Background Transcatheter Aortic Valve Implantation (TAVI) is increasingly used to treat patients with severe aortic stenosis at high surgical risk. The severity of post-implantation valvular or paravalvular regurgitation has been shown to adversely affect patient outcome. The aim of the study was to assess the prevalence and severity of aortic regurgitation (AR) at 6 months post-TAVI using cardiovascular magnetic resonance (CMR).
Methods

25 severe aortic stenosis patients underwent a 1.5T CMR (Intera, Philips Healthcare) scan at baseline and 6 months after CoreValve™ TAVI. LV function was assessed using cine imaging with a steady state free precession pulse sequence. The LV outflow tract was imaged in two planes and through-plane phase contrast velocity imaging was performed perpendicular to the aortic valve and transverse to the aorta at the sinotubular junction. Post-processing was performed using QMass 7.2 and QFlow 5.2 (Medis, The Netherlands). AR severity was defined using regurgitant fraction (RF) as: none to mild<8%, mild to moderate 8–19%, moderate to severe 20–29% and severe >30%. Transthoracic echocardiography (iE33, Philips Healthcare) was performed at baseline and 6 months follow-up. Aortic regurgitation was graded using a comprehensive integrated approach following the recent Valve Academic Research Consortium (VARC) guidelines.

Results

Mean age was 80.6±6.6 years, 44% were female, Logistic EuroSCORE 19.5±14.9 LV ejection fraction significantly improved post-TAVI (52.1±11.8% vs 55.9±9.6%, p<0.0001) and reduction in indexed end-systolic LV volume (46±18 ml/m² vs 41±17 ml/m², p=0.02). The end-diastolic volume (95±18 ml/m² vs 91±20 ml/m², p=ns) and stroke volume (48±10 ml/m² vs 50±10 ml/m², p=ns) did not change. There was a significant reduction in aortic RF 6 months post-TAVI (median RF 12.4%, IQR 5.6–16.8% vs 6.2% IQR 3.6 to 13.2%, p=0.034) (figure 1). There was no significant difference between the transthoracic echo grading and CMR grading of aortic regurgitation. (χ²=3.74 p=0.159) (figure 2). Echocardiography showed statistically significant reductions in peak forward flow velocity (4.87±0.57 m/s vs 4.98±0.35 m/s p<0.05), peak pressure gradient (96.1±24.3 mm Hg vs 17 ±5.7 mm Hg p<0.05) and mean pressure gradient (54.8 ±15.9 mm Hg vs 8±3 mm Hg p<0.05) compared to baseline; the effective orifice area (EOA) was significantly larger compared to the baseline state (0.57±0.03 cm² vs 1.63±0.3 cm² p<0.05).

Conclusions

There was an overall reduction in aortic regurgitant fraction post-TAVI even in the presence of pre-existing AR. CMR can be used in the TAVI population, pre- and post-procedure to quantify the degree of aortic regurgitation.

Funding

SP is funded by a British Heart Foundation fellowship (FS/10/62/28409). SP and JPG receive an educational research grant from Philips Healthcare.