Editorial Commentary

Treatment of postoperative air leak with fresh frozen plasma

Youngkyu Moon

Department of Thoracic & Cardiovascular Surgery, Eunpyeong St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea

Correspondence to: Youngkyu Moon, MD, PhD. Department of Thoracic & Cardiovascular Surgery. Eunpyeong St. Mary's Hospital, College of Medicine, The Catholic University of Korea.1021, Tongil-ro, Eunpyeong-gu, Seoul 03312, Republic of Korea. Email: mykae@catholic.ac.kr.

Provenance: This is an invited article commissioned by the Section editor Laura Chiara Guglielmetti (Cantonal Hospital Winterthur, Kantonsspital Winterthur, Switzerland).

Comment on: Stamenovic D, Messerschmidt A, Steger V, *et al.* New method in treatment of post-operative air leakage with fresh frozen plasma. ANZ J Surg 2019. [Epub ahead of print].

Submitted Nov 23, 2019. Accepted for publication Dec 13, 2019.
doi: 10.21037/jtd.2019.12.77
View this article at: http://dx.doi.org/10.21037/jtd.2019.12.77

Postoperative air leak is one of the most common complications after pulmonary resection. A prolonged air leak (PAL) is defined as a persistent air leak over 5 (or 7) days (1), which occurs in approximately 7% to 15% of patients after major pulmonary resection (1-4). PAL also causes other complications. For example, a chest tube that is left in place for an extended period can result in labored breathing, difficult ambulation, and postoperative pneumonia. Chest tube drainage over a long duration causes chronic pain at the site of chest tube insertion. It also increases the length of the hospital stay, leading to increased costs. It is true that empyema is also very likely to occur in patients with PAL (5). Thus, most thoracic surgeons try to prevent air leaks during surgery. An air-leak test can be done by pouring saline solution into the chest cavity to submerge the lungs and then monitoring for air bubbles. If an area of air leakage is localized and visible, lung parenchymal sutures can be performed. There are several methods to prevent air leak during surgery, such as buttressing the staple line, use of topical sealants, and parietal pleural abrasion. Even with such methods, it is impossible to completely prevent postoperative air leaks.

Various methods have been attempted to treat PAL after surgery. If the lung is well expanded, it is common to wait until the air leak stops. Several studies reported that digital thoracic drainage systems shorten the chest tube duration (6-8). Many surgeons prefer digital devices because these devices can measure the amount of airflow, allowing them to determine exactly when the tube can be removed. The portable device is also a viable option when a PAL occurs. Hospital discharge can be achieved by connecting a portable device to the patient's chest tube; this can reduce hospital stays and costs. Although chest tubes often require a long duration, studies have shown that PAL has resolved in most patients discharged with a Heimlich valve (2). Pleurodesis is also one of the methods used to treat PAL. Some chemical agents such as talc, tetracycline, and doxycycline have been used to induce inflammation and sclerosis of the pleural space. The use of these agents has shown a high success rate in the treatment of air leaks (9). During treatment, however, the patient's pain can reach severe levels, and inflammation of the pleura can sometimes cause empyema. Therefore, pleurodesis using chemical agents is only selectively performed. Several studies have reported that air leaks have been well treated with autologous blood-patch pleurodesis (10-12). Blood-patch pleurodesis has the advantage of not causing severe pain or inflammation. However, there are potential undesirable events such as tension pneumothorax due to obstruction of the chest tube with a clot (13). If the blood is not drained well and collects in the thoracic cavity, it can be a good medium for bacterial growth.

In the Stamenovic *et al.* paper, "New method in treatment of postoperative air leakage with fresh frozen plasma" (14), it was reported that intrapleural instillation of fresh frozen plasma (FFP) can be a feasible method for the treatment of postoperative air leaks. The author said intrapleural instillation of FFP resolves all of the disadvantages of autologous blood-patch pleurodesis.

Instead, FFP, like autologous blood, has various coagulation factors that can help stop air leaks. In this study, 12% of patients undergoing pulmonary resection sustained an air leak for more than 3 days and were treated with FFP. Eventually, 80% of patients who had sustained an air leak for 3 days experienced a resolution of the air leak. In other words, only 2.4% of patients showed PAL, which are very good results considering the incidence of PAL after pulmonary resection. This study did not reveal any complications after intrapleural instillation of FFP.

Another study reports the application of FFP for the treatment of PAL after lobectomy (15). Konstantinou *et al.* reported that 98% of PAL stopped within 48 hours after intrapleural infusion of FFP. This study further revealed that no complications occurred after treatment.

In fact, only 2 studies have used FFP to treat air leaks after pulmonary resection. Both studies revealed that FFP is an effective material to treat postoperative air leak. Furthermore, it was safe without any complications. However, it is difficult to validate the efficacy of FFP for the treatment of air leak with only 2 studies.

Blood components are lifesaving but scarce resources from human donors (16). Therefore, when using blood products, we must follow strict guidelines (17). Depending on the country, there may be restrictions on using blood products such as FFP for nontransfusion purposes. Therefore, it seems difficult to apply FFP in all surgical cases at present. Despite many practical limitations, the research of Stamenovic *et al.* can be of great importance in suggesting the possibility that FFP can be used safely in the treatment of postoperative air leaks.

This study has several limitations. First of all, the study was retrospective and the data were heterogenous. In order to increase the credibility of the study, it is recommended to analyze homogenous groups as much as possible. For example, it would have been better if the study were limited to patients who had undergone the same surgical procedure. It is also unfortunate that the study did not analyze the presence of underlying lung disease. It is well known that emphysematous lung disease is more prone to PAL and responds poorly to treatment. Second, the study is not a comparative study. A treatment comparison between the group using FFP *vs* the group using conventional treatment to resolve air leaks can clearly delineate the use of FFP to reduce the incidence of PAL. Prospective and well-designed studies should be conducted to increase the accuracy of the findings.

In conclusion, intrapleural instillation of FFP had good results in the treatment of postoperative air leaks. Of course, there are several limitations in this study. Therefore, it is difficult to generalize the result and apply it to the treatment of all postoperative air-leak cases. Nevertheless, the absence of complications is an interesting result. In the future, prospective and large-scale comparative studies should be pursued to confirm whether FFP can treat air leaks and demonstrate that it can reduce the incidence of PAL.

Acknowledgments

None.

Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. French DG, Plourde M, Henteleff H, et al. Optimal management of postoperative parenchymal air leaks. J Thorac Dis 2018;10:S3789-98.
2. Cerfolio RJ, Bass CS, Pask AH, et al. Predictors and treatment of persistent air leaks. Ann Thorac Surg 2002;73:1727-30; discussion 1730-1.
3. Moon Y, Park JK, Lee KY, et al. Predictive factors for invasive adenocarcinoma in patients with clinical non-invasive or minimally invasive lung cancer. J Thorac Dis 2018;10:6010-9.
4. Rivera C, Bernard A, Falcoz PE, et al. Characterization and prediction of prolonged air leak after pulmonary resection: a nationwide study setting up the index of prolonged air leak. Ann Thorac Surg 2011;92:1062-8; discussion 1068.
5. Brunelli A, Xiume F, Al Refai M, et al. Air leaks after lobectomy increase the risk of empyema but not of cardiopulmonary complications: a case-matched analysis. Chest 2006;130:1150-6.
6. Filosso PL, Nigra VA, Lanza G, et al. Digital versus traditional air leak evaluation after elective pulmonary resection: a prospective and comparative mono-

institutional study. J Thorac Dis 2015;7:1719-24.
7. Cho HM, Hong YJ, Byun CS, et al. The usefulness of Wi-Fi based digital chest drainage system in the post-operative care of pneumothorax. J Thorac Dis 2016;8:396-402.
8. Pompili C, Detterbeck F, Papagiannopoulos K, et al. Multicenter international randomized comparison of objective and subjective outcomes between electronic and traditional chest drainage systems. Ann Thorac Surg 2014;98:490-6; discussion 496-7.
9. Liberman M, Muzikansky A, Wright CD, et al. Incidence and risk factors of persistent air leak after major pulmonary resection and use of chemical pleurodesis. Ann Thorac Surg 2010;89:891-7; discussion 897-8.
10. Oliveira FH, Cataneo DC, Ruiz RL, Jr., et al. Persistent pleuropulmonary air leak treated with autologous blood: results from a university hospital and review of literature. Respiration 2010;79:302-6.
11. Athanassiadi K, Bagaev E, Haverich A. Autologous blood pleurodesis for persistent air leak. Thorac Cardiovasc Surg 2009;57:476-9.
12. Dugan KC, Laxmanan B, Murgu S, et al. Management of Persistent Air Leaks. Chest 2017;152:417-23.
13. Williams P, Laing R. Tension pneumothorax complicating autologous "blood patch" pleurodesis. Thorax 2005;60:1066-7.
14. Stamenovic D, Messerschmidt A, Steger V, et al. New method in treatment of post-operative air leakage with fresh frozen plasma. ANZ J Surg 2019. [Epub ahead of print].
15. Konstantinou F, Potaris K, Syrigos KN, et al. A Novel Technique to Treat Air Leak Following Lobectomy: Intrapleural Infusion of Plasma. Med Sci Monit 2016;22:1258-64.
16. Ellingson KD, Sapiano MRP, Haass KA, et al. Continued decline in blood collection and transfusion in the United States-2015. Transfusion 2017;57 Suppl 2:1588-98.
17. Mueller MM, Van Remoortel H, Meybohm P, et al. Patient Blood Management: Recommendations From the 2018 Frankfurt Consensus Conference. JAMA 2019;321:983-97.

Cite this article as: Moon Y. Treatment of postoperative air leak with fresh frozen plasma. J Thorac Dis 2019;11(12):5655-5657. doi: 10.21037/jtd.2019.12.77

