



Clinical assessment scoring system for tracheostomy (CASST) criterion: Objective criteria to predict pre-operatively the need for a tracheostomy in head and neck malignancies



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ABSTRACT

Background: Tracheostomy is a mainstay modality for airway management for patients with head-neck cancer undergoing surgery. This study aims to define factors predicting need of tracheostomy and define an effective objective criterion to predict tracheostomy need.

Methods: 486 patients undergoing composite resections were studied. Factors analyzed were age, previous surgery, extent of surgery, trismus, extent of mandibular resection and reconstruction etc. Factors were divided into major and minor, using the clinical assessment scoring system for tracheostomy (CASST) criterion.

Results: Sixty seven (13.7%) patients required tracheostomy for their peri-operative management. Elective tracheostomies were done in 53 cases during surgery and post-operatively in 14 patients. All patients in whom tracheostomies were anticipated had a score of seven or more.

Conclusion: A decision on whether or not an elective tracheostomy in head and neck surgery is necessary and can be facilitated using CASST criterion, which has a sensitivity of 95.5% and a negative predictive value (NPV) of 99.3%. It may reduce post-operative complications and contribute to safer treatment.

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1. Introduction

Tracheotomy has been used for many centuries as a means to bypass upper airway obstruction (Alberti, 1984; Brandt and Goerig, 1986; Jackson, 1909). Head and neck cancers are often associated with anatomic changes which can create a potentially difficult airway (Dougherty and Nguyen, 1994). After major oral and oropharyngeal resections in head and neck cancer surgery, the airway is often compromised due to edema, the presence of a pedicle flap and the possibility of tongue fall, leading to either respiratory distress or aspiration (Agnew et al., 1992; Castling et al., 1994; Bernard and Kenady, 1999). In these cases, conventional

tracheotomy is often required instead of prolonged intubation (Astrachan et al., 1988; Berrouschot et al., 1997). It is generally known that complications are more frequent in tracheotomies performed under emergency conditions (Waldron et al., 1990; Chew and Cantrell, 1972).

Also patients who require a tracheostomy after major head and neck surgery have a high incidence of pulmonary complications that prolong recovery, require more intensive care, delay rehabilitation and discharge from the hospital, and inevitably lead to greater health care costs. Studies have shown that 45% of patients undergoing major head and neck surgery that involved a tracheostomy develop pulmonary complications, most of which occur in the first 5 days after surgery. The patients most at risk seem to be elderly people, especially those with comorbid respiratory disease, with poor clearance of lower respiratory secretions (Morton et al., 1990, 1994).

At present tracheostomy or prolonged intubation have remained mainstay modalities for airway management for patients

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with oral and oropharyngeal cancer undergoing major surgery. It was the purpose of this study to detect the prognostic pre-surgical parameters with a high predictive value concerning potential respiratory insufficiency in the post-operative period of major head and neck cancer surgery. These evaluated parameters were used to create a predictive tracheotomy score system to detect an individual risk profile focusing on possible post-operative respiratory insufficiency and the need for tracheotomy.

2. Material & methods

After obtaining the required clearance from the Institutional Review Board, the medical records of 386 patients who underwent major composite resections with reconstructions with either pedicled (pectoralis major myocutaneous flap, latissimus dorsi flap etc.) or microvascular free flaps (radial artery free flap; antero-lateral thigh flap; myocutaneous fibular flap etc.) with or without tracheostomy from January, 2004 to December, 2008 at HCG Cancer Centre, Ahmedabad, Gujarat, India were studied. Various factors contributing to the need for tracheostomy in the patients ranging from extent of surgical resection; amount of mandibular resection; size of the tumor; extent of neck dissection; duration of surgery; pre-operative morbidities of the patients; age of the patients; presence of trismus; chest condition etc. were evaluated.

A total of twenty parameters were studied for their impact on contribution towards a need for a tracheostomy in a patient. The statistical analysis and selection of significant data were performed using binary logistic regression (significance level $p < 0.05$). The groups of tracheostomized and non-tracheostomized patients were compared with reference to twenty parameters. The aim was to identify significant influencing parameters.

2.1. Data analysis

The data were analyzed using SPSS software (SPSS Inc., Chicago, IL; versions 10.0 and 11.0 for Windows). Descriptive analysis was performed to identify normality, linearity, and outliers. The strength of univariate associations was examined using logistic regression, with separate models for each predictor (determined previously). Multiple logistic regression analysis was used to find independent associations between a priori predictors and need for a peri-operative tracheostomy. Ten parameters were identified, which had a statistically significant ($p < 0.05$) bearing in prediction about the need for a peri-operative tracheostomy in a patient. Based on their significance they were divided into major and minor categories, using the clinical assessment scoring system for tracheostomy (CASST) system:

Six major risk-factors for prediction of need for a tracheostomy ($p < 0.001$):

1. Previously radiated in same region of surgery.
2. Resection of two more sub-sites of oral cavity or oropharynx.
3. Bilateral neck dissection.
4. Extended hemi or central arch mandibulectomy.
5. Bulky flap for reconstruction: latissimus dorsi; double skin island pectoralis major myocutaneous flap.
6. Flap with a compressing element: intact mandibular rim; use of a concomitant reconstruction plate.

Four minor risk-factors ($p < 0.05$):

1. Age >65 years.
2. Previously operated at the same site.
3. Trismus (Inter-incisor distance <1 cm).
4. Pathological CT chest findings (evidence of COPD, emphysema).

Each major risk-factor was given two points and each minor risk-factor one point. The individual score (measured in points) was compared with the previously obtained predictive value for the likelihood of a tracheotomy. The data were analyzed using SPSS software (SPSS Inc., Chicago, IL; versions 10.0 and 11.0 for Windows). A score from 0 to 6 predicted no requirement of tracheostomy, whereas a score of 7 or more was a predictor for tracheostomy.

With this scoring system developed from retrospective chart review of 386 patients, the devised CASST criterion was prospectively validated to predict the need of peri-operative tracheostomy in patients with oral cavity and oropharyngeal malignancies who underwent composite resections and reconstruction at our center from January, 2009 to September, 2014 (Fig. 1).

A total of 486 patients underwent oral and oropharyngeal cancer surgery at our center from 2009 to 2014. These 486 patients underwent the airway assessment using the CASST criterion to identify the patients requiring peri-operative tracheostomy. The airway assessment was done by an anesthetist and an onco-surgeon not directly related to the management of the patient to avoid any bias in decision.

The risk-factor analysis of these patients was done using our scoring system and the decision to do a tracheostomy or not was based on the score obtained, with a score ≤ 6 was suggestive of no need for a tracheostomy, whereas a score of ≥ 7 was indicative of a need for a tracheostomy in the patient (Table 1). After the surgery, according to the airway management requirement of that cohort, the point system was validated.

3. Results

A total of 486 patients were operated for oral and oropharyngeal malignancies from 2009 to 2014. These patients underwent composite resections with neck dissections and required complex reconstructions and were presumed to need a critical airway management during treatment period and required tracheostomy on conventional grounds and were analyzed in detail.

Thus, these 486 patients formed the study collective. The age of the patients ranged from 20 years to 89 years, with a mean age of

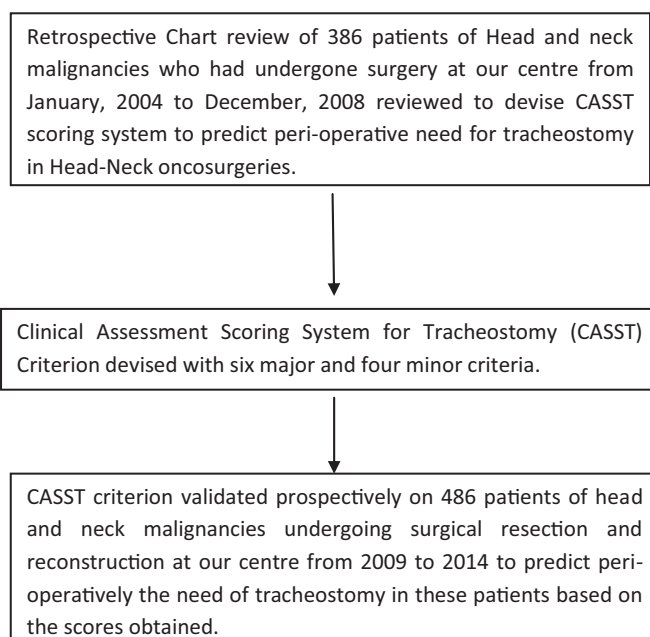


Fig. 1. Workflow of the study.

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