

## Peer Review File

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### Reviewer A

Comment 1: In the title, the term “protocol” should read “technique”. The authors do not present a protocol.

Reply 1: We have modified the title as advised.

Changes in the text: Page 1, line 1.

Comment 2: Abstract: Authors state “The traditional method of pulmonary artery anastomosis is an end-to-end anastomosis, and it may lead to arterial tortuosity, oozing, stenosis, and thrombosis”. All these complications, in fact, are not related with the suturing technique itself, but with leaving long arterial stumps. The development of thrombosis in the arterial anastomosis, contrary to that of venous anastomosis, is extremely infrequent. Therefore, the potential benefit of the novel technique presented is controversial, and requires a consistent comparative trial.

Reply 2: I agree with the review 's point about long arterial stumps is one of the causes of these complications, However, the causes of these complication are diverse. The surgeons need the donor and recipient 's stump be well aligned and in accordance with the anatomical position before performing the anastomosis. When the initial position of the anastomosis is not good, it may cause complications such as torsion and angulation. In addition, when the traction line is not used for positioning and traction during anastomosis, it may also lead to more or less donor or recipient 's arterial wall on one side during anastomosis, which may lead to the possibility of staxis. So the technique is not just about anastomosis, it's also about the preparation before anastomosis. This article is only surgical technique, so it is not compared with conventional arterial anastomosis alone now.

Changes in the text: None

Comment 3: In line 26, “technology” should read “technique”.

Reply 3: We were really sorry for our careless mistakes. Thank you for your reminder.

Changes in the text: Page 1, line 25.

Comment 4: Lines 43-46: The novel cuff anastomosis reduces thrombosis avoids torsion stenosis of the reconstructed artery and does not increase anastomosis time. This modified technique is worth popularizing among surgeons”. I completely disagree with such statement. The authors did not demonstrate any of these by presenting 7 cases without any comparison with the standard technique.

Reply 4: We feel great thanks for your professional review work on our article. This article is surgical technique, which is not compared with the standard technique. In the later stage, when the cases applying this anastomosis technique increases, relevant research will be carried out according to the reviewer. We modified this statement appropriately.

Changes in the text: Page1, line 61-64.

Comment 5: Line 56. What do the authors mean with the need of multiple assistants?

Reply 5: The participation of three surgeons is often required in lung transplantation. In addition to the chief surgeon, the other two surgeons mainly assist in the leakage of visual field and assist the chief surgeon complete the operation. By using this suspension and anastomosis method, one surgeon can complete the surgical operation.

Changes in the text: Page 4, line 83-86.

Comment 6: Lines 87-88. There were all single lung transplants. May the authors present the indications for the lung transplants, and their indications of either single or double lung transplants? May the authors comment on the potential deleterious effects of their anastomotic technique in cases of arteries of little size, or in those cases of wide discrepancies between the recipient and the donor artery?

Reply 6: We agree that adding indications for single and double lung transplantation could round out this article. The indications for lung transplantation include a diverse spectrum of pulmonary diseases of the airways, parenchyma, and vasculature, such as Chronic obstructive pulmonary disease (COPD), idiopathic pulmonary fibrosis (IPF), Cystic fibrosis (CF). Other less common indications include emphysema due to  $\alpha 1$ -antitrypsin deficiency, sarcoidosis, non-CF bronchiectasis, idiopathic pulmonary arterial hypertension (IPAH), and lymphangioleiomyomatosis. The choice between a single and double lung transplantation depends on various factors, including the patient's condition, the availability of donor organs, and the specific disease being treated. The technique has no potential deleterious effects in cases of arteries of little size, or in those cases of wide discrepancies between the recipient and the donor artery. Before anastomosis, it is necessary to sling the thread at both ends of the arterial anastomosis to determine the relative matching position. For large size of arteries, the needle distance is larger, and for small size of arteries, the needle distance is smaller. We will add the content to the text.

Changes in the text: Page 4, line 97-99.

Comment 7: Line 89: The statement “The arterial anastomosis time was  $14.14 \pm 3.48$  minutes” is meaningless.

Reply 7: We agree that the statement is meaningless. We just tell people the time it takes for pulmonary artery anastomosis. In the following report, we will compare it with the traditional method of pulmonary artery anastomosis, so that this statement will be more meaningful.

Changes in the text: None

Comment 8: Conclusion should be corrected. The authors cannot state that this novel technique reduces the complications of pulmonary artery anastomosis.

Reply 8: We have re-written this part according to the reviewer's suggestion.

Changes in the text: Page 5, line 173-177.

Comment 9: The video is interesting and well presented. At the completion of the anastomosis they release the clamp. No bleed is seen. Can the authors explain their technique of deairing

and reperfusion on completion of the transplant?

Reply 9: Thank you for your question. The technique of deairing and reperfusion on completion of the transplant is consistent with normal arterial anastomosis so we didn't shown in the video. At the end of the anastomosis, the knot was not tied at the end. After releasing the clamp, the blood was extubated from the last unknotted place, and then the knot was tied to complete the whole anastomosis process.

Changes in the text: None

## **Reviewer B**

Comment 1: When the length of pulmonary artery is not sufficient, how do you manage to elongate the artery?

Reply 1: This technique is no not applicable when the length of pulmonary artery is not sufficient. In the vast majority of cases, the length is sufficient when the left and right pulmonary arteries are separated from the bifurcation of the main pulmonary artery. In special cases, if the pulmonary artery is too short, we have several methods to lengthen the pulmonary artery, such as using donor pericardium, bovine pericardium, artificial blood vessel, etc

Changes in the text: None.

Comment 2: How long does this method need the length of pulmonary artery?

Reply 2: There is no specific value for the length of pulmonary artery. The appropriate length of the pulmonary artery is related to the size of the recipient thorax, the size of the donor lung, and the anatomical variation of the pulmonary artery. The technique can be performed when the pulmonary artery is 2-5mm more than the appropriate length.

Changes in the text: None.

Comment 3: Because the adjustment of the arterial length seems to be difficult, this technique can lead to pulmonary arterial kink after inflation of the lung.

Reply 3: We agree with you that this technique may lead to pulmonary arterial kink after inflation of the lung, but the chances of that happening are extremely low. In brief, an extra segment of the pulmonary artery was reserved when the pulmonary artery was trimmed. The length and structure of the anastomosis are not different from those of the conventional method

Changes in the text: None.

Comment 4: When pulmonary arterial size mismatch is encountered, how do you manage? I would like to know the reason why this technique can decrease arterial torsion, oozing, and stenosis compared with conventional technique.

Reply 4: In the past, we used to adjust the caliber of the pulmonary artery by trimming it into an oblique opening. We have now found that with this technique, it is possible to perform a good anastomosis of mismatched pulmonary arteries by using suspension wire before anastomosis. The pulmonary artery was well aligned by the suspension wire, the needle distance of the side with small diameter was small, and the needle distance of the side with large diameter was large. At the same time, the turned pulmonary artery played the role of a gasket, which not only avoided distortion and angulation caused by poor alignment, but also avoided the

occurrence of bleeding.

Changes in the text: Page 8, line166-170.

### **Reviewer C**

Comment 1: When reviewing the manuscript, I found it quite challenging to comprehend the procedure. While the provided video was clear, it could likely benefit from additional comments or captions. Moreover, I strongly suggest incorporating several figures or diagrams to facilitate a step-by-step understanding of the procedure. The current inclusion of actual images is not as helpful.

Reply 1: We think this is an excellent suggestion. It's hard to understand for people who don't do this kind of work. We have incorporating several diagrams to facilitate a step-by-step understanding of the procedure.

Changes in the text: None.

Comment 2: I am unclear as to why this technique is considered superior to the conventional anastomotic procedure. I would appreciate it if you could provide more information, not only regarding pulmonary artery anastomosis but also other vascular anastomosis techniques. Additionally, if the authors could describe the underlying mechanism, it would greatly enhance the value of this research for readers interested in further investigation.

Reply 2: This technique is considered superior to the conventional anastomotic procedure. The surgeons need the donor and recipient 's stump be well aligned and in accordance with the anatomical position before performing the anastomosis. When the initial position of the anastomosis is not good, it may cause complications such as torsion and angulation. In addition, when the traction line is not used for positioning and traction during anastomosis, it may also lead to more or less donor or recipient 's arterial wall on one side during anastomosis, which may lead to the possibility of stasis. So the technique is not just about anastomosis, it's also about the preparation before anastomosis. The reason why this technique is only used for pulmonary artery anastomosis in lung transplantation is that sufficient length of pulmonary artery can be harvested from the donor and recipient. The length of residual arteries in patients undergoing sleeve resection of pulmonary vessels for lung cancer is not sufficient to support this technique. This article is only surgical technique, so it is not compared with conventional arterial anastomosis alone. In the following report, we will compare it with the traditional method of pulmonary artery anastomosis, so that this statement will be more meaningful.

Changes in the text: None.

Comment 3: It may sound similar to comment #2, but I find the Discussion section to be quite immature. It should elaborate on the strengths and weaknesses of existing methods and provide detailed insights into what makes the proposed method superior and its limitations. Explaining why it is considered superior is crucial. The current version lacks substantial content, making it less useful for clinicians.

Reply 3: That's a great suggestion. It's a key suggestion that we really want to prove to other scholars. Part of the content is described in reply 2, and at the same time, we make appropriate changes in the discussion section to explain why it is considered superior.

Changes in the text: None.

#### **Reviewer D**

Comment 1: It is an interesting article, dealing with a technical issue, but to the best of my knowledge, this is a technique already used for vascular anastomosis, in particular for the posterior vessel wall.

As for the anterior wall, a traditional suture already everts the tissue outward, so I don't think this technique is necessary in this site.

From the video, I noticed that you declamp the vessel without deaerating the anastomosis; in our practice, we prefer to tie the suture after back bleeding. I would like to know your opinion on this.

Reply 1: We sincerely thank the reviewer for careful reading. This type of vascular anastomosis has not been reported for pulmonary artery anastomosis in lung transplantation. This technique is not only the technique of anastomosis, but also the preparation before anastomosis. The adjustment of artery position and the application of traction lines contribute to the perfect completion of pulmonary artery anastomosis. Neglecting some details can lead to disastrous consequences. The advantages of this method for the posterior wall of the artery are obvious, however this method has been apply equally to the anastomosis of the anterior wall of the vessel. Unlike the eversion suture, this method is equivalent to adding a spacer during the anastomosis, which reduces the possibility of bleeding. We can not discount the anastomosis of the anterior wall of the artery just because the anterior wall oozing is easy to repair. The technique of deairing and reperfusion on completion of the transplant is consistent with normal arterial anastomosis so we didn't shown in the video. At the end of the anastomosis, the knot was not tied at the end. After releasing the clamp, the blood was extubated from the last unknotted place, and then the knot was tied to complete the whole anastomosis process.

Changes in the text: None.

#### **Reviewer E**

Comment 1: The authors present us with 7 cases with a modified technique for PA anastomosis. Their rational is that their technique will reduce tortuosity, stenosis and thrombosis.

In my opinion tortuosity is associate no to the suturing technique but to the length of donor PA in correlation to recipient PA. Thrombosis is extremely rare in lung transplant PA end to end anastomoses, and this eversion technique may lead to a reduce caliber/stenosis in a higher proportion than the end-to-end technique.

The authors do not present any convincing evidence on size ratios since no pressure gradient data or contrast CT is available in this manuscript.

Reply 1: I agree with the review 's point about long arterial stumps is one of the causes of these complications, However, the causes of these complication are diverse. The surgeons need the donor and recipient 's stump be well aligned and in accordance with the anatomical position before performing the anastomosis. When the initial position of the anastomosis is not good, it may cause complications such as torsion and angulation. In addition, when the traction line is not used for positioning and traction during anastomosis, it may also lead to more or less donor

or recipient 's arterial wall on one side during anastomosis, which may lead to the possibility of staxis. So the technique is not just about anastomosis, it's also about the preparation before anastomosis. One of the factors in thrombosis is vascular endothelial damage. The traditional method of pulmonary artery anastomosis inevitably causes mechanical damage to the vessel wall during the pruning of the donor and recipient's pulmonary artery. This technique uses an eversion cuffed suture to align the intima of the vessel as closely as possible, while allowing the vessel wall, which may be mechanically damaged, to eversion and act as a spacer. We agree that more data would be useful to improve this paper even better. Some imaging data are added in this paper. In the following report, we will compare it with the traditional method of pulmonary artery anastomosis, so that this statement will be more meaningful.

Changes in the text: None.

## **Reviewer F**

Comment 1: The abstract requires numerous revisions and clarifications. There is room in the abstract to be more concise and more clearly convey the “gist” of the technique and its advantages. For example, the sentence “The main innovation of this technology concentrates on the improvement of pulmonary anastomosis strategies” does not add to the message of the abstract and may confuse readers.

Reply 1: We are very grateful to Reviewer for reviewing the paper so carefully. We have tried our best to improve and made some changes in the abstract.

Changes in the text: Page 1, line17-44.

Comment 2: The language throughout the manuscript is difficult to follow and needs substantial revision to improve flow. The word “technology” should be replaced with technique, as it implies a new device/equipment was utilized in the technique. In addition, there are numerous instances on incongruent language tense which interrupts the flow and may confuse readers. The beginnings of some sentences are not capitalized. Normally we detail the line and exact material needing corrected, however we will not put forth the effort on this here.

Reply 2: Thanks for your suggestion. We will try our best to polish the language in the revised manuscript. These changes will not influence the content and framework of the paper. And here we did not list the changes but marked in the revised paper.

Changes in the text: None.

Comment 3: The introduction is quite disjointed and does not introduce the subject matter of the paper in a well flowing way. This needs to be completely rewritten. Some examples of sentences of concern are the following:

- Line 49: Arterial anastomosis is one of the critical portions of the case rather than “indispensable.”

- Lines 53-55: Stenosis and distortion of reconstructed vessels are not “catastrophic” outcomes; catastrophic outcomes are those that result in serious patient harm or death. Some listed are not necessarily intraoperative complications as well.

- Lines 55-58: It is confusing what this example adds. It may be helpful to include a preamble to this statement such as “Previous techniques utilized during pulmonary arterial anastomosis

to improve quality include...” The inclusion of this sentence contributes to the disjointed structure of the introduction.

3) The description of the methodology is generally confusing at its introduction and this is likely related to syntax. There is also lay-language that is not appropriate for the manuscript (e.g. “lap” in line 83).

Reply 3: We sincerely thank the reviewer for careful reading. We have re-written the introduction according to the Reviewer’s suggestion.

Changes in the text: Page 2, line 68-94.

Comment 4: Describing the population and demographic information of patients who underwent this technique should be placed in the discussion section of this manuscript rather than the step-by-step description of the technique.

Reply 4: Thanks for your careful checks. We have placed the population and demographic information of patients who underwent this technique in the discussion section of this paper.

Changes in the text: Page 2, line 148-159.

Comment 5: What were the indications for transplant/overall condition of the 7 patients included in this paper? Though this paper describes a surgical technique, it would be helpful for readers to know.

Reply 5: Thanks for your suggestion, we have added indications for lung transplant surgery in the manuscript

Changes in the text: Page 4, lin 97-75.

Comment 6: What are the limitations of this technique relative to traditional end-to-end anastomosis? These are not discussed in the manuscript.

Reply 6: You are right that this technique also has some limitations relative to traditional end-to-end anastomosis. One is that the pulmonary artery of sufficient length should be preserved in the donor and recipient. In the process of turning the pulmonary artery, it should not be turned over too much to cause excessive tension in the pulmonary artery anastomosis. We have added this section to the manuscript.

Changes in the text: Page 5, line166-170.

Comment 7: What other complications, if any, did these patients experience (e.g. recurrent laryngeal nerve injury, prolonged intubation, postoperative bleeding, cardiogenic shock, etc)? These are not discussed outside of thrombosis and stenosis. The interval and method that patients were examined for thrombosis/stenosis was also unclear. Was CT performed routinely, or was there a concerning indication? Was it a CT with contrast or an angiogram? This information would be very helpful. and it would be important to know how the average patient’s hospital course compared to that of a traditional lung transplant procedure. This would also be helpful to present this information in the context of the current literature and institutional experience.

Reply 7: This article mainly introduces the modification of the technique of pulmonary artery anastomosis during lung transplantation, and the other surgical procedures are the same, so it is not very significant to consider other related complications here. Chest CT was performed

routinely 2-4 weeks after lung transplantation. This technique has not been compared with conventional anastomosis due to the small sample. In the following report, we will compare it with the traditional method of pulmonary artery anastomosis, so that this statement will be more meaningful.

Changes in the text: None.

Comment 8: The conclusion is too strong, as a cohort of 7 patients is not high-powered enough to make a practice-changing recommendation regarding less thrombosis, torsion, stenosis, etc. Rather a “we present a novel technique with acceptable postoperative outcomes” statement with the discussion to analyze this with a formal study once adequate case numbers and long-term outcomes can be obtained.

Finally, we would like to let the authors know that many surgeons perform the pulmonary arterial anastomosis in this way including this reviewer for many years with success.

Reply 8: Thank you for your suggestions. We have re-written this part according to the Reviewer’s suggestion. This type of vascular anastomosis has not been reported for pulmonary artery anastomosis in lung transplantation.

This technique is not only the technique of anastomosis, but also the preparation before anastomosis. The adjustment of artery position and the application of traction lines contribute to the perfect completion of pulmonary artery anastomosis. Neglecting some details can lead to disastrous consequences. The advantages of this method for the posterior wall of the artery are obvious, however this method has been apply equally to the anastomosis of the anterior wall of the vessel. Unlike the eversion suture, this method is equivalent to adding a spacer during the anastomosis, which reduces the possibility of bleeding.

Changes in the text: Page 8, line 176-180.

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