Open Access

Original Article

Prevalence of Elective Tracheostomy Complications in Neck Dissection Patients

Tariq Mahmood, Shafi ullah Khan, Sabir Ali*, Idrees Khan, Shahid Iqbal Khan, Muhammad Junaid

Department of Oral and Maxillofacial Surgery, Armed Forces Institute of Dentistry, Rawalpindi/National University of Medical Sciences (NUMS) Pakistan,
*Department of Oral pathology, Liaquat University of Medical & Health Sciences, Jamshoro Pakistan

ABSTRACT

Objective: To evaluate the incidence and nature of complications associated with elective tracheostomy in patients undergoing neck dissection.
Study Design: Descriptive Analytical Observational Study.
Place and Duration of Study: Department of Oral and Maxillofacial Surgery, Armed Forces Institute of Dentistry, Rawalpindi Pakistan, from Jan to Dec 2024.
Methodology: A total of 60 patients were analyzed in the final study protocol undergoing neck dissection. Primary variables studies were frequency of tracheostomy associated complications after neck dissection and reconstruction in the immediate, short and long term follow-up.
Results: Immediate tracheostomy complications included bleeding in 07(11.6%) patients and surgical emphysema in 02(3.4%) patients. Short term complications included tube related issues in 04(6.6%), infection in 05(8.4%) and dysphagia in 02(3.4%) patients. Long term complications showed tracheal stenosis in 01(1.6%) and tracheoesophageal fistula in 01(1.6%) patients
Conclusion: Elective tracheostomy in neck dissection patients is associated with a considerable risk of intraoperative and postoperative complications. However, most complications are manageable with timely and appropriate care. Continued refinement in surgical technique and postoperative protocols is essential to minimize these risks in this high-risk population.

Keywords: Airway management, Elective tracheostomy, Neck dissection, Postoperative complications, Tracheostomy care, Tracheostomy complications.

How to Cite This Article: *Mahmood T, Khan S, Ali S, Khan I, Khan SI, Junaid M. Prevalence of Elective Tracheostomy Complications in Neck Dissection Patients. Pak Armed Forces Med J 2026; 76(Suppl-1): S213-S217. DOI: https://doi.org/10.51253/pafmj.v76iSUPPL-1.13505*

INTRODUCTION

Tracheostomy remains one of the most widely utilized procedures for airway management during major head and neck surgeries with multiple studies highlighting the comparative outcomes of elective versus emergency tracheostomies.[1,2] The literature contrasts surgical and percutaneous tracheostomy techniques each applied under varying clinical circumstances.[3] Despite the American Academy of Otolaryngology endorsing tracheostomy as a key method for securing the airway, particularly in complex head and neck surgeries its recommendations lack specificity in certain clinical contexts. For instance, in cases involving maxillofacial trauma many clinicians often favor submental intubation as an alternative to tracheostomy although the evidence base supporting such alternatives in head and neck cancer remains limited.[4]

Despite the routine nature of tracheostomy its complications particularly those arising from surgical procedures remain underreported in adult populations. A significant proportion of these procedures are performed by otorhinolaryngologists and head and neck surgeons (ORL-HNS).[5] Tracheostomy, whether performed electively or in an emergency involves creating a surgical opening in the trachea to secure the patient's airway.[6-7] While generally regarded as safe, the procedure carries inherent risks with mortality rates from tracheostomy-related causes ranging between 3.9% and 4.8% in the elderly population along with an annual increased risk of 0.7%.[8] Emergency tracheostomies have a significantly higher complication rate of 36% compared to 16% in elective cases with hemorrhage, apnea, and tube obstruction being the most common complications associated with elective tracheostomy.[9] The development of percutaneous dilatational tracheostomy by Ciaglia in 1985 marked a significant advancement offering a minimally invasive alternative.[10]

The present study aims to examine the incidence and nature of complications associated with elective tracheostomy specifically in neck dissection patients, a cohort that remains underrepresented in the existing literature in our part of the world.

Correspondence: Dr Tariq Mahmood, Department of Oral and Maxillofacial Surgery, AFID, Rawalpindi Pakistan
Received: 20 May 2025; revision received: 06 Aug 2025; accepted: 09 Sep 2025

METHODOLOGY

This study was carried out at the Department of Oral and Maxillofacial Surgery in Armed Forces Institute of Dentistry (AFID) Rawalpindi, Pakistan from January to December 2024 after ethical approval from the ERB of the institute (vide letter no 918/Trg dated 13-05-2020). Sample size was calculated using the WHO calculator keeping the confidence interval at 95%, power of test at 80% with population proportion having complications in elective versus emergency tracheostomy after neck dissection at 13% versus 44% respectively.[11] Minimum sample size came out to be 30 patients. We included 60 patients in the final study protocol using convenience sampling.

Inclusion Criteria: Adult patients of both genders presenting to the Oral and Maxillofacial Surgery Department who underwent elective tracheostomy during tumor resection along with neck dissection were included in the study.

Exclusion Criteria: Patients who were unwilling to participate, had terminal illness, concurrent head and neck surgeries or who failed to return for follow-up were excluded. Patients with psychological illnesses and neurological impairments who underwent emergency tracheostomy or those who underwent neck dissection for conditions other than OSCC were also excluded.

After inclusion in the study protocol a written informed consent was obtained from all patients. Variables including age, gender, comorbidities, resection of tumor, site of tumor, complications and neck dissection level was recorded for patients. Each patient with a tracheostomy was admitted for appropriate monitoring and data collection. The primary indications for elective tracheostomy were documented, with particular attention to the underlying pathology necessitating the surgery. Complications were assessed based on clinical signs and symptoms and the extent and severity of the disease. Various diagnostic modalities were included such as indirect laryngoscopy (IDL), Flexible Naso laryngoscopy, and Stereo Video Laryngoscopy for detailed visual assessment of the laryngeal region. Where required, Direct laryngoscopy (DL) was performed for biopsy and histopathological evaluation.

A structured questionnaire focusing on demographics, comorbidities, tumor site, neck dissection level, reconstruction method, and tracheostomy-related complications was formulated. The questionnaire was validated through a pilot study conducted on 10 patients. It achieved a Content Validity Index (CVI) of 0.8 and a Content Validity Ratio (CVR) of 1, as evaluated by a panel of five experts in the relevant field. The final section of the questionnaire recorded both intraoperative and postoperative complications, with specific fields to categorize the type and severity of complications. For cases requiring further diagnostic evaluation, investigations such as chest X-rays (to detect thoracic complications), blood cultures, and local swabs for culture and sensitivity (C/S) tests to assess infections. Barium/Gastrin swallow studies were included for the evaluation of tracheoesophageal fistula and bleeding profiles were documented when needed especially in patients at risk of coagulation abnormalities.[12-13]

Data was entered and analyzed using Statistical Package for Social Sciences version 26.0. Normality of data was checked for continuous variables and was normally distributed. Variable of age was expressed as Mean±SD. Gender, co-morbidities, tumor location, stage, resection technique, neck dissection, tracheostomy duration and tumor reconstruction was expressed as frequency and percentage. Tracheostomy complications were stratified according to duration and expressed as frequency and percentage.

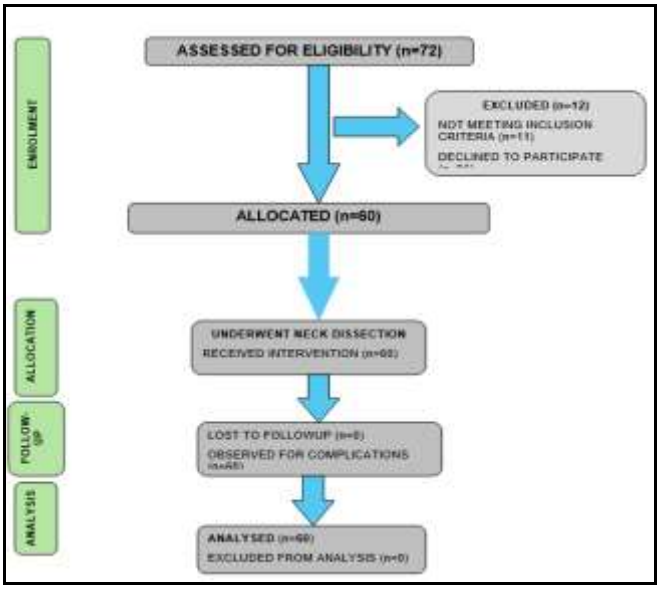

Figure-1: Patient Flow Diagram

RESULTS

A total of 60 patients were analyzed in the final study protocol undergoing neck dissection. Mean age was 56.93±10.68 years. Gender distribution showed

18(30.0%) males and 42(70.0%) females. Co-morbidities in the study group showed no co-morbidities in 37(61.7%) patients, hypertension in 08(13.3%), diabetes mellitus in 13(21.7%), respiratory disease in 01(1.7%) and coagulopathy in 01(1.7%) patients. Tumor site was buccal mucosa in 26(43.3%), alveolus and retromolar trigone in 22(36.7%), tongue and floor of mouth in 10(16.7%), maxilla and palate in 02(3.3%) patients. Tumor staging showed Stage-I in 12(20.0%) patients, Stage-II in 28(46.7%) patients, Stage-III in 12(20.0%) patients and Stage-IV in 08(13.3%) patients. Tracheostomy duration was 9 days in 12(20.0%) patients and 10 days in 48(80.0%) patients (Table-I).

Table-I: Demographic and Clinical Characteristics of the Study Cohort (n=60)

Variable(s)	Values
Mean Age (Years)	56.93±10.68
Gender	
Male	18(30.0%)
Female	42(70.0%)
Co-Morbidities	
None	37(61.7%)
Hypertension	08(13.3%)
Diabetes Mellitus	13(21.7%)
Respiratory Disease	01(1.7%)
Coagulopathy	01(1.7%)
Tumor Site	
Buccal Mucosa	26(43.3%)
Alveolus And Retromolar Trigone	22(36.7%)
Tongue And Floor Of Mouth	10(16.7%)
Maxilla And Palate	02(3.3%)
Tumor Stage	
Stage-I	12(20.0%)
Stage-II	28(46.7%)
Stage-III	12(20.0%)
Stage-IV	08(13.3%)
Tracheostomy Duration	
9 Days	12(20.0%)
10 Days	48(80.0%)

Level of neck dissection was supraomohyoid in 28(46.7%) patients, extended supraomohyoid in 18(30.0%) patients, modified radical in 12(20.0%) and bilateral neck dissection in 02(3.3%) patients. Tumor resection technique was marginal mandibulectomy in 19(31.7%) patients, segmental mandibulectomy in 18(30.0%) patients, maxillectomy in 03(5.0%) patients and wide local excision in 20(33.3%) patients (Table-II).

Immediate tracheostomy complications included bleeding in 07(11.6%) patients and surgical emphysema in 02(3.4%) patients. Short term complications included tube related issues in 04(6.6%), infection in 05(8.4%) and dysphagia in 02(3.4%) patients. Long term complications showed tracheal stenosis in 01(1.6%) and tracheoesophageal fistula in 01(1.6%) patients.

Table-II: Type of Neck Dissection, Tumor Resection and Neck Reconstruction Technique (n=60)

Variable(s)	n(%)
Level of Neck Dissection	
Supraomohyoid	28(46.7%)
Extended Supraomohyoid	18(30.0%)
Modified Radical	12(20.0%)
Bilateral	02(3.3%)
Tumor Resection Technique	
Marginal Mandibulectomy	19(31.7%)
Segmental Mandibulectomy	18(30.0%)
Maxillectomy	03(5.0%)
Wide Local Excision	20(33.3%)
Method of Re-Construction	
Primary Closure	14(23.3%)
Radial Forearm Free Flap	10(16.7%)
Vascularized Free Fibula Flap	14(23.3%)
Nasolabial Flap	14(23.3%)
Other Regional Flap	08(13.3%)

Table-III: Frequency of Tracheostomy Complications (n=60)

Duration	Variables	n(%)
Immediate (0-48 Hours)	Bleeding	07(11.6%)
	Surgical Emphysema	02(3.4%)
Short Term (2 Days-2 Weeks)	Tube Related Issues	04(6.6%)
	Infection	05(8.4%)
	Dysphagia	02(3.4%)
Long Term (>2 Weeks)	Tracheal Stenosis	01(1.6%)
	Tracheoesophageal Fistula	01(1.6%)
Total		22(36.6%)

DISCUSSION

The findings of this study revealed an overall complication rate of 36.6% following elective tracheostomy in patients undergoing neck dissection which is consistent with previously published data. The slightly higher rate observed in the present study may be attributed to patient-specific factors, the complexity of concurrent procedures (such as tumor resection and flap reconstruction) and the underlying oncological pathology specifically oral squamous cell carcinoma (OSCC). Minor complications dominated the spectrum with bleeding (11.6%) emerging as the most prevalent possibly if patient had already

undergone neck dissection. This is consistent with findings by Hassan *et al*.,[12]

Burjan *et al*., reported a 30% complication rate in their cohort with granulation tissue formation and infection being the most frequently observed complications.[13]

Previous studies such as Abril *et al*., documented high rates of local infection due to the surgical site's continuous exposure to oropharyngeal and respiratory flora.[14] Tube-related issues (tube obstruction and dislodgement) were recorded in (6.6%) patients. The present results closely mirror findings from a local study by Wasim *et al*., conducted at a tertiary care hospital in Karachi, Pakistan. In their study, a complication rate of 37% was observed with hemorrhage and tube dislodgement being the most common events particularly in older patients and emergency cases; however, in this study, all the patients underwent elective surgical tracheostomy and neck dissections.[15] The studies emphasize the importance of age, comorbidities and urgency of the procedure in influencing complication rates.[16]

Mild bleeding was observed in 11.6% of patients in the current study. While typically self-limiting, bleeding remains a common and well-documented issue in both elective and emergency tracheostomy procedures. More serious complications, such as tracheal stenosis (1.6%) and tracheoesophageal fistula (1.6%) were less frequent but clinically important in this study. Tracheal stenosis has been reported to occur in 2–10% of tracheostomized patients usually developing as a late complication due to prolonged tube placement, pressure necrosis, or infection.[16] In this study stenosis cases were identified during long-term follow-up, emphasizing the need for extended postoperative surveillance.

Hemorrhage, although less frequent poses a life-threatening risk and often necessitates immediate surgical or interventional management. This highlights the importance of meticulous surgical technique, careful intraoperative hemostasis, and preoperative assessment of coagulation profiles, particularly in patients with comorbidities such as hypertension or those on anticoagulant therapy.[17] Airway compromise due to tube obstruction or accidental dislodgement was also reported in 6.5 % patients. Although these events were limited in number, their critical nature mandates proactive measures such as secure tube fixation, proper sizing, and continuous staff training in airway emergency protocols. These findings are consistent with prior studies emphasizing early detection and prompt airway management.[18] The average hospital stay in the current cohort was 10.2 days and the mean time to decannulation was 14.5 days. The 15.6% readmission rate was primarily related to complications such as infection and bleeding reinforcing the importance of structured postoperative care and routine follow-up. Several studies have highlighted that vigilant monitoring combined with meticulous surgical technique can significantly reduce morbidity associated with major head and neck surgeries.[19-20] Overall, the complication profile observed in this study is comparable to those reported in similar patient cohorts both nationally and internationally. Notably, complications such as pneumothorax and airway obstruction were relatively rare in the present study (each at 3.6%) contrasting with higher rates reported in series involving more extensive or complex reconstructions. The low incidence of tracheal stenosis and stomal granulation is consistent with findings by Ruohoalho *et al*., although these complications remain clinically significant and demand precise surgical execution and tailored postoperative care.[21] Most complications in elective tracheostomy are minor and manageable, their occurrence highlights the importance of comprehensive patient evaluation, standardized operative protocols, and continuous monitoring particularly in patients undergoing simultaneous oncologic and reconstructive surgery. Further research is warranted to optimize protocols, reduce complication rates and improve long-term outcomes in this high-risk population.

CONCLUSION

Elective tracheostomy performed during neck dissection is associated with a considerable complication rate of 37.7%, with bleeding being the most frequent issue. The study's novel classification of complications by timing, immediate, short-term, and long-term provides a practical framework for the timely identification of complications of tracheostomy and improving the quality of postoperative care.

Conflict of Interest: None.

Funding Source: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

TM & SK: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

SA & IK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SIK & MJ: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Vulcu Cordunianu A-G, Cordunianu MA, Cochior D. Elective vs. emergency tracheotomy complications in advanced hypopharyngeal cancer. Experimental and Exp Ther Med 2024; 28(4): 388. https://doi.org/10.3892/etm.2024.12677
2. Natasha N, Khurshied S, Zahid MA, Khurshid N, Hussain A, Khizer MA, et al. Comparison between complications of elective and emergency tracheostomies. Cureus 2023; 15(11): e48612. https://doi.org/10.7759/cureus.48612
3. Katial T, Shree S, Mishra K, Mishra S, Mustajab MA, Gupta M et al. Comparison of percutaneous single-stage dilatational tracheostomy and surgical tracheostomy in critically ill patients: a randomized controlled trial. Int J Crit Illn Inj Sci 2024; 14(1): 9-14. https://doi.org/10.4103/ijciis.ijciis_53_23
4. Goh E, Loh N, Loh J. Submental intubation in oral and maxillofacial surgery: a systematic review 1986–2018. Brit J Oral Maxillofac Surg 2020; 58(1): 43-50. https://doi.org/10.1016/j.bjoms.2019.10.314
5. Selekwa M, Maina I, Yeh T, Nkya A, Ncogoza I, Nuss RC, et al. Tracheostomy care quality improvement in low-and middle-income countries: A scoping review. PLOS Glob Public Health 2023; 3(11): e0002294. https://doi.org/10.1371/journal.pgph.0002294
6. Mukherjee S, Jain A, Waindeskar V. Clinical outcome of perioperative airway and ventilatory management in patients undergoing surgery for oral cavity cancer: a prospective observational study. J Korean Assoc Oral Maxillofac Surg 2024; 50(3): 146-52. https://doi.org/10.5125/jkaoms.2024.50.3.146
7. Gaware SG, Babu MS. A Surgical Audit of Tracheostomy. Indian J Otolaryngol Head Neck Surg 2024; 76(2): 1491-1497. https://doi.org/10.1007/s12070-023-04308-w
8. Jin YJ, Han SY, Park B, Park IS, Kim JH, Choi HG et al. Mortality and cause of death in patients with tracheostomy: Longitudinal follow-up study using a national sample cohort. Head Neck 2021; 43(1): 145-152. https://doi.org/10.1002/hed.26471
9. Khan T, Rashid A, Samee MA, Ali A. Comparison of Outcomes between Elective Tracheostomy versus Emergency Tracheostomy. Pak J Med Health Sci 2021; 15(7): 1560-1562. https://doi.org/10.53350/pjmhs211571560
10. Romem A, Gilboa H. Percutaneous tracheostomy in the ICU: a review of the literature and recent updates. Curr Opin Pulm Med 2023; 29(1): 47-53. https://doi.org/10.1097/MCP.0000000000000928
11. Natasha N, Khurshied S, Zahid MA, Khurshid N, Hussain A, Khizer MA, et al. Comparison between complications of elective and emergency tracheostomies. Cureus. 2023; 15(11): e48612. https://doi.org/10.7759/cureus.48612
12. Hassan ZU, Akbar F, Maka TA. Short-term complications of emergency and elective tracheostomy; a comparative study. Life Sci 2021; 2(2): 5. https://doi.org/10.37185/LnS.1.1.117
13. Burjan O, Yurevich N, Kuchmiy YY, Zmeyev V. Evention of infectious complications of tracheostomy in patients with head and neck cancer pathology. Kharkiv Surg School 2022(4-5): 30-33. https://doi.org/10.37699/2308-7005.4-5.2022.06
14. Abril MK, Berkowitz DM, Chen Y, Waller LA, Martin GS, Kempker JA et al. The epidemiology of adult tracheostomy in the United States 2002–2017: a serial cross-sectional study. Crit Care Explor 2021; 3(9): e0523. https://doi.org/10.1097/CCE.0000000000000523
15. Wasim MF, Riaz N, Aslam S, Asad Shabbir Bukhari SM, Mumtaz H, Ahmed W. Complications of tracheostomy and leading factors among patients presenting at a tertiary care hospital, karachi. Pak Armed Forces Med J 2021; 71(3): 775-778.
16. Khammas AH, Dawood MR, Hamad AK. Evaluation of early complications of open surgical tracheostomy. Mustansiriya Med J 2017; 16(2): 36-42.
17. Lubianca Neto JF, Castagno OC, Schuster AK. Complicações de traqueostomia em crianças: uma revisão sistemática. Brazilian J Otorhinolaryngol 2022; 88: 882-890. https://doi.org/10.1016/j.bjorlp.2022.09.010
18. Zouk AN, Batra H. Managing complications of percutaneous tracheostomy and gastrostomy. J Thorac Dis 2021; 13(8): 5314. https://doi.org/10.21037/jtd-19-3716
19. Ranjan AA, Kumar PP, Shivappa SK, Ahmed M, Basavaraja GV. Indications and outcome of tracheostomy in a pediatric intensive care unit: A prospective observational study. J Pediatric Crit Care 2021; 8(4): 182-185. https://doi.org/10.4103/jpcc.jpcc_173_20
20. Spataro E, Durakovic N, Kallogjeri D, Nussenbaum B. Complications and 30-day hospital readmission rates of patients undergoing tracheostomy: a prospective analysis. Laryngoscope 2017; 127(12): 2746-2753. https://doi.org/10.1002/lary.26668
21. Ruohoalho J, Xin G, Bäck L, Aro K, Tapiovaara L. Tracheostomy complications in otorhinolaryngology are rare despite the critical airway. Eur Arch OtoRhinoLaryngol 2021; 278(11)4519-4523. https://doi.org/10.1007/s00405-021-06707-7