American Journal of Otolaryngology–Head and Neck Medicine and Surgery xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

American Journal of Otolaryngology–Head and Neck Medicine and Surgery

journal homepage: www.elsevier.com/locate/amjoto

Otolaryngology consultation tracheostomies and complex patient population

Kristan P. Alfonso [a], Michael R. Kaufman [a], Emily V. Dressler [b], Meng Liu [b], Rony K. Aouad [a,*]

[a] Department of Otolaryngology, University of Kentucky Medical Center, 800 Rose St, C-236, Lexington, KY 40536, United States
[b] Department of Biostatistics, University of Kentucky Medical Center, 800 Rose St, C-236, Lexington, KY 40536, United States

ARTICLE INFO

Article history:
Received 14 March 2017
Available online xxxx

Keywords:
Open tracheostomy
Percutaneous tracheostomy
Otolaryngology
Comorbidities
Morbid obesity
Awake tracheostomy

ABSTRACT

Purpose: To assess for the differences in patients undergoing tracheostomy by the otolaryngology consult service versus other specialties.
Materials and methods: A series of 1035 tracheostomies performed at our institution from January 2013 through November 2015 was retrospectively reviewed. Patient-related factors that contribute to procedural difficulty were reviewed.
Results: 805 consecutive tracheostomies were included. Otolaryngology performed 176/805 (21.8%) tracheostomies as a consulting service. Morbidly obese patients were three times as likely to be referred to otolaryngology as other services (adjusted OR: 3.23; 95% CI: 2.21–4.72). Mean BMI was 36.38 kg/m^2 for Consults vs. 28.69 kg/m^2 for Others and morbidly obese patients had a mean BMI of 49.84 kg/m^2 vs. 42.68 kg/m^2 for Consults and Others respectively ($p < 0.001$). Patients with upper airway compromise (8.5% of Consults vs. 1.6% for Others) had 5.5 times higher odds to be performed by otolaryngology (adjusted OR: 5.46; 95% CI: 2.24–13.28). Otolaryngology performed 81.8% of awake tracheostomies ($n = 9/11$). There were significantly higher proportions of patients with diabetes, renal, pulmonary and cardiovascular disease in the Consults groups vs. Others ($p < 0.05$).
Conclusions: More complex tracheostomies are being referred to and performed by otolaryngology at our institution. Difficult and challenging tracheostomies seem to be the "standard" for otolaryngologists.

1. Introduction

Tracheostomy is one of the oldest surgical procedures recorded in human history for treating an impending death from airway obstruction, with the earliest images from Egypt dating from about 3600 BCE [1]. It is one of the most commonly performed procedures in the hospital, with up to 10% of critical care patients undergoing tracheostomy placement. Evidence has shown tracheostomy to decrease need for sedation, shorten wean from ventilator and time in the intensive care unit (ICU) [2]. Furthermore, it offers several advantages over endotracheal intubation, including decreased airway resistance, smaller dead space, greater patient comfort and more efficient pulmonary toilet [3,4]. Open tracheostomy was widely accepted as the standard of care for a long period of time and mostly performed in the operating room, usually by an otolaryngologist [5]. With the advent of percutaneous tracheostomy and its increase in popularity since 1985 through the Ciaglia technique [6], the paradigm has shifted to other specialties rapidly adopting this procedure as it has been cost effective, convenient and in experienced hands, has very low morbidity compared to open tracheostomy [7,8].

The rise of percutaneous tracheostomy and the "reluctance" [9] of the greater otolaryngology community to embrace this procedure have raised questions about the future role of the otolaryngologist in tracheostomy placement [10–12]. "In an era in which percutaneous tracheostomies are frequently performed in 'suitable' necks, more technically complex cases are referred to the otolaryngologist" Khoo stated [13]. This seems to be the general consensus among otolaryngologists and constitutes the basis of this study.

Our otolaryngology service is frequently consulted for tracheostomy placement by the intensive care units in our academic center and performs open tracheostomy in the operating room setting. We tried in this current study to objectively explore the patient-related factors associated with tracheostomies performed by the otolaryngology consult

* Corresponding author at: University of Kentucky Medical Center, Department of Otolaryngology – Head and Neck Surgery, 800 Rose St, C-236, Lexington, KY 40536, United States.
E-mail address: rony.aouad@uky.edu (R.K. Aouad).

http://dx.doi.org/10.1016/j.amjoto.2017.05.009
0196-0709/

service compared to other specialty services at our institution. We hypothesized that the tracheostomies performed by the otolaryngology consult service were of increased complexity secondary to increased urgency, difficult anatomy and increased comorbidities of patients.

2. Materials and methods

2.1. Study characteristics

Institutional Review Board approval was granted by Office of Research Integrity. One thousand and eighty tracheostomies performed at the University of Kentucky, a tertiary academic care center, from January 2013 through November 2015 were reviewed. Patients were excluded if they were younger than 18 years old, had a wrong procedure documented as a tracheostomy (e.g. tracheostomy tube change); in the event of a revision surgery, the most recent procedure and its associated encounter were reviewed. Tracheostomies were performed by multiple services over this time frame: General Surgery (including Trauma Surgery), Otolaryngology, Cardiothoracic Surgery, Pulmonary Critical Care, Anesthesia Critical Care and Plastic Surgery.

The tracheostomies performed by the Otolaryngology service were further divided into two groups, Consults and Primary. The tracheostomies performed at the request of another service were grouped into Consults while patients admitted to the Otolaryngology service were grouped as Primary. We only compared the tracheostomies in the Consults group to those performed by other services (Others). All Primary tracheostomies performed by Otolaryngology were excluded with the purpose of analyzing those cases referred to Otolaryngology, as other services will make a decision when to refer for tracheostomy or perform the procedure themselves since Otolaryngology will not refer primary patients for tracheostomy.

Tracheostomies billed under Current Procedural Terminology (CPT) codes 31600, 31603 and 31610 were obtained and used to generate a list of subjects. Impeding airway surgeries (such as cricothyroidotomies, whether performed by Otolaryngology or not) were excluded as these surgeries were performed under extremely emergent conditions. The only emergent cases that we included are the ones that necessitated an urgent tracheostomy but referred to either Otolaryngology or any other service. Data were obtained through review of electronic medical charting data and were saved on a central database. Patient-specific data acquisition included demographics of age, gender and body mass index (BMI), risk factors (tobacco and alcohol use), comorbidities, reason for admission (including upper airway problems) and type of anticoagulation (active of the time of the procedure or discontinued). The BMI was classified as underweight (≤18.49 kg/m^2), normal (18.5–24.9 kg/m^2), overweight (≥25 kg/m^2) and obese (≥30.0 kg/m^2). Morbidly obese patients had a BMI between 35.0 kg/m^2 and 39.9 kg/m^2 with at least one obesity related comorbidity or a BMI ≥40 kg/m^2. Those comorbidities included diabetes, hypothyroidism, heart disease, hypertension, gastrointestinal disease, renal disease, liver disease, vascular disease, pulmonary disease (other than chronic intubation) and stroke. Comorbidities were recorded if chronic (e.g. chronic kidney disease) and active at time of admission. The anticoagulation status at the time of the procedure was also assessed: aspirin, clopidogrel and warfarin were considered discontinued if held at least 5 days prior to the tracheostomy, and enoxaparin or heparin if held prior to the day of surgery. Perioperative data was obtained from operative reports, progress notes and nurse-charted surgical records. This included hospital location of tracheostomy procedure, technique, type and size of tracheostomy placed and complications (specifically, bleeding).

2.2. Statistical analysis

To compare the descriptive demographics as well as perioperative characteristics for Otolaryngology consulted patients and patients with tracheostomy performed by other services, Chi-squared test (the Fisher's exact test when appropriate) was used to compare categorical variables and independent two-sample *t*-test (Wilcoxon-Mann-Whitney test when appropriate) was used to compare continuous variables. Multiple logistic regression was performed to analyze the risk factors that may potentially influence the decision making for Otolaryngology consulted patients. Variables that were statistically significant in univariate logistic regression model were included in the full models and model selection was performed to identify critical variables with lower values of Akaike Information Criteria (AIC) suggesting better model fit.

The level of statistical significance was set at 0.05 for all tests conducted, and all analyses were performed with SAS software version 9.4 for Microsoft Windows on x64 (SAS Statistical Institute, Cary, NC).

3. Results

3.1. Patients' characteristics

A total of 1035 consecutive tracheostomy patients' charts were reviewed: 57 patients met exclusion criteria (9.4%). In addition, as the purpose of the study was to study the tracheostomies performed by otolaryngology as consults compared to those performed by the other services, we excluded 173 patients who underwent primary tracheostomy (Fig. 1). Therefore, a total 805 patients were included in the analysis: 176 Otolaryngology Consults and 629 tracheostomy done by other services (Others).

Table 1 outlines the baseline characteristics of the study patients from the Consults and the Others group. The mean age was similar: 55.3 years in Consults and 56.4 years in Others ($p = 0.4739$). The gender difference was not statistically significant: 60.2% males and 39.8% females in Consults vs. 55.5% males and 44.5% females in Others ($p = 0.2619$). Patients from other services were more likely to smoke ($p =$

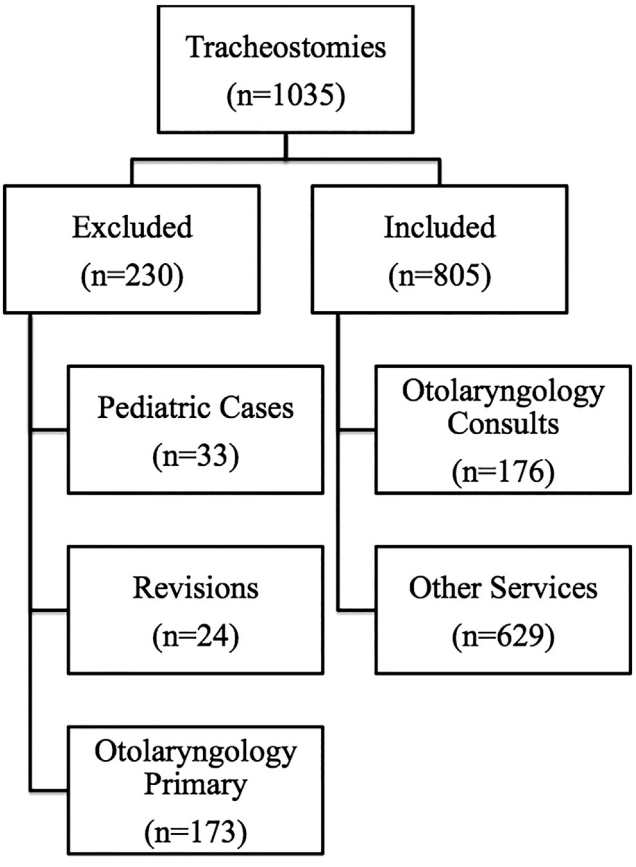

Fig. 1. Distribution of tracheostomies performed by service at our medical center.

Please cite this article as: Alfonso KP, et al, Otolaryngology consultation tracheostomies and complex patient population, American Journal of Otolaryngology–Head and Neck Medicine and Surgery (2017), http://dx.doi.org/10.1016/j.amjoto.2017.05.009