Peer Review File

Article information: https://dx.doi.org/10.21037/jtd-23-1306

Reviewer A

Comment 1: Page 4 lines 92-93 and Table II. If the authors could show definition of the types of AF (PAF, pers AF, lspers AF) more specifically based on the duration of AF (i.e. PAF: <7 days, lspers> 12 months etc), it would be helpful for the readers.

Reply 1: Thank you for this important observation. We added the corresponding definitions as well in text as in Table 2.

Changes in the text 1: 'Between July 2019 and December 2021 we performed 187 robotic assisted MV procedures. In sixty-four of them, a concomitant cryoablation was conducted, due to paroxysmal (PAF), persistent (persAF) or long-standing persistent AF (lspersAF). PAF is classified as an episode of AF that ends on its own and lasts less than 7 days. People with persAF have an arrhythmia event that lasts for more than 7 days and needs electrical or drug-based cardioversion to end. As lspersAF, we described AF that is unresponsive to treatment by cardioversion and has been going on for more than a year.' (Page 4)

Please also see Table 2.

Comment 2. Page 5 lines 141- (AF ablation section). I understand lesion sets of cryoablation were based on surgeons preference. However, biatrial MAZE adds longer cross clamp time or cardiopulmonary bypass compared with left side MAZE. Moreover, biatrial MAZE might have higher rate of PPM implantation. If there is a general principle/rule to choose biatrial MAZE over left side MAZE, please indicate that.

Reply 2: Thank you for this comment. A biatrial MAZE would be conducted if there was also a right heart condition, such as tricuspid valve insufficiency or significant right atrial enlargement, as well as in individuals with a history of atrial flutter paired with atrial fibrillation. We added this explanation to the text.

Changes in the text 2: 'The selection of cryolesions set was based on surgeon preference. However, as a general rule, a biatrial MAZE would be conducted if there was also a right heart condition, such as tricuspid valve insufficiency or significant right atrial enlargement, as well as in individuals with a history of atrial flutter paired with atrial fibrillation.' (Page 6)

Comment 3a: Baseline characteristics section (Page 8), Table I, and Table II. There are several preoperative risk factors for recurrence of AF after MAZE, such as duration of AF, atrial dimension, f wave voltage in EKG, according to literature. If there are such data, it would be helpful.

Reply 3a: Thank you for this question. The duration of AF is listed in Table 2 under: 'history of AF' (months). For clarity we changed the name of the variable to 'duration of AF since first diagnosis (months)' and also added a sentence in the description of baseline characteristics.

Unfortunately, concerning the left atrial size we had very different preoperative echocardiographic data from the referring cardiologist reporting either over volume in ml/m^2, either over surface in cm^2 and in over a third of the case not reporting over it at all. This is the reason why we explicitly left out this parameter, due to inconsistency in its reporting.

Also, we have no data of f wave voltage in EKG. This parameter wasn't one that we focused on.

Changes in the text 3a: 'Compared to patients in the MIMVS group, those in the RMV group had a longer median duration of AF since first diagnosis (12.5 vs. 7 months, $p = 0.22$).' (Page 8)
Please see Table 2.

Comment 3b: In addition, given that this study focus on the cohorts undergoing mitral valve surgery and concomitant MAZE procedure, the authors should show etiology (primary vs secondary) and functional classification (type II etc) of mitral valve.

Reply 3b: Thank you again for your observation. We added the data concerning type and etiology of the mitral valve pathology to the baseline characteristics chapter and also to Table 3.

Changes in the text 3b: 'Most patients presented with normal left ventricular function. 81.7% presented primary mitral valve pathology with type II insufficiency according to the Carpentier classification as being the most encountered in both study groups. 95.2% had 3rd degree mitral insufficiency.'

Please also see Table 3.

Comment 4: Page 8 lines 249-250 and Table III. Please define the grades of LV function more specifically (i.e. normal LVEF> 60% etc).

Reply 4: Thank you for this observation. We added a classification of LV EF as well in the text as in Table III.

Changes in the text 4: 'The preoperative echocardiography findings are presented in Table III. Based on the preoperatively defined LV EF, patients were distributed into three categories: normal LV EF (> 55%), moderate LV EF (30-50%), and severe LV EF (< 30%). Most patient presented with normal left ventricular function.' (Page 8) Please also see Table 3.

Comment 5: Page 8 lines 257-258 and Table IV. Bypass time seems shorter ($p < 0.05$) in MIMVS group.

Reply 5: Thank you again for this comment. You are completely right; we corrected the sentence in the 'intraoperative data' section.

Changes in the text 5: 'The RMV group had a substantially longer median bypass time than the MIMVS group (181 vs. 166 minutes, p= 0.02), however this difference is not reflected in the crossclamp time, which is quite similar between the two groups (99 vs. 101 minutes, p= 0.67).' (Page 8)

Comment 6: Post-operative outcomes section (Page 9). Was there any late PPM implantation? It is known that late-onset PPM implantation can occur.

Reply 6: Thank you for this question. There was only one case of late PPM implantation. We added a sentence reporting about this late-onset PPM implantation in the section describing the follow up results.

Changes in the text 6: Only one patient necessitated the implantation of a two chamber PPM during follow up. (Page 9)

Comment 7: Table V. There is one case of perioperative ECMO management, which is a significant event for minimally invasive mitral valve surgery. Could you describe the case?

Reply 7: Thank you for pointing this fact out. We added the description of this particular case to the post-operative outcomes chapter, Page 9, as for sure others would ask themselves the same question you did.

By the patient in question, the surgical procedure included biatrial MAZE ablation in addition to mitral and tricuspid valve repair. Lactate levels as well as vasopressor support kept rising in the early postoperative phase, and due to biventricular dysfunction, we made the decision to set up a veno-arterial ECMO to provide hemodynamic and respiratory support. Following three days of continuous therapy, the hemodynamic situation stabilized with time, allowing the VA ECMO flow to be decreased. After a week, the VA ECMO was taken out and a VV ECMO was installed because pulmonary weaning off the extracorporeal system was not viable. After a further week of weaning, the VV ECMO was removed. The patient made a full recovery and was discharged from our standard ward on the 28th day following the surgical procedure.

Changes in the text 7:' With one exception, there were no significant differences in the postoperative course between the two patient populations (Table V). The exception constitutes a patient who needed an extracorporeal membrane oxygenation (ECMO) therapy. By the patient in question, the surgical procedure included biatrial

MAZE ablation in addition to mitral and tricuspid valve repair. Lactate levels as well as vasopressor support kept rising in the early postoperative phase, and due to biventricular dysfunction, we made the decision to set up a veno-arterial ECMO (VA ECMO) to provide hemodynamic and respiratory support. Following three days of continuous therapy, the hemodynamic situation stabilized with time, allowing the VA ECMO flow to be decreased. After a week, the VA ECMO was taken out and a veno-venous ECMO (VV ECMO) was installed because pulmonary weaning off the extracorporeal system was not viable. After a further week of weaning, the VV ECMO was removed. The patient made a full recovery and was discharged from our standard ward on the 28th day following the surgical procedure.'

Reviewer B

Comment 1: I would only ask if comment could be made on if the same surgeons were performing the MIMVS and the robotic cases? Also, how the learning curve of robotic surgery is represented – for example, have you selected the robotic cases after the learning curve etc. Just to give clarity on who is doing the surgery in both groups.

Reply 1: There are three operating surgeons who have extensive expertise with the MIMVS approach, two of whom have furthered specialized and are now performing the surgeries robotic assisted.
In the paper entitled 'Robotically assisted mitral valve surgery-experience during the restart of a robotic program in Germany' (reference 20) we present the result of the first 182 patients who underwent robotically assisted mitral valve surgery in our unit. The establishing phase of RMV was reasonably quick after thorough planning, with no elevated risks for the patients. The program's initial extended operative times were greatly lowered by focusing on structured and standardized operation methods. As early as 2020, less than a year after the program began, operation times were comparable to standard MIMVS procedures. In the above mentioned paper it is stated that when comparing the first with the last six month period in a 31 months interval in total, there was a reduction in operating time, bypass time and cross-clamp time of 32%, 31% and 25%, respectively. For the current study we didn't rule out patients that were operated on in the establishment phase.

Changes in the text 1: ‘The inclusion and exclusion criteria for robotic assisted surgery in our centre, as well as the operative approach have been previously published (20). There are three operating surgeons who have extensive expertise with the MIMVS approach, two of whom have furthered specialized and are now performing the surgeries robotic assisted. The establishing phase of RMV was reasonably quick after thorough planning, with no elevated risks for the patients (20). The program’s initial extended operative times were greatly lowered by focusing on structured and standardized operation methods (20). As early as 2020, less than a year after the program began, operation times were comparable to standard MIMVS procedures (20).

With growing experience, robotic MVR almost replaced completely mini-MVR in our institute. In the present study we did not exclude patients, who underwent surgery during the establishment phase.’ (Page 6)

Comment 2: One question – regarding survival – your p value is 0.056, which is not <0.05 as stated in methods and therefore, you should not say that the survival was higher as this is not true according to the criteria you have laid out and this will need changing elsewhere it is written.

Reply 2: Thank you for this valuable observation. We have corrected throughout the text the reporting of the survival results.

Changes in the text 2: Abstract: ‘At the mid-term survival was similar between groups, log-rank test P =0.056.’(Page 2)

Results: ‘Five patients died during follow-up. As shown in the Kaplan-Meier survival curves (Figure 1), the survival rate was similar between our two study groups (log-rank test P = 0.056).’ (Page 9)

Reviewer C

Comment: Very well paper I suggest to use the echocardiographic patterns to define the atrial diameter before ablation.

Reply: Thank you, I very much agree with your observation. Unfortunately,

concerning the left atrial size we had very different preoperative echocardiographic data from the referring cardiologist reporting either over volume in ml/m^2, either over surface in cm^2 and in over a third of the case not reporting over it at all. This is the reason why we left this parameter out.