

## President's Page

# Transcatheter Aortic Valve Replacement: Current Status and Future Prospects

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*“Eppur si muove.” (And yet it moves.) Galileo Galilei (1564-1642)*

In the elderly, aortic stenosis usually has a degenerative aetiology and deteriorates rapidly with age, leading to symptoms of angina, syncope, dyspnoea, and finally death.<sup>1-3</sup> The pathophysiological mechanisms resemble those of atherosclerosis, with the valve progressively thickening as a result of inflammation processes and lipid and calcium deposition. The presence of comorbidities, very common in this age group, accelerates these processes. Patients with aortic stenosis often have concomitant coronary, carotid, and peripheral arterial disease, as well as kidney failure.

Until a few years ago, the only effective therapy when symptoms appeared was surgical aortic valve replacement (AVR),<sup>4</sup> which often required simultaneous aortocoronary bypass and/or endarterectomy. This surgical procedure profile, as one might expect, is associated with high periprocedural morbidity and mortality. It also excludes many patients from the beneficial effects of AVR, which have been proven to spectacularly improve symptoms and especially survival.<sup>5,6</sup>

Transcatheter aortic valve replacement (TAVR) has been used during the last decade, and the clinical benefits of this procedure are steadily improving.<sup>7</sup> Thus, TAVR is today the therapy of choice in patients at high surgical risk and in those who are “unsuitable” for surgery, since it has been proved to prolong survival.<sup>8</sup> There is now a large body of surgical experience, with more than 50,000 valves having been implanted in more than 40 countries.

The PARTNER trial, apart from beneficial results in terms of morbidity and survival, also provided interesting evidence regarding quality of life and

the cost-effectiveness of this procedure. Thus, in patients of the B cohort, who were judged unsuitable for surgery and who underwent transfemoral TAVR, a significant improvement was seen in symptoms and quality of life, as assessed by the Kansas City Cardiomyopathy Questionnaire and Short Form-12, up to 12 months after the procedure.<sup>9</sup> Similarly, in patients of the A cohort, who were judged to have high surgical risk but were still operable, the quality of life and overall condition of health, after 30 days and over a 12-month follow up, were significantly better in those who underwent TAVR versus AVR. The improved quality of life at one year was seen only in patients who underwent transfemoral, not transapical TAVR, although the patients' overall state of health showed similar improvement following both kinds of procedure.<sup>10</sup> Similar improvements in indexes of quality of life at one year were also observed in a study by Fairbairn et al in the United Kingdom, using TAVR to implant a CoreValve prosthesis in 102 patients.<sup>11</sup>

Cost-effectiveness data regarding TAVR were reported recently by the PARTNER 1B study, where despite the lower cost of follow up with TAVR, the total cost for the first year remained higher compared to pharmaceutical treatment (\$106,076 versus \$53,621).<sup>12</sup> The incremental cost-effectiveness ratio was \$50,200 per life-year gained, or \$61,889 per quality-adjusted life-year (QALY) gained. Compared to the approximately \$70,000 per life-year achieved by dialysis in end-stage kidney disease, the current value of \$50,000 for TAVR appears favourable. However, no risk stratification was performed in that study, and it remains to be proven whether patients with different risk profiles

will have significantly different cost-effectiveness ratios in comparison with the published population. It is interesting that in PARTNER 1A, even though during the 12-month follow up the cost and the QALYs were similar for TAVR and AVR, transfemoral TAVR was found to be more attractive than AVR from the economic point of view, while transapical TAVR was found to be less attractive.<sup>13</sup>

Similarly, for the CoreValve there appear to be a significant number of patients with better survival after the first year in comparison with those who underwent AVR.<sup>14</sup> As regards quality of life, it appears to be non-inferior in comparison with AVR. In contrast to the PARTNER 1A study, the above study using the CoreValve did not show any increased risk of occurrence of neurological events compared to surgery.<sup>14</sup> A 20-year prospective analysis from a group in Canada showed that, while transfemoral TAVR would be financially effective for patients unsuitable for surgery, in comparison with pharmaceutical treatment, it would not be equally effective for operable patients in comparison with AVR.<sup>15</sup>

The cost-effectiveness ratio for any treatment depends on a multitude of factors. The materials that are commercially available for TAVR are becoming more and more competitive, and their cost is expected to decrease, so that the cost-effectiveness ratio may become more favourable in selected patient populations in the future. The careful selection of patients and device improvements may help us face up to the current challenges.

It will be necessary to develop a Risk Score especially for TAVR, on the basis of which we can make a better selection of patients to undergo this procedure. Perhaps in the future, when the long term haemodynamic course of these valves, the survival rate, and the cost-benefit ratio have been better elucidated, the indications for TAVR can be expanded even further.

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