Massive Pulmonary Hemorrhage Following Pulmonary Endarterectomy

Mustafa Mert Özgür[1], Mehmed Yanartaş[1], Serpil Taş[1], Ece Altınay[2], Halide Oğuş[2], Atakan Erkılınç[2], Bedrettin Yıldızeli[3]

[1] University of Health Sciences, İstanbul Kartal Koşuyolu High Specialization Health Application and Research Center, Clinic of Cardiovascular Surgery, İstanbul, Turkey
[2] University of Health Sciences, İstanbul Kartal Koşuyolu High Specialization Health Application and Research Center, Clinic of Anesthesiology, İstanbul, Turkey
[3] University of Marmara, Faculty of Medicine, Department of Chest Surgery, İstanbul, Turkey

ABSTRACT

Perioperative reperfusion injury, acute right heart failure, and massive pulmonary hemorrhage are the most important factors determining mortality following pulmonary endarterectomy operation (PEA). Our approach for the treatment of intraoperative pulmonary hemorrhage following pulmonary endarterectomy is discussed. We retrospectively studied a PEA case with massive pulmonary hemorrhage that occurred in 2017. We used endobronchial blocker to ensure that the bleeding is stopped and used extracorporeal membrane oxygenation (ECMO) for respiratory and hemodynamic requirements. ECMO is a good alternative for most of the pre- and postoperative major complications of PEA. Combined use of endobronchial blocker and ECMO could be a useful treatment method for massive pulmonary hemorrhage following pulmonary endarterectomy.

Key Words: PEA; pulmonary endarterectomy; ECMO; pulmonary hemorrhage

Pulmoner Endarterektomi Sonrası Oluşan Masif Pulmoner Kanamanın Yönetimi

ÖZET

Pulmoner endarterektomi (PEA) operasyonu sonrası gelişen perioperatif reperfüzyon hasarı, akut sağ kalp yetmezliği ve masif pulmoner hemoraji gibi komplikasyonlar mortalite ve morbiditeyi belirleyen en önemli faktörlerdir. Bu olguda pulmoner endarterektomi operasyonunda intraoperatif masif pulmoner hemoraji gelişen hastada tedavi yönetimimiz tartışıldı. 2017 yılında yapılan pulmoner hemoraji gelişen PEA operasyonu geriye dönük olarak incelendi. Bu olguda masif kanamayı durdurmak için endobronşiyal bloker kullanıldı. Hemodinamik ve respiratuvar gereksinimden dolayı da ekstrakorporeal membran oksijenizasyonu (ECMO) kullanıldı. ECMO kullanımı, PEA operasyonlarında per ve postoperatif gelişen birçok komplikasyon için alternatif bir yaklaşımdır. Bizim olgumuzda olduğu gibi endobronşiyal bloker ve Ecmo'nun birlikte kullanımı PEA sonrası gelişen masif pulmoner hemorajide etkin ve kullanışlı bir yaklaşım olabilir.

Anahtar Kelimeler: Pulmoner endarterektomi; PEA; PTE; ECMO; pulmoner hemoraji

INTRODUCTION

Currently, the foremost treatment method for chronic thromboembolic pulmonary hypertension (CTEPH) is pulmonary endarterectomy (PEA) operation[(1)]. Perioperative reperfusion injury, acute right heart failure, and massive pulmonary hemorrhage are the most important factors determining mortality. Our approach for the treatment of intraoperative pulmonary hemorrhage following PEA is discussed.

CASE REPORT

We retrospectively studied a PEA case with massive pulmonary hemorrhage that occurred in 2017.

A 38-year-old male patient with history of 2 years of exertional dyspnea was referred to our clinic. Chest X-Ray performed was normal. On arterial blood gas analysis, $Pa0_2$ was 61 in room air. Echocardiography revealed normal left ventricular ejection fraction, dilated right ventricle, and moderate-to-high degree of tricuspid regurgitation. Tricuspid annular plane systolic excursion (TAPSE) value was 1.5 cm. Computed tomography showed filling defects

Cite this arcticle as: Özgür MM, Yanartaş M, Taş S, Altınay E, Oğuş H, Erkılınç A, et al. Massive pulmonary hemorrhage following pulmonary endarterectomy. Koşuyolu Heart J 2019;22(2):134-6.

Correspondence

Mustafa Mert Özgür

E-mail: drmertozgur@yahoo.com.tr
Submitted: 03.02.2019
Accepted: 11.06.2019

from both sides of the pulmonary vasculature, which was compatible with CTEPH (Figure 1). The diagnosis was confirmed using ventilation-perfusion scintigraphy. Mean pulmonary arterial pressure (mPAP) was 60 mmHg and pulmonary vascular resistance was 1840 dynes/sec/cm-5 on the right heart catheterization. PEA decision was made because the patient exhibited surgically reachable proximal disease on pulmonary computed tomography. PEA operation was performed with median sternotomy under general anesthesia. Standard aortic arterial cannulation and bicaval venous cannulation was performed to establish cardiopulmonary bypass. Patient was cooled to 20°C. After cooling, aorta was clamped. Myocardial protection was provided by intermittent antegrad cardioplegia. Pulmonary endarterectomy was performed under deep hypothermia (20°C) and total circulatory arrest. Standard pulmonary endarterectomy was performed after pulmonary arteriotomy. Massive endarterectomy material was extracted from both sides of the pulmonary vasculature (Figure 2). During the operation, after the CPB support was terminated, massive hemorrhage was noted from the endotracheal tube. After the suction of the endotracheal tube, fiberoptic bronchoscopic examination was performed and bleeding was detected in the left lower bronchi. The CPB support was established again because of the massive bleeding and to provide hemodynamic stability. Instead of surgical resection of the bleeding lobe, it was decided to occlude the left main bronchus. Because double lumen cannula was inadequate to provide adequate occlusion, it was occluded using an endobronchial blocker. The endotracheal tube was changed to a double lumen cannula and a Fogarty catheter was inserted to the left main bronchus. Because of hemodynamic and respiratory instability, it was decided to provide central veno-arterial (V-A) ECMO support following CPB discontinuation. Patient was transferred to the intensive care unit with the V-A ECMO and inotropic support. A chest X-Ray revealed full opacity at the left side (Figure 3). Patient was sedated with continuous infusions. Anticoagulation was established with continuous heparin infusion, maintaining the activated clotting time between 180-200 seconds. Multiple bronchoscopies were performed to eliminate the clots and discontinue bleeding. On postoperative 2nd day, the opacity in chest X-Ray mitigated and bronchoscopy showed that the bleeding had stopped. It was decided to remove the endobronchial blocker. The blocker was removed and the double lumen endotracheal tube changed to a single lumen one. After the blocker was removed, there was improvement in respiratory functions as well as the need for oxygenator decreased. Thereafter, the hemodynamic and oxygen support of ECMO was gradually reduced. On postoperative 3rd day, the patient was weaned off from the ECMO support and sedative analgesics were discontinued. The patient was extubated on

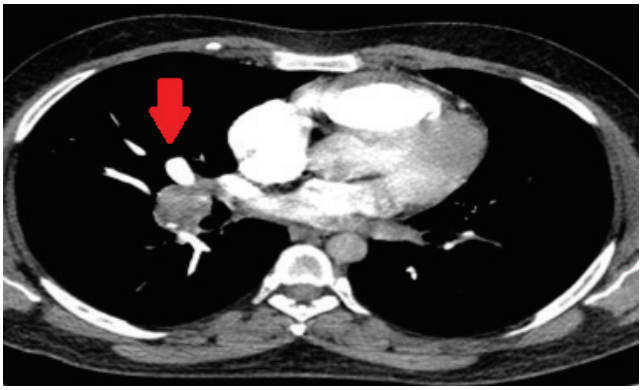

Figure 1. Preoperative computed tomography showing filling defects compatible with CTEPH.

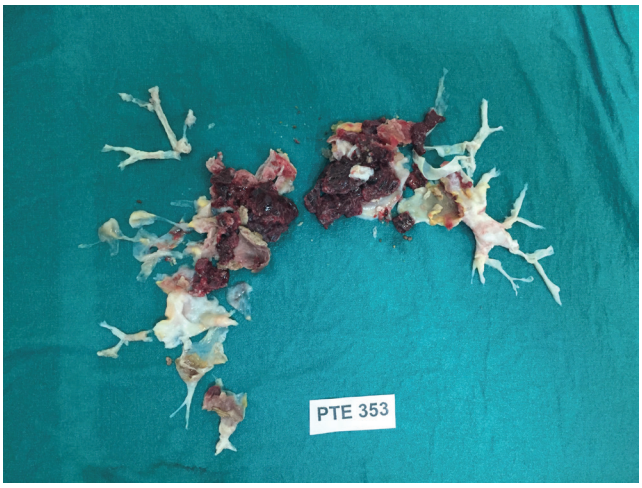

Figure 2. Massive endarterectomy material is extracted from both sides of the pulmonary vasculature.

Figure 3. Complete opacity at the left side observed on chest X-Ray performed on postoperative 1st day.

Figure 4. Clean chest X-Ray before discharge.

6th day, with no occurrence of dyspnea. He was transferred to the in-patient clinic on postoperative 10th day. Finally, the patient was discharged on postoperative 16th day after complete recovery, and he had a systolic pulmonary arterial pressure of 35 mmHg as well as exhibited a clean chest X-Ray (Figure 4).

DISCUSSION

Although massive pulmonary hemorrhage is not common (prevalence of 0.5%-2%), it is a fatal complication of PEA operation[1]. Traditional methods, such as saline, protamine administration, fresh frozen plasma infusion, and high positive expiratory pressure (PEEP), are used to control hemorrhage, but in some cases, these methods may be insufficient[2]. Although intervention with bronchial blocker to control endobronchial hemorrhage has been used since the early 90s, pulmonary functions of the patient may not controlled at the CPB support discontinuation[3]. Manecke and colleagues have lost one patient during the operation and another during the intensive care follow-up period despite the use of bronchial blockade[4]. Yuan and colleagues used ECMO support in a patient with massive endobronchial hemorrhage following blunt trauma and succeeded[5]. Moreover, Guth and colleagues used short term V-A ECMO support as a different alternative with restoring coagulation using full dose protamine in the operating theater immediately after CPB support discontinuation and under ECMO support[6]. This may be useful but there is a risk of the coagulation of the oxygenator. Several methods using ECMO to manage this issue are defined in literature, but the combined use of endobronchial blockade and ECMO have rarely been reported in the literature, except in a similar case published earlier by our team[7-10].

CONCLUSION

Currently, PEA is the only accepted treatment method for CTEPH. ECMO support is a good alternative for most pre- and postoperative major complications of PEA (such as pulmonary edema and bleeding), which can lead to death. If there is any suspicion of bleeding, bronchoscopy should be performed in the operating theater, and the combined use of endobronchial blocker and ECMO could be an effective treatment method for massive hemorrhage following PEA.

REFERENCES

1. Chacón-Alves S, Pérez-Vela JL, Grau-Carmona T, Domínguez-Aguado H, Marín-Mateos H, Renes-Carreño E. Veno-arterial ECMO for rescue of severe airway hemorrhage with rigid bronchoscopy after pulmonary artery thromboendarterectomy. Int J Artif Organs 2016;39:242-4.
2. Shetty DP, Nair HC, Shetty V, Punnen J. A novel treatment for pulmonary hemorrhage during thromboendarterectomy surgery. Ann Thorac Surg 2015;99:e77-e78.
3. Purut CM, Scott SM, Parham JV, Smith PK. Intraoperative management of severe endobronchial hemorrhage. Ann Thorac Surg 1991;51:304-6.
4. Manecke GR, Kotzur A, Atkins G, Fedullo PF, Auger WR, Kapelanski DP, et al. Massive pulmonary hemorrhage after pulmonary thromboendarterectomy. Anesth Analg 2004;99:672-5.
5. Yuan KC, Fang JF, Chen MF. Treatment of endobronchial hemorrhage after blunt chest trauma with extracorporeal membrane oxygenation (ECMO). J Trauma 2008;65:1151-4.
6. Guth S, Wiedenroth CB, Wollenschläger M, Richter MJ, Ghofrani HA, Arlt M, et al. Short-term venoarterial extracorporeal membrane oxygenation for massive endobronchial hemorrhage after pulmonary endarterectomy. J Thorac Cardiovasc Surg 2018;155:643-9.
7. Thistlethwaite PA, Madani MM, Kemp AD, Hartley M, Auger WR, Jamieson SW. Venovenous extracorporeal life support after pulmonary endarterectomy: indications, techniques, and outcomes. Ann Thorac Surg 2006;82:2139-45.
8. Kolnikova I, Kunstyr J, Lindner J. Extracorporeal membrane oxygenation used in a massive lung bleeding following pulmonary endarterectomy. Prague Med Rep 2012;113: 299-302.
9. Cronin B, Maus T, Pretorius V, Nguyen L, Johnson D, Ovando J, et al. Case 13--2014: management of pulmonary hemorrhage after pulmonary endarterectomy with venovenous extracorporeal membrane oxygenation without systemic anticoagulation. J Cardiothorac Vasc Anesth 2014;28:1667-76.
10. Yıldızeli B, Arslan Ö, Taş SG, Eldem B, Aksoy E, Koçak T, et al. Management of massive pulmonary hemorrhage following pulmonary endarterectomy. Thorac Cardiovasc Surg 2014;62:89-9.