

Peer review file

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Comment 1: As for the materials and method section, it would be important to note for the reader the overall typical volume of aortic surgery performed at the Center. Are these patients also referred for open surgical consideration or solely for interventional procedures? Have all of the patient's been evaluated by a surgeon?

Reply 1: Thank you very much for this great comment and we definitely agree that we didn't decelerate clearly the indications for percutaneous management in our manuscript. We have definite the indications in the materials and method section. Thank you.

We have revised the manuscript accordingly in the METHODS section and PATIENT'S ENROLLMENT section.

Changes in the text (Line 89~93):

MATERIALS AND METHODS

Patients' enrollment

" This study was performed with approval of the Institutional Review Board of our center. We retrospectively identified 20 consecutive patients who underwent percutaneous intervention for AALs at our center between October 2015 and November 2017. The Society of Thoracic Surgeons risk score and the EuroSCORE II system are widely used for surgical risk evaluation in cardiac surgery; however, such scores have been validated only in standard surgical-risk patients, and they may fail to adequately

capture risk factors for patients undergoing AAL closure. These factors must be considered by the heart team when deciding on the appropriateness of intervening. The indications for percutaneous in our center were patients in high risk of redo-surgery after assessment by our heart team, as well as meeting one of the conditions:1) with severe dyspnea ;2) asymptomatic but with moderate or severe AAL ;3) with persistent bleeding evidenced by medical imaging and have the risk for rupture of the pseudoaneurysm or the false lumen. The patients who were with a history of Behcet's syndrome or couldn't tolerate general anesthesia was defined as in high risk of redo-surgery. Percutaneous repair is contraindicated in patients with active endocarditis or significant dehiscence involving more than one-fourth to one-third of the aortic prosthesis."

Comment 2: Under the technical success portion, the other is described the severity of a PVL but do not define this terminology. How was this related to AAL? Read the echo criteria listed a standard classification system? We generally use these for valvular diseases, and I am not familiar with shunt classification using these criteria. Have the authors considered using 3D printing for potentially more complex or anatomically challenging pathology - in addition to the imaging criteria listed?

Reply 2: We are sorry for the unclear expression for severity of AAL's regurgitation. Under the technical success portion, there is a clerical error in the assessment of the regurgitation severity for AALs, not for PVLs (Line 115). Interventional AAL closure has emerged as an alternative approach just in a few anecdotal case reports in recent

years. There is still not enough standard to learn from for the assessment of the AALs. Actually, assessment of AAL in our centre can be challenging and requires an integrative approach. Echocardiographic assessment of regurgitation should consider an assessment of the AALs' type and quantification of regurgitant severity. Refer to the standard for assessment of the aortic prosthetic paravalvular leak's regurgitation, the severity of each type I or type III AAL was evaluated by 2D-TEE and RT-3D-TEE using several parameters: area of the color-Doppler blood shunt area (jet area, JA), the narrowest diameter of the leak jet (vena contracta, VC) and 3D color effective regurgitation orifice (ERO). The degree of blood shunt was classified into 3 grades: I(mild, VC: <0.3cm,JA: <6cm², ERO: <0.1cm²); II (moderate, VC: 0.3~0.6cm,JA: 3-6cm², ERO: 0.1-0.3cm²), III (severe, VC:>0.6cm, JA: > 6cm², ERO: > 0.3cm²). For type II AALs, 3D color effective regurgitation orifice is more difficult to assess, however, the jet area /pseudoaneurysm area (%) can be used to grade severity of the regurgitation, a 3-class grading scheme have also been used to report the severity of regurgitation for type II AAL, I(mild, VC: <0.3cm,JA: <6cm², jet area /pseudoaneurysm area: <30%); II (moderate, VC: 0.3~0.6cm,JA: 3- 6cm², jet area /pseudoaneurysm area: 30%~45%), III (severe, VC:>0.6cm, JA: > 6cm², jet area /pseudoaneurysm area: >45%).

In addition,3D Echocardiography techniques have evolved over the past decade, which had a major impact on the interventional AAL closure at our institution. 3D printing for potentially more complex or anatomically challenging pathology might be a good idea for our further exploration.

We have revised the manuscript accordingly in the TECHNICAL SUCCESS section.

Changes in the text (Line 112~120):

Technical success

" Technical success was considered be achieved if both the following criteria met: 1) the successful implantation of occluder(s) without interfering with the aortic valve, as well as the blood flow in the aorta or major branches; 2) the shunt of the AAL reduced at least one grade. Actually, assessment of AAL in our center can be challenging and requires an integrative approach. Echocardiographic assessment of regurgitation should consider an assessment of the AALs' type and quantification of regurgitant severity. Refer to the standard for assessment of the aortic prosthetic paravalvular leak's regurgitation, the severity of each type I or type III AAL was evaluated by 2D-TEE and RT-3D-TEE using several parameters: area of the color-Doppler blood shunt area (jet area, JA), the narrowest diameter of the leak jet (vena contracta, VC) and 3D color effective regurgitation orifice (ERO). The degree of blood shunt was classified into 3 grades: I(mild, VC: <0.3cm,JA: <6cm², ERO: <0.1cm²); II (moderate, VC: 0.3~0.6cm,JA: 3- 6cm², ERO: 0.1-0.3cm²), III (severe, VC: > 0.6cm, JA: > 6cm², ERO: > 0.3cm²). For type II AALs, 3D color effective regurgitation orifice is more difficult to assess , however, the jet area /pseudoaneurysm area (%) can be used to grade severity of the regurgitation, a 3-class grading scheme have also been used to report the severity of regurgitation for type II AAL, I(mild, VC: <0.3cm,JA: <6cm², jet area /pseudoaneurysm area: <30%); II (moderate, VC: 0.3~0.6cm,JA: 3- 6cm², jet area

/pseudoaneurysm area: 30%~45%), III (severe, VC: > 0.6cm, JA: > 6cm², jet area /pseudoaneurysm area: > 45%) ."

Comment 3: The techniques listed could include some additional details. The sizing of the occluded device is not well defined. Also, the author is noted that the type 2 leaks require careful positioning of the super stiff guidewire and the dilator but do not state how much entrance into the pseudoaneurysm is required. With standard monitoring is required during these procedures? In the event of a perforation, whether some of the backup strategies that should be employed? What potential complications should one be prepared for?

Reply 3:About the sizing of the occluder, we prefer to choose a relatively small device for AAL closure. For example, if the leak was measured about 4mm basing on the CTA or angiography, we would like to choose a 6mm occluder. And about the backup strategy, in our case series, pseudoaneurysm rupture did not occur. During the procedure, the sheath was placed just passing through the entry of the pseudoaneurysm and avoiding the dilator tip touching the pseudoaneurysm wall. If the complication occurs, we prefer to embolize the pseudoaneurysm using coils immediately.

Comment 4: interventional procedures to fix these leaks. Upon review of the table, it is unclear to me why patient is with leaks at the distal side of the graft presented with dyspnea. The offer is usually do not describe this as a problem for type 2 leaks. What was the rationale for pursuing this and asymptomatic patients?

Reply 4: We cannot agree more than your comments about why asymptomatic patients refer to interventional procedures in this study. The reason might be that the Type III AAL is defined as the continued patency of the false lumen and Type II AAL means a localized hematoma

(pseudoaneurysm), whereby a suture line dehiscence occurs at the proximal or distal suture lines . Most of type II or type III AAL are asymptomatic, few patients may present with dyspnea or persistent bleeding ,which may lead to procedural ineffectiveness of the primary surgery for aortic dissection or rupture of false lumen and pseudoaneurysm in the future. So even if few type II or type III patients are younger or asymptomatic, they still received interventional procedure in this study.

Comment 5: Was there are certain size criteria or anatomic limitations? Again, this dissection appears a bit nebulous.

Reply 5: Thank you very much for your kind advice. Closure of less-severe AAL remains controversial. Percutaneous repair is contraindicated in patients with active endocarditis or significant dehiscence involving more than one-fourth to one-third of the aortic prosthesis. And the indications for percutaneous in our center were patients in high risk of redo-surgery after assessment by our heart team, as well as meeting one of the conditions:1) with severe dyspnea ;2) asymptomatic but with moderate or severe AAL ;3) with persistent bleeding evidenced by medical imaging and have the risk for rupture of the pseudoaneurysm or the false lumen.

