

Peer Review File

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Reviewer A

Comment 1: In this study, the superiority of hemodynamics over Intuity's Magna Ease is well understood. However, there is no explanation for the difference in surgical indication between Intuity and biological valves.

Reply 1: There was no definite surgical indication between Intuity and other biological valves but surgeon's preference largely influenced the prosthesis selection.

We added the explanation for the strategy of prosthesis selection in '**Operative Techniques and Strategy**'.

Changes in the text: Prosthesis selection between Intuity valve and other bioprostheses including Magna Ease valve was largely determined by the surgeon's preference. Intuity valve was used exclusively by a single surgeon, whereas Magna Ease valve was used by all surgeons in our institution. (see Page 6, line 117)

Comment 2: In cases where the valve ring is soft, a conventional AVR will be suitable, and how about the form of the valve opening? No matter how elliptical it is, can Intuity be fixed?

Reply 2: Even in cases of aortic valves with elliptical opening, Intuity can be well-fixed and takes best advantage with our modified technique of additional anchoring sutures. Distorted geometry of native annulus was frequently observed, particularly in bicuspid aortic valves, and with additional anchoring sutures, the sewing ring of Intuity could be completely fitted to the native annulus (Reference No. 24). The skirt portion of Intuity also have advantages in reducing turbulent flow and optimizing the hemodynamic performance by reshaping the left ventricular outflow tract (LVOT), particularly in patients with elliptical or distorted LVOT.

We revised the section 'Discussion' to discuss Reviewer's comment.

Changes in the text: Even in cases of aortic valves with elliptical opening, Intuity valve can be well-fixed and takes best advantage of our modified technique. Distorted geometry of native annulus was frequently observed, particularly in bicuspid aortic valves, and with additional anchoring sutures, the sewing ring of Intuity valve could be completely fitted to the native annulus (24). The skirt portion of Intuity valve also have advantages in reducing turbulent flow

and optimizing the hemodynamic performance by reshaping the left ventricular outflow tract, particularly in patients with elliptical or distorted LVOT. (see Page 12, line 266)

Comment 3: In addition, although the superiority of Intuity is observed in patients with narrow LVOT, some patients who require left ventricular outflow tract resection may be suitable AVR.

Reply 3: We totally agree to the Reviewer's comment that although the superiority of Intuity is observed in patients with narrow LVOT, some patients require left ventricular outflow tract resection to relieve outflow obstruction and perform suitable AVR. We added Reviewer's comment in the section 'Discussion'.

Changes in the text: It should also be noted that although the superiority of Intuity valve is observed in patients with narrow LVOT, some patients require LVOT resection to relieve outflow obstruction and perform suitable AVR. (see Page 12, line 256)

Comment 4: I believe that it is necessary to consider the disadvantages or shortcomings of Intuity in the discussion.

Reply 4: As Reviewer indicated, we revised our manuscript to include the disadvantages or shortcomings of Intuity in the section 'Discussion'.

Changes in the text: Several shortcomings of Intuity valve reported in the previous studies should be recognized. The number of new postoperative conduction disorders, especially left bundle branch block, remains high during follow-up, although the long-term clinical significance was undetermined (31). There are also concerns that the existence of the subvalvular structure might cause anatomical changes in the aortic-mitral fibrous continuity, thus resulting in the alteration of mitral annular motion (32). (see Page 13, line 294)

Comment 5: There is also this case report in the Trifecta early failure literature.

Kataoka H, Tanaka H, Toshida T, et al. Intraoperative trifecta valve malfunction. *Ann Thorac Surg* 2021;112:e107-e109.

Reply 5: We cited this case report in the section 'Discussion'.

Changes in the text: However, there are studies reporting intraoperative malfunction (26) or early degeneration in cases of the Trifecta prosthesis because of leaflet dysfunction, with calcification, fibrous thickening, or pannus formation (27,28). (see Page 12, line 279)

Reviewer B

Comment 1: Moreover, the implantation technique of the PERIMOUNT Magna Ease heart valve prostheses was inconsistent. In most patients, non-everting mattress sutures buttress-reinforced with polytetrafluoroethylene as a tubule were used. Everting or non-everting mattress sutures with polytetrafluoroethylene as a usual pledget instead of a tubule were occasionally used as needed. Continuous suture technique was used in 11 study patients (5.1%). Knot-tying was performed manually or with an automated knot fastener.

Of course, these technical aspects are very important because they might have a significant impact on hemodynamics and this has been a controversial issue in the past. Authors should please elaborate on this matter.

Reply 1: Thank you for your valuable comments. It is true that the implantation technique of the PERIMOUNT Magna Ease heart valve prostheses was inconsistent and that technical aspects are very important because they might have a significant impact on hemodynamics. This limitation originated from the fact that PERIMOUNT Magna Ease prostheses were used by variable surgeons and that the implantation techniques varied according to the surgeons' preference, whereas Intuity was used exclusively by a single surgeon.

We revised our manuscript to include this limitation in the section 'Limitation'.

Changes in the text: The implantation technique of the Magna Ease valve, which varied among surgeons, might also confound the hemodynamic outcomes. (see Page 14, line 307)

Comment 2: Also, especially in small sized aortic annuli and geriatric patients TAVR should be mentioned as a treatment option in the discussion section (e.g. page 12, line 268).

Reply 2: We revised our manuscript to include Reviewer's comment.

Changes in the text: Especially in these geriatric patients and small-sized aortic annuli, transcatheter aortic valve implantation (TAVI) should be considered a reasonable treatment option. (see Page 13, line 287)

Comment 3: There was one spelling mistake: page 10 line 199 PEMRIMOUNT (instead of PERIMOUNT).

Reply 3: We revised the spelling mistake.

Changes in the text: First, the early postoperative hemodynamic performances of Edwards Intuity were superior to those of Carpentier-Edwards PERIMOUNT Magna Ease for all prosthesis sizes. (see Page 10, line 205)

Reviewer C

Comment 1: Although addressing final transvalvular gradient, authors should be able to definitively rule out the pathophysiological mechanisms underlying the already known results. Hence, authors should:

- 1) present dimensionless parameters (e.g. DVI).
- 2) focus their attention on LVOT hemodynamics (gradients, peak and mean velocities, VTI).

Reply 1: As Reviewer indicated, we re-analyzed our raw data and added the table in the ‘**Supplementary Appendix**’ to include dimensionless parameters and LVOT hemodynamic parameters.

Changes in the text: Dimensionless parameter (Doppler velocity index [DVI]) and LVOT hemodynamic parameters (LVOT velocity time integral [VTI] and peak velocity) also demonstrated significant differences between the groups in the overall population. When stratified by prosthesis size, a trend of superior hemodynamics was observed in Intuity valve, although it failed to prove statistical significance in some subgroups of patients (*Table S1*). (see Page 10, line 197)

Reviewer D

Comment 1: Data regarding the long-term durability (+5 years) and incidence of SVD would be of greater importance and interest for the reader.

Reply 1: Absence of data regarding long-term durability beyond 5 years is the limitation of our data because Intuity was first introduced in 2016 at our institution. We are going to deal with the long-term outcomes in the future study.

We revised our manuscript to include Reviewer’s comment in the section ‘Limitation’.

Changes in the text: Also, data regarding the long-term durability beyond 5 years and incidence of structural valve deterioration, which would be of great importance, was not investigated. (see Page 13, line 311)

Comment 2: Line 53: Correct to “ RD valves are known to...”

Reply 2: We revised our manuscript as Reviewer indicated.

Changes in the text: RD valves are known to have several advantages compared with conventional bioprostheses. (see Page 4, line 53)

Comment 3: Line 56: Correct to "...of RD valves are reported to be..."

Reply 3: We revised our manuscript as Reviewer indicated.

Changes in the text: Furthermore, the hemodynamic performance of RD valves are reported to be better than that of conventional bioprostheses (4,5). (see Page 4, line 56)

Comment 4: Line 61: Correct to "The Magna Ease valve/ prosthesis.."

Reply 4: We revised our manuscript as Reviewer indicated.

Changes in the text : Magna Ease valve/prosthesis is a bovine, stented, supra-annular aortic valve bioprosthesis based on the designs of the well-established PERIMOUNT and Magna valves with proven long-term durability (6). (see Page 4, line 61)

Comment 5: Generally I would refer to the "Intuity" or "Magna" valve, not only Intuity or Magna.

Reply 5: We revised our manuscript as Reviewer indicated.

Changes in the text: We revised every "Intuity" to "Intuity valve" and every "Magna" to "Magna valve".

Comment 6: The Intuity system is can be used for minimally invasive procedures, as it potentially lowers procedural times and facilitates the implant process. Why were all procedures performed over a median sternotomy?

Reply 6: Minimally invasive procedures have several advantages, but it also has disadvantages including prolonged procedures times and difficulty to deal with an unexpected event during procedures. It also has the possibility that safe and secure implantation procedures with complete annulus fitting, which our group emphasized from the previous publications [Ann Thorac Surg. 2021;112:1356-1362., Thorac Cardiovasc Surg. 2022. doi: 10.1055/s-0042-1757241.], might be compromised. We think lower incidence of paravalvular leakage and lower incidence of permanent pacemaker implantation by secure procedure with standard sternotomy is more important than the advantages obtained by minimally invasive procedures. We revised our manuscript in the section 'Limitation' to discuss about Reviewer's comment.

Changes in the text: Fourth, all RDAVRs were performed with median sternotomy in this study, not like in other studies in which minimally invasive procedures were frequently used. The responsible surgeon put more value on lower incidence of paravalvular leakage and lower

incidence of permanent pacemaker implantation by secure procedure with standard sternotomy than the advantages obtained by minimally invasive procedures. (see Page 14, line 314)