

Shedding some light on tricuspid intervention

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Abstract

More than 1.6 million Americans have at least moderate to severe tricuspid regurgitation, yet fewer than 8000 tricuspid valve operations are performed annually in the USA. The under-treatment for isolated tricuspid regurgitation might be related to the fact that in the past years no clear guidelines on how and when to treat tricuspid regurgitation were issued. Here, we discuss the meta-analysis by Sarris-Michopoulos et al, and we comment what is available in literature on diagnosis and decision making for tricuspid valve intervention.

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We read with interest the Meta-analysis performed by Sarris-Michopoulos et al, that aimed to investigate the role of tricuspid valve repair (TVr) versus replacement (TVR) in patients with isolated tricuspid valve regurgitation (TR) (1).

Patients with first time surgery for isolated TR without previous left-side valve surgery were included in this paper. Ten studies were screened for a total of 1407 patients included in the quantitative analysis. Authors conclude that patients who underwent TVr showed less 30-days mortality and postoperative pacemaker implantation rates.

This study in addition to the meta-analysis recently published by Wang et al (2), that included more than 15000 patients, might shed a light in a grey area. The issue investigated by authors in fact is still

a matter of investigation. The 2021 ESC/EACTS guidelines for the management of valvular heart disease (3), recommended surgery (class 1) in symptomatic patients with isolated severe primary or secondary TR without severe right ventricular (RV) dilatation/dysfunction or severe pulmonary hypertension (PH). Surgery should be considered (class 2a) for asymptomatic or mildly symptomatic patients with isolated primary severe TR and RV dilatation who are appropriate for surgery. In the 2020 ACC/AHA valvular heart disease guideline (4) surgery should be considered (class 2a) for patients with isolated severe primary or secondary TR with signs and symptoms of right-side heart failure in the absence of severe PH and RV dysfunction to reduce symptoms and recurrent hospitalizations.

More than 1.6 million Americans have at least moderate to severe TR, yet fewer than 8000 TV operations are performed annually in the USA. Historically, isolated primary TR was thought to be limited to patients with congenital heart disease and secondary TR is associated with PH and left-side valvular or myocardial pathology.

In the last decade, the incidence of isolated TR appears to be rising along with the prevalence of atrial fibrillation (AF), heart failure and the presence of intracardiac devices.

The under-treatment for isolated TR could be due to the fact that in the past years there are no clear guidelines to guide how and when to treat TR.

Quantification by trans-thoracic echocardiography often is not accurate because regurgitation grade is related to several conditions such as preload, after-load and RV function. Preload is often decreased by vasodilators and diuretics therapies and after-load is often/always pulmonary or left-side related. Right ventricular function assessment by echo isn't accurate and its role is underestimated when the right ventricle is chronically failing.

MRI scan is perhaps the best way to assess RV function, shape, and stroke volume but not widely available. We should aim to investigate not only the severity of TR but also to the TV/RV morphology. Shape of the RV (from elliptical to spherical), TV annular dilatation, mismatch between leaflets and annular dimension, lack of leaflets coaptation and tethering should be accurately evaluated. Once all these features are present, absence or grade of TR can be misleading as any changes in preload under medical therapy and after-load can unmask severity of TR.

Isolated moderate to severe TR is associated with worse outcomes and is a highly detrimental condition for which a prompt intervention should be applied timely. The clinical impact of isolated TR was described first by Nath, J. et al in 2004 (5). In a cohort study of 5223 patients, the presence of severe TR was associated with decrease survival after adjustment for PH and ejection fraction (Hazard Ratio (HR): 1.31, 95% CI 1.05, 1.66). Similarly, Topilsky, et al. found that patients with isolated severe TR had worse long-term survival (HR 2.67, 95% CI 1.66 to 4.23) and even in the absence of significant cardiopulmonary comorbidities, adversely affected outcomes (6).

On the other side, there are little data about timing of surgery in patients with isolated severe TR. Several studies investigate the relationship between right atrial pressure and RV function with outcomes in patients undergoing TV surgery. In patients undergoing stand-alone TV surgery, RV end-systolic dimension, RV end-systolic area and the RV index of myocardial performance have all been associated with survival free of death, heart failure, cardiac readmissions, and TV reoperation (6-8). Authors found that RA pressure and RV function were key determinants of postoperative outcomes.

These findings suggest early surgery for patients with isolated severe TR. Surgical treatment is based on several clinical observations. First of all, progressive RV dysfunction drives further annular dilatation and results in more severe TR; hence, TR begets more severe TR. Medical therapy will not reverse RV dysfunction. Once severe right heart failure symptoms develop and TR remains untreated there is progressive clinical deterioration with development of end-stage liver and kidney failure and surgical options become either inappropriate or compassionate.

The current high mortality associated with surgery for isolated severe TR may be related to late surgical referral and furthermore early surgery should be performed before end-organ damage have already occurred.

Tricuspid valve repair should be the first option when possible.

Careful evaluation of the morphology of the TV and RV should be applied. Patients with pure annular dilatation without severe lack in leaflets coaptation and tethering (coaptation high less than 0.8cm) may be treated by prosthetic annuloplasty. In cases of severe leaflets tethering, lack in coaptation and mismatch between leaflets and annulus, pericardial patch augmentation of the anterior leaflet in concomitant to ring annuloplasty might be performed. In patients with intracardiac device and lead-to-leaflet adherence present, lead extraction or shaving with leaflet mobilization should be done in concomitant to other repair procedures. In these cases, when repair approach is challenge, TVR with exteriorisation of the lead outside the valve ring could be an optimal option. On the other side, in case of lead extraction or when conduction disturbances are anticipated, epicardial implantation should be performed as part of the initial operation.

Residual and recurrent regurgitation after tricuspid valve annuloplasty are common. Residual TR occurs in 10%-14% of patients early after annuloplasty (9). Suture-annuloplasty are associated with more recurrent regurgitation rate than the prosthetic ring. The higher the grade of preoperative TR, the higher the risk of repair failure within 6 months. Factors as permanent pacemakers, ventricular dysfunction and suture annuloplasty were identified as a risk for late regurgitation. To improve repair outcomes, suture annuloplasty should be avoided and lead pacemaker correctly managed.

In term of in-hospital complications, TVr had lower rates mortality, lower postoperative renal failure and pacemaker implantation. Obviously, TVr procedure in complex anatomical scenario should be performed in heart valve reference centre by high skill surgeons.

When TVr is not feasible, TVR could be a good option (10). The choice between mechanical or biological prosthesis is still debated. Recently, Cheng Z et al published a systematic review and meta-analysis investigating the role of mechanical versus biological prostheses for tricuspid valve replacement (11). In tricuspid valve position, mechanical valve prostheses have higher risk of thrombosis than biological prostheses, but no differences between both was emerged respect to prosthetic valve failure, bleeding, reoperation, early mortality and long-term survival. Negm et al found an equal risk of 30-day and late mortality, reoperation and 5-year valve failure in patients with mechanical versus biological TVR (12). The choice of the prosthesis in the tricuspid position should depend mainly on patient's age, valve disease, and risk factors because of non-superiority of one over the other. In the current era of percutaneous treatment biological prosthesis could be preferred in perspective of future valve-in-valve intervention.

In conclusion, TVr is associated with lower mortality and postoperative complication rates respect to valve replacement. The operative risk of both procedures remains high probably due to late referral. Further investigations and experience with regard to earlier surgery, optimizing medical therapy for reverse RV remodelling, and percutaneous interventions for inoperable/high risk patients are necessary to improve outcomes in this challenging issue.

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