

## Peer Review File

Article Information: <https://dx.doi.org/10.21037/jtd-23-1776>

### Reviewer A

Comments:

**Comment A1:** The text lacks a clear definition of AFTR and does not address how the authors considered the atrial origin of TR. Additional information about the disease should be included in the introduction.

**Reply A1:** We have incorporated additional information for AFTR in the introduction. As suggested, we distinguish between ventricular FTR and atrial FTR with new references, outlining the specific etiologies and mechanisms involved. And we added definitions of AFTR in method section.

#### Changes in the text:

(Page 3, line 6)

According to etiology, functional tricuspid regurgitation (FTR) can be categorized into two types: ventricular FTR and atrial FTR. Left-sided valvular or myocardial diseases, along with intrinsic pulmonary vascular diseases, result in pressure overload on the right ventricle (RV), leading to ventricular remodeling. This remodeling includes ventricular enlargement, displacement of papillary muscles, leaflet tethering, and annular flattening and dilation, ultimately contributing to TR, now defined as ventricular FTR (1,2). On the contrary, atrial fibrillation (AF) can induce remodeling of the right atrium (RA) without concurrent RV remodeling, subsequently enlarging the tricuspid annulus and resulting in the development of FTR, now classified as atrial FTR (3).

(Page 5, line 3)

In this study, atrial FTR was defined as 1) isolated TV annular dilatation with RA enlargement and AF and 2) no other reasons to cause FTR, such as significant left ventricular systolic dysfunction (left ventricular ejection fraction (EF) <50%), left-sided valvular heart disease ( $\geq$  moderate degree), RV failure (RVEF <35%), significant pulmonary hypertension (pulmonary arterial systolic pressure above 50 mmHg) (8), and atrial or ventricular septal defect.

**Comment A2:** Important data regarding RA and TV dimensions are missing, which is crucial when discussing AFTR to avoid confusion between ventricular and atrial TR.

**Reply A2:** We included preoperative echocardiographic dimensional data in Table 1 and found that not only RA was enlarged severely but also RV was larger than the normal (Table 1). And we assumed that was because significant TR induced volume overload to result in RV enlargement without significant RV dysfunction in most cases as we already discussed this fact when we stated “AF-induced TR usually originates from a dilated and posteriorly displaced TV annulus, accompanied by RA enlargement and RV eccentric dilatation (15,16).” (4.1. Key findings)

#### Changes in the text

We add the echocardiographic data related RA and TV dimension in Table 1.

**Comment A3:** Concomitant mitral regurgitation (MR) and AFMR, although rare, should be addressed in terms of rate and severity.

**Reply A3:** We added echocardiographic data about combined functional MR. As the patients with left-sided valvular heart disease more than moderate were excluded in this study, all patients didn't suffer from concurrent MR more than moderate degree.

**Changes in the text:**

(Page 8, line 21)

Thirty-nine (90.7%) patients had severe TR and four (9.3%) had moderate-to-severe TR. As for concurrent functional MR, 2 (4.7%) patients had mild-to-moderate MR, 16 (37.2%) had trivial or mild MR while 25 (58.1%) patients had no MR.

**Comment A4:** The method section should specify the particular surgical technique employed. **Reply A4:** We elaborated on the details of surgical techniques as suggested and accordingly deleted the references which previously substituted the following descriptions about surgical techniques.

**Changes in the text:**

(Page 6, line 5)

All patients underwent full median sternotomy under moderate hypothermia and cold cardioplegic arrest, except for 1 patient with right thoracotomy. TV repair, also known as tricuspid annuloplasty (TAP), was preferred in almost all cases, however, the decision to perform a TV replacement (TVR) or TV repair was made at the discretion of the attending surgeon. Throughout the study period, 3 patients underwent direct TVR due to severely dilated annulus including septal leaflet annulus with or without leaflet thinning while another 3 patients initially underwent TV repair but subsequently required TVR because of residual TR after TAP.

For De Vega annuloplasty, annular size reduction was performed using commercially available cylindrical valve sizers with labeled sizes of 27 (actual diameter 29.5), 29 (31.5), and 31 (33.5) millimeters (mm). The plication sutures, made of 3-0 extended polytetrafluoroethylene (e-PTFE), were tied down with the cylindrical size inserted into the TV orifice. For ring annuloplasty, Tri-Ad Adams tricuspid ring (Medtronic, Minneapolis, MN, USA) and MC3 annuloplasty ring (Edwards LifeScience, Irvine, CA, USA) were used during study period and were chosen based on the attending surgeon's preference. The ring size was determined based on the inter-commissural distance of the septal leaflet and the attached leaflet area originating from the anterior papillary muscle.

**Comment A5:** Comparisons between AFTR patients and those with non-functional or non-AF-related TR would enhance the paper's interest.

**Reply A5:** While we appreciate the suggestion to compare AFTR patients with those having non-functional or non-AF-related TR, it seems to fall beyond the scope of our current study. Our primary focus has been on atrial functional tricuspid regurgitation (AFTR), and due to the limitations of our study design, a comprehensive comparison with all types of TR is not feasible within the present manuscript. However, we fully acknowledge the importance of this comparison and plan to consider it in future research endeavors. Thank you for your valuable feedback.

**Changes in the text:** We added a comment as "The further comparative studies according to surgical techniques or origin of TR should be performed." (Page 14, line 9) in limitation section.

**Comment A6:** Since a significant percentage of patients underwent COX-MAZE III, information about left atrial (LA) dimensions should be included.

**Reply A6:** We recognized the necessity to mention echocardiographic data of LA dimensions so that we included those in Table 1. (Table 1)

**Changes in the text:** We included those in Table 1.

In conclusion, this paper could benefit from substantial improvements through the implementation of some modifications. I encourage the authors to transform their descriptive study into an observational one, comparing all causes of TR, rather than its current focus.\*\*

**Reply:** We appreciate your valuable feedback again. While our current study focuses specifically on AF-induced TR, we sincerely agree with your suggestion to consider a more comprehensive approach. We are actively planning additional research to explore various causes of TR in a broader spectrum.

**Changes in the text:** No

## **Reviewer B**

The authors present a small series of patients treated because of AF-induced tricuspid valve regurgitation.

**Comment B1:** For the reader the definition of AF-induced TR is too weak and there is no real proof that for instance heart failure was not the reason for TR instead of Afib. How can the authors convince the readership that TR was induced by Afib and not the contrary?

**Reply B1:** We thankfully recognized the significance of detailed definition of AF-induced TR according to the comments, so we added some sentences in the introductions.

Also, the authors had reviewed all enrolled patients to ensure that the patients were diagnosed as AF before TR and there were any other causes of TR than AF, so we included this information in the methods. To exclude any other reason for FTR than AF, we applied the definitions as we stated below.

**Changes in the text:**

(Page 5, line 3)

In this study, atrial FTR was defined as 1) isolated TV annular dilatation with RA enlargement and AF and 2) no other reasons to cause FTR, such as significant left ventricular systolic dysfunction (left ventricular ejection fraction (EF) <50%), left-sided valvular heart disease ( $\geq$  moderate degree), RV failure (RVEF <35%), significant pulmonary hypertension (pulmonary arterial systolic pressure above 50 mmHg) (8), and atrial or ventricular septal defect.

(Page 5, line 13)

After excluding patients with missing data, 43 patients were finally enrolled in this study and those patients were reviewed by 2 physicians to confirm the presence of AF preceding TR and the absence of any other etiology besides AF.

**Comment B2:** As the authors state in the § limitations, 43 patients collected over an observational interval of more than 20 years makes any conclusions impossible. I agree with the sentence "Second, the number of patients included in the study may not have been sufficient to draw comprehensive conclusions" but I would propose to exchange "may" with is not sufficient.

**Reply B2:** We revised the sentence as recommended.

**Changes in the text:**

(Page 14, line 11)

Therefore, the number of patients included in the study is not sufficient to draw comprehensive conclusions.

**Comment B3:** In that sense, the authors should explain why the present study is more adequate than other studies since they stated that "However, studies on TV surgery for AF-induced TR are inadequate" (line 42).

**Reply B3:** We understand the concern about the term 'inadequate.' Our intent was to highlight the limited research on TV surgery for AF-induced TR. We revised the sentence to make it clearer.

**Changes in the text:**

(Page 4, line 15)

However, research on TV surgery for AF-induced TR is insufficient.

**Comment B4:** I have some problems to accept the inclusion of cardiac death as a tricuspid valve related event. Since the majority of these patients is really sick (with low RV ejection fraction for instance) it is worthwhile that cardiac death is not caused by TR nor by the consequences of its surgical correction but from heart failure or sudden cardiac arrest for instance. If the authors would like to include cardiac death as TVRE, they should explain in depth how they can differentiate the role of TR in the causality of death?

**Reply B4:** We defined TVRE according to the guidelines<sup>1)</sup> where major adverse valve-related events included sudden, unexplained death which was not caused by heart failure in patients with advanced myocardial disease and satisfactorily functioning cardiac valves. To reduce confusion, we elaborated the definition of these death instead of using "valve-related mortality". For reference, we organized 'major adverse valve-related events' as below and added this reference in the manuscript as well.

Valve-related mortality – any death caused by structural valve deterioration, nonstructural dysfunction, valve thrombosis, bleeding event, or operated valve endocarditis, death related to reintervention on the operated valve or sudden, unexplained death. Here, deaths caused by heart failure in patients with advanced myocardial disease and satisfactorily functioning cardiac valves are not counted.

All valve-related morbidity – structural valve deterioration, nonstructural dysfunction, valve thrombosis, embolism, bleeding event, antithrombotic management, operated valve endocarditis, and reintervention.

Need for new permanent pacemaker or defibrillator within 14 days after the valve intervention.

Akins CW, Miller DC, Turina MI, et al. *Guidelines for reporting mortality and morbidity after cardiac valve interventions.* *Eur J Cardiothorac Surg.* 2008;33(4):523-8.

**Changes in the text:**

(Page 8, line 5)

TVRE included development of moderate or severe TV disease, TV reoperation, congestive heart failure (CHF) requiring readmission, major bleeding or thrombosis, and valve-related mortality (14).

**Comment B5:** For a series with a recruitment starting as early as 2000, it is surprising that the mean follow-up is less than 4 years? Can the authors give some precisions when was the majority of patients operated on?

**Reply B5:** As 36 patients (83.7%) of the whole cohort underwent TV surgery since 2014, we added this description in the manuscript.

**Changes in the text:**

(Page 8, line 1)

The follow-up duration was 42.0 (IQR: 17.3 – 152.5) months and most of the patients (n = 36, 83.7%) underwent TV surgery since January 1, 2014.

**Comment B6:** The authors concluded that "interval from initial diagnosis of severe TR to surgery was 2.4 months but TVRE was a significantly associated with longer interval from diagnosis of severe TR to surgery". Could they precise from which time interval between the diagnosis of severe TR the impact on incidence of TVRE significantly starts to increase?

**Reply B6:**

We calculated the cut-off value of interval from diagnosis of severe TR to surgery. And we described in text.

**Changes in the text:**

(Page 8, line 12)

The overall survival and TVRE were compared between groups using log-rank test and Fine-Gray's test.

(Page 8, line 14)

The minimal *p*-value approach was used to estimate a cutoff value of time interval that predicted the occurrence of TVRE.

(Page 11, line 13)

The cutoff value of interval from the diagnosis of severe TR to surgery for predicting the TVRE was 23.1 months.

**Comment B7:** § Methods: Please correct the following sentence "After excluding the patients who underwent concomitant left-sided valve surgery and coronary bypass grafting for aortic surgery" CABG for aortic surgery??

**Reply B7:** We corrected the mistyping and rephrased the sentence.

**Changes in the text:**

(Page 5, line 8)

In a total of 987 patients who underwent concomitant left-sided valve surgery, coronary bypass grafting, or aortic surgery, TR could be attributed to causes other than AF, those patients were excluded from the study.

**Comment B8:** § Surgical procedure: please simplify the following sentence - it is not clear what was left at the discretion of the surgeons?

Before 2005, the surgery type was chosen at the discretion of the attending surgeons. However, TV repair has been the preferred method since

2005. After 2005, all patients underwent TV repair first. However, three patients underwent TV replacement because of repair failure. The decision to perform a tricuspid valve repair or replacement was made at the discretion of the attending surgeon.

**Reply B8:** We acknowledged the lack of clarity describing the indications for TVR so that we revised several sentences as suggested hoping it could enhance reader's clear comprehension.

**Changes in the text:**

(Page 6, line 5)

All patients underwent full median sternotomy under moderate hypothermia and cold cardioplegic arrest, except for 1 patient with right thoracotomy. TV repair, also known as tricuspid annuloplasty (TAP), was preferred in almost all cases, however, the decision to perform a TV replacement (TVR) or TV repair was made at the discretion of the attending surgeon. Throughout the study period, 3 patients underwent direct TVR due to severely dilated annulus including septal leaflet annulus with or without leaflet thinning while another 3 patients initially underwent TV repair but subsequently required TVR because of residual TR after TAP.

**Comment B9:** § Results: the median follow-up for echo was 21 months but FU examinations were performed at 3 to 54 months interval (line 96) and overall follow-up was 42 months. There are some data concerning the schedule of follow-up which seem strange and here also the authors should clarify for instance why patients who were followed at 3-4 months intervals did not get more than 1 echo at a mean follow-up of 21 months?

**Reply B9:**

As we described in text, the echocardiographic follow-up was performed at the discretion of the operating surgeon. The echocardiography usually was performed 1 year and 5 year after surgery, if the patients didn't have problem. Therefore, if the patient has no special problems during 21 months after surgery, one echocardiography would be performed

**Changes in the text:** no

**Comment B10:** I believe that a mean cardiopulmonary bypass (CPB) and aortic cross-clamp (ACC) times were  $160.6 \pm 50.7$  and  $100.4 \pm 27.5$  minutes is extremely long if isolated TV surgery was performed. Can the authors confirm this or add which concomitant surgery except Cox Maze was performed? What is the reason for such a long clamping time?

**Reply B10:**

The majority of the patients (n=39, 90.7%) underwent concomitant Cox-maze III procedures, and some patients required re-clamp because of initial repair failure. These factors affected the relatively long CPB and ACC time.

**Changes in the text:** no

**Comment B11:** Could the authors give some precisions regarding the technique of repair: with ring or de Vega or others?

**Reply B11:** Among 37 cases of tricuspid valve repair, most cases were ring annuloplasty – 23 cases of Tri-Ad ring and 10 cases of MC 3 ring annuloplasty while 4 patients underwent De-Vega type annuloplasty. So, the authors added this information in Table 3.

**Changes in the text:** We included those in Table 3.

**Comment B12:** It would also be interesting to know about the regime of anticoagulation?

**Reply B12:** As suggested, we elaborated additional data about anticoagulation in the Results section of “Mid-term clinical outcomes”.

**Changes in the text:**

(Page 9, line 19)

As for anti-coagulation during follow-up, 5 patients (11.9%) without mechanical TV and free from atrial fibrillation were prescribed no anti-coagulation. Fifteen patients (35.7%) were on novel oral anticoagulants (NOAC) while 10 (23.8%) on anti-platelet agents such as aspirin or clopidogrel, and 7 (16.7%) on warfarin. Additionally, 5 patients (11.9%) with concurrent cerebral or coronary arterial disease received a combination of anti-platelet therapy with NOAC or warfarin.

**Comment B13:** § Discussion. Here the authors referred to "critical morbidity and mortality associated with tricuspid valve surgery, based on previous studies but to my impression the list of complications in this small series is also impressive.

**Reply B13:** We understand the concerns about the impressive rates of morbidity in the entire cohort. Despite of limited sample size of our study, the mortality rate of 2.2% and morbidity rate of 51.2% were still lower than those of 8.8% and 67.6% respectively, according to the nationwide reports about surgical outcomes of isolated TV surgery performed between 2004 and 2013 in USA<sup>2)</sup> which was included in the reference lists of the present manuscript.

Zack CJ, Fender EA, Chandrashekar P, et al. *National Trends and Outcomes in Isolated Tricuspid Valve Surgery*. J Am Coll Cardiol. 2017;70(24):2953-60.

## Reviewer C

**Comment C1:** The investigators summarized the perioperative and mid- to long-term results of 43 single tricuspid valve surgery (39 cases with Cox-maze III) for tricuspid regurgitation due to atrial fibrillation.

The relatively good results were attributed to the short period between the diagnosis of severe tricuspid regurgitation and the surgery.

The recurrence rate of atrial fibrillation after Cox-Maze surgery was 67.6%, which is not good from the perspective of atrial fibrillation control.

This study is an achievement in clarifying the postoperative real world of stand-alone tricuspid valve surgery. On the other hand, the value of the study is questionable, as there are many unexamined aspects, such as whether tricuspid valve replacement or tricuspid valve plasty is recommended, and the usefulness of surgical intervention on the tricuspid valve papillary.

**Reply C1:** We appreciate the reviewer's acknowledgment of our study's contribution in elucidating the postoperative outcomes of stand-alone TV surgery in the real world. Regarding the unexamined aspects mentioned, such as the choice between tricuspid valve replacement and tricuspid valve repair, and the utility of surgical intervention on the tricuspid valve papillary, we acknowledge the importance of these considerations. But the present study could not conduct thorough comparative research on these specific techniques because of its insufficient volume, so we mentioned this in the limitations. While our current study primarily aimed to present perioperative and mid- to long-term results, we recognize the need for further investigations to address these specific aspects. Future research endeavors from our team will aim to explore and provide insights into these important questions. Thank you for your valuable feedback.

**Changes in the text:**

(Page 14, line 7)

Therefore, the number of patients included in the study is not sufficient to draw comprehensive conclusions, particularly in terms of conducting detailed research on surgical techniques, such as a comparison between TV replacement and repair due to the small sample size.

## Reviewer D

Major comments;

**Comment D1:** The authors focus on AF induced TR and report on its surgical outcomes. Authors reported that tricuspid valve surgery for TR induced by Af showed low surgical mortality and favorable mid-term outcomes.

TRs caused by Af are the subject of this study, but 43 cases out of 1301 tricuspid valve surgeries is a very small number. The authors excluded the patients who underwent left sided valve surgery and coronary bypass grafting. Although we know that most of them are secondary to diseases of the left heart system (mitral valve, etc.), there are many mixed types that are difficult to determine whether they are caused by atrial fibrillation or not. The distribution of these patients should be mentioned.

**Reply D1:** We fully agreed that the mixed types of etiologies can exist in the same patient, so we'd like to exclude those patients at the start (Figure 1). To mitigate any potential misunderstanding, we modified several sentences in the methods.

### Changes in the text:

(Page 5, line 8)

In a total of 987 patients who underwent concomitant left-sided valve surgery, coronary bypass grafting, or aortic surgery, TR could be attributed to causes other than AF, those patients were excluded from the study. Among 314 patients who underwent isolated TV surgery, 48 patients who had morphological defects at TV apparatus and 212 patients with other origins of FTR than AF were also excluded. After excluding patients with missing data, 43 patients were finally enrolled in this study and those patients were reviewed by 2 physicians to confirm the presence of AF preceding TR and the absence of any other etiology besides AF.

**Comment D2:** This main pathology of these patients is atrial fibrillation; it is very important if it was treated simultaneously or not. So the indications for MAZE procedure need to be described in detail.

**Reply D2:** Thank you for your comment. All surgeons basically considered concomitant anti-arrhythmic surgery for vast of the patients but there were a few exceptions – 1 patient who underwent TV surgery 20 years ago experienced concomitant right-side Maze procedure while 3 patients were not indicated for any Maze procedure due to severe pericardial adhesion, thin and large RA, RV dysfunction and co-morbidities including old age above 80. So we added this information in the results as suggested.

### Changes in the text:

(Page 9, line 6)

The concomitant Cox-maze III procedure was performed in 39 patients (90.7%). For 3 patients, the Maze procedure was not indicated due to the factors such as severe pericardial adhesion, a significantly enlarged and thin RA, concurrent RV dysfunction, and various co-morbidities including old age above 80. Among the entire cohort, 34 patients underwent the left atrial appendage (LAA) treatment through various technique including internal obliteration (n = 7), external exclusion (n = 12), or excision (n = 15).



**Comment D3:** And Authors should show the outcome of the patients who underwent MAZE or not separately. And they should show the outcome of the patients who successfully regained the sinus rhythm or not.

**Reply D3:** We fully understand the importance of subgroup analysis, and we acknowledge your point about comparing outcomes based on the concurrent Maze procedure. However, due to the limited sample size of only 3 patients who did not undergo the Maze procedure, statistical stratification was not practically feasible in this study. Appreciating your valuable insights, we plan to conduct future studies with a larger cohort to further investigate the efficacy of the concurrent Maze procedure in patients with AF-induced TR. Meanwhile, we add the outcomes patients who gain the sinus rhythm.

**Changes in the text:**

(Page 11, line 17)

During follow-up, sinus rhythm was maintained in 20 patients. There was no long-term mortality in patients with sinus rhythm, and the cumulative incidence of TVRE was 10% at 3 years. While there was a significant difference in overall survival between patients with sinus rhythm and those without sinus rhythm ( $P = 0.011$ , Supplemental Figure 1(A)), there was no significant difference in the incidence of TVRE between patients with sinus rhythm and those without sinus rhythm ( $P = 0.147$ , Supplemental Figure 1(B)).

**Comment D4:** Also authors should mention the Cumulative incidence of the recurrence of Af stratified by the patients who underwent MAZE procedure or not.

The postoperative echo data should be described. (RV reverse remodeling, residual TR, etc)

**Reply D4:** In previous text, we already showed the cumulative incidence of the recurrence of AF in patients who performed Cox Maze procedure. It might be unnecessary to present AF recurrence in patients who did not undergo a maze procedure. In this study, three patients who didn't undergo MAZE procedure sustained AF. Also, postoperative follow-up data concerning recurred TR were described in Table 4 and Figure 3.

**Changes in the text:** We added the information for recurred TR in Table 4 and Figure 3.

Minor comments

**Comment D5:** Line 53 “coronary bypass grafting for aortic surgery” What does this mean?

**Reply D5:** It was a typing error. We corrected a mistyping.

**Changes in the text:**

(Page 5, line 10)

“coronary bypass grafting or aortic surgery”

For these reasons, I do not believe that this paper is appropriate for publication in Journal of Thoracic Disease in this version. I recommend that major revision is required.

**Reviewer E**

**Comment E1:** difference between AF-induced tricuspid regurgitation and other causes should be more detailed.

**Reply E1:** We revised some sentences in the introduction to include more details about different types of functional TR according to the etiologies to compare AF-induced (atrial) FTR and ventricular FTR.

**Changes in the text:**

(Page 3, line 6)

According to etiology, functional tricuspid regurgitation (FTR) can be categorized into two types: ventricular FTR and atrial FTR. Left-sided valvular or myocardial diseases, along with intrinsic pulmonary vascular diseases, result in pressure overload on the right ventricle (RV), leading to ventricular remodeling. This remodeling includes ventricular enlargement, displacement of papillary muscles, leaflet tethering, and annular flattening and dilation, ultimately contributing to TR, now defined as ventricular FTR (1,2). On the contrary, atrial fibrillation (AF) can induce remodeling of the right atrium (RA) without concurrent RV remodeling, subsequently enlarging the tricuspid annulus and resulting in the development of FTR, now classified as atrial FTR (3).

(Page 5, line 3)

In this study, atrial FTR was defined as 1) isolated TV annular dilatation with RA enlargement and AF and 2) no other reasons to cause FTR, such as significant left ventricular systolic dysfunction (left ventricular ejection fraction (EF) <50%), left-sided valvular heart disease ( $\geq$  moderate degree), RV failure (RVEF <35%), significant pulmonary hypertension (pulmonary arterial systolic pressure above 50 mmHg) (8), and atrial or ventricular septal defect.

**Comment E2:** considering isolated tricuspid valve surgery, a mean aortic cross clamp time of 100 minutes seems high, and this might impact outcomes.

**Reply E2:** The majority of the patients (n=39, 90.7%) underwent concomitant Cox-maze III procedures, and some patients required re-clamp for re-repair or replacement because of initial repair failure. These factors affected the relatively long CPB and ACC time.

**Changes in the text:** no

**Comment E3:** similarly, in many centers isolated tricuspid valve surgery is performed with CPB but without aortic cross clamp (to minimize aortic manipulation, avoid cardioplegia and the resulting right ventricular dysfunction). please discuss.

**Reply E3:** Our surgical strategy for TV surgery typically involves full median sternotomy and cardioplegia infusion. Especially, we believe that concomitant Maze procedure should be performed for patients with atrial induce TR. In these cases, we believe that median sternotomy approach can be a better option to perform the TV surgery and Maze procedure. We added the comments in the limitations section.

**Changes in the text:**

(Page 14, line 13)

Third, although isolated TV surgery can be performed safely through minimally invasive procedures (29), most surgeries in the present study were conducted via median sternotomy because the concomitant Maze procedure can increase the complexity of surgery for patients with atrial FTR. Further studies regarding surgical approach for these patients are needed to assess more effective strategies.

**Comment E4:** in Kaplan Meier figures, censored cases should be marked, and X-axis should be truncated earlier (e.g. when patients at risk are <10% of the initial cohort, so at 12 years for Figure 2, 8 years for Figure 3A, 4 years for Figure 3B)

**Reply E4:** As recommended, we revised the figures to indicate censored cases and truncate the X-axis when the proportion of patients at risk falls below 10% of the initial cohort for better clarity. (Figure 2,3A,3B)

**Comment E5:** Cox regression analysis is mentioned but results are missing.

**Reply E5:** We performed Cox regression analysis to find the risk factors for time related events. Only interval from the diagnosis of severe TR to surgery was associated with TVRE, and the result was written in “Mid-term clinical outcomes” section.

**Changes in the text:** no

**Comment E6:** late (= follow up) outcomes should be summarized in table

**Reply E6:** We added new table summarizing mid-term outcomes including late mortality and major morbidities during follow-up as suggested (Table 4). Also, we added descriptions about TV re-operation cases as well.

**Changes in the text:**

(Page 11, line 2)

One patient in the TVR group underwent reoperation because of structural bioprosthetic valve degeneration, approximately 40 months after the first surgery while 2 patients in the TAP group underwent reoperation of TVR with concomitant mitral valve repair due to recurred TR along with newly developed significant MR. During follow-up, bleeding events occurred in two patients, but there were no embolic events, including thromboembolic stroke (Table 4).

**Comment E7:** avoid duplication of results between text and tables. remove un-necessary data from text to improve fluency.

**Reply E7:** Following the recommendation, we deleted some sentences in the results to avoid unnecessarily repeated information.

**Changes in the text:** We deleted some sentences including “~~The mean age of the patients was 69.3 ± 1.4 years and 22 patients (51.2%) were female. The most common comorbidity was hypertension (n = 19, 44.4%), followed by chronic kidney disease (n = 19, 42.2%).~~” in the Result section

**Comment E8:** references should be updated as many pertinent, recent, and relevant papers were not included and discussed.

**Reply E8:** We updated some references (reference number 2,3,4,5,20) to include recently published studies as suggested.