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Selective tracheostomy in oral cancer reconstruction with myomucosal flaps: Outcomes and an appraisal of published risk scores

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ABSTRACT

Selective tracheostomy after resection of oral tongue cancer remains contentious, particularly when reconstruction uses intraoral myomucosal flaps whose bulk and edema are not well represented in existing airway risk scores. We retrospectively reviewed 62 consecutive patients who underwent partial glossectomy with myomucosal (buccinator/FAMM-type) flap reconstruction. Primary outcome was elective tracheostomy; secondary outcomes included airway events, ICU utilization, and length of stay (LOS). We compared clinical decisions with the Cameron and Gupta/CASST scores and fitted a multivariable logistic regression to evaluate associations with elective tracheostomy. Selective tracheostomy was performed in 43/62 patients (69%); no airway emergencies occurred among patients managed without tracheostomy. ICU admission occurred in 11% without tracheostomy versus 65% with tracheostomy, and median LOS was 8 versus 20 days, respectively. At prespecified thresholds, both scores showed high specificity, but low sensitivity compared with real-world decisions (Cameron $\geq$ 5: sensitivity 32.6%, specificity 94.7%; Gupta/CASST $\geq$ 7: sensitivity 4.7%, specificity 100%); agreement beyond chance was slight ($\kappa \approx 0.19$ and $\kappa \approx 0.03$). The multivariable model demonstrated acceptable discrimination (ROC-AUC 0.73); no individual covariate reached statistical significance, although advancing T stage showed a non-significant trend toward elective tracheostomy. All flaps survived, with only minor distal ischemia managed conservatively. These data suggest that, in the context of intraoral myomucosal reconstruction, institutional thresholds for elective tracheostomy exceed those implied by generic scores; conversely, carefully selected patients can safely avoid tracheostomy. Tailoring risk prediction to flap-specific mechanics may refine decision support and reduce unnecessary tracheostomies without compromising safety.

Introduction

Oral squamous cell carcinoma often requires surgical resection followed by reconstruction of the defect. While free flaps are the standard for large or complex defects, they increase operative time and length of stay. For small–to–moderate oral tongue defects, regional myomucosal flaps provide like-for-like mucosa with low donor-site morbidity. These local flaps avoid distant donor site morbidity and can achieve "like-with-like" reconstruction with oral mucosa, often resulting in satisfactory speech and swallowing function in properly selected cases [1–5]. In fact, recent studies confirm that most patients reconstructed with buccinator myomucosal flaps attain good functional recovery and quality of life post-operatively [6]. Therefore, for T1–T2 and certain T3 tongue cancers (especially lateral tongue lesions not involving the apex), a Bozola or FAMM (facial artery myomucosal flap), or Zhao myomucosal flap [7–10] can be a viable alternative to a free flap.

A critical perioperative consideration in oral cancer surgery is airway management in the immediate postoperative period. Extensive tongue resections and flap reconstructions carry risk of airway obstruction due to edema, bleeding, or tongue swelling. Traditionally, many head and neck surgeons perform a prophylactic (elective) tracheostomy to secure the airway in moderate to major resections [11]. However, tracheostomy itself can lead to complications in 8–45% of cases (hemorrhage, infection, stomal problems, etc.) [12–14] In the absence of clear guidelines, the decision for elective tracheostomy has often been left to individual surgeon judgment based on clinical factors. To bring

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objectivity to this decision, scoring systems have been proposed from Cameron et al. [15], to Gupta et al.'s CASST [16], Kruse-Lösler et al. [17], Mohamedbhai et al. [18] and Cai et al. [19]. Each score was derived from retrospective cohorts of head and neck oncology patients and incorporated factors related to tumor, surgical extent (tumor site/size, neck dissection, comorbidity, prior therapy) and reconstruction method.

Cameron's score assigns point values for four factors – tumor site, extent of mandibular resection, neck dissection, and reconstruction type – to stratify airway obstruction risk; a total score ≥ 5 indicates high risk warranting tracheostomy. Gupta's score is another system that evaluates 10 risk factors (categorized as major or minor) with a point sum ≥ 7 suggesting need for tracheostomy. These scoring tools have shown fair success in aligning with experienced surgeons' decisions in some studies. Nonetheless, variations in practice persist. Some centers have trended toward more selective airway management, such as avoiding tracheostomy and instead using overnight intubation or close observation for certain cases, to improve recovery and reduce unnecessary tracheotomies.

In Cameron's scale, radial forearm and anterolateral thigh (ALT) flaps each count 2 points and a total score ≥ 5 was recommended to prompt elective tracheostomy (sensitivity/specificity were not explicitly reported). Similarly, Gupta et al. studied 486 patients with composite head–neck resections and classified variables into "major" (e.g. prior radiotherapy, large composite defects) and "minor" (e.g. age ≥ 65, trismus) criteria. CASST assigns 2 points for free flaps such as radial forearm or ALT and a cutoff of ≥ 7 identified high-risk patients. In their cohort (13.7% ultimately needing tracheostomy), Gupta et al. reported a sensitivity of 95.5% (NPV 99.3%) using this threshold.

Other scores emphasize similar risk factors. Kruse-Lösler et al. [17] retrospectively reviewed 152 oropharyngeal cancer patients (59 radial forearm vs. 93 local flaps) undergoing mandibular resection and neck dissection. They identified tumor size/site, general health (comorbidity/multimorbidity), alcohol use, and abnormal chest X-ray as significant predictors of postoperative respiratory failure,and created a weighted score with ~ 96.7% accuracy for predicting tracheostomy need. Mohamedbhai et al. [18] retrospectively analyzed 149 head and neck cancer patients with flap reconstruction. The TRACHY acronym encompasses T stage, Reconstruction (flap bulk/type), Anatomic site, Comorbidities, History of prior treatment, and laterality of neck dissection. A score ≥ 4 yielded sensitivity 91.4% and specificity 90.8% for elective tracheostomy. Cai et al. [19] reviewed 533 free-flap cases (with 131-case validation) to build a logistic-based model for selective tracheostomy. Their score (sum of $\log_2$ odds-ratio weights) advises tracheostomy for scores > 3, with intermediate scores requiring individualized judgment.

Notably, none of these systems was specifically designed or validated for intraoral reconstructions using myomucosal flaps and neither Cameron nor CASST explicitly assigns points to purely mucosal flaps. This gap motivates our approach: we adopted the Cameron score and arbitrarily assign 2 points to intraoral myomucosal flaps (by analogy to radial forearm flaps) after multidisciplinary consensus because Cameron does not specify intraoral pedicled flaps and compare this adapted scheme to Gupta's CASST.

In this context, we aimed to (i) describe airway management patterns and early postoperative outcomes after intraoral myomucosal flap reconstruction; (ii) benchmark the Cameron and CASST/Gupta scores against the clinical decision to perform an elective tracheostomy; and (iii) evaluate associations with elective tracheostomy using multivariable logistic regression.

Materials and methods

We conducted a single-center retrospective study of consecutive adults with oral tongue/floor-of-mouth SCC undergoing partial glossectomy and myomucosal flap reconstruction (January 2020–December 2024). Inclusion criteria were: (1) pathologically confirmed squamous cell carcinoma (SCC) of the oral tongue (lateral border, ventral tongue, or base of tongue extending to oral tongue) or anterior floor-of-mouth requiring partial glossectomy, (2) reconstruction of the defect using a buccinator myomucosal flap (3) availability of complete perioperative data in the medical record. Patients who had primary closure or free flap reconstruction were not included. In total, 62 patients met these criteria for inclusion in the study.

For each patient, we selected the following variables: age, sex, comorbidities, any prior head-neck treatments, tumor characteristics, type of neck dissection, flap type, whether an elective tracheostomy was performed at the time of surgery, radiologic findings from preoperative chest imaging. Postoperative course data included eventual need for intensive care unit (ICU), number of ICU days, and total length of hospital stay.

The primary outcome was elective tracheostomy (yes/no) at the index resection.

Secondary outcomes were: (a) airway events (unplanned airway interventions and airway emergencies); (b) tracheostomy-related complications; (c) ICU admission and length of stay; and (d) hospital length of stay. As secondary analytic outcomes, we also quantified score performance (sensitivity, specificity, PPV, NPV, Cohen's κ), model discrimination (ROC-AUC) and adjusted effects are reported as odds ratios (aOR, 95% CI).

Airway complications/rescue interventions were predefined as unplanned airway failure after the index operation: re-intubation, emergent surgical airway (tracheostomy or cricothyrotomy), ICU escalation specifically for airway compromise, or unplanned prolongation of endotracheal intubation beyond 24 h for airway protection. Planned postoperative ventilation or routine ICU observation were not counted.

ICU admission and length of stay were analyzed as measures of resource utilization associated with the postoperative airway strategy; given the observational design and institutional pathways, no causal inference was intended.

Statistical analysis

Continuous variables were summarized as mean ± SD or median (IQR), as appropriate, and compared with the *t*-test or Mann–Whitney *U* test. Categorical variables were compared with Fisher's exact or $\chi 2$ tests (two-sided $\alpha = 0.05$). Agreement between score-based recommendations (Cameron ≥ 5; Gupta/CASST ≥ 7) and the clinical tracheostomy decision was quantified using Cohen's κ; diagnostic metrics (sensitivity, specificity, PPV, NPV) were reported. We fitted a multivariable logistic regression (binary outcome yes/no). Covariates were prespecified based on clinical plausibility and availability before extubation: age (years), sex, tumor T stage (T3–T4 vs T1–T2), neck dissection (bilateral vs unilateral/none), and were entered simultaneously. Results are presented as adjusted odds ratios (aOR) with 95% confidence intervals and p-values in Table 3; overall discrimination was summarized by ROC-AUC. Because Cameron score does not include a category for intraoral pedicled myomucosal flaps, we operationalized this item by assigning 2 points after multidisciplinary consensus. This choice is unvalidated; we therefore present it transparently and discuss its implications. This coding was prespecified as an exploratory mapping used solely for benchmarking the score against our cohort; results should be interpreted in that context. All statistical analyses were performed using SPSS 26.0 (IBM Corp., Armonk, NY).

Results

A total of 62 patients met inclusion criteria. The cohort's median age was 66 years (range 37–88), and 61% (n = 38) were female. Table 1 summarizes the clinical characteristics. Most tumors were located at the lateral tongue margin (44 patients, 71%); a smaller number had lesions involving the anterior floor of mouth (5 patients), base of tongue

Table 1
Baseline characteristics of patients by postoperative airway management group.

Characteristic	No Tracheostomy (n = 19)	Elective Tracheostomy (n = 43)	Total Cohort (N = 62)
Age, years (mean ± SD; range)	65 ± 12.1 (range 37–84)	69 ± 10.5 (range 47–88)	66 ± 11.3 (range 37–88)
Sex – Male:Female (%)	9 M: 10F (47% male)	15 M: 28F (35% male)	24 M: 38F (39% male)
Comorbidity ≥ 1	10 (53%)	31 (72%)	41 (66%)
Tumor T-stage – T1 / T2 / T3 / T4 / Not documented with large tongue involvement	3 / 11 / 4 / 0 / 1	5 / 25 / 10 / 1 / 2	8 / 36 / 14 / 1/ 3
Pathologic N+ (N1–N3)	3 (16%)	13 (30%)	16 (26%)
Bilateral neck dissection	1 (5%)	9 (21%)	10 (16%)
Reconstruction flap	5 Zhao, 1 FAMM reverse, 13 Bozola (incl. 0 bilat)	10 Zhao, 1 FAMM reverse, 32 Bozola (incl. 1 bilat)	15 Zhao, 2 FAMM reverse, 45 Bozola (incl. 1 bilat)
Cameron score (median, range)	4 (3–10)	5 (4–11)	4 (3–11)
Gupta score (median, range)	1 (0–4)	1 (0–7)	1 (0–7)

Abbreviations.
SD = standard deviation; N+ = node-positive; FAMM = facial artery myomucosal flap; bilat = bilateral.

extending to the glossotonsillar sulcus (2 patients). Pathologic T-stages were T1 in 8 patients (13%), T2 in 36 patients (58%), T3 in 14 patients (23%), and T4 in 1 patient (2%) (three cases lacked a documented T but had large tongue involvement). Pathologic nodal metastases (N1–N3) were present in 16 patients (26%), while 46 (74%) had no cervical metastasis (including clinically N0 cases). Almost all patients (60/62, 97%) underwent neck dissection: 50 patients had unilateral neck dissection and 10 (16%) had bilateral neck dissections.

Reconstruction patterns favored Bozola flaps, with Zhao and reverse-FAMM used in selected cases. This distribution reflects our preference for designs that balance arc of rotation and mucosal match. None of the patients in this series required conversion to a free flap; all reconstructions were accomplished with the regional flaps.

Most patients were medically fit: 21 patients (34%) had no significant comorbidities, whereas 41 (66%) had at least one comorbidity, the most common being cardiovascular disease (hypertension) and diabetes. A history of prior head and neck oncologic treatment was present in only 4 patients (6%) meaning the vast majority were primary tumors. Preoperative imaging of the chest was unremarkable in 52% of patients; however, 30 patients (48%) had some radiologic finding of chronic lung disease (e.g. emphysema, fibrosis, old granulomas). This high rate reflects an older population with smoking history. Only one patient among those managed without tracheostomy had significant chronic lung changes (advanced interstitial fibrosis) noted on imaging.

Out of 62 patients, 43 (69%) underwent a prophylactic tracheostomy at the end of surgery, whereas 19 patients (31%) were managed without an initial tracheostomy (extubated in the operating room or after brief overnight intubation). The decision for a tracheostomy in every case was made after multidisciplinary discussion between surgeons and anesthesiologists. Among patients without tracheostomy, none experienced serious airway obstruction postoperatively – notably, there were no cases of re-intubation or emergent tracheostomy in this group. Using the predefined definitions, no airway complications or rescue airway interventions occurred in the non-tracheostomy group.

Patients who did not receive a tracheostomy included 4 T1 cases; three were extubated without airway complications. By contrast, more advanced lesions had higher tracheostomy rates (all T4 and 79% of T3 cases had tracheostomy). However, even among the 47 patients with "low risk" Cameron scores (<5), 29 (62%) were electively tracheostomized. Many patients with a Cameron score of 4 (the most common score in our cohort) still received a tracheostomy. Similarly, among patients with Gupta < 7, 41 underwent tracheostomy (Fig.1).

To illustrate, Cameron score ≥ 5 (the threshold recommending tracheostomy) was observed in 15 patients. The surgeons performed tracheostomy in 14 of those 15 (93% concordance when score was high). However, the surgeons also performed tracheostomy in an additional 29 patients who had Cameron scores below 5 (i.e. in many cases where the score would not have "required" it). This yielded a sensitivity of 14/43 = 32.6% for the Cameron score (identifying only one-third of the cases where a tracheostomy was done) but a high specificity of 18/19 = 94.7% (almost all patients not getting a tracheostomy indeed had low scores). Discrimination is illustrated by the ROC curves. (Fig. 2) Gupta score ≥ 7 was even more restrictive – only 2 patients had Gupta ≥ 7, and both did receive tracheostomies (100% of high-Gupta patients got tracheostomies). Yet, the remaining 41 tracheostomies were done in patients with Gupta scores below 7 (some as low as 1–4). In our series, the Gupta score showed sensitivity 4.7% and specificity 100%; none of the non-tracheostomy patients had a score above threshold. The agreement (κ) between score recommendations and actual decisions was poor: we calculated κ ≈ 0.19 for Cameron and κ ≈ 0.03 for Gupta, indicating only slight agreement beyond chance. In summary, our surgeons' threshold for performing tracheostomy was generally lower (more aggressive) than what the objective scoring systems would dictate (Table 2).

In the firth bias-reduced multivariable logistic regression, overall discrimination was acceptable with ROC-AUC 0.73 (Fig.3) Adjusted effects were: age per year aOR 1.01 (95% CI 0.98–1.04; p = 0.708); male sex aOR 0.54 (0.16–1.79; p = 0.313); T3–T4 vs T1–T2 aOR 2.69 (0.61–11.9; p = 0.193); bilateral neck dissection 12.08 (0.62–234.73; p = 0.100); none reached statistical significance (Table 3).

Patients who underwent tracheostomy were slightly older on average (median 69 vs 65 years), and a higher proportion were female (65% of the tracheostomies group vs 53% of no-tracheostomies group), but these differences were not statistically significant (p = 0.40 for age; p = 0.53 for sex). The presence of significant comorbidities was somewhat higher in the tracheostomies group (72% vs 53%), but this trend did not reach significance (p = 0.15). Tumor stage was the strongest predictor: T3–T4 tumors almost always had a tracheostomy, whereas T1–T2 tumors were managed without tracheostomies in about one-third of cases. On univariable analysis, this stage-tracheostomy association was significant (p = 0.02). Likewise, patients who required bilateral neck dissections were more likely to get a tracheostomy (90% of bilateral ND cases did, compared to 64% of unilateral ND cases; p = 0.18).

The Cameron score was naturally higher in those who underwent tracheostomy (mean Cameron 4.95 vs 4.32, p = 0.04), reflecting that more extensive procedures often led to tracheostomy; however, as noted above, many with moderate scores also received tracheostomy. Gupta scores were low across the board (median 1 in both groups), so there was no meaningful difference (p = 0.26). Interestingly, our internally assigned Defect Size Score correlated strongly with tracheostomy decisions (median score 7 in tracheostomy group vs 3p < 0.001). Essentially, any case we rated as very extensive (score ≥ 7) received a prophylactic tracheostomy, whereas those we rated 2–3 often did not. Tracheostomy decisions in practice were more common in patients with greater perceived defect magnitude, whereas the Cameron score assigns fixed points that may not fully reflect this dimension.

All 62 flap reconstructions survived without failure. There were no cases of total flap necrosis. Two patients (3%) experienced minor partial flap ischemia at the distal end, which resolved with conservative management; in both cases the flap eventually healed without requiring reoperation. Donor site morbidity was minimal – some patients had

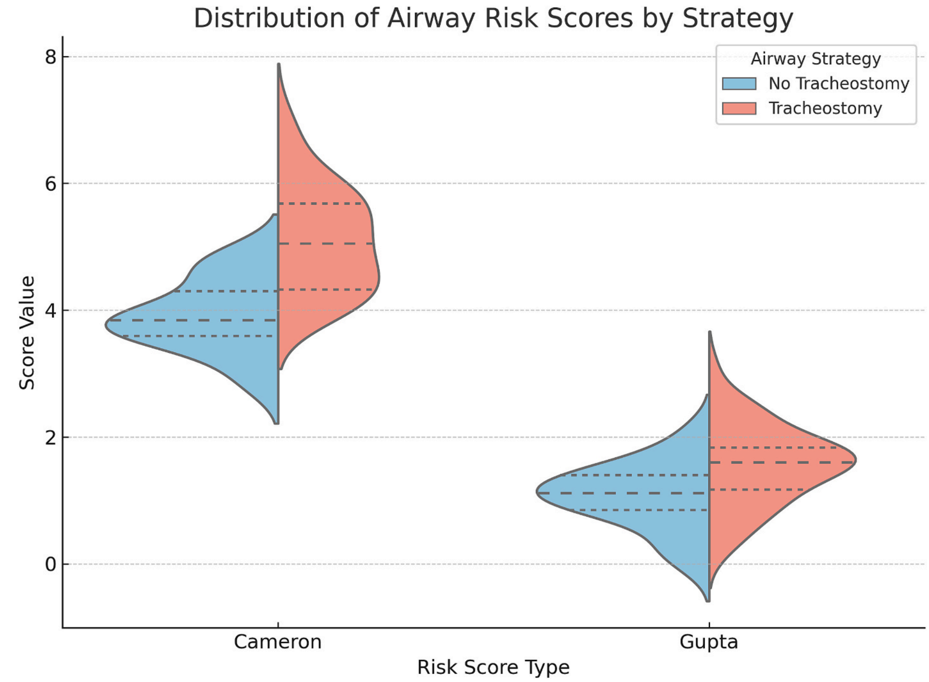

Fig. 1. Violin plots of risk scores by airway strategy. Distribution of Cameron and Gupta scores stratified by postoperative airway strategy. Each pair of violins compares patients managed without tracheostomy (No) versus with tracheostomy (Yes); central lines indicate the mean. Cameron skewed higher in the tracheostomy group, whereas Gupta remained low in both groups.

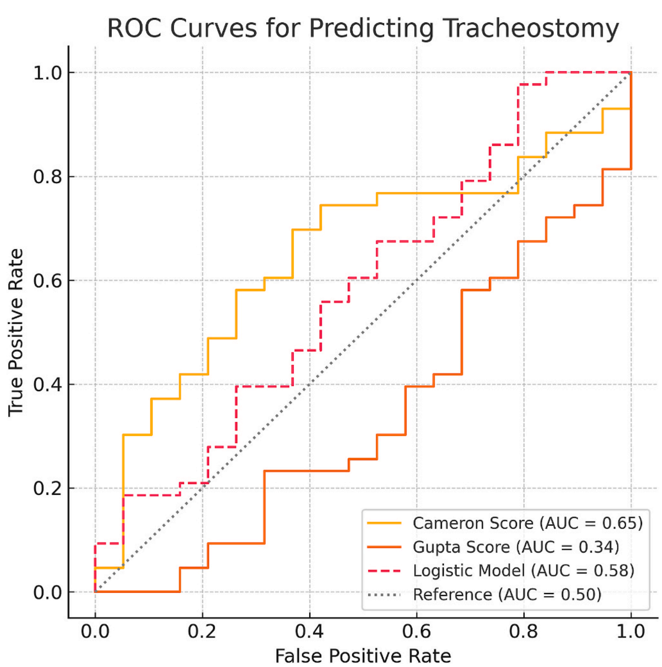

Fig. 2. Receiver operating characteristic (ROC) curves (Cameron, Gupta, logistic model). Receiver operating characteristic (ROC) curves comparing the Cameron score (AUC = 0.65) and the Gupta score (AUC = 0.63) in predicting elective tracheostomy. The diagonal line indicates chance discrimination (AUC = 0.50).

temporary oral incompetence or cheek numbness, but no chronic functional deficits of the donor site were noted in follow-up. As mentioned, no airway emergencies occurred in the non-tracheostomy group. Among the 43 tracheostomy patients, routine decannulation occurred typically by postoperative day 7–10. There were two tracheostomy-related minor complications (4.7%): one case of mild stomal infection treated with antibiotics, and one case of minor bleeding from the surgical site that resolved with local measures. No long-term tracheostomy tubes were needed.

Per the predefined definitions, no airway complications or rescue airway interventions occurred in the non-tracheostomy group.

All patients were monitored postoperatively in a high-dependency setting. Thirty patients (48%) were admitted to the ICU for at least one night (this included approximately two-thirds of tracheostomy patients and a few select extubated patients for close observation). The remaining patients stayed in a step-down recovery unit. The median ICU stay among those admitted was 2 days (range 1–6 days). The overall median hospitalization length was 17 days (range 7–42). ICU admission in our unit is protocol-driven for ventilated patients and selected extubated cases; accordingly, ICU use is reported as resource utilization rather than a causal effect of tracheostomy. Length of stay differed between groups as a measure of resource utilization: median 8 days without tracheostomy versus 20 days with tracheostomy (Fig. 4). These descriptive differences likely reflect institutional postoperative pathways and the monitoring needs associated with the chosen airway strategy.

Discussion

Airway management remains a central challenge in oral cancer surgery because postoperative edema, bleeding risk, and tongue swelling can unpredictably narrow the airway. Intraoral pedicled myomucosal flaps add bulk within a confined space, and their postoperative behavior may differ from external free flaps, an aspect not fully captured by generic risk scores [14,20].

Our findings suggest that currently available scores, developed primarily in free-flap populations, under-predict the frequency with which clinicians opt for airway protection in intraoral myomucosal reconstructions. This mismatch reinforces the need for flap-contextual predictors or adjusted thresholds in this setting.

These results suggest that these local flaps provided reliable reconstruction for lateral oral tongue defects up to moderate size, with a 100% flap survival rate and generally good functional outcomes. We observed

Table 2
Predictive performance of airway scores.

Score (threshold)	Sensitivity	Specificity	PPV	NPV	Cohen's κ	Notes (counts)
Cameron (≥5)	32.6%	94.7%	93.3%	38.3%	≈0.19	TP = 14, FP = 1, FN = 29, TN = 18; 14/15 high-risk had tracheostomy
Gupta (≥7)	4.7%	100.0%	100.0%	31.7%	≈0.03	TP = 2, FP = 0, FN = 41, TN = 19; 2/2 high-risk had tracheostomy

Thresholds follow manuscript text: Cameron ≥ 5; Gupta ≥ 7. Metrics calculated from reported counts.
Cameron adaptation: intraoral pedicled myomucosal flaps were coded as 2 points after multidisciplinary consensus.
PPV (Positive Predictive Value) = TP/(TP + FP): probability of tracheostomy, given a high-risk score.
NPV (Negative Predictive Value) = TN/(TN + FN): probability of no tracheostomy, given a low-risk score.
Cohen's κ: agreement beyond chance between the score recommendation (tracheostomy vs no-tracheostomy at the chosen threshold) and the actual clinical decision (range − 1 to 1; 0 = chance agreement).
TP (True Positive): score recommends tracheostomy and tracheostomy performed.
FP (False Positive): score recommends tracheostomy but tracheostomy not performed.
FN (False Negative): score recommends no tracheostomy but tracheostomy performed.
TN (True Negative): score recommends no tracheostomy and no tracheostomy performed.

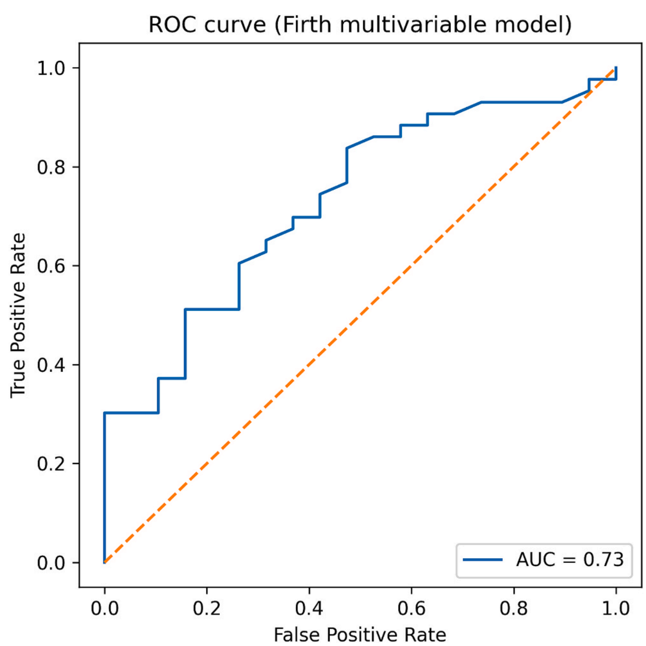

Fig. 3. Receiver operating characteristic (ROC) curve for the multivariable model predicting elective tracheostomy. Predicted probabilities were obtained from a bias-reduced (Firth) logistic regression including age (years), sex, tumor T stage (T3–T4 vs T1–T2), and neck dissection (bilateral vs unilateral/none). Model discrimination was acceptable (area under the curve, AUC = 0.73); the diagonal dashed line denotes no-discrimination (AUC = 0.50). Abbreviations: ROC, receiver operating characteristic; AUC, area under the curve.

Table 3
Multivariable logistic regression (Firth bias-reduction) for elective tracheostomy.

Predictor	aOR	95% CI	p-value
Age (per year)	1.01	0.98–1.04	0.708
Male sex (vs female)	0.54	0.16–1.79	0.313
T stage: T3–T4 (vs T1–T2)	2.69	0.61–11.90	0.193
Bilateral neck dissection (vs unilateral/none)	12.08	0.62–234.73	0.100

Firth bias-reduced logistic regression with simultaneous entry of covariates (age, sex, tumor T stage T3–T4 vs T1–T2, neck dissection bilateral vs unilateral/none). Wald p-values are shown for convenience; inference should prioritize 95% CI given sparse data and quasi-separation in the bilateral stratum (9/10 with tracheostomy). Abbreviations: aOR, adjusted odds ratio; CI, confidence interval.

that a majority (two-thirds) of patients received a prophylactic tracheostomy, reflecting a cautious approach in our practice. Notably, none of the patients who were managed without an initial tracheostomy

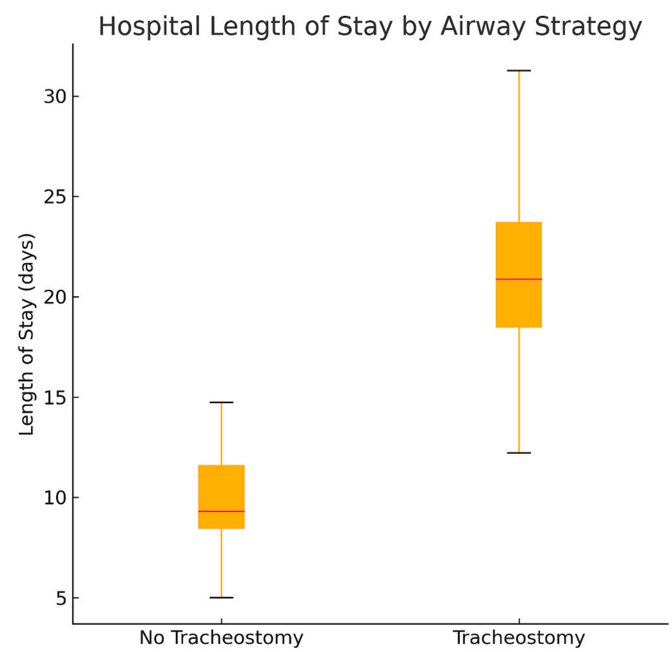

Fig. 4. Hospital length of stay by postoperative airway strategy. Patients managed with tracheostomy had significantly longer hospitalizations (median 20 days, IQR 15–29) compared to those without tracheostomy (median 8 days, IQR 7–15), $p < 0.001$. Box-and-whisker plot shows median line, interquartile range (box), and full range excluding outliers (whiskers).

experienced airway compromise, suggesting that, when carefully selected, primary extubation or short-term intubation can be safely achieved even in the setting of oral tongue reconstruction. This aligns with the experience of other centers that have begun to favor selective avoidance of tracheostomy to enhance patient recovery. Avoiding an unnecessary tracheostomy can improve patient comfort, reduce ICU utilization, and eliminate the risk of tracheostomy-related complications, which in previous reports occur in up to 1 out of 3–4 cases. Our tracheostomy complication rate was low (under 5%), likely owing to meticulous surgical technique and routine stoma care, but any complication in this vulnerable postoperative period can be serious. Thus, striking the right balance in airway management is important.

Compared with clinical practice, both scores showed high specificity yet limited sensitivity, producing only slight agreement with real-world decisions. There are a few possible explanations for our divergence. First, our patient cohort and surgical context differ we focused on tongue cancers reconstructed with local flaps, whereas Cameron's and Gupta's criteria were developed in cohorts including many free flap cases and larger composite resections. The presence of an intraoral pedicled flap could itself influence the decision towards tracheostomy beyond the factors captured in the mentioned scales. This might partially explain why many patients with Cameron score 4 (which typically signifies a modest risk) still had tracheostomies in our series as the scoring system does not explicitly account for pedicle positioning or oral cavity swelling from local flap harvest.

Second, institutional culture and prior experiences play a role. Our department's inclination has been to prioritize safety given the limited downside of a short-term tracheostomy. In contrast, some institutions have protocols to attempt overnight intubation instead of tracheostomy for borderline cases. Coyle et al. reported that implementing a policy of routine overnight observation with an endotracheal tube (instead of upfront tracheostomy) reduced their tracheostomy rate and led to faster patients' recovery with no increase in airway complications [12,21]. It is possible that our team's comfort level with prolonged intubation was lower, or that the availability of ICU beds influenced the threshold: performing a tracheostomy allows transfer to a surgical ward sooner, whereas keeping a patient intubated mandates ICU monitoring. These logistical considerations may not be captured in formal scoring but do affect decision-making. Taken together, the absence of airway complications in the non-tracheostomy group and the observed differences in resource utilization support a selectively conservative approach to tracheostomy in our setting, while acknowledging the observational design and potential confounding.

Interestingly, one case in our study highlights the potential to safely avoid tracheostomy even in a high-risk scenario. This was a patient with a base-of-tongue extending tumor (pT2 N2b) who had a Cameron score of 11 – normally an unequivocal indication for tracheostomy – yet was managed successfully without one. The surgeon's reasoning was that the patient had excellent preoperative airway and pulmonary function, and the flap (a Bozola flap) was inset in a way that didn't significantly encroach on the oropharynx. Indeed, the patient had an uneventful recovery. While this is only an anecdote, it suggests that individual anatomic factors and intraoperative findings can sometimes allow deviation from the score-based recommendation. In that instance, Cameron's algorithm may have overestimated risk whereas the reality was that the flap was thin and tension-free. This underscores that risk scores should complement, not replace, experienced clinical judgment. Our data show that had we strictly followed Cameron/Gupta scores, we would have performed far fewer tracheostomies – which hypothetically could spare many patients an invasive procedure – but it is uncertain whether that approach would have yielded equally safe outcomes in our context.

The literature supports that tongue reconstruction with myomucosal flaps results in satisfactory functional outcomes for small-to-medium defects [22–24]. In our series, we largely adhered to using local flaps for lateral defects not reaching the contralateral side or tip. Others have recommended the Bozola flap primarily for Ansarin class I–IIIa glossectomies (roughly, up to half of the tongue) and not for more extensive or tip-involving resections [25]. Our practice aligns with that recommendation, as we did not attempt local flaps for total or near total glossectomies.

This study has some limitations. First, it is limited by its retrospective design and single-institution scope. Second, the airway management decision was not randomized; thus, there can be selection bias. This makes it difficult to determine how a no-tracheostomy approach would have fared in the higher-risk patients, since we lack a comparison in those individuals. Third, we acknowledge that our internally defined score was subjective; however, it served as a useful post-hoc measure to interpret our decision-making. This implementation required a non-validated mapping of intraoral myomucosal flaps to the 2-point category in Cameron. If fewer points were assigned to these flaps, even fewer patients would exceed the high-risk threshold, decreasing sensitivity (with specificity unchanged or higher); hence the under-prediction of tracheostomy would be at least as pronounced. This does not alter our main conclusion but underscores the need for flap-specific calibration. Fourth, we did not formally evaluate speech or swallowing outcomes in this report. Finally, while we reported that no airway emergencies occurred, the study's observational nature means we cannot definitively conclude that all tracheostomies performed were necessary – only that no major issues arose in cases managed without them. Taken together, these observations indicate that published risk scores such as Cameron and CASST have limited transportability to intraoral myomucosal flap reconstruction. In our cohort they showed high specificity and low sensitivity with only slight agreement with real-world decisions, likely because generic scores do not account for flap bulk/edema dynamics and tongue biomechanics influencing extubation risk. Importantly, no airway emergencies occurred among patients managed without tracheostomy, while ICU use and length of stay reflected postoperative pathways (resource utilization) rather than causality. Existing scores should therefore be used as contextual aids rather than prescriptive rules, and flap-contextual thresholds or local calibration are warranted.

Conclusion

Myomucosal flaps provided dependable reconstruction for small-to-moderate oral tongue defects with low morbidity. Elective tracheostomy was common in our practice, and generic scores under-estimated the threshold at which clinicians chose airway protection. This may highlight nuances in evaluating airway risk for patients with intraoral pedicled flaps, or a differing risk tolerance. Future prospective studies or multi-centre data could help refine airway management protocols, potentially incorporating factors unique to local flap reconstructions.

Ethics statement

The study was conducted in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. To ensure patient confidentiality, all personal identifiers were removed or coded during data collection, and access to sensitive information was restricted to authorized personnel only. All the procedures followed the ethical standard of IRCCS ethical committee with the approval code 656/2025.

AI statement

During the preparation of this work the author(s) used ChatGPT-5 (OpenAI, San Francisco, CA, USA) in order to proofread and refine english language of this manuscript. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

CRediT authorship contribution statement

Alfonso Manfuso: Writing – review & editing, Investigation, Formal analysis, Data curation, Conceptualization. **Giulio Cirignaco:** Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis. **Stefan Cocis:** Investigation, Data curation, Conceptualization. **Fabio Volpe:** Formal analysis, Data curation. **Saverio Capodiferro:** Validation, Supervision. **Gianfranco Favia:** Visualization, Validation, Supervision. **Chiara Copelli:** Writing – review & editing, Validation, Supervision, Conceptualization.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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