An unusual cause of pacemaker-induced severe tricuspid regurgitation

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Pacemaker (PM) induced tricuspid regurgitation (TR) is a common echocardiographic finding. Although mild or moderate TR is frequently observed, severe TR is rare. We report the exceptional observation of a severe TR due to leaflet malcoaptation occurring late after PM implantation and in the following weeks after an aortic valve replacement. Our hypothesis is that the aortic valve surgery has been responsible for conformational changes between cardiac cavities, tricuspid valve and PM leads resulting in a severe TR.

**KEYWORDS**

Tricuspid regurgitation; Pacemaker; Cardiac surgery

**Introduction**

Tricuspid regurgitation (TR) is a common Doppler-Echocardiographic finding in the population and can result either from intrinsic valve abnormalities (organic TR) or from functional malcoaptation of structurally normal valves (functional TR). Mild or moderate TR is frequently observed in patients with pacemaker (PM) but severe TR is rare. We report the case of a severe TR occurring late after PM implantation and in the following weeks of an aortic valve replacement in a 75-year-old woman. Mechanisms and etiologies of PM-induced TR are discussed.

**Case report**

A 75-year-old woman was admitted in our department for symptomatic aortic stenosis. Her non-cardiac past medical history was unremarkable. A single chamber right ventricular PM was implanted 17 years ago for atrioventricular block with a second right ventricular lead implantation 8 years later and a right atrium lead in 1999. Several preoperative transthoracic echocardiographies (TTE) were performed by multiple experienced operators and there was only mild TR. Systolic pulmonary arterial pressure was normal. ECG showed a normal atrioventricular pacing.

The patient underwent an aortic valve replacement (mechanical prosthesis, Saint Jude Flex 23). The immediate post-operative course was unremarkable with only mild TR.

One month later, the patient started complaining of dyspnoea on exercise and fatigue. Symptoms insidiously increased to NYHA class III within a few weeks and the patient was readmitted to our department. On physical examination, temperature was normal, blood pressure 120/70 mmHg. A systolic murmur was noted at the apex with mild jugular distension, hepatojugular reflux, and a pulsatile and mildly enlarged liver. The chest radiograph showed a mild enlargement of the cardiac silhouette and the presence of three leads: two into the right ventricular, one into the right atrium. Blood counts and other laboratory tests were normal. The ECG showed a permanent pacing similar to pre-operative rhythm. TTE showed a normal left...
ventricle function and a normal aortic valve prosthesis (mean gradient 12 mmHg). The right-sided chambers and the tricuspid annulus were mildly enlarged (Figure 1) but a severe TR was observed (Figure 2A, loop 1) with hepatic venous flow reversal. Systolic pulmonary artery pressure was 45 mmHg. The echocardiography report concluded at a severe TR due to septal leaflet malcoaptation (Figure 2B, loop 2) caused by one of the ventricular leads.

Of note, pulmonary function tests and lung perfusion scanning were normal. The patient was referred to the electrophysiology department for withdrawal of the ventricular leads but unsuccessfully.

After several months of follow-up, despite high dose of diuretics, the patient remained symptomatic with severe TR. A tricuspid valve surgery was offered to the patient but she was reluctant to undergo a new cardiac surgery.

Discussion
Mild or moderate TR is a common echocardiographic finding in patients with PM and has been reported as high as 53%. Such a prevalence of mild or moderate TR is expected since the lead crosses the tricuspid valve and may slightly impair its closure. This mechanism is supported by the increasing incidence of PM-induced TR with the number of ventricular leads. Postaci et al. have evaluated the influence of multiple ventricular leads on TR incidence. Incidence of grade I, II, and III TR with 1 vs. 2 leads were, respectively, 11.1% vs. 46.9%, 33.3% vs. 43.7%, and 9.4% vs. 55.6%. This study shows that TR is more frequent and of higher degree in patients with multiple leads.

Severe PM-induced TR is seldom. It results mainly from perforation or laceration of the tricuspid leaflets during PM implantation or extraction or lead impingement of the tricuspid valve leaflet. It can also be due to an abnormal activation of the right ventricle with a delayed activation of the apex and the papillary muscles. Fibrosis adherences between lead and tricuspid valve have been described and may cause delayed severe TR. In regard of these considerations, our observation is exceptional. TR was severe, due to leaflet malcoaptation, and occurred several years after PM implantation. TR resulted in recurrent congestive heart failure requiring a new surgery. Our hypothesis is that the aortic valve surgery has been responsible for conformational changes between cardiac cavities, tricuspid valve, and PM leads resulting in a severe TR. A real time 3D echocardiography would have been useful for depicting the abnormal relationship between tricuspid leaflets and PM leads but was unfortunately not performed. The exact incidence of severe TR after cardiac surgery in patients with PM, especially with multiple leads, is unknown and deserves further prospective evaluation.

Conclusion
Mild or moderate TR are frequently observed in patients with PM but severe regurgitation is seldom and is mainly traumatic (implantation or lead extraction). We report the exceptional observation of a severe TR due to leaflet malcoaptation occurring several years after PM implantation in the following weeks after an aortic valve replacement, which resulted in recurrent congestive heart failure and required a new surgery. Our hypothesis is that the aortic valve surgery has been responsible for conformational changes between cardiac cavities, tricuspid valve and PM leads resulting in a severe TR. We are not aware of similar complication in the literature but its real incidence is in fact unknown and deserves additional studies.

Conflict of interest: none declared.

Supplementary material
Supplementary data associated with this article can be found in the online version.

References


