Extracorporeal Membrane Oxygenation after Tonsillectomy

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Extracorporeal membrane oxygenation (ECMO) was introduced in the late 20th century specifically for pulmonary rescue of neonates suffering from primary pulmonary hypertension, meconium aspiration, or respiratory distress syndrome. It is achieved using either venovenous bypass through the right jugular vein alone or venoarterial bypass exiting through the right internal jugular vein and re-entering after oxygenation through the right common carotid artery. Lines are placed using the Seldinger technique, and heparin is used to prevent line clotting with a goal activated clotting time of 180 to 200 seconds (physiological range, 80-160 seconds). We describe here a patient who required ECMO shortly after adenotonsillectomy (T&A).

Case Presentation
A 2-year-old patient presented to our otolaryngology clinic with a history of snoring, restless sleep, worsening mouth breathing, and mild reactive airway disease. The physical examination demonstrated clear rhinorrhea and “kissing tonsils.” The patient was scheduled to undergo T&A with planned overnight observation. On the day of surgery, he was mouth breathing and afebrile, with ongoing clear nasal congestion. Given the benign presentation of the patient preoperatively, with a chronic runny nose secondary to adenoid obstruction, clear lungs, and no fever, there was no specific predictor to justify further preoperative workup such as chest x-ray or viral polymerase chain reaction (PCR). He was cleared for surgery by pediatric anesthesia. Intraoperatively, his tonsils were found to entirely obstruct his oropharynx, while the adenoids completely filled the nasopharynx. The tonsils were removed using monopolar cautery forceps (Symmetry Medical, Antioch, Tennessee). Adenoïdectomy was performed with monopolar suction cautery (Covidien, Dublin, Ireland).

Upon emerging from anesthesia, the patient suffered bronchospasm and laryngospasm requiring reintubation. He was transferred to the intensive care unit for care and monitoring. Respiratory virology PCR results were positive for respiratory syncytial virus, coronavirus, and adenovirus. Despite maximum medical therapy and continuous ventilation, his pulmonary status worsened presumably due to an acute infection, coupled with pulmonary edema and reactive airway disease. On postoperative day (POD) #7, after evaluating the patient’s risk of bleeding and death secondary to heparinization, venovenous ECMO was deemed necessary due to refractory hypoxemia, worsening acidosis, and pulmonary failure. On POD #8, the patient began bleeding slowly from the oral cavity, about 25 mL per 8-hour shift. Since bleeding was minimal and intermittent, with the formation of a clot within the oropharynx and oral cavity, surgical cauterization was deferred in favor of close monitoring. The patient’s hematocrit (hct) level was observed with a goal of 40%, and he was transfused as needed to maintain his goal hct level while ECMO therapy continued. A total of 13 U of red blood cells were given, which is a typical volume of blood during venovenous ECMO therapy. On POD #15, he was decannulated after suspension of ECMO. Bleeding within the oral cavity stopped, with a persistent oropharyngeal clot. He remained intubated for 5 more days for continued respiratory support. Just prior to extubation, his oral cavity, oropharynx, and nasopharynx were thoroughly interrogated. Findings were significant for a small amount of granulation tissue, but there was no evidence of bleeding. The large oropharyngeal clot was removed. The patient was extubated and weaned to room air. He was discharged to a rehabilitation facility and fully

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recovered 2 months after surgery with resolution of his obstructive symptoms.

**Discussion**

This is the first reported case of ECMO to treat catastrophic pulmonary failure after T&A. The development of ECMO has revolutionized medicine and likely saved this patient’s life.\(^1\) With ECMO therapy hemorrhaging is the most common complication reported in the literature,\(^2,^3\) with some studies indicating rates up to 22% for surgical site bleeding.\(^4\) Additional complications include ischemic stroke (4%), intracranial hemorrhage (6%), and infection (18%).\(^3\) The decision to initiate ECMO must be balanced against the risk of hemorrhaging, with additional considerations for neurological, pulmonary cardiologic, and renal sequelae. The risk of catastrophic bleeding should be explained to the patient or guardian prior to beginning ECMO therapy. In our patient after T&A within the 2-week high-risk period, bleeding appeared to be minimal and manageable with the supplementation of blood products. If mandatory, ECMO should not be avoided in the patient after recent T&A. This report was reviewed by the University of Nebraska Medical Center institutional review board, which determined that this project does not constitute human subject research as defined by 45CFR46.102 and 32CFR219.102.

**Author Contributions**

Paul D. Judge, substantial contributions to the conception and design of the work, drafting and revising the work for important intellectual content, final approval of the version to be published, accountability for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved; Carol Lydiatt, substantial contributions to the conception and design of the work, drafting and revising the work for important intellectual content, final approval of the version to be published, accountability for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved; Dwight T. Jones, substantial contributions to the conception and design of the work, drafting and revising the work for important intellectual content, final approval of the version to be published, accountability for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.

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**References**