

A Retrospective Analysis of Tracheostomy in Patients with Tumors of the Aerodigestive Tract

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Abstract

Background: Airway management in patients with tumors involving the aerodigestive tract can be a challenge as a result of late presentation. **Objective:** To determine the clinical characteristics of tracheostomy done for patients presenting with tumors in the aerodigestive tract. **Methods:** A chart review of patients presenting with various tumors in the aerodigestive tract over a 6-year period. Data was analyzed for age, gender, presenting symptoms, duration of symptoms, and diagnosis at presentation, immediate airway intervention measures, definitive intervention and outcome. **Results:** 52 (35.4%) had tracheostomy, age ranging 2 years to 82 years (Median= 49 years) constituting 48 males and 4 females (M:F= 12:1). Patients in the 6th and 7th decades of life were in the majority. 40 (76.9%) emergency tracheostomies were performed of which 38 (95%) were awake tracheostomies. Post-operative complication rate was 15.4%. Commonest presenting complaint was dyspnea (n= 20; 38.5%). Laryngeal cancer was recorded in 67.3%. Mean length of hospital stay was 6.5-days; SD= ±4.4. No statistical correlation was found between patients' length of hospital stay and emergency intervention offered (r= -0.89; p= 0.528) and definitive interventions (r= 0.221; p= 0.115). A case fatality rate of 7.7%, unrelated to tracheostomy was recorded. **Conclusion:** Laryngeal cancer was the commonest indication for tracheostomy in this study. Tracheostomy in aerodigestive tract tumors is safe and effective.

Keywords: Tumors; Aerodigestive tract; Tracheostomy; Kaduna-Nigeria

Introduction

Tumors involving the aerodigestive tract can present a great challenge with airway management especially in developing countries like Nigeria where it has become an integral part of the treatment of these patients as a result of late hospital presentation. Tumors either benign or malignant usually would have grown to large proportions compromising the upper airway at presentation requiring interventions such as endotracheal intubation or tracheostomy. Encroachment on the airway may be slow as the tumors grow and acute dyspnea may not be a feature until stridor occurs when airway obstruction is more than 50%.^[1]

Airway management in the form of tracheostomy may be done as an emergency or elective procedure^[2,3] depending on when the patient presents and it usually involves a multi-disciplinary team including the anesthesiologist and emergency physician.^[1]

Aside airway compression by tumors, securing an airway by an anesthesiologist during head and neck tumor surgeries can be a difficult task as mask ventilation and tracheal intubations are made difficult following induction of general anesthesia.^[4] This may necessitate more invasive procedures like tracheostomy to access and secure the airway in order to by-pass upper airway obstruction and to provide complete and easy access to the operative field. As a result of the low morbidity and mortality recorded from tracheostomy, its indications have expanded and it is known to have more advantages over translaryngeal intubation especially for patients with head and neck tumors requiring prolonged intubation.^[5]

Tracheostomy is also beneficial in maintaining a patent airway in patients with upper aerodigestive tract tumors who can develop airway

obstruction pre and post treatment especially those with malignancies before and after chemo radiation therapy.^[6]

Benign conditions such as juvenile and adult onset recurrent respiratory papillomatosis may present with airway compromise requiring interventions such as tracheostomy.^[7]

The purpose of this study is to present our experience with tracheostomies carried out for patients presenting with tumors in the aerodigestive tract in order to determine the commonest indications and the rate of associated post-tracheostomy complications.

Methods

Study design and setting

This is a chart review of consecutive patients presenting with aerodigestive tract tumors requiring airway management at the National Ear Care Center, Kaduna, Nigeria in the period January 2010 to December 2015.

Ethical consideration

Approval for this study was obtained from the Health Research Ethics Committee (HREC) of the National Ear Care Center, Kaduna.

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Methods

The inclusion criterion for this study was patients with aerodigestive tract tumors (benign and malignant) requiring airway management. The exclusion criteria were patients whose indication for airway management was not tumors in the aerodigestive tract and patients with incomplete records.

Patients' records were retrieved and all necessary data were entered into a prepared proforma and analyzed descriptively for age, gender, presenting symptoms, duration of symptoms, and diagnosis at presentation, immediate intervention measures, definitive intervention and outcome of intervention.

The tracheostomies were performed in the operating room under general or local anesthesia as emergency or elective cases. Following routine cleaning and draping, a transverse skin crease incision was employed in all the cases to below the platysma muscle. The subcutaneous fat was dissected to expose the strap muscles which were retracted laterally to widen the median raphe and expose the pretracheal fascia. The thyroid isthmus was reflected upwards and a vertical incision made between the 2nd and 3rd tracheal rings. In cases of laryngeal cancer the incision was usually made between the 1st and 2nd tracheal rings. With the help of tracheal dilator forceps, appropriate sized tracheostomy tubes were inserted and adequately secured to the patients' necks. The standardized post-operative tracheostomy care was followed in all cases.

Statistical analysis

Data collected was entered into the Statistical Products and Service Solutions (SPSS) software version 20 (SPSS Inc., Chicago, IL, USA).

Descriptive analysis of mean and standard deviations was used to summarize the collected data. Pearson's moment correlation analysis was used to determine the statistical relationship between emergency and definitive interventions offered and length of hospital stay on the one hand and duration of symptoms and outcomes on the other. A p-value of <0.05 was considered significant. The results obtained are presented in tabular form.

Results

In the study period, 147 patients were managed for various aerodigestive tract tumors of which 52 (35.4%) had undergone tracheostomy constituting 48 (92.3%) males and 4 (7.7%) females ranging in age from 2 years to 82 years (Mean= 42.9 years; Standard Deviation= ±

Table 1: Age characteristics of patients.

Age group (years)	Frequency	Percent
0-9	6	11.5
10-19	3	5.8
18-29	6	11.5
30-39	4	7.7
40-49	8	15.4
50-59	12	23.1
60-69	10	19.2
70-79	2	3.9
80-89	1	1.9
Total	52	100.0

Table 2: Presenting complaints.

Symptom	Frequency	Percent
Hoarseness	19	36
Difficulty with breathing	20	0.5
Difficulty with breathing preceded by hoarseness	13	38.5
By hoarseness	52	25.0
Total		100.0

21.0). Individuals in the 6th and 7th decades of life were in the majority [Table 1].

The commonest presenting complaint was dyspnea (n= 20; 38.5%) followed by hoarseness (n= 19; 36.5%) and hoarseness with dyspnea (n= 13; 25%) [Table 2]; and symptom duration before hospital presentation of more than 6-months recorded in 35 (67.3%) patients. There was no statistical correlation between the duration of symptoms and the outcome of intervention (r= -0.39; p= 0.783) [Table 3].

Tracheostomy was done for 39 (75%) malignant cases of which the commonest recorded diagnosis at presentation was laryngeal cancer in 35 (67.3%) patients. Benign pathologies requiring tracheostomy were mainly recurrent respiratory papilloma in 12 (23.1%) patients [Table 4].

Forty (76.9%) emergency tracheostomies were performed of which 38 (95%) were awake tracheostomies and elective tracheostomy was performed in 12 (23.1%) patients. No intra-operative complications were recorded. Post-operative complications occurred in 8 (15.4%) patients. The post-tracheostomy complications recorded were early in 2 (25%) patients and late in 6 (75%) patients and are thus; suprastomal granuloma (n=1), tube blockage (n=2), difficult decannulation (n=2) and tracheostomy dependence (n=3). All complications were seen in patients who had emergency tracheostomy. The emergency and definitive intervention measures offered our patients are shown in Tables 5-7.

The length of hospital stays ranged from 2 days to 21 days (Mean=6.5; Standard Deviation= ±4.4). Forty-six (88.5%) patients were successfully decannulated. No statistically significant correlation was each found between patients' Length of hospital stay and emergency intervention offered (r= -0.89; p= 0.528) and definitive interventions (r= 0.221; p= 0.115) [Table 3].

Table 3: Pearson correlation analysis of associations.

		Symptom duration	Intervention outcomes
Symptom duration	Pearson correlation	0.988	-0.390
	Sig. (2-tailed)	-	0.783
	N	52	52
Intervention outcomes	Pearson correlation	-0.390	0.988
	Sig. (2-tailed)	0.783	-
	N	52	52
Correlation is significant at the 0.05 level			
		Length of hospital stay	Emergency intervention
Length of hospital stay	Pearson correlation	0.476	-0.891
	Sig. (2-tailed)	-	0.528
	N	52	52
Emergency intervention	Pearson correlation	-0.891	0.476
	Sig. (2-tailed)	0.528	-
	N	52	52
Correlation is significant at the 0.05 level			
		Length of hospital stay	Definitive intervention
Length of hospital stay	Pearson correlation	0.482	-0.221
	Sig. (2-tailed)	-	0.115
	N	52	52
Definitive intervention	Pearson correlation	-0.221	0.482
	Sig. (2-tailed)	0.115	-
	N	52	52
Correlation is significant at the 0.05 level			

Table 4: Diagnosis at presentation.

Diagnosis	Frequency	Percent
Laryngeal cancer	35	67.3
Rec. Resp. Papilloma	12	23.1
Hypopharyngeal cancer	2	3.9
Nasopharyngeal cancer	1	1.9
Oropharyngeal cancer	1	1.9
Parapharyngeal cancer	1	1.9
Total	52	100.0

Table 5: Immediate interventions.

Interventions	Frequency	Percent
Tracheostomy	18	34.6
Tracheostomy and clearance biopsy	20	38.5
Direct laryngoscopy	2	3.8
Direct laryngoscopy and biopsy	3	5.8
Tracheostomy, DL and biopsy	9	17.3
Total	52	100.0

DL- Direct Laryngoscopy

Table 6: Definitive interventions.

Interventions	Frequency	Percent
Surgery	22	42.3
Chemotherapy	1	1.9
Radiotherapy	13	25.0
Chemoradiation	6	11.5
Surgery + Chemoradiation	10	19.2
Total	52	100.0

Table 7: Overall outcomes of interventions.

Outcomes	Frequency	Percent
Referred	33	63.5
Discharged	18	34.6
Died	1	1.9
Total	52	100.0

Eighteen (34.6%) patients were discharged, 33 (63.5%) were referred for further treatment in the form of chemotherapy and radiation therapy [Table 7]. One patient died on admission and 3 others post total laryngectomy during follow up, all as a result of malignant processes, giving a mortality rate of 7.7%. All patients have been on regular follow up except 1 patient post laryngeal clearance for respiratory papilloma that was referred to another center for follow up. Tumor recurrence was recorded in all 12 patients with respiratory papillomatosis and 3(25%) of whom had at least 3 repeated laryngeal clearance surgeries.

Discussion

Tracheostomy is a surgical procedure that entails making an opening into the trachea and maintaining same with a tube to establish communication with the exterior,^[8] the major aim of which is circumventing upper airway obstruction. The most frequent recorded indications for tracheostomy in literature are trauma and head and neck cancers.^[9,10] In these situations, it is done to relieve upper airway compromise as an emergency at patient presentation or an elective procedure pre or post head and neck surgeries.

Our experience in this study shows a tracheostomy prevalence rate of 35.4% amongst patients presenting with aerodigestive tract tumors. This is higher than the rate obtained from a study done on airway management in patients undergoing head and neck cancer surgery in which a tracheostomy prevalence rate of 20.25% was recorded.^[11] The higher rate recorded in our study could be attributed to the fact that our review was on airway management of patients with tumors involving the aerodigestive tract from time of presentation while the

latter was on airway management of patients undergoing head and neck cancer surgeries. Literature search did not reveal a similar study for comparison of the prevalence of tracheostomy.

The commonest indication for tracheostomy in our series was laryngeal cancer. This is similar to other previous studies that however reviewed tracheostomies done for various other pathologies and as a result, different study populations.^[9,10,12]

The highest age incidence of tracheostomy in our review was in the 6th and 7th decades of life, mostly affecting males. This is buttressed by the fact that laryngeal cancer was the commonest indication for the procedure, a disease commonly affecting males in this age group with males about 4 or more times more affected than females.^[13,14] The male to female ratio of 12:1 obtained in this study is however higher than many reports in literature.

Upper airway obstruction as a result of laryngeal papilloma was the commonest indication we recorded in the pediatric age group requiring emergency tracheostomy as the patients presented late with acute upper airway obstruction, a common feature previously documented in our environment.^[7,8] A large number of the patients in our review presented more than 6-months after their symptoms first occurred with the commonest presenting complaint being dyspnea followed by hoarseness as a result of the significant number of upper airway obstruction from both benign and malignant lesions necessitating emergency tracheostomy in as high as 76.9% of patients of which 95% were awake tracheostomies. However, symptom duration had no negative effect on the outcome measures in our patients and this can be explained to be due to proper and adequate airway management intervention on presentation.

Emergency awake tracheostomy is beneficial in patients that present in impending airway obstruction and is a safe procedure when performed appropriately.^[15] The challenge with this type of tracheostomy is the difficulty patients experience with lying in a supine position and the neck extended in their hypoxic state. This makes the procedure difficult and increases risks.^[16] However, no intra-operative complication was recorded in our series despite these challenges.

We recorded a post-operative complication rate of 15.4% in our study. This rate is similar to that reported from another study on children in our region.^[8] The rate of complications following tracheostomy varies from one part of the world to another and ranges of 5% to 40% have been reported with these rates increasing 2 to 5 folds following emergency tracheostomy.^[17] Like previous studies documented above we also declare that emergency tracheostomy in patients with aerodigestive tract tumors is a relatively safe procedure. All the complications recorded in our review were following emergency tracheostomy and this can be explained as due to poor tissue handling in emergency situations as majority of our patients presented late in acute respiratory distress. The commonest complication recorded was tracheostomy dependence in 3 children. This phenomenon is common in the pediatric age group and is avoided by relatively early decannulation as soon as the indication for tracheostomy no longer exists.^[8]

The patient with suprastomal granuloma had tracheoscopy and granuloma excision before decannulation. Tube blockage recorded in the study was from secretions. These were managed by instilling drops of sodium bicarbonate solution into the tube lumen and suctioning the tubes repeatedly.

The median length of hospital stays of 6.5 days obtained in our study is similar to that reported in other studies in our environment,^[10,12] indicating the effective post-operative care given to our patients necessitating early hospital discharge. A shorter hospital stay reduces

the risk of nosocomial infections, reduces morbidity and mortality and the financial burden on patients and care-givers.^[18] Less invasive procedures like percutaneous dilatational tracheostomy have been reported in recent times with lesser complication rates than open tracheostomy;^[19] however, our center lacks facilities for this method of tracheostomy.

Our decannulation rate of 88.5% is higher than a previously reported rate of 72.4%.^[20] Decannulation of patients requires a lot of caution and should only be considered when the initial upper airway obstruction has resolved, when secretions are controlled and when mechanical ventilation is no longer a requirement.^[21]

The overall mortality rate of 7.7% obtained in our study unrelated to tracheostomy further highlights the relative safety and effectiveness of this procedure in patients with tumors of the aerodigestive tract in our environment and that cancer related deaths are still a significant factor to contend with in the management of these patients.

The following are the limitations of this study; first, it is a single center study. Secondly it is a retrospective review and thirdly, it involves a relatively small study population and this may have resulted in a lack of statistically significant correlations limiting interpretation of the relationships between variables. We therefore recommend a multi-center study on a larger population to obtain national figures and for future references.

Conclusion

Laryngeal cancer is the commonest indication for tracheostomy in patients with tumors of the aerodigestive tract in the present study. Tracheostomy in these patients is safe and effective with a relatively low complication rate.

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Conflict of Interest

The authors disclose that they have no conflicts of interest.

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