Balancing the Benefits of Tricuspid Annuloplasty

Charles Yankah[1] and Volkmar Falk[1]

[1]Charite Universitatsmedizin Berlin

February 27, 2022

Abstract

Tricuspid annuloplasty for moderate to severe TR (Class I, IIb) is the current standard of practice to restore the normal tricuspid annular dimension and function (1,2). The current controversy in atrioventricular surgery concerns the indication for concomitant TA in patients with moderate TR and significant annular dilatation of at least > 40 mm or at least 21 mm/m^2 indexed for body surface area (Class IIb) during mitral valve surgery proposed by the American Heart Association/American College of Cardiology and European Society of Cardiology (1,2,3)

Editorial

Balancing the Benefits of Tricuspid Annuloplasty

Charles Yankah[1], Volkmar Falk[2]

Humanitrian Cardiac Surgery - Global Heart Care, German Heart Center Berlin - Charité University Hospital, Berlin, Germany[1], Dept. of Cardiothoracic & Vascular Surgery, German Heart Center Berlin - Charité University Hospital, Berlin, Germany[2]

Tricuspid annuloplasty for moderate to severe TR (Class I, IIb) is the current standard of practice to restore the normal tricuspid annular dimension and function (1,2). The current controversy in atrioventricular surgery concerns the indication for concomitant TA in patients with moderate TR and significant annular dilatation of at least> 40 mm or at least 21 mm/m^{2}indexed for body surface area (Class IIb) during mitral valve surgery proposed by the American Heart Association/American College of Cardiology and European Society of Cardiology (1,2,3).

It is reported that 65–85% of the population present with trivial to moderate TR which remain asymptomatic until it is discovered in an echocardiogram for preoperative cardiac evaluation or routine cardiovascular checkup (3). Moderate to severe TR occurs in patients with right- and left-sided congenital and acquired diseases and may be associated to bi-ventricular failure, increased risk for associated morbidity such as pulmonary arterial hypertension (PAH), hepato-renal syndrome and mortality (1,4, 7-9).

It is recognized that 14-35% of the patients with RHD have mild-to-moderate functional TR who have an incremental risk of developing severe TR. The patients have a low survival at a mean follow up of 5 years if they remain untreated without concomitant TA during mitral valve surgery (4-9).

The editorial will discuss the paper of Arafat and colleagues with references to recently reported similar topics.

The article published in this edition of Journal of Cardiac Surgery, Arafat and colleagues discuss the results of their ten year clinical experience of concomitant tricuspid annuloplasty (TA) for moderate to severe tricuspid regurgitation (TR) during mitral valve surgery in patients with rheumatic (RMVD - n= 345; 61% had mitral regurgitation and 39% mitral valve stenosis) and degenerative (DMVD n= 135) mitral valve diseases, The objective of the observational non-randomized trial was to identify predictors of durability of TA for moderate to severe TR in patients with RMVD and DMVD undergoing mitral valve repairs and replacements. Valve repair was feasible in 12% in the RMVD group as compared to 52% in DMVD group (10). The TA was performed with flexible, rigid prostheses and the de Vega suture technique.

The mean ages of the two groups (RMVD and DMVD) were 51 and 56 years, respectively. The demography of the RMVD group represents an age shift from juvenile rheumatic heart disease (RHD) to a stage of a burn-out RHD in which structural deterioration process of the rheumatic mitral valve has ceased and stabilized. The pathology of the mitral valve apparatus is presented with annular dilatation or mixed lesion. In absence of calcification valve repair is feasible in experienced hands, otherwise replacement is inevitable (1)

The endpoints of the study by Arafat and colleagues were 30-day mortality, long-term survival, freedom from grade II or higher tricuspid valve regurgitation, change in the degree of tricuspid regurgitation during follow-up and tricuspid valve re-interventions. The Kaplan-Meier method was used to calculate survival at 1, 5, and 7 years, cumulative incidence for recurrent TR and reintervention. Follow-up was 97.8% complete. The median follow-up time was 53 months (25-85 months).

The cumulative incidence of death in Arafat et al. series at 7 years was 4.8% (10). *Similar studies were conducted by Farooq and Bernal and their colleagues in younger patients at a mean age of 41- 46 years, the 30-day mortality was 4.5 - 5.9% (11,12). The Kaplan-Meier survival probability in the series of Bernal and colleagues was 74.4% at 10 years and age >65 years was the only predictor of late mortality (12).*

Progression of moderate TR from the baseline was similarly observed in rheumatic and degenerative populations at a median follow-up of 53 months at 1, 5 and 7 years. It was 15.6% 33.8 and 39.3% in RHD group and 16.1%, 30.4% and 36.02% in degenerative group, respectively. In contrast to mitral valve repair versus replacement plus TA, progression of moderate TR was less in the MV repair group (SHR: 1.69(1.03-2.78); P= 0.038).

In a similar study by Farooq and colleagues on TA plus mitral valve replacement there was no progression of TR reported at three years (11). **Recently reported randomized controlled trial by Gammie and colleagues showed much lesser progression of moderate TR at two years (0.6% vs. 6.1% control group, relative risk, 0.09; 95% CI, 0.01 to 0.69) (3). Bernal and colleagues reported progression of TR during their 15,8 years mean follow up in 23,5% of the RHD population caused by recurrent rheumatic disease (12). Progression of TR in rheumatic endemic region is recognized as an important clinical event which is a sequelae of rheumatic fever caused by streptococcal infection of the throat (Strept-Throat). Consequently, long-term penicillin prophylactic therapy against recurrent RHD as recommended by the World Health Organization (WHO) should be included in the protocol for optimal medical therapy (OMT) for TA-MV Repair.**

The authors should be congratulated for their laudable clinical studies and for sharing the results with the global cardiovascular community. Although it is a single centre observational trial *like others,* which they admit, their data provide valuable information that stimulates discussions in the clinical practice, which encourages early aggressive approach for concomitant tricuspid annuloplasty (TA) plus mitral valve surgery (MVS) in rheumatic populations (11,12). A multi-centre randomized controlled trial to provide predictive power of the resultant data

is required for developing a surgical strategy for TA and MVS in rheumatic patients (10-12). Pacemaker implantation was not an issue in their series *as well as Farooq and Bernal and their colleagues*, but it is a global concern as indicated by a recent multicenter trial that TA carries an additional risk of pacemaker (PM) implantation at a rate of up to 14% as compared to 2.5% for mitral valve surgery alone (rate ratio, 5.75; 95% CI, 2.27 - 14.60) (3,11,12). The risk for procedural related PM implantation needs to be addressed (4-13). It can be reduced or eliminated by refined TA techniques (2,3, 5-8,10-12).

In conclusion, concomitant TA and mitral valve surgery in patients with burn-out rheumatic mitral valve disease will remain a challenge in the next half century. Intensive patient screening program in RHD endemic regions is required to capture reparable burn-out rheumatic mitral valve disease for early valve repair plus TA for moderate TR. The papers by Arafat, Farooq and their colleagues have stimulated timely discussion and incentives for a multicenter randomized controlled trials in rheumatic patients to provide further evidence for supporting the current surgical practice. We are looking forward to the five-year follow up results of the randomized trial for MVS plus TA in patients with degenerative mitral valve disease.

References

1. Antunes MJ, Rodríguez-Palomares J, Prendergast B et al. Management of tricuspid valve regurgitation: Position statement of the European Society of Cardiology Working Groups of Cardiovascular Surgery and Valvular Heart Disease. *Eur J Cardio-Thorac Surg.2017;* 52 (6):1022–1030.

2. David TE, David CM, and Manhiolt C. When is tricuspid valve annuloplasty necessary during mitral valve surgery? J Thorac Cardiovasc Surg 2015;150:1043-4.

3. Gammie JS, Chu MWA, Falk V et al. Concomitant tricuspid repair in patients with degenerative mitral regurgitation. N Engl J Med. 2022;386(4):327-339.

4. Singh JP, Evans JC, Levy D et al. Prevalence and clinical determinants of mitral, tricuspid, and aortic regurgitation (the Framingham Heart Study) Am J Cardiol 1999; 83:897–902.

5. Yankah CA, Siniawski H, Detschades C, Stein J, Hetzer R. Rheumatic Mitral Valve Repair: 22-Year Clinical Results. J Heart Valve Dis 2011;20:257-264.

6. Kim JB, Yoo DG, Kim GS, et al. Mild-to-moderate functional tricuspid regurgitation in patients 336 undergoing valve replacement for rheumatic mitral disease: the influence of tricuspid valve repair on 337 clinical and echocardiographic outcomes. Heart. 2012; 98:24-30.

7. Poveda JJ, Bernal JM, Matorras P et al.. Tricuspid valve replacement in rheumatic disease: preoperative predictors of hospital mortality. J Heart Valve Dis 1996;5(1):26-30.

8. Izumi C, Iga K, Konishi T. Progression of isolated tricuspid regurgitation late after mitral valve surgery for rheumatic mitral valve disease. J Heart Valve Dis. 2002;11(3):353-6.

9. Goldstone AB, Howard JL Cohen JE, et al. Natural history of coexistent tricuspid regurgitation in patients with degenerative mitral valve disease: implications for future guidelines. J Thorac Cardiovasc Surg. 2014;148(6):2802-9.

10. Arafat AA, Alfonso J, Hassan E et al.. The influence of mitral valve pathology on the concomitant tricuspid valve repair. doi.org/10.1111/jocs.16250

11. Farooq O, Jan A, Ghani U, et al. Effect of Concomitant Tricuspid Annuloplasty on Early Outcomes of Mitral Valve Replacement: A Study on Rheumatic Heart Disease Patients. Cureus 2021;13(3): e13646

12. Bernal, JM, Pontón A, Diaz B et al. Combined Mitral and Tricuspid Valve Repair in Rheumatic Valve Disease. Circulation. 2010;121:1934–1940.

13. J Chikwe and M Gaudino. The Price of Freedom from Tricuspid Regurgitation. N Engl J Med. 2022;386(4):389-390.

Disclosure Statement

The authors declare that no conflicts of interest exist.

Corresponding address

Prof. Charles Yankah

Director, Cardiac Simulation Training &

Humanitarian Cardiac Surgery- Global Heart Care

German Heart Centre Berlin

Augustenburger Platz 1

13353 Berlin, Germany

E-mail: yankah@dhzb CC: cyankah@web.de