Awake vs Sedated Tracheostomies: A Review and Comparison at a Single Institution

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Abstract

Objective. The literature surrounding awake tracheostomies is sparse, particularly comparing awake tracheostomy patients to that of the sedated tracheostomy population. This study sought to compare tracheostomy patient demographics, indications, and outcomes of the 2 populations.

Study Design. Case series with chart review.

Setting. Tertiary care center.

Materials and Methods. All tracheostomies performed at our tertiary academic medical institution between January 2013 through November 2015 were reviewed. The data collected included demographics, comorbidity, anticoagulation, and outcomes.

Results. A total of 978 tracheostomies performed during this period met inclusion criteria, with 78 (8.0%) on awake patients. Most awake procedures were performed by otolaryngology (97.4%). Male sex predominated (73.1% awake vs 57.8% sedated). Forty-four patients (56.4%) were smokers in the awake group vs 326 of 900 (36.2%) in the sedated group. Malignancy was the primary indication for awake tracheostomy (68/78, 87.1%). One patient (1.3%) had significant postoperative bleeding compared to 26 of 900 (2.9%) of the sedated tracheostomy patients (P = .406). Only 9 (11.4%) were ever decannulated. Thirty-one (39.2%) patients ultimately underwent total laryngectomy, 3 could not be decannulated secondary to anatomical causes (stenosis or vocal fold paralysis), and 19 were lost to follow-up after discharge. There were 12 of 78 (15.4%) overall deaths in the awake cohort, with 215 of 900 (23.9%) in the sedated cohort (P = .088).

Conclusion. Despite all the differences between the 2 patient populations, the urgent awake tracheostomy appears to be safe and its complications do not appear significantly different from the sedated population.

Keywords

awake tracheostomy, standard tracheostomy, airway otolaryngology complications

Tracheostomy is one of the most common procedures performed in the hospital. Patient populations requiring tracheostomy are quite variable, ranging from critically ill intensive care unit patients to cancer patients to young, unfortunate maxillofacial trauma victims. There are very specific indications for performing an awake tracheostomy, the majority surrounding impending airway loss. Other less common indications include extrinsic compression, severe aerodigestive infection, systemic inflammatory conditions, vocal fold paralysis, and subglottic stenosis.1 The choice to perform an awake tracheostomy is undertaken as a cooperation between the anesthesiologist and the operating surgeon. It is especially important for both parties to recognize an impending difficult airway as multiple studies in the anesthesia literature have reported that difficult airways have been responsible for as many as 30% of deaths attributable to anesthesia.2-4 Attempting to intubate a patient with a large, friable supraglottic tumor can be extremely challenging, with a high rate of failure and inherent complication. There have also been reports of cases where an awake fiber-optic intubation is the preferred method to secure the airway in acute airway obstruction.5 Predictors of failed intubation include cancer diagnosis, previous radiotherapy, and supraglottic lesions, which are indicative of the challenges of the head and neck patient population for airway management.6 Tracheostomy does pose a risk to the patient with multiple complications, including postoperative bleeding, tracheitis, tube dislodgement, tracheoinnominate fistula, or tracheoesophageal fistula, all of which can be life-threatening. The literature on tracheostomy complications is sparse, with single-institution studies and database studies making up most what is reported.7,9

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studies attempting to look in a prospective manner tend to have small numbers but do report overall tracheostomy complication rates at up to 47% and 30-day readmission rates around 33%.\(^\text{10}\) There has been little research regarding clinical situations surrounding awake tracheostomies, particularly in comparing this patient population to those undergoing sedated tracheostomy. Retrospective analysis in awake tracheostomy-specific studies has shown complication rates under 10%, with the most common including minor bleeding, obstruction, dislodgement, pneumonia, and long-term complications, including tracheitis and suprastomal granulomas. Severe complications such as acute myocardial infarction and hypoxia/arrest during the procedure are very rare.\(^\text{1,11}\) In these studies, decannulation of awake tracheostomy patients is highly variable depending on etiology. Only 8% of patients with malignant disease were decannulated, while over 70% without malignant disease were successfully decannulated.\(^\text{1}\)

This study was designed to compare patient demographics, indications, and outcomes in awake vs sedated tracheostomy patients. We hypothesized that complications are not significantly different between the 2 groups.

Materials and Methods

Study Characteristics

Institutional review board approval was granted by the Office of Research Integrity. A total of 978 tracheostomies performed at the University of Kentucky, a tertiary academic care center, from January 2013 through November 2015 were reviewed. Exclusion criteria consisted of age younger than 18 years and incorrect procedure documented as a tracheostomy (eg, tracheostomy tube change). In the event of a revision surgery, the most recent procedure and its associated encounter were reviewed. Multiple services performed the tracheostomies in this time frame that were reviewed: general surgery (including trauma surgery), otolaryngology, cardiothoracic surgery, pulmonary critical care, anesthesia critical care, and plastic surgery (Table 1). The tracheostomies performed in this time frame were divided into 2 groups: awake and sedated.

Tracheostomies billed under Current Procedural Terminology (CPT) codes 31600 ("Tracheostomy, Planned [Sep Proc]") , 31603 ("Tracheostomy, Emergency Proc; Transtracheal"), and 31610 ("Tracheostomy, Fenestration Proc w/Skin Flaps") were obtained and used to generate a list of subjects. Impeding airway surgeries, such as cricothyroidotomies, were excluded, as these surgeries were performed under extremely emergent conditions. The only cases included in the study were those that necessitated an urgent tracheostomy, including awake tracheostomy. 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, sex, body mass index (BMI), risk factors (tobacco and alcohol use), comorbidities, reason for admission (including upper airway problems), and type of anticoagulation (active at 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 1 obesity-related comorbidity or a BMI ≥40 kg/m\(^2\). Other comorbidities were studied, including diabetes, heart disease, hypertension, gastrointestinal disease, renal disease, liver disease, vascular disease, pulmonary disease (other than chronic intubation), and stroke. Comorbidities were recorded if chronic and active at the 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 were 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). Mortality was defined as in-hospital death.

Statistical Analysis

To compare the descriptive demographics, as well as perioperative characteristics, for awake and sedated tracheostomies, the \(\chi^2\) test (the Fisher exact test when appropriate) was used to compare categorical variables, and independent 2-sample \(t\) test (Wilcoxon-Mann-Whitney test when appropriate) was used to compare continuous variables. Multiple logistic regression was performed to analyze the patient demographics, indications, and outcomes of the 2 populations. Variables that were statistically significant in the univariate logistic regression model were included in the full models, and model selection was performed to identify critical variables with lower values of the Akaike information criteria (AIC) suggesting better model fit. The level of statistical significance was set at .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, North Carolina) and SPSS Statistics for Macintosh, Version 24 (SPSS, Inc, an IBM Company, Chicago, Illinois).

Results

Patients’ Characteristics

A total of 978 consecutive tracheostomy patients’ charts were reviewed and met inclusion criteria. Of these, 78 (8.0%) were performed on awake patients while 900 were performed on...
Patients’ Indications.

Malignancy was the primary indication for awake tracheostomy (68/78, 87.1%). Other indications included trauma, glottis scarring, and bilateral vocal fold paralysis. Patients who underwent awake tracheostomies had significant upper airway obstructions compared to the sedated and intubated patients, 60.3% vs 6.4% (P < .001).

Surgical Techniques, Complications, and Outcomes.

All the awake tracheostomy patients (n = 78) underwent the procedure as an open surgery, compared to only 42.7% (n = 384) in the sedated group (P < .001), with a majority that underwent a percutaneous tracheostomy (57.3%, n = 516; P < .001) (Table 3). Regular length tracheostomy tubes were placed in 94.9% and 91.7% in the awake and sedated groups, respectively, with P = .319. Only 1 (1.3%) of the awake patients had significant postoperative bleeding, which was comparable to 26 of 900 (2.9%) of the sedated tracheostomy patients (P = .406). Those patients underwent surgical exploration for bleeding control. On the other hand, only 1 (1.3%) of the awake patients experienced postoperative minor bleeding (nonsurgical), which was comparable to 34 of 900 (3.7%) of the sedated patients (P = .270), and this resolved without any surgical interventions. Of the awake patients, 11.5% (n = 9) were decannulated compared to 39.3% (n = 354) in the sedated group, and this was statistically significant (P < .001). Decannulation was defined as permanent removal of the tracheostomy. Of the patients in the awake group, 39.2% (n = 31) ultimately underwent total laryngectomy, 3 could not be decannulated secondary to anatomical causes (stenosis or vocal fold paralysis), and 19 were lost to follow-up after discharge. There were 12 of 78 (15.4%) overall deaths in the awake cohort and 215 of 900 (23.9%) in the sedated cohort (P = .088), but none of the deaths were related to the procedure itself.

Discussion

Securing a safe airway in a patient with obstruction requires communication, swift decision making, and a well-
formulated plan. Patients with airway obstruction requiring emergent awake tracheostomy have been shown previously to have higher rates of complications, likely due to any obstruction of the tube becoming a more severe issue due to heavier reliance on the tube for air exchange. Our study presents one of the larger series of awake tracheostomy patients and highlights the characteristics of the patient populations more likely to be associated with the procedure compared to the standard sedated group that undergoes the same procedure.

The patients in the awake tracheostomy group were significantly older than the sedated group, 59.3 vs 56.3 years, with an average BMI of 24.2 kg/m² vs 30.2 kg/m². Significantly more smokers were found in the awake group (56.4%) vs the sedated group (36.2%, P < .001). This may be explained by the fact that most of the awake group have obstruction of their upper airway in 60.3% of the cases with an underlying malignancy in 87.1% of the cases.

Our study shows that, at our institution, the otolaryngology service performed 35.7% (n = 349) of the tracheostomies, 21.8% (n = 76/349) of which were awake, compared to other services that mostly performed sedated tracheostomies (n = 627, 99.7%) and only 2 of 629 (0.3%) awake. The general surgery department was leading the group with 40.8%, followed by otolaryngology (35.7%) and pulmonary services (16.1%).

Interestingly, our sedated patients were found to have significantly worse comorbidities: diabetes, coronary artery disease, hypertension, and renal disease. In addition, 56.3% of this group was on active anticoagulation at the time of surgery. This high rate of comorbidities most likely led to an overall higher mortality in our data set (23.9%) compared to 15.4% for the awake tracheostomy group.

On the other hand, similar to previous studies, the decannulation rate was low (11.5%) in the awake group due to the high proportion of our patients undergoing awake tracheostomy for malignant causes. Only a small portion could not be decannulated due to other causes such as persistent vocal fold paralysis or airway stenosis. This contrasts with the 39.3% decannulation rate in the sedated group, and the difference was statistically significant. Most of this latter group had nonobstructing etiologies for the tracheostomy, and hence decannulation was successful.

While our sedated patients tended to have higher rates of anticoagulation at the time of surgery, the postoperative bleeding rates were relatively low. This is in line with previous awake tracheostomy studies showing rates of 1% to 5%. We did not find any pneumothoraces in the awake group vs only 1 case in the sedated group (0.11%). This falls in the range reported in the literature (0%-17%) and in an earlier review of percutaneous tracheostomies at our institution where 4 pneumothoraces (4.8%) were found in 829 tracheostomies. In our study, this patient had an intraesophageal probe and underwent a sedated tracheostomy performed by a nonotolaryngology service. Her surgery was complicated by a pneumothorax, managed conservatively, and an esophageal perforation that necessitated surgical repair. No recorded tracheostomy dislodgements were noted in the awake tracheostomy cohort, which may stem from a single service performing the procedure and decreased BMI.

Limitations of this study relate to its retrospective nature and the fact that it was conducted at a single academic institution, as this may not necessarily represent the current practices at other institutions. Furthermore, the indications for awake tracheostomy may be physician and institution specific. As with most studies, electronic medical records can be incomplete, leading to changes in data interpretation.

Conclusion

Our cohort of patients undergoing awake tracheostomy seems to be significantly different from the cohort of sedated and intubated patients undergoing a tracheostomy. Despite the urgency associated with awake tracheostomies, this procedure remains safe, and its complications do not appear significantly different.

Author Contributions

Michael R. Kaufman, data acquisition, drafting, final approval; Kristan P. Alfonso, design, draft, approval; Kristen Burke, data acquisition, draft approval; Rony K. Aouad, design, draft, approval.

Disclosures

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References

