

# Airway management and postoperative length of hospital stay in patients undergoing head and neck cancer surgery

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## Abstract

**Background and Aims:** General anesthesia and airway management of patients for head and neck cancer surgery is a challenge for the anesthesiologist. Appropriate assessment and planning are essential for successful airway management. Our objectives were to review airway management strategies in patients undergoing head and neck cancer surgery in our tertiary care institution and also to observe the effect of airway management techniques on postoperative length of hospital stay (PLOS).

**Material and Methods:** A retrospective medical record review of 400 patients who underwent major head and neck cancer surgery in our institution was conducted. A special form was used, and records were searched for airway and anesthetic management in the operating room and recovery room, and for PLOS.

**Results:** 289 (72.25%) of the patients were male, and 111 (27.75%) female. 49.8% of patients had Mallampati score of 3 and 4. Airway was managed with tracheostomy in 81 (20.25%) patients; nasal intubation was performed in 177 (44.25%) and oral intubation in 142 (35.5%) patients. Postoperative emergency tracheostomy was not done in any of the patients.

**Conclusion:** Median postoperative hospital stay was significantly longer ( $P = 0.0005$ ) in patients who had a tracheostomy performed compared with those where the airway was managed without it.

**Key words:** Airway management, head and neck cancer, length of stay

## Introduction

Head and neck cancers are categorized amongst the top 10 malignancies globally. Pakistan lies in a high-risk geographical area with one-fifth (21%) of the cancers occurring in males and about one-tenth (11%) in females. Often the patients present late and the treatment is not appropriate.<sup>[1,2]</sup>

General anesthesia (GA) and airway management of patients scheduled for head and neck cancer surgery is challenging for the anesthesiologist. The incidence of difficult airway is high due to factors like restricted head and neck movement, limited mouth opening or reduction of upper airway space due to the

tumor or previous surgery. In addition, upper airway anatomy may be distorted due to the tumor, previous operation or fixation of the tissue of the oral cavity, pharynx or larynx by surgical scarring or fibrosis due to radiation.<sup>[3]</sup>

This retrospective study was conducted to review airway management strategies used in patients who underwent head and neck cancer surgery in our tertiary care institution. Our secondary objective was to observe the effect of airway management techniques on postoperative length of hospital stay (PLOS).

## Material and Methods

We performed a retrospective chart review of a cohort of 400 patients who underwent head and neck cancer surgery at our institution. Exemption from ethical approval for this study was provided by Ethical Committee of our University Hospital, (Protocol number: 2556-Ane-ERC-13) on 25 April 2013, before collecting the data. Data were collected retrospectively between 2006 and 2010 from the patient medical records in the hospital database system. All patients undergoing head and neck surgery due to oral and oropharyngeal cancers, laryngeal tumors, hypo-pharyngeal and parotid carcinomas with or without neck dissection were

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included. Patients undergoing surgery for thyroid cancers were excluded. Variables were predefined before the start of the study, and a special form was designed and used for data collection. Preoperative records were reviewed for co-morbid conditions and assessment of difficult airway (mouth opening, Mallampati classification and head and neck movements). All this information is routinely recorded in our institutional preoperative forms. Any previous head and neck cancer surgery or radiation history was also recorded.

Intra-operative anesthesia records were reviewed for use of induction agents, technique of airway management and route of intubation. The need for emergency tracheostomy was also noted. From the postoperative records, we noted the time of extubation, need for postoperative ventilation, analgesia given in the recovery room, extended stay in recovery room (defined as stay of more than 2 h) and any postoperative airway related complication like airway obstruction, emergency surgical airway, cardiac arrest, postoperative ventilation, unanticipated hemorrhage or unexpected intensive care unit (ICU) admission. The PLOS was defined as the interval between the date of surgery to date of hospital discharge or death.

All statistical analyses were performed using Statistical Package for Social Sciences version 19 (SPSS Inc., Chicago, IL, USA). Mean and standard deviation were computed for quantitative variables; frequency and percentage were estimated for qualitative variables. Median (interquartile range [IQR]) was computed for PLOS and after normality assumption Mann-Whitney test was applied. A  $P < 0.05$  was considered significant.

## Results

Two hundred and eighty-nine (72.3%) of the 400 patients were male, and 111 (27.8%) female. Seventy-nine (19.75%) patients had previous head and neck cancer surgery and were operated for recurrence or flap reconstruction. Flap reconstruction was done in 55 (13.75%) patients.

Preoperatively restricted mouth opening was present in 171 (42.8%) patients; 199 (49.8%) had Mallampati score of 3 or above. Signs of upper airway obstruction were present in 30 (7.5%) patients [Table 1]. 264 (66%) patients had oral and oro-pharyngeal cancers, 84 (21%) had laryngeal tumors, 19 (4.75%) hypo-pharyngeal tumors while 33 (8.25%) had parotid tumors or tumors originating outside the oral cavity.

308 (77%) patients were induced with intravenous induction agents and 40 (10%) with inhalational induction. Fifty two

(13%) patients were managed under sedation.

Airway management techniques are detailed in Table 2. In two patients, tracheostomy was done under GA. One of them was a patient of carcinoma of pharynx with Grade 4 Cormack and Lehane grade on laryngoscopy, whereas the second was a patient of carcinoma tongue where conventional intubation had failed.

Nasotracheal route was used to secure airway in 177 (44.25%) patients while, in 142 (35.5%) patients, airway was managed by oral intubation. Neuromuscular blocking agents were used in 288 (72%) patients prior to intubation.

54 (13.5%) patients had tracheostomy performed at the end of the procedure for postoperative airway management. In 267 (66.8%) patients, the airway management device was removed just after the end of the operation. No patients required emergency tracheostomy for airway maintenance in the post-anesthesia care unit. One patient was shifted to the ICU postoperatively for mechanical ventilation because of inadequate ventilatory efforts. This patient was a 55-year-old female who had a history of long-standing hypertension, ischemic heart disease and chronic liver disease due to hepatitis C. She underwent a laryngectomy and bilateral neck dissection for carcinoma of larynx. The duration of procedure was 4 h and tracheostomy was performed at the end of surgery. She came off the ventilatory support and was discharged 9 days after surgery. There was no other airway-related morbidity or mortality during the peri-operative period.

114 (28.5%) patients had an extended stay (defined as a stay of more than 2 h) and seven overnight stay in the recovery

**Table 1: Demographic and preoperative characteristics of the patients (n = 400)**

Variables	Statistics
Demographic characteristic	
Age (years)	52.58 (13.06)
Weight (kg)	61.71 (13.09)
Height (cm)	161.47 (11.36)
Gender (male/female) (%)	289 (72.3)/111 (27.8)
Preoperative characteristic	
Mallampati score (1/2/3/4)	60/141/101/98
Restricted neck movement present (%)	31 (7.8)
Previous airway radiation (%)	30 (7.5)
Co-morbidity (%)	
Diabetes mellitus	41 (25.8)
Hypertension	108 (67.9)
Hypothyroidism	11 (6.9)
Ischemic heart disease	08 (5)
Asthma and COPD	12 (7.5)
Others	27 (17)

Data are presented as mean (SD), or number (%), SD = Standard deviation, COPD = Chronic obstructive pulmonary disease

**Table 2: Anesthetic and airway management techniques (n = 400)**

Airway management technique	n (%)
Tracheal intubation under GA	279 (69.75)
Tracheostomy	
Tracheostomy tube <i>in situ</i>	07 (1.75)
Under LA alone	51 (12.75)
Under LA and sedation	21 (5.25)
Under GA	02 (0.5)
Fiber-optic intubation	
Under LA alone	10 (2.5)
Under LA and sedation	30 (7.5)

Data are presented as n (%), LA = Local anesthesia, GA = General anesthesia

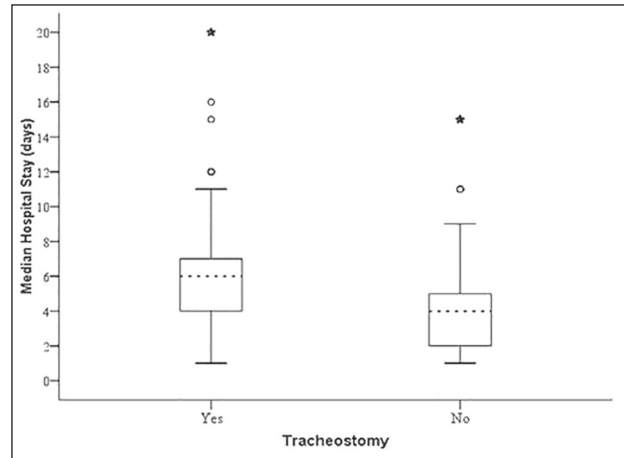
room. 170 (42.5%) patients received only opioid-based analgesia while 69 (17.3%) received multimodal analgesia for pain management in the recovery room.

Median (IQR) hospital stay after surgery was 6 days (IQR = 3) in patients who had a tracheostomy performed for airway management. This was significantly higher ( $P = 0.0005$ ) compared to 4 days (IQR = 3) in patients whose airway was managed with oro-tracheal or naso-tracheal intubation [Figure 1].

## Discussion

Cancer is now becoming a serious threat to health in many Asian countries, and is now the leading cause of death in the Asia Pacific region.<sup>[4]</sup> Institution-based data on cancer incidence in Pakistan shows cancer of head and neck as the most frequent malignancy recorded in males (32.62%). It is the second most frequent cancer in females with an incidence of 15.12%.<sup>[5]</sup> A marked increase in oral cavity cancer in both genders has been observed over the last decade. The major risk factors are smoking, areca nut, betel quid or paan and tobacco chewing, naswar (snuff), paan masala and gutka (a highly addictive substance and a known carcinogen; a preparation of crushed areca nut also called betel nut, tobacco, catechu, paraffin, slaked lime and sweet or savory flavorings) and poor nutrition.<sup>[6]</sup> The highest recorded rate for larynx cancer for males in Asia is seen in Karachi, Pakistan with the males exhibiting a 6-fold higher risk than the females.<sup>[7]</sup>

In our experience, the factors that contribute to the difficulty in managing airway peri-operatively are the presence of oral cancer growth, anatomical changes and fibrosis due to prior surgery or radiotherapy, lengthy surgical procedure, bulky flap reconstruction and edema around the airway.<sup>[8]</sup> In patients with supraglottic obstruction the airway can be managed using techniques such as awake orotracheal intubation using conventional or fiber-optic laryngoscopy, awake nasotracheal



**Figure 1:** Median postoperative hospital stay in patients undergoing head and neck surgery with and without tracheostomy ( $P = 0.0005$ ); (—) median; (\*) extreme value and (o) outliers

intubation, intubation following inhalational induction, rapid sequence induction or tracheostomy under local anesthesia.<sup>[9]</sup>

Awake tracheostomy is one of the options of restoring the airway in patients with airway obstruction and is associated with a low rate of complications if performed appropriately.<sup>[10]</sup> The benefits of tracheostomy need to be balanced against its risks. Complications of tracheostomy include hemorrhage, obstruction, displacement, local infection, pulmonary infection, fistulae, tracheal stenosis and stomal tumor recurrence.<sup>[11]</sup> In cases with supraglottic obstruction, which include oral cancer awake intubation is not preferable because it may be technically difficult due to the presence of pathology. The passage of tracheal tube over the fiber-optic bronchoscope is sometimes impossible.<sup>[12]</sup> In our study no patient underwent awake conventional tracheal intubation.

Fiber-optic intubation is an essential skill for patients where conventional oro-tracheal intubation is anatomically difficult, like in patients with upper airway tumors.<sup>[13,14]</sup> The benefits of naso-tracheal intubation in head and neck surgery outweigh the potential disadvantages.

Bonner and Taylor recommend induction of GA using an inhalational agent and rapid sequence induction with barbiturates and muscle relaxant as the two preferred choices in head and neck surgery.<sup>[15]</sup> Mishra *et al.* have shown that patients with oral cancer can be safely managed without the routine use of tracheostomy using nasotracheal intubation.<sup>[16]</sup>

In 54 (13.5%) of our patients, tracheostomy was done at the end of the operation. Common problems relating to the airway that are associated with major head and neck surgery are oedema of the larynx, pharynx and posterior tongue and the presence of bulky reconstructive flaps. Bilateral neck

dissections and resections of the mandible, tongue and floor of mouth are at a high risk of these complications. Performing elective tracheostomy as part of the original procedure makes the airway management safer.<sup>[17]</sup>

None of our patients had any major intraoperative and immediate postoperative complications unlike the experience in published literature. Cook *et al.* found that 39% of postoperative complications in head and neck surgery in all NHS hospitals in UK over a 1-year period were airway related.<sup>[18]</sup> Moorthy *et al.* have recommended a systematic approach for securing the airway for laryngeal tumor surgery and hence reducing emergency situations like lost airway, bleeding or dislodgement of tumor pieces.<sup>[19]</sup> Between 1985 and 1999, ASA Closed Claims database reported 179 claims for difficult airway management. Sixty seven percent arose during induction of anesthesia while 17% during extubation and recovery. Twenty-one percent of the cases were ENT surgeries. Persistent intubation attempts were associated with death and brain damage.<sup>[20]</sup> In a recent publication, Agra *et al.* observed postoperative complications in a cohort of 124 patients after en bloc salvage surgery for head and neck cancer. Four patients (3.2%) died within the postoperative period due to systemic complications and carotid artery rupture.<sup>[21]</sup>

We also looked at the PLOS in our patients. PLOS was significantly longer ( $P = 0.0005$ ) in those patients who had a tracheostomy done compared to those without. The median PLOS in our study was much shorter than that reported by other authors. Penel *et al.* from France reported a median postoperative stay of 21 days (IQR: 17-30 days) in 260 patients.<sup>[22]</sup> Agra *et al.* reported the length of stay (LOS) as 7.4 days per patient without complications.<sup>[21]</sup> LOS varies from institution to institution. Several factors like cultural influence, resources and practices can influence it. We only measured PLOS and not the total LOS from admission to discharge. One of the reasons of a shorter PLOS in our institution could be that ours is a private institution where all expenses are borne by the patients. In addition, in eastern culture, there is ample family support available when the patients are nursed at home. LOS is important as longer stay may have consequences like increased chances of infection, increase in morbidity and mortality, delayed rehabilitation, increased financial burden and discomfort to family members.<sup>[23]</sup>

Studies like ours provide a means to improve services and management of patients but have some limitations. First, this was a retrospective chart review. Although we tried to capture maximum information, some information could have been undocumented. Secondly the study reflects the practice at a single institution.

## Conclusion

About 80% of our patients with head and neck cancers were managed without a tracheostomy. There was no major morbidity or mortality reported related to the airway except in one patient who had unanticipated ICU admission. Median hospital stay after surgery was significantly longer ( $P = 0.0005$ ) in patients who had a tracheostomy done for airway management compared with those managed without it.

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## Conference Calendar January 2016

Name of conference	Dates	Venue	Name of organising Secretary with contact details
7 <sup>th</sup> National Airway Conference NAC 2016	September 16 <sup>th</sup> -19 <sup>th</sup> , 2016	Vadodara	Dr. Amit Shah Organizing Chairman Dr. Apeksh Patwa Organizing Secretary Contact: Dr. Dinesh Patel Telephone: 9879925025 Email Id: nac2016vadodara@gmail.com Website: <a href="http://www.nac2016.in">http://www.nac2016.in</a>
9 <sup>th</sup> National Conference of Association of Obstetric Anaesthesiologists AOA-MASCON 2016	October 14 <sup>th</sup> -16 <sup>th</sup> , 2016	The Renaissance, Powai, Mumbai, India	Dr. Satish Kulkarni, Dr. Manju Sinha, Dr. Vijay Shetty Organising Secretaries Dr. Mayuri Shetty The Secretariat, AOA-MASCON 2016 Vikas Paradise, Tower I, A-1402, L.B.S. Road, Mulund (W). Mumbai - 400 080. Maharashtra, INDIA. Mobile: 09820185527 E-mail: <a href="mailto:aomumbai2016@gmail.com">aomumbai2016@gmail.com</a> Website: <a href="http://www.mumbaiana.org/www.aoaindia.com">www.mumbaiana.org/www.aoaindia.com</a>
64 <sup>th</sup> Annual National Conference of Indian Society of Anaesthesiologists ISACON 2016	November, 25 <sup>th</sup> -29 <sup>th</sup> , 2016	Punjab Agricultural University Campus, Ludhiana	Dr. Sunil Katyal, Organizing Secretary 19-H, Ashok Vihar, Rishi Nagar, Ludhiana - 141 001, Punjab, India Mobile: +91 9814030552, Email ID: <a href="mailto:katyalsunilmd@gmail.com">katyalsunilmd@gmail.com</a> Web: <a href="http://www.isacon2016.com">www.isacon2016.com</a>