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REVIEW

Tricuspid valve and percutaneous approach: No longer the forgotten valve!

Valve tricuspide et traitements percutanés : décidément plus la valve oubliée !

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Summary Tricuspid valve disease is mainly represented by tricuspid regurgitation (TR), which is a predictor of poor outcome. TR is usually secondary, caused by right ventricle pressure or volume overload, the leading cause being left-sided heart valve diseases. Tricuspid surgery for severe TR is recommended during left valve surgery, and consists of either a valve replacement or, most often, a tricuspid repair with or without prosthetic annuloplasty. When TR persists or worsens after left valvular surgery, redo isolated tricuspid surgery is associated with high mortality. In addition, a sizeable proportion of patients present with tricuspid surgery deterioration over time, and need a reintervention, which is associated with high morbi-mortality rates. In this context, and given the recent major breakthrough in the percutaneous treatment of aortic and mitral valve diseases, the tricuspid valve appears an appealing challenge, although it

Abbreviations: BP, bioprosthesis; CT, computed tomography; IVC, inferior vena cava; NYHA, New York Heart Association; RA, ring annuloplasty; RVP, rapid ventricular pacing; TEE, transoesophageal echocardiography; THV, transcatheter heart valve; TR, tricuspid regurgitation.

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raises specific issues. The first applications of transcatheter techniques for tricuspid valve disease were valve-in-valve and valve-in-ring implantation for degenerated bioprosthesis or ring annuloplasty. Some concerns remain regarding prosthesis sizing, rapid ventricular pacing and the best approach, but these procedures appear to be safe and effective. More recently, bicuspidization using a transcatheter approach for the treatment of native tricuspid valve has been published, in two patients. Finally, other devices are in preclinical development.

MOTS CLÉS
Valve tricuspide ;
Implantation de prothèse valvulaire ;
Valvulopathies ;
Implantation valvulaire percutanée

Résumé La pathologie tricuspide est le plus souvent une insuffisance tricuspide (IT), qui est un facteur de mauvais pronostic. L'IT est en général secondaire à une surcharge de pression ou de volume du ventricule droit, la première cause en étant une valvulopathie gauche. Durant une chirurgie valvulaire gauche, la correction d'une IT sévère est recommandée et consiste en un remplacement valvulaire tricuspide ou en une plastie tricuspide avec ou sans anneau prothétique. Si l'IT persiste après une opération du cœur gauche, une chirurgie redux dédiée est grevée d'une lourde mortalité. Par ailleurs, une proportion non négligeable de patients présentent une détérioration de leur chirurgie tricuspide au cours du temps et requièrent une réintervention, associée à une morbi-mortalité élevée. Au vu des récentes avancées des techniques percutanées concernant les valves aortiques et mitrales, la valve tricuspide apparaît comme un challenge défi majeur, malgré des obstacles propres. Les premières applications ont été les techniques percutanées de « valve-in-valve » et de « valve-in-ring » pour les dégénérescences de bioprothèse et d'anneau tricuspides. Même si des questions persistent concernant l'évaluation optimale de la taille de prothèse à implanter, la stimulation ventriculaire rapide ou l'approche la plus appropriée, ces procédures apparaissent sûres et efficaces. Plus récemment, la bicuspidisation percutanée a été publiée chez 2 patients pour le traitement d'une IT sur valve native. Enfin, d'autres procédés sont en développement au stade préclinique.

Background

Dysfunction of a native or previously operated tricuspid valve encompasses a variety of situations, which are frequently sources of difficulty in patient management. Tricuspid disease is most often tricuspid regurgitation (TR), which is mainly secondary to left-sided heart valve disease [1]. Tricuspid valve disease has long been ignored, with the belief that TR would improve after surgical correction of left valve disease. A large body of evidence now supports the negative effect of significant TR, and this recognition has led to more frequent indications for combined tricuspid surgery, with the inherent risk of subsequent dysfunction of tricuspid repair or replacement [2,3]. Whatever the clinical context, redo tricuspid valve surgery is often associated with high morbi-mortality rates. Following the recent development of transcatheter therapies for aortic and mitral valve diseases, the possibility of lower-risk tricuspid valve intervention is therefore particularly attractive.

This review presents current status and perspectives regarding transcatheter therapies for tricuspid valve disease, both for bioprosthesis or ring annuloplasty failure and for native valves.

Rationale for percutaneous treatment of tricuspid valve disease

Native tricuspid valve disease can be either stenotic or regurgitant. The extremely rare stenotic lesions, caused mainly by rheumatic fever or carcinoid syndrome, will not be addressed in this paper. The most common disease of the tricuspid valve is regurgitation, which is more often secondary rather than caused by a primary valve lesion, particularly in Western countries [1]. Secondary TR is caused by annular dilatation and increased tricuspid leaflet tethering in relation to right ventricular pressure and/or volume overload [4]. Pressure overload is most often caused by pulmonary hypertension resulting from left-sided heart disease or, less frequently, pulmonary disease, while right ventricular volume overload is observed in left-to-right shunts or intrinsic disease of the right ventricle.

TR has a strong negative effect on outcomes [5—8]. In a study of more than 5200 patients followed for longer than 5 years [5], both moderate and severe TR were associated with increased mortality. Moderate TR may indeed worsen during long-term follow-up after surgery for left-sided valvular disease, and is also associated with decreased