Clinical and hemodynamic influences of prophylactic tricuspid annuloplasty in mechanical mitral valve replacement

Heemoon Lee, MD,[a] Kiick Sung, MD, PhD,[a] Wook Sung Kim, MD, PhD,[a] Young Tak Lee, MD, PhD,[a] Sung-Ji Park, MD, PhD,[b] Keumhee Chough Carriere, PhD,[c,d] and Pyo Won Park, MD, PhD[a]

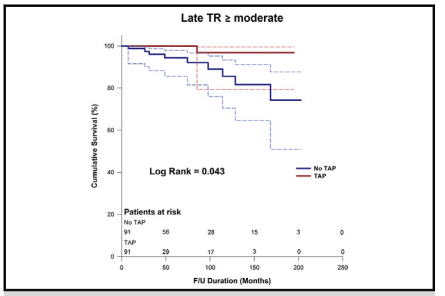
ABSTRACT

Objective: The aim of this study was to evaluate the long-term clinical and hemodynamic influences of prophylactic tricuspid annuloplasty (TAP) in patients with less-than-moderate tricuspid regurgitation (TR) who underwent mitral valve replacement (MVR).

Methods: Between November 1994 and December 2010, 293 patients with less-than-moderate TR who underwent primary mechanical MVR were categorized into 2 groups: TAP (n = 151) or no TAP (n = 142). The median age was 51 years (quartile (Q)1-Q3, 43-59 years). The cause of valve pathology was rheumatic in 92.5% of patients (n = 271). The prevalence of preoperative atrial fibrillation was in 73.0%. Using propensity score matching based on demographic information, 91 TAP patients could be matched to 91 no TAP patients. Median follow-up duration was 107 months (Q1-Q3, 76-162 months).

Results: There was no early mortality in either group. Early morbidities, including heart block were not different between groups. Although overall survival and freedom from cardiac-related mortality did not differ between groups ($P = .519$ and $P = .115$, respectively), freedom from recurrence of moderate or higher TR grade were significantly higher in the TAP group ($P = .043$). In subgroup analyses, these group differences of TAP were especially prominent in patients with sinus rhythm compared with patients with atrial fibrillation at discharge ($P = .047$ vs $P = .460$).

Conclusions: Prophylactic TAP for patients with less-than-moderate TR grade who underwent mechanical MVR can prevent late TR progression without increasing early surgical risks. Longer-term follow-up is required to determine the clinical beneficial effect of prophylactic TAP. (J Thorac Cardiovasc Surg 2016;151:788-95)



Kaplan-Meier curves for moderate-or-greater late tricuspid regurgitation (TR) in the matched TAP and no TAP groups.

Central Message

Prophylactic TAP for patients with less-than-moderate TR who underwent mechanical MVR can prevent late TR progression.

Perspective

Our study demonstrated that prophylactic tricuspid annuloplasty (TAP) with mechanical mitral valve replacement prevents late recurrence of tricuspid regurgitation without increasing early surgical risk. Although prophylactic TAP showed a marginal significance in clinical benefits for patients with less-than-moderate tricuspid regurgitation, the beneficial effect of TAP would be more prominent in longer-term follow-up.

See Editorial Commentary page 796.

Severe tricuspid regurgitation (TR) or even moderate TR after cardiac surgery is associated with a poor prognosis and has an adverse influence on survival.[1-3] Current guidelines recommend tricuspid valve repair for severe TR associated with mitral valve disease requiring mitral valve surgery (class I). Tricuspid valve repair is suggested for TR of lesser severity during mitral valve surgery for patients with tricuspid annular dilatation (class IIa),[4] prior evidence of right-side heart failure (class IIa), or pulmonary hypertension (class IIb).[5] Nevertheless, there are still controversies and discrepancies in concomitant tricuspid

From the [a]Department of Thoracic and Cardiovascular Surgery and [b]Division of Cardiology, Department of Medicine, and [d]Biostatistics and Clinical Epidemiology Center, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea; and [c]Department of Mathematical and Statistical Sciences, University of Alberta, Edmonton, Alberta, Canada.

Read at the 41st Annual Meeting of The Western Thoracic Surgical Association, Whistler, British Columbia, Canada, June 24-27, 2015.

Received for publication July 16, 2015; revisions received Oct 20, 2015; accepted for publication Oct 26, 2015; available ahead of print Jan 9, 2016.

Address for reprints: Pyo Won Park, MD, PhD, Department of Thoracic and Cardiovascular Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, 81 Irwon-ro, Gangnam-gu, Seoul 135-710, Korea (E-mail: pwpark@skku.edu).

0022-5223/$36.00

http://dx.doi.org/10.1016/j.jtcvs.2015.10.104

Scanning this QR code will take you to the article title page.

Abbreviations and Acronyms

AF = atrial fibrillation
BSA = body surface area
IPTW = inverse-probability-of-treatment weighted
LAD = left atrial diameter
MVR = mitral valve replacement
TAD = tricuspid annular diameter
TAP = tricuspid annuloplasty
TR = tricuspid regurgitation

annuloplasty (TAP) with mitral valve surgery.[6,7] Several authors suggested concomitant TAP with mitral valve surgery can be performed safely and effectively.[8,9] However, there have been few reports on the results of concomitant TAP with mitral valve surgery in less-than-moderate TR.[8,10,11] Further, these reports included a mixed population or only early results or a preliminary result from a subgroup analysis. Furthermore, reports on long-term follow-up data are lacking. The aim of our study was to evaluate early and late clinical outcomes of concomitant TAP in patients who underwent isolated mechanical mitral valve replacement (MVR) with less-than-moderate TR.

PATIENTS AND METHODS

Study Population

We retrospectively reviewed data from November 1994 to December 2010 for 490 patients who underwent primary MVR with mechanical prosthesis at our hospital. A total of 147 patients with moderate (+2) or greater TR were excluded. Among the remaining 343 patients, 50 patients with endocarditis, concomitant coronary bypass grafting, or history of previous cardiac surgery were excluded. The remaining 293 patients were then classified into 2 groups: TAP (n = 151) or no TAP (n = 142) (Figure 1). Median age was 51 years (quartile (Q) 1-Q3, 43-59 years). The cause of valve pathology was rheumatic in 271 patients (92.5%). The prevalence of preoperative atrial fibrillation (AF) was 73.0% (n = 214). The study protocol was approved by the hospital's institutional review board, which waived the requirement for patient consent.

Surgical Procedures

All operations were performed through standard median sternotomy. Cardiopulmonary bypass was performed using bicaval cannulation. Myocardial protection was achieved with intermittent cold blood cardioplegia, usually via an antegrade or retrograde route. Retrograde cardioplegia was infused by direct coronary sinus cannulation in patients with significant aortic regurgitation. Bileaflet mechanical valves were implanted in all patients. The concomitant modified Cox-maze III procedure has been performed in patients with AF since the late 1990s. The technique of maze procedure in our hospital was described in previously published reports.[12-14]

In patients with sinus rhythm and gross right atrial enlargement, the right atrium was opened to observe tricuspid valve annular dilatation. TAP was performed in patients with tricuspid valve annular dilatation

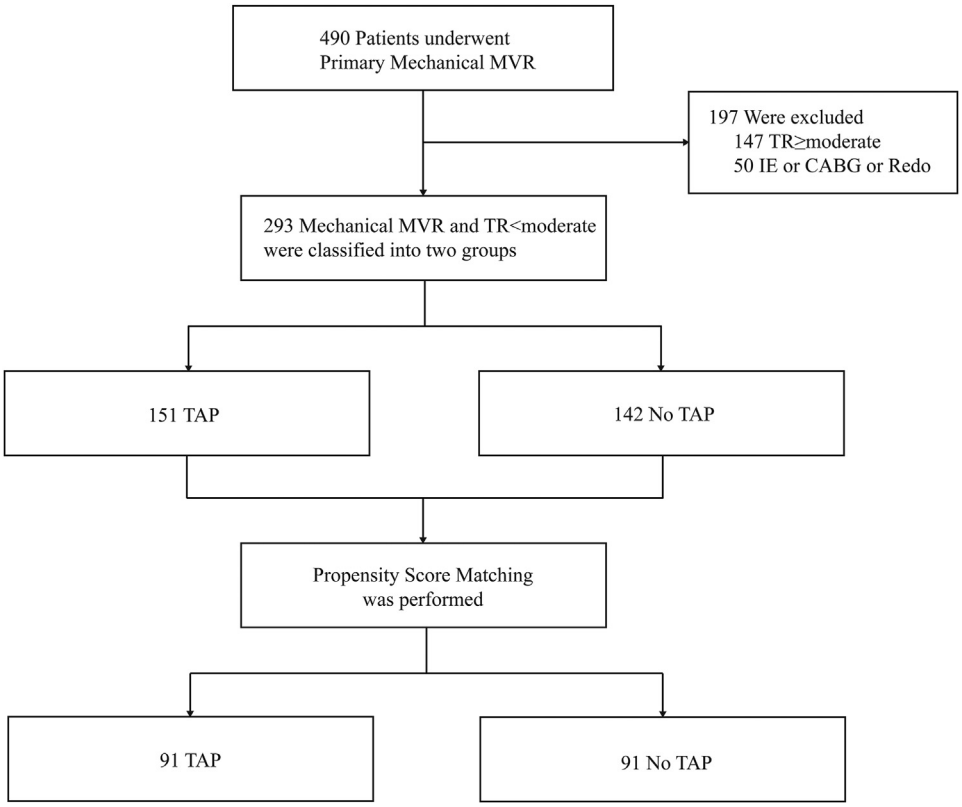


FIGURE 1. Flow diagram of patients enrollment criteria for the study. *MVR*, Mitral valve replacement; *TR*, tricuspid regurgitation; *IE*, infective endocarditis; *CABG*, coronary artery bypass grafting; *TAP*, tricuspid annuloplasty.