

New Atrial Anastomosis Technique for an Inadequate Left Atrial Cuff in Lung Transplantation

JeongA Son, M.D.¹, Seungji Hyun, M.D.¹, Seokjin Haam, M.D., Ph.D.¹, Do Hyung Kim, M.D.²

¹Department of Thoracic and Cardiovascular Surgery, Ajou University Hospital, Ajou University School of Medicine, Suwon; ²Department of Thoracic and Cardiovascular Surgery, Pusan National University Yangsan Hospital, Medical Research Institute of Pusan National University, Yangsan, Korea

ARTICLE INFO

Received December 8, 2021

Revised February 10, 2022

Accepted March 2, 2022

Corresponding author

Do Hyung Kim

Tel 82-55-360-2127

Fax 82-55-360-2127

E-mail yumccs@nate.com

ORCID

<https://orcid.org/0000-0002-8774-3397>

In lung transplantation surgery, the pulmonary veins are anastomosed by connecting each atrium of the donor and recipient. However, occasionally the recipient's left atrium is not suitable for anastomosis for various reasons. In these cases, several techniques for atrial anastomosis have been introduced, but these are somewhat complicated for an inexperienced surgeon. Here, we propose a new atrial anastomosis technique that is easier and safer than previously introduced techniques.

Keywords: Lung transplantation, Atrial anastomosis, Neo-cuff technique

Introduction

In lung transplantation surgery, the pulmonary veins (PVs) are anastomosed by connecting each atrium of the donor and recipient. However, if there are anomalies in the recipient PV or if the left atrium (LA) is too small to hold with a clamp, it is impossible to make a single LA cuff. To overcome these difficulties, several alternative methods have been suggested. In this study, we propose a new LA anastomosis technique that is easier and safer than previously reported techniques.

Surgical technique

After the LA is circumferentially isolated from the pericardium, the LA is clamped as proximal as possible using a Satinsky clamp to sufficiently include the point of the junction where the superior and inferior PVs drain into the LA. If a sufficient LA cuff cannot be secured for several reasons, our technique can be used. First, the proximal parts of both PVs are clamped using a Satinsky clamp, and the stapler line of the PV is resected (Fig. 1A). Then, the medial parts of 2 separate veins are sutured together directly with a wide septum to create an oval cross-sectional cuff. To reduce the time taken for suturing, a continuous

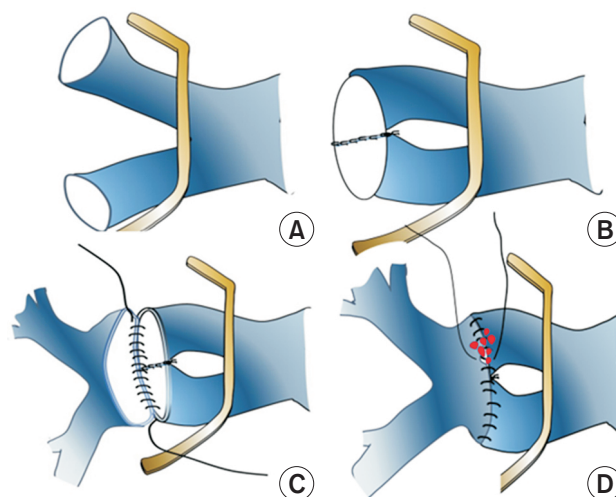


Fig. 1. (A) The proximal parts of the superior and inferior pulmonary veins (PVs) are clamped using a Satinsky clamp, and the stapler line is trimmed. (B) The medial side of the PVs is sutured with a wide septum to recreate an oval cross-sectional cuff. (C) The atrial cuff of the donor and the neo-cuff of the recipient are anastomosed. (D) To drain the remaining preservation solution and air, the blood is flushed by partially loosening the clamp.

suture is preferred over an interrupted suture, and it is better to place the knot outside the PV (Fig. 1B). Subsequently, the donor's LA cuff and the newly created neo-cuff are

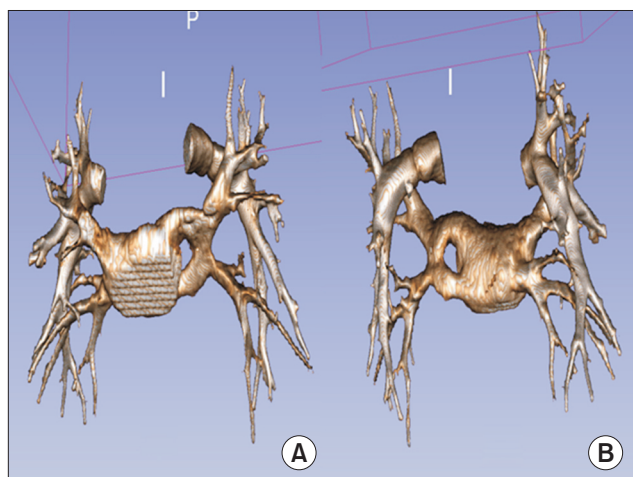


Fig. 2. Three-dimensional reconstructed chest computed tomography showing the left atrium and pulmonary veins, anastomosed using our technique. (A) Anterior view. (B) Posterior view.

connected by performing conventional continuous sutures using 4-0 polypropylene (Fig. 1C). The last few sutures are left loose without being tractioned. The Satinsky clamp is then slightly loosened to remove the air inside the LA and to flush blood (Fig. 1D). After confirming that there is no severe bleeding at the suture site, the clamp is removed, and the last sutures are tied.

The patient provided written informed consent for the publication of clinical details and images.

Discussion

In 1988, Patterson et al. [1] first proposed PV anastomosis using the LA cuff, and this method has been accepted as the gold standard until now. However, if an insufficient LA of the recipient is clamped, alternative anastomosis techniques are required. In a report by Robert et al. [2], when a sufficient LA cuff of the recipient was not secured, a slit was made on both PVs to face each other. The slits were then sewn to create a common ostium (i.e., a neo-cuff). However, this technique had the following limitations. First, a slit is induced in the inner side of both PVs and then they are sewed together to each other again. Thus, this technique is technically complex and requires 2–3 times more surgical time than the conventional anastomosis of atrial cuffs. In contrast, in our method, there is no slit incision. Furthermore, both the superior and inferior veins are directly sutured back together to form a wide septum that makes an oval cross-sectional cuff, which reduces the complexity and surgical time. Second, similar to the standard technique, severe cardiac traction is required

to secure an operative view, especially in anastomosis of the left lung. Third, clamping and opening the PV leads to a narrow and short inner diameter compared to when the vessel is filled with blood, which prohibits a detailed and precise common ostium (Fig. 2).

In this study, we modified this neo-cuff technique to overcome these shortcomings. Oto et al. [3] reported various techniques for the reconstruction of inadequate donor atrial cuffs, which included a method of creating an oval cross-sectional cuff by inducing a wide septum through direct suture of the inside of the separated PVs when the superior and inferior PVs were separated. This is a familiar technique for thoracic surgeons as it is similar to the method of airway reconstruction after carinal resection [4]. The technique suggested in this study does not require severe traction of the heart, even in patients with cardiomegaly, as the suture is far from the heart in LA anastomosis. Moreover, unlike Robert's method, there is no slit incision in our method, which may reduce the time and complexity of surgery.

Article information

ORCID

JeongA Son: <https://orcid.org/0000-0002-0736-1226>

Seungji Hyun: <https://orcid.org/0000-0002-2578-3510>

Seokjin Haam: <https://orcid.org/0000-0002-0403-2216>

Do Hyung Kim: <https://orcid.org/0000-0002-8774-3397>

Author contributions

Conceptualization: S Haam. Data curation: DHK. Formal analysis: JAS. Methodology: S Haam. Project administration: DHK. Visualization: S Hyun. Writing—original draft: JAS. Writing—review & editing: JAS. Final approval of the manuscript: S Haam.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

1. Patterson GA, Cooper JD, Goldman B, et al. *Technique of successful clinical double-lung transplantation*. Ann Thorac Surg 1988;45:626-33.
2. Robert JH, Murith N, de Perrot M, Bednarkiewicz M, Licker MJ, Spiliopoulos A. *Lung transplantation: how to perform the venous anastomosis when clamping is too distal*. Ann Thorac Surg 2000;70:2164-5.
3. Oto T, Rabinov M, Negri J, et al. *Techniques of reconstruction for inadequate donor left atrial cuff in lung transplantation*. Ann Thorac Surg 2006;81:1199-204.
4. Mitchell JD. *Carinal resection and reconstruction*. Chest Surg Clin N Am 2003;13:315-29.