



Tracheostomy in Papua New Guinea: A Retrospective Analysis of 33 Cases in a Subspecialty Limited Setting

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Abstract

Tracheostomy is a lifesaving procedure primarily done by a specialist head and neck surgeon. In Papua New Guinea there is a deficit of specialists and the burden of conditions requiring tracheostomy is associated with increased mortality and morbidity. As such, a retrospective review was conducted at Alotau Provincial Hospital (Papua New Guinea) between January 1st, 2017 to December 31st, 2020 to describe the rate, indications, complications and mortality of patients who underwent tracheostomy. The tracheostomy rate over the study period was 1.1%. The most common indication for patients undergoing tracheostomy was prolonged ETT intubation (n=13). The tracheostomy complication rate was 42.42% (n=14) and the mortality rate was 39.39% (n=13). Emphasis must be placed on training for both general surgeons and nursing staff to competently perform and care for tracheostomies. Future prospective studies are needed to understand outcomes amongst tracheostomy patients in such resource limited setting.

Keywords: Tracheostomy; Indications; Complications; ETT; Papua New Guinea

Introduction

Tracheostomy is a life-saving procedure [1]. Records of this surgical procedure dates back to 3600 BC during the pre-Christianity era in Greece [2,3]. The procedure involves the formation of a stoma at the anterior skin surface of the neck to the trachea in-order to facilitate air passage and improve pulmonary secretion clearance [2]. Up to 45% of hospitalized patients require a tracheostomy with the majority being critically ill [4-6].

The emergency indication for tracheostomy involves airway obstruction [2]. Elective indications include prolonged mechanical ventilation to avoid subglottic stenosis and as an adjunct surgery for airway protection during other surgeries like laryngectomies [7]. Mortality rates differ across hospitals, from 25% to as high as 60% in resource limited settings [8,9].

Complications are common and can occur in up to 20% of cases [10]. These complications include pneumothorax, bleeding, subglottic stenosis, tracheoesophageal fistula, vocal cord dysfunction, stomal granulation, persistent tracheal fistula, and scarring [4]. The poor care of tracheostomy tubes is associated with high morbidity and mortality in third world countries [11]. In such settings it is often the role of the general surgeon to competently perform a tracheostomy in the absence of an Otorhinolaryngologist (ENT specialist).

Papua New Guinea (PNG) is a third world country in the western pacific region that has managed to produce under 20 ENT specialists in the last two decades [12]. The shortfall in specialist to population ratio means that surgical trainees and general surgeons must be knowledgeable about conditions requiring tracheostomies. There is limited literature on tracheostomies in PNG and the region. As such this study aims to describe the rate of tracheostomy, indications, complications and mortality of persons who undergo tracheostomy at Alotau Provincial Hospital (APH) in PNG.

Methodology

Study design

A retrospective review of patients who underwent tracheostomy at APH was done from the 1st of January 2017 to the 31st of December 2020.

Study setting

APH serves as a secondary referral hospital in Milne Bay Province. This provincial hospital is capable of providing safe anesthesia and surgery for an estimated 331,000 population [13]. It has a

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four-bed high dependency unit that is run by the critical care team.

Study sample

The inclusion criteria for the study were continuous patients who had undergone tracheostomy. Patients were excluded from the study if they had missing information from their charts or absconded from treatment.

Tracheostomy technique and care

For patients requiring tracheostomy, a transverse incision through the skin was made half way between the inferior border of the cricoid cartilage and the sternal notch or 2 finger breadths above the sternal notch. Once the skin had been incised, dissection continued through the subcutaneous fat.

Thinned platysma fibers and the superficial investing layer of deep cervical fascia are entered and strap muscles are identified retracted laterally through the linea alba. The thyroid isthmus can come into view at this point. The anterior tracheal wall is identified and cleaned. A tracheotomy window is created (Bjork flap) on the 3rd or 4th tracheal rings and the tracheostomy tube is checked and inserted.

Trained Nursing officers and Community Health workers provide post-operative tracheostomy care. Tracheostomy decannulation was then carried out depending upon the etiology and satisfactory maintenance of the airway as well as the surgeons or anesthetist preference. As such some cases were decannulated in the ward and some in the theatre. They were kept under observation for 24 hours after decannulation and were sent home after no complications.

All cases successfully decannulated had an air sealed dressing over the stoma and allowed to heal by secondary intention.

Variables and data collection

Data were retrieved from operating theatre log book and patient charts. These were then entered into an excel spread sheet and cross checked by a co-author before analysis. Patient characteristics are shown in Table 1. They included age, sex, wards, primary diagnosis, indication for tracheotomy, length of hospital stay and outcome.

Age was divided into pediatrics, teenagers and adults. Pediatrics were persons whose age were below 13 years; teenagers were those whose ages were between 14 to 18 and adults were above 18 years of age. The wards included internal medicine, surgery, pediatrics and high dependency unit.

The indications for tracheostomy were divided into prolonged endotracheal intubation (more than 7 days), upper airway obstruction, adjunct to head and neck surgeries and airway protection.

Outcomes in this study were reported as complications and mortality. Complications related to tracheostomy were classified as: immediate complications (intraoperatively and first 24 h after surgery), intermediate complications (one week post operatively) and late complications (beyond one week). Length of hospital stay was reported in days.

Statistical analysis

Data was entered into Microsoft excel 2016 for analysis.

Ethical clearance

Ethical approval to conduct the study was granted by the hospital ethics and research committee.

Results

A total of 33 tracheostomy patients were reviewed. The tracheostomy rate during this study period was 1.1 %. Of the 33 patients who had a tracheostomy, 66.67% (n=22) were males and 32.33% (n=11) were females with a ratio of 2:1. The mean age of patients with tracheostomy was 28 years.

Surgical ward had the highest number of tracheostomy patients (n=16) followed by the high dependency ward (n=7) and Internal Medicine (n=6). Of the total cohort, 47.58% (n=14) of patients had an emergency tracheostomy and 52.42% (n=19) had an elective tracheostomy. The most common indication for tracheostomy was prolonged endotracheal intubation (39.39%), followed by upper airway obstruction (36.36%) as shown in Table 2. Patients with Meningitis had the highest number of tracheostomies (n=10).

Tracheostomies were performed by the surgical registrars in 75.76% of cases and by the Surgeon 24.24% of cases. The complication rate in this study was 42.42%. The majority of complications were late complications (n=8) as shown in Table 3. The mean hospital length of stay was 16 days. The overall mortality rate was 39.39% (n=13). Infections had the highest mortality (n=10) as shown in Table 4.

Table 1: Showing patient characteristics of patients with tracheostomy at APH between 1st of January 2017 to the 31st December 2020.

| Patient characteristics | Frequency (%) |
|---------------------------------|---------------|
| Gender (n=33) | |
| Male | 22 (66.7) |
| Female | 11 (32.3) |
| Age (n=33) | |
| Pediatrics | 7 (21.21) |
| Teenagers | 3 (9.09) |
| Adults | 23 (69.70) |
| Primary Diagnosis (n=33) | |
| Meningitis | 10 (30.30) |
| Cancer | 5 (15.15) |
| Mandible fracture | 3 (9.09) |
| Stab wound to the neck | 2 (6.06) |
| Cerebrovascular accident | 2 (6.06) |
| Ludwigs angina | 2 (6.06) |
| Tumors | 2 (6.06) |
| Cerebral palsy | 1 (3.03) |
| Snake bite | 1 (3.03) |
| Tracheal injury | 1 (3.03) |
| Traumatic brain injury | 1 (3.03) |
| Surgery (n=33) | |
| Elective | 19 (57.58) |
| Emergency | 14 (42.42) |
| Surgeon | |
| Surgical registrar | 25 (75.76) |
| General Surgeon | 8 (24.24) |
| Mortality (n=33) | |
| Yes | 13 (39.39) |
| No | 23 (60.61) |

Table 2: Showing indications for tracheostomy amongst patients between 1st of January 2017 to 31st December 2020 at APH.

| Tracheostomy Indications | Frequency (%) |
|---|---------------|
| Upper Airway Obstruction (n=12) | |
| Foreign Body | 1 (3.03) |
| Cancer | 5 (15.15) |
| Mandible Fracture | 2 (6.06) |
| Stab Wound to the neck | 2 (6.06) |
| Ludwig's Angina/Laryngitis | 2 (6.06) |
| Prolonged ETT (n=13) | |
| Meningitis | 10 (30.30) |
| Cerebrovascular Accident | 2 (6.06) |
| Cerebral Palsy | 1 (3.03) |
| Adjunct to Head and Neck Surgery (n=3) | |
| Tumors | 2 (6.06) |
| Mandible Fracture | 1 (3.03) |
| Airway Protection (n=5) | |
| Cerebral Palsy | 1 (3.03) |
| Snake Bite | 1 (3.03) |
| Mandible Fracture | 1 (3.03) |
| Tracheal Injury | 1 (3.03) |
| Head Injury | 1 (3.03) |

Table 3: Showing complications for tracheostomy amongst patients between 1st of January 2017 to 31st December 2020 at APH.

| Tracheostomy Complications | Frequency (%) |
|----------------------------|---------------|
| Immediate (n=2) | |
| Cardiac Arrest | 1 (7.14) |
| Thyroid Storm | 1 (7.14) |
| Surgical Emphysema | 1 (7.14) |
| Hematoma | 1 (7.14) |
| Intermediate (n=4) | |
| Dyspnea | 1 (7.14) |
| Blocked Tube | 3 (9.09) |
| Late (n=8) | |
| Blocked Tube | 7 (57.74) |
| Infection | 1 (7.14) |

Discussion

This study describes the tracheostomy rate, indications and outcomes of patients undergoing tracheostomies at APH. The tracheostomy rate over the study period was 1.1%. The most common indication for patients undergoing tracheostomy was prolonged ETT intubation (39.39%) and the tracheostomy complication rate was 42.42% with a mortality rate of 39.39%.

There was a male (66.67%) predominance of patients with tracheostomies as compared to females in this study. This was consistent with Gilyoma et al. [14] who reported in a 10-year retrospective study that males showed to have had three times more tracheostomies done than females [14]. Our mean age (28 years) of patients with tracheostomies was not consistent with other studies that reported tracheostomies done in mainly the third decade of life

Table 4: Showing tracheostomy deaths amongst patients between 1st of January 2017 to 31st December 2020 at APH.

| Cause of death | Frequency (%) |
|---------------------------|---------------|
| Sepsis (n=10) | |
| Tuberculosis Meningitis | 7 (53.85) |
| Bacterial Meningitis | 1 (7.69) |
| Ludwig's Angina | 2 (15.38) |
| Cancer (n=1) | |
| Esophageal Cancer | 1 (7.69) |
| Neurological (n=2) | |
| Cerebrovascular accident | 2 (15.38) |

[14,15].

The distribution of tracheostomies in the adult population (69.70%) in this study was significantly higher compared to other studies [14,16]. The predominance in the older age group of males may be due to the increased tendency of trauma occurrence which results in prolonged intubation and assisted ventilation [14]. In comparison, the pediatric tracheostomy rate in this study was 21.21%. Dubey and Garap in a study at Port Moresby General Hospital showed that the commonest indication for tracheostomy in pediatric patients was upper airway obstruction [17].

Meningitis in this study was associated with high rates of tracheostomies especially in patients who have had prolonged ETT intubation [18]. Our study showed no difference between emergency and elective tracheostomies. However, complications amongst emergency tracheostomies have been reported to be higher in one study done in Bangladesh [19].

As mentioned, prolonged ETT intubation (39.39%) was the main indication for tracheostomy in this study. Compared to other studies, the main indication for tracheostomy was upper airway obstruction [11-18]. The incongruence in results may be due to the high number of intubated patients in our study and difference in disease pattern across various studies.

Most of the tracheostomy complications in this study were late complications of a blocked tube that was seen in 57.74% of patients. This complication highlights the need for appropriate care of the tracheostomy tube by the nursing team and relatives. Alexandra et al. reported that 95% of tracheostomy manipulations were done by bedside nurses that resulted in complications [20].

Mortality in this study was mainly from the primary condition and not from the tracheostomy procedure. This is consistent with other studies that showed low rates of mortality resulting from doing a tracheostomy [14,17]. Amongst deaths, sepsis was associated with the highest number of mortality (n=10) in this study. This is consistent with studies that show increased mortality in high risk septic patients post tracheostomy [21,22].

This study has various limitations. The retrospective design of the study and small sample size meant that certain data were missed and were not recorded. These included timing to tracheostomy, the type of anesthesia used, comorbidities and timing of decannulation. Never the less the aim of the study was achieved.

Conclusion

Tracheostomies account for 1.1% of all surgical procedures during

this study period. This is significant in a provincial hospital where ENT services are limited. Indications for tracheostomy in this study follow prolonged ETT intubation and complications arose mainly from poor tracheostomy tube care. As such emphasis must be placed on training for both general surgeons and nursing staff to competently perform and take care of tracheostomies. Future prospective studies are needed to understand outcomes amongst tracheostomy patients in a resource limited setting.

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