Pacemaker Implantation Associated with Tricuspid Repair in the Setting of Mitral Valve Surgery: Insights from a Cardiothoracic Surgical Trials Network Randomized Trial

Objectives: In a recent CTSN trial, the addition of tricuspid annuloplasty (TA) at the time of mitral valve surgery (MVS) in patients with degenerative MR and moderate or less TR reduced the composite rate of death, re-operation for tricuspid regurgitation (TR), or TR progression at 2 years. However, this outcome was counterbalanced by an increased incidence of permanent pacemaker (PPM) implantation. We analyze here the timing, indications, and risk factors for PPM implantation in patients enrolled in this trial.

Methods: We randomly assigned 401 patients undergoing MVS for degenerative MR to receive MVS with (n=198) or without TA (n=203). Two patients with PPMs at baseline were excluded. The association between potential risk factors and PPM implantation was assessed using multivariable time to event models with death and implantation for indications other than conduction abnormalities as competing risks. Potential risk factors (baseline characteristics, echocardiographic parameters, and operative details) were compared between patients with and without PPM.

Results: A PPM was implanted in 36 patients (9.0%) within 2 years of randomization, with 30/198 (15.2%) in those randomized to MVS+TA and 6/201 (3.0%) in the MVS alone group (RR 5.08; 95% CI 2.16-11.94; p<0.001). The indication for PPM was AV block in 50.0% (3/6) of MVS alone patients and 73.3% (22/30) of MVS+TA patients. The majority (29/36, 80.6%) of implants occurred within 30 days of surgery (Figure 1). Univariate analysis identified age, history of AF, TA procedure, and concomitant MAZE as potential risk factors for PPM within 30 days. However, in the multivariable model, TA was the only independent risk factor (HR 4.24; 95% CI 1.73-10.41; p=0.002). In the subset of patients who received concomitant TA (n=197), those who required PPM, compared with those who did not require PPM, were older (mean age: 70.9±10.2 vs. 66.0±10.7; p=0.02) and had slightly larger baseline TV annulus dimensions (43.7±4.6 vs. 41.7±4.5; p=0.03), but had similar preoperative atrial fibrillation, need for MV replacement, surgical approaches to the TV, and TV implant size. Univariate analysis identified the following potential risk factors for PPM within 30 days (23/197): age, history of AF, MV procedure type, concomitant MAZE, and TV annulus dimension. The final model included age (5 years; HR 1.23; 95% CI 0.96-1.57; p=0.096), MV replacement (HR 2.20; 95% CI 0.92-5.28; p=0.078), and TV annulus dimension (5mm; HR 1.46; 95% CI 0.95-2.26; p=0.087), but none was statistically significant. PPM implantation did not prolong index LOS and was not associated with an increase in 2-year mortality risk.

Conclusions: Our study identified concomitant TA as the only independent risk factor for PPM implantation in patients undergoing MV surgery for degenerative MR. Larger studies with longer follow-up are needed to identify additional risk factors and fully assess the impact of PPM implantation on clinical outcomes in these patients.
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Figure 1: PPM implant vs days from surgery