

Airway Complications of Total Artificial Heart

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Abstract

The total artificial heart is the mechanical device which is used as a bridge to the heart transplant in patients with biventricular failure. Due to the mechanical nature of the device, patients receiving total artificial heart (TAH) require to be on anticoagulation therapy. Hemorrhage and coagulopathy are few of the known complications of TAH.

Keywords: Airway clot, artificial heart transplant, Roth net, total artificial heart

INTRODUCTION

We report the airway complications of total artificial heart (TAH) and the use of an endoscopic retrieval basket to remove the blood clot from the airway.

CASE REPORT

The patient was a 52-year-old African American male with a past medical history of nonischemic cardiomyopathy (ejection fraction of 15%) from a viral infection, coronary artery disease with implantable cardioverter, diabetes mellitus, and chronic kidney disease stage III who was admitted with decompensated heart failure. The patient had weight gain, renal failure, and congested liver due to heart failure. The patient continued to deteriorate clinically, requiring dialysis for renal failure and mechanical ventilation and venoarterial extracorporeal membrane oxygenation (ECMO) for hypoxic respiratory failure and biventricular failure. On day 8, he underwent TAH implantation and ECMO decannulation. The patient required almost daily platelet transfusions for thrombocytopenia due to worsening liver dysfunction. Despite being coagulopathic, low dose bivalirudin was initiated with a partial thromboplastin time goal of 40–60 s given the high increased risk of clot in the setting of a TAH. His respiratory status was stable until hospital day 14 when he developed acute onset hypoxia. Chest X-ray revealed complete opacity of the left lung. He underwent bronchoscopy, which demonstrated severe mucous plugging of the left bronchus. During bronchoscopy, a left main stem airway cast was removed with subsequent expansion of his left lung.

On hospital day 19, the patient developed increased peak airway pressures. He became difficult to ventilate and experienced sudden onset loss of TAH flows and resultant hypotension. A large blood clot was pulled through the endotracheal tube (ETT) using a 14-french suction catheter with the return of ventilation and improvement in TAH flows. A bronchoscopy the following morning revealed diffuse hemorrhage. The bivalirudin was held. Subsequently, the patient again developed increased peak airway pressures and decreased TAH flows. An emergent bronchoscopy revealed a large clot at the carina spilling from left to right main bronchus. The clot was noted to cause air trapping through a ball-valve phenomenon allowing air to enter but not escape [Figure 1a and b].

Interventional pulmonology procedure

A Roth net which is an endoscopic retrieval basket [Figure 2] was introduced through the therapeutic bronchoscope. Roth net had a sheath diameter of 2.5 mm, length of 230 cm, and net size of 3 cm × 6 cm. The distal end of the clot was encased in the net, and the entire basket with the clot was slowly pulled out. Due to the large size of the clot, we were unable to retrieve the clot through the ETT. Therefore, the ETT, bronchoscope, Roth net and clot were all removed as one unit. An 8.5 mm ETT was replaced along with a left main stem bronchial blocker

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to tamponade the bleeding. On inspection, the clot was found to be 14 cm in length by 5 cm at the widest point [Figure 3].

Eventually, patient's bleeding stopped, and the bronchial blocker was removed. Unfortunately, the patient's multiorgan failure continued to worsen, and on hospital day 23, the patient's family decided to withdraw care.



Figure 1: (a) Clot sitting on the carina – During inspiration. (b) Clot sitting on the carina – During expiration.



Figure 2: Roth net.



Figure 3: Clot removed from the airway.

DISCUSSION

Our case is the reflection of potential complications that may arise in patients who are on mechanical circulatory support devices in the Intensive Care Unit. As more and more of these procedures are being done throughout the country, it is pertinent that these complications be kept in mind. Managing these complications could be difficult; we, in our case, presented the novel use of Roth net to remove the clot from the airways. The clot was causing a “ball-valve” mechanism and thus creating lung hyperinflation with a subsequent effect on gas exchange and the risk of barotrauma to the lungs. This in return was affecting the total artificial heart circulation.

The TAH has been approved by Food and Drug Administration as a bridge to transplant in patients awaiting cardiac transplantations.^[1-5] Risk of early bleeding is not uncommon in patients with total artificial heart and therefore delayed sternal closure is preferred in many centers.^[1] Other complications such as mediastinal tamponade and renal failure could occur due to altered physiology. Bleeding in the airway can be severe and can form a clot and the cast of the airway which could be life threatening.

Removing the clot from the airway can be a tedious process. Use of Roth net is a new technique which can help remove the clot in the safest and fastest way.

CONCLUSION

Airway bleeding with subsequent air trapping through a ball-valve phenomenon is an emergent complication which can be of dire consequences if not recognized early and treated. Roth net could be used to remove the clot efficiently.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Parker MS, Fahrner LJ, Deuell BP, Olsen KM, Kasirajan V, Shah KB, *et al.* Total artificial heart implantation: Clinical indications, expected postoperative imaging findings, and recognition of complications. *AJR Am J Roentgenol* 2014;202:W191-201.
2. Thanavaro KL, Tang DG, Kasirajan V, Shah KB. Clinical indications for implantation of the total artificial heart. *ASAIO J* 2014;60:594-6.
3. Copeland JG. Syncardia total artificial heart: Update and future. *Tex Heart Inst J* 2013;40:587-8.
4. Gerosa G, Scuri S, Iop L, Torregrossa G. Present and future perspectives on total artificial hearts. *Ann Cardiothorac Surg* 2014;3:595-602.
5. Shah KB, Smallfield MC, Tang DG, Malhotra R, Cooke RH, Kasirajan V. Mechanical circulatory support devices in the ICU. *Chest* 2014;146:848-57.