka

**Dr Chayan Kumar Singha**

Medical Officer, Department of Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka

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