information and uniformity of practice may be better positioned to answer such questions. In the end, while the size of study population is important, details matter just as much.

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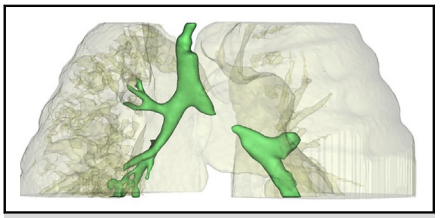
Commentary: Congenital heart disease patients with airway anomalies do worse: We knew that, or so we thought

Reilly D. Hobbs, MD, MBS, and
Richard G. Ohye, MD



Computed tomography scan showing severe left mainstem stenosis from bronchomalacia with hyperinflation on the left lung. (Reprinted from Zopf DA, Hollister SJ, Nelson ME, Ohye RG, Green GE. Bioresorbable airway splint created with a three-dimensional printer. *N Engl J Med*. 2013;368:2043-45, with permission from the Massachusetts Medical Society.)

CENTRAL MESSAGE

This study using the Society of Thoracic Surgery Congenial Heart Surgery Database helps quantify the impact of airway anomalies and tracheal surgery on congenital heart surgery outcomes.

In their article in this issue of the *Journal*, Riggs and colleagues[1] use data from the Society of Thoracic Surgery Congenital Heart Surgery Database (STS-CHD) to investigate the impact of airway anomalies and tracheal surgery on the outcomes of children undergoing congenital heart surgery. Although the presence of concomitant airway anomalies in children with congenital heart disease is well known,[2] there are little available data to quantify the associated risks. The authors should be congratulated, as this manuscript will be an important resource for preoperative counseling and provides a necessary framework for future studies.

The study included 198,674 patients who underwent cardiovascular surgery between January 2010 and September 2018. Concomitant or same hospitalization airway surgery was performed in 428 of these patients. The authors grouped patients with airway anomalies into 5 groups: patients undergoing tracheal interventions with stenosis, patients undergoing tracheal intervention without stenosis, patients with tracheal stenosis not undergoing intervention, patients with airway malacia, and patients with other airway anomalies. The main finding of their study is that patients

From the Section of Pediatric Cardiovascular Surgery, Department of Cardiac Surgery, University of Michigan Medical School, Ann Arbor, Mich.

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Address for reprints: Richard G. Ohye, MD, Section of Pediatric Cardiovascular Surgery, Department of Cardiac Surgery, University of Michigan Medical School, Room 11-742, 1540 E Hospital Drive, SPC 4204, Ann Arbor, MI 48109-4204 (E-mail: ohye@umich.edu).

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undergoing concomitant tracheal and cardiac surgery were at significantly higher risk for morbidity and mortality. In addition, children with documented airway anomalies not requiring airway interventions were still at increased risk for operative morbidity and mortality.

This study provides clinicians with a broad overview of the impact of airway disease in congenital heart surgery; however, it also highlights a lack of granularity in our understanding of airway anomalies and cardiac surgery. A significant impediment to our understanding is the vast array of airway anomalies that we encounter. In this study, the most commonly coded airway anomaly was "airway malacia" (56%), and the second most commonly coded airway anomaly was "other" (30%). Patients with airway malacia are often diagnosed postoperatively when failure to wean from the ventilator or failed extubation is encountered.[3] This leads us to wonder how many patients have unrecognized airway malacia but are successfully weaned from respiratory support regardless and never receive a diagnosis. In other words, can we really be confident in the denominator? Furthermore, the types of airway anomalies in the group categorized as "other" remains uncharacterized, as does the proportion of airway disease that is the result of prolonged ventilation secondary to cardiac disease.

Also striking in this article is the small number of patients who undergo concomitant or same admission tracheal and cardiac surgery. According to this study, only approximately 55 patients undergo concomitant or same hospitalization cardiac and tracheal surgery in the United States each year. It would be interesting to better understand which centers are performing these procedures, whether this patient cohort is being transferred to experienced centers, and what the criteria for tracheal stenosis repair are across these different centers. A review of the literature reveals several case series of patients undergoing open heart and tracheal surgery; however, the majority of these reports are focused on surgical technique and outcomes rather than on the preoperative workup and inclusion criteria for intervention.[4]

In summary, this article is an important first step toward improving the care of children with congenital heart and airway anomalies. This patient population is a complex group of patients who likely will always be at elevated operative risk. Nevertheless, it is difficult to read this article without believing that we can improve on our current national outcomes.

CONG

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