Risk of complications after elective tracheostomy in infants with congenital heart disease

Ethan Bassett MD1, Dmitry Tumin PhD2, Rebecca Miller3, Christopher McKee MD2, and Joseph Tobias MD2

1 Division of Pediatric Otolaryngology, Nationwide Children’s Hospital
2 Division of Pediatric Anesthesiology and Pain Medicine, Nationwide Children’s Hospital

Background

In 2016, the first review of the NSQIP-P database for tracheostomies in neonates and infants under two years of age was published reporting a complication rate of 24.3%.1 Independent risk factors that were predictive of complications included neonatal age, intraventricular hemorrhage, and cardiac risk factors (CRFs).2 Excess risk of major complications was significant for minor CRFs (p = 0.02), but not for major or severe CRFs (p = 0.63).1 This report updates the previously published data (2012-2013) with the most current NSQIP-P registry (through 2015) to confirm whether CRFs are associated with excess risk of 30-day adverse outcomes after tracheostomy tube placement. Our primary aim is to determine if CRFs (or congenital heart disease - CHD) is an independent risk factor for adverse outcomes after tracheostomy tube placement in children ages 0-2 years. Our secondary aim is to determine whether CRFs contribute to risk of complications in older children undergoing tracheostomy tube placement, included in the 2015 registry data.

Methods

NSQIP-P data were obtained for the years 2012-2015. Current Procedural Terminology codes 31600 and 31601 were used to identify elective tracheostomy placement performed as the primary procedure. CHD was identified using International Classification of Diseases, 9th revision, codes 745-747. Patients with cardiac comorbidities apart from CHD were excluded. Major complications were defined as surgical site infection (deep or organ space), unplanned reintubation, pneumonia, seizure, stroke, coma, postoperative sepsis, cardiac arrest, reoperation, or mortality. Following the model derived from 2012-2013 data, analysis of complications was adjusted for neonatal age and intraventricular hemorrhage.1

Results

In the 0-2 year old cohort, there were 337 patients meeting inclusion criteria (190/147 boys/girls, age 218 ± 214 days). Congenital heart disease was noted in 181 (54%) cases and major complications occurred in 96 (28%) cases (Figure 1). On bivariate analysis of this cohort, major complication rates were not significantly different between children with CHD (31%) and those without CHD (25%). The adjusted odds ratio (aOR) was 1.4 (95% confidence interval: 0.8, 2.2; p = 0.222). On analysis of older children, we identified 83 patients age 10 ± 4 years, of whom 20% had major complications. CHD, noted in 17% of cases, was not associated with increased risk of adverse events (aOR = 0.6; 95% CI: 0.1, 3.0; p = 0.532) (Figure 2)

![Figure 1: Major complications following elective tracheostomy placement in 96 patients ages 0-2 yr.](image)

![Figure 2: The adjusted odds ratio (aOR) of postoperative complications in different age groups depending on severity of congenital heart disease.](image)

Discussion

Analysis of the updated registry data refutes earlier conclusions from the NSQIP-P that suggest increased risk of major complications after elective tracheostomy in young children with CRFs.1 Similarly, analysis of older patients included in the registry since 2015 did not reveal excess risk of complications associated with CRFs. Improved perioperative care and selection of patients for elective tracheostomy may have reduced the possible risks attributed to cardiac comorbidities.

In other NSQIP-P studies, CRFs have been shown to be associated with complications of elective pediatric surgeries.2-8 However, not all studies find such associations.9-14 The University Hospital Consortium, which predates NSQIP-P, is a similar registry of hospitalized patients. In 2000, a review of 191,261 patients from this database under 18 years of age who underwent noncardiac surgery determined that CRFs added significant incremental risk of mortality in neonates and infants under one year of age, but not for children 1-18 years.15 It is possible that as the NSQIP-P collects further data on a wider range of ages among children undergoing tracheostomies, similar findings may result.

The NSQIP-P Registry is a valuable tool for risk assessment and outcome analyses and further data accumulation and analysis will continue to improve perioperative care, while recognizing limitations and possible bias of its procedure-based sampling technique.

References