Transthoracic echocardiography guidance of transcatheter edge-to-edge percutaneous tricuspid valve repair: the TTE-TTVR pilot study and methodology proposal


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Background: Transcatheter tricuspid valve repair (TTVR) is an emerging option for treating high-grade tricuspid regurgitation (TR) [1], mostly performed by edge-to-edge repair, and always guided by transesophageal echocardiography (TOE). In patients with excellent acoustic window, transthoracic echocardiography (TTE) can also provide a comprehensive understanding of tricuspid valve (TV) morphology [2]. Also, in TTVR there is no need for transseptal puncture.

Purpose: We sought to determine if TTVR can be successfully conducted by a novel TTE guiding approach, in conjunction with fluoroscopy [3].

Methods: 30 consecutive patients, scheduled for TTVR, were assigned to a TTE group (n=10), in the presence of excellent acoustic window, and a TOE group (n=20). On top of fluoroscopy, TTVR was guided exclusively by TTE in the first group, with TOE result confirmation solely upon clip release, due to safety reasons. The second group underwent classical TOE guidance. Understanding the 4 right heart chamber views (Fig. 1) and their respective fluoroscopic angulations was paramount. TR severity, parameters of quality of life and functional capacity were assessed and compared between-groups, at baseline and 30 days.

Results: Except for lower BMI (TTE 22.3±0.8 vs TOE 29.8±4.3, p<0.001), other baseline characteristics were very similar between groups, e.g., age (81.7±3.9 vs 82.8±4.1, p=0.483) or EuroSCORE II (11.9±10.3 vs 10.4±8, p=0.692). Device success was achieved in all patients, with a total of 15 implanted clips in the TTE group (mean no. of clips / patient 1.5±0.7) and 31 clips in the TOE group (1.5±0.6). Device time (75±37.1 vs 65.7±31.3 minutes, p=0.506) and fluoroscopy duration (16.3±10.5 vs 14.4±7.2 minutes, p=0.564) were also close. TR reduction was successful in all but one patient, in each group (90% vs 95%, p=1.000). TR improvement was equal between-groups, with 2 or more grade reduction in 60% of each group, at 30 days. Thus, grade IV/V and V/V TR, present in 60% of all patients at baseline, dropped to 10% (9/10 vs 18/20, p=1.000) by procedure end and follow-up (Fig. 2). No device associated complications occurred by 30 days, there was one non-cardiac death and one major bleeding.

At follow-up, all but one patient had at least one grade reduction in NYHA class (10/10 vs 19/20, p=1.000), Kansas City Cardiomyopathy Questionnaire score and 6-minute walk distance similarly improved (Δ20.7±4.9 vs 15.5±7.9 points, p=0.227, Δ38.9±5.6 vs 46.6±30.6 meters, p=0.121). A statistical in-group difference was also noticed in renal function improvement by follow-up (glomerular filtration rate (GFR) TTE group 56.8±18.7 vs 64.8±12.5 ml/min/1.73 m², p=0.028; TOE group 50.7±19.9 vs 62.2±25.9, p<0.001).

Conclusion: TTE guidance of TTVR is feasible in selected patients with excellent acoustic window and could offer an alternative in case of high anesthetic risk. Similar procedural success and clinical outcomes, as with TOE guidance, can be achieved.

Figure 1

Figure 2