

Tracheostomy for Upper Airway Obstruction in Rims Hospital

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Abstract:

Tracheostomy is considered as the airway management of choice for patients who need prolonged mechanical ventilation support or airway protection. There are two main tracheostomy techniques: (1) surgical tracheostomy (ST) and (2) percutaneous dilatational tracheotomy (PDT). AIMS AND OBJECTIVES :1. To assess various factors for undergoing tracheostomy in patients admitted at RIMS hospital 2. To determine the association between tracheostomy and other variables of interests. Cross-Sectional Study was carried out for a period of two calendar years from September 2018 to August 2020 at Department of Otorhinolaryngology, Regional Institute of Medical Sciences, Imphal, Manipur; Department of Anaesthesiology and Critical Care Regional Institute of Medical Sciences, Imphal, Manipur in all patients ≥ 18 years of age who had undergone tracheostomy in RIMS hospital and willing to participate in the study but patients underwent tracheostomy in other hospitals and being referred to RIMS hospital were excluded. CONCLUSION: Commonest factor to undergo tracheostomy was prolonged intubation in Intensive Care Unit (ICU) followed by carcinoma of larynx, carcinoma oral cavity. Lower respiratory tract infection appears to be the most common complication following a procedure. There is no difference between surgical tracheostomy and endoscopic percutaneous tracheostomy technique in terms of complications.

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I. Introduction:

Tracheostomy comes from the Greek, meaning "I cut the trachea."¹ Tracheotomy is the term used to describe the surgical opening of the trachea. Tracheostomy is used to describe the creation of a stoma at the skin surface which leads into the trachea.² It has been routinely used since the middle of the 19th century, when Armand Trousseau improvised the technique in order to treat diphtheria patients with dyspnea.³ Chevalier Jackson is credited with the first clear open surgical (OS) description in 1909 and Ciaglia is credited with the first percutaneous dilatational tracheostomy (PDT) in 1985.⁴ In 1921 Chevalier Jackson modified indications and techniques for modern tracheostomy. Then, Galloway (1943) reported on the use of tracheostomy to facilitate aspiration of secretions from the bronchial tree in cases of bulbar poliomyelitis.⁵ Today tracheostomy is most commonly performed in patients with upper airway obstruction and prolonged intubation.⁶ The indications of the procedure are increasing day by day. Initially all tracheostomies were carried out only to relieve upper airway obstruction, gradually its indication became extensive and now it is being increasingly used as a temporary procedure for airway access especially for anesthetic purpose and artificial ventilation. Similarly the indication of long term or permanent tracheostomy as in cases of severe respiratory distress, sleep apnea syndrome and terminal malignant neoplasm are also increasing.³ There are four main indications for tracheostomy:

- 1) Long-term mechanical ventilation,
- 2) Weaning failure,
- 3) Upper airway obstruction,
- 4) Copious secretions.⁷

The timing of tracheostomy is influenced by its indications for the procedure. Because there are no definitive guidelines, the timing of tracheostomy depends on clinical conditions, physician judgement and communication with families. The judgement of the attending physician can be influenced by the patients' likelihood of extubation, life expectancy and other clinical conditions, including haemodynamic status, oxygenation, consciousness level and ability to protect the airway.⁷ There are two main tracheostomy

techniques: (1) surgical tracheostomy (ST), and (2) percutaneous dilatational tracheostomy (PDT).⁸ Tubes varying in shape are available in graded lengths and diameters. Tracheostomy tubes can be metal or plastic.⁷ Metal tubes are constructed of silver or stainless steel. Metal tubes are not used commonly because of their expense, their rigid construction, the lack of a cuff, and the lack of a 15-mm connector to attach a ventilator. Plastic tubes are most commonly used and can be made from polyvinyl chloride or silicone. Polyvinyl chloride softens at body temperature conforming to patient anatomy and centering the distal tip in the trachea. Silicone is naturally soft and unaffected by temperature.⁹ The procedure of tracheostomy is associated with numerous complications that may occur during the operative and postoperative periods. These complications are more common in emergency tracheostomies than in elective ones.¹⁰ Some complications are related to the procedure and others to the cannula. Late complications of tracheostomy are difficult to categorise and quantify, as many patients are critically ill and lost to follow-up secondary to discharge before decannulation.⁷

Common complications noted with tracheostomy are:-

A. Early complications:-

1) Intraoperative:- haemorrhage, decannulation, injury to structures, displacement of tube

2) Post-operative:- death, pneumonia, emphysema, decannulation, infection, tube obstruction, haemorrhage.¹¹

B. Late complications:- tracheal stenosis, granulation around stoma, tracheomalacia, tracheoinnominate-artery fistula, tracheoesophageal fistula, pneumonia and aspiration.¹²

The process of weaning from tracheostomy to maintenance of spontaneous respiration and airway protection is termed —decannulation. This apparently requires a near perfect coordination of brain, swallowing, coughing, phonation and respiratory muscles. Multifactorial aberrations in this complex interplay can result in decannulation failure. Old age, obesity, poor neurological status, sepsis and tenacious secretions are the predominant reasons of failed decannulation.¹³ Patient level of consciousness, ability to tolerate tracheostomy tube capping, cough effectiveness, and secretions are taken as the four most important determinants in the decision to decannulate a tracheostomized patient. Patient comorbidities, etiology of respiratory failure, swallowing function, respiratory rate, and oxygenation are of moderate importance.¹⁴

II. Method:

A Cross-Sectional Study was conducted in the Department of Otorhinolaryngology and the Department of Anaesthesiology and Critical Care Regional Institute of Medical Sciences, Imphal, Manipur for a period of two calendar years from September, 2018 to August, 2020 in all the patients ≥ 18 years of age who had undergone tracheostomy in RIMS hospital and willing to participate in the study but all the patients underwent tracheostomy in other hospitals and being referred to RIMS hospital were excluded. Sample size (N) is calculated based on the following formula: $N = Z^2 PQ/L^2$ with the calculated sample size is 51. Data was collected in predesigned proforma. Informed written consent about the purpose of the study was taken from participants.

Techniques:

The patient is positioned with the neck moderately extended. General anaesthesia is preferred, but local anaesthesia may be used. In ventilated patients, 100% oxygen is given. Pulse rate, blood pressure and saturation should be monitored continuously

1. Surgical tracheostomy (ST)

Elective surgical tracheostomy is ideally performed in the operation theatre, however bedside tracheostomy can be performed. A 3—5 cm transverse skin incision is made 1 cm below the cricoid cartilage. The strap muscles are retracted laterally. The thyroid isthmus is retracted superiorly or inferiorly or divided. The endotracheal tube is slowly withdrawn to just above the tracheostomy incision but not removed, in case difficulty in tracheostomy placement requires urgent reinsertion of the endotracheal tube.

2. Endoscopic percutaneous dilatational tracheostomy (PDT)

The technique relies on progressive blunt dilatation of a small initial tracheal aperture created by a needle using a series of graduated dilators. The procedure involves making a very small skin incision and introducing a needle into the trachea, through which a J-tipped guide wire is passed. The needle is removed and a guiding catheter is threaded over the J-wire. Subsequent adequate blunt dilatation of the aperture over the J-wire/guiding catheter unit by means of a series of eight graduated dilators allows insertion of a preselected tracheostomy tube.

All the data were entered after checking for completeness using software SPSS version 21 (SPSS Inc, USA). Statistical analysis was performed with the appropriate statistical tests including Chi-square test for categorical data. Descriptive statistics like mean, percentage and standard deviation were used for socio-demographic variables like age, sex, occupation. A p-value of 0.05 or less is considered significant. The study was conducted after obtaining approval from the Research Ethics Board, Regional Institute of Medical Sciences, Imphal, Manipur.

III. Results:

Total of 46 patients were included in this study. The mean age was 57±1 years. Minimum age of participant was 23 years and maximum age was 84 years. Out of 46 patients 34 were males (73.9%) and 12 were females (26.1%) with M:F ratio of 2.8:1. Out of 46 patients, Majority (69.6%) of patients were above 57 years of age.

Table1. Distribution of occupations among patients in the study group (N=46)

Occupation	Frequency	Percentage
Unemployed	20	43.5
Farmers	13	28.3
Housewife	6	13.0
Local Business	4	8.7
Students	2	4.3
Teacher	1	2.2

Table-1. Shows out of 46 patients majority were unemployed (43.5%), followed by farmers (28.3%) and least being teacher (2.2%).

Table 2. Distribution of symptoms among patients in the study group (N=46)

Chief complaint	Frequency	Percentage
Hoarseness	11	23.9
Weakness of limbs	8	17.4
Loss of consciousness	7	15.2
Shortness of breath	5	10.9
Swelling in mouth	5	10.9
Pain abdomen	4	8.7
Head injury	2	4.3
Generalised body weakness	2	4.3
Cut throat injury	2	4.3

Table-2. Shows 11 cases (23.9%) came with a chief complaint of hoarseness, 2 cases (4.3%) came with cut throat injury.

Table 3. Admission to various wards according to indications, age group and technique (N=46)

Indications	Ward admission			Age group		Technique	
	ICU	ENT	Plastic Surgery	<57 yrs n(%)	≥57 yrs n (%)	Surgical tracheostomy n (%)	Endoscopic percutaneous n (%)
Prolonged intubation	23	0	0	7 (50.0)	8 (50.0)	3 (11.5)	20 (100.0)
Carcinoma Larynx	0	14	0	0 (0.0)	14 (43.8)	14 (53.8)	0 (0.0)
Suicidal cut throat	0	2	0	2 (14.3)	0 (0.0)	2 (7.7)	0 (0.0)
Carcinoma oral cavity	0	4	0	4 (28.6)	0 (0.0)	4 (15.4)	0 (0.0)
Carcinoma pyriform fossa	0	2	0	0 (0.0)	2 (6.3)	2 (7.7)	0 (0.0)
Carcinoma floor of mouth	0	0	1	1 (7.1)	0 (0.0)	1 (3.8)	0(0.0)

Table-3. Shows 23 cases (50%) were admitted in Intensive Care Unit (ICU) ward, 22 cases (47.8%) in Otorhinolaryngology ward and 1 case (2.2%) in Plastic surgery ward, where all 23 cases admitted in ICU had undergone tracheostomy for prolonged ventilation. 50% of aged above 57 years of age was indicated for prolonged intubation followed by carcinoma larynx (43.8%). Also, 50% of aged below 57 years of age was indicated for prolonged intubation. Majority of surgical tracheostomy technique were indicated for Carcinoma larynx (53.8%) and other upper airway obstruction conditions, whereas all cases undergoing percutaneous dilatational technique were indicated for prolonged intubation.

Table 4. Relationship between two different techniques and timing(N=46)

Timing	Technique		p-value
	Surgical tracheostomy n (%)	Endoscopic percutaneous n (%)	
Emergency	13 (50.0)	0(0.0)	0.001
Elective	13 (50.0)	20 (100.0)	

Table-4. Shows 50% of surgical tracheostomy were done as an emergency procedure, whereas all cases undergoing percutaneous technique where done electively, which gave the p-value less than 0.05 which is statistically significant.

Table 5. Distribution of complications following tracheostomy in the study group(N=46)

Complications	Frequency	Percentage
Lower respiratory tract infection	11	23.9
Blockage of tube	3	6.5
Blockage of tube with respiratory tract infection	4	8.7
Postoperative Bleeding	2	4.3
Granulation around stoma	2	4.3
Displacement of tube	2	4.3
No identifiable complications	22	47.8

Table-5. Shows 22 cases had no identifiable complications (47.8%) following tracheostomy, while 11 cases had experienced lower respiratory tract infection (23.9%) and 4 cases had both blockage of tube with respiratory tract infections (8.7%).

Table 6 . Relationship between two types of techniques and complication(N=46)

Complications	Technique		p-value
	Surgical tracheostomy n (%)	Endoscopic percutaneous n (%)	
With complication	14 (53.8)	10 (50.0)	0.515
Without complications	12 (46.2)	10 (50.0)	

Table-6 shows 14 cases undergoing surgical tracheostomy (53.8%) had complications and 10 cases undergoing endoscopic percutaneous technique (50.0%) had complications, giving the p-value greater than 0.05 which is statistically not significant.

Table 7. Relationship between age group and complication(N=46)

Complications	Age group		p-value
	<57 years n (%)	≥57 years n (%)	
With complication	2 (14.3)	22 (68.8)	0.001
Without complication	12 (87.7)	10 (31.3)	

Table-7. Shows 22 cases of aged above 57 years (68.8%) had complications following tracheostomy, while 2 cases below aged 57 years (14.3%) had complications following tracheostomy, giving a p-value less than 0.05 which is statistically significant.

Table 8. Relationship between the timing of tracheostomy and complication(N=46).

Complication	Timing		p-value
	Elective n (%)	Emergency n (%)	
With complication	5 (38.5)	19 (57.6)	0.200
Without complication	8 (61.5)	14 (42.4)	

Table-8. Shows 5 cases undergoing tracheostomy as an emergency procedure had developed complications (38.5%), while 19 cases undergoing tracheostomy as an elective procedure (57.6%) had complications, with the p-value greater than 0.05 which is statistically not significant.

Table 9. Relationship between two techniques and decannulation(N=46)

Decannulation	Technique		p-value
	Surgical tracheostomy n (%)	Endoscopic percutaneous n (%)	
Successful	6 (23.1)	16 (80.0)	0.032
Not done	11 (42.3)	4 (20.0)	
Lost to follow up	9 (34.6)	0 (0.0)	

Table-9. Shows 16 cases undergoing endoscopic percutaneous tracheostomy (80%) was decannulated successfully, while 6 cases undergoing surgical tracheostomy (23.1%) was decannulated and 9 cases undergoing surgical tracheostomy were lost of follow up (34.6%), with p-value less than 0.05 which is statistically significant.

IV. Discussion

Tracheostomy is considered as the airway management of choice for patients who need prolonged mechanical ventilation support or airway protection.²⁹

In our study, out of 46 cases 34 were males (73.9%) and 12 were female (26.1%) with M:F ratio of 2.8:1. The age ranged from 23 to 84 years with a mean age of 57 years, which is similar to studies conducted by , Sigdel B et al⁶El-Alabi BS et al²¹ and Khammas AH et al²⁷. Anwar MW et al⁸, Gilyoma JM et al¹⁰, All 23 cases which were admitted under intensive care unit (50.0%) had undergone tracheostomy for prolonged intubation which is similar to the study conducted by Sigdel B et al⁶ and El-Anwar MW et al⁸. In the study group, 23 cases were indicated for upper airway obstruction (50.0%) out of which most common condition being carcinoma larynx (60.9%). Also, all cases of upper airway obstruction conditions had undergone surgical tracheostomy, which is similar to the studies conducted by Alabi Sigdel B et al⁶, BS et al²¹ and Khammas AH et al²⁷. Most common indication for tracheostomy among age group above 57 years was carcinoma of larynx (43.8%), which is similar to the studies conducted by Khammas AH et al²⁷. Out of 46 cases, 26 cases had undergone surgical tracheostomy (56.5%) and 20 cases had undergone endoscopic percutaneous technique (43.5%), out of which 13 cases of surgical tracheostomy were done as an emergency procedure (50.0%) which is in contrast to the study conducted by Gilyoma JM et al¹⁰ and Alabi BS et al²¹. All 20 cases of endoscopic percutaneous technique were done electively which is similar to study conducted by . El-Anwar MW et al⁸. In our study, 24 cases had experienced complications most common being lower respiratory tract infection (23.9%) and 22 cases from aged above 57 years (68.8%) had complications following tracheostomy while 2 cases from aged below 57 years (14.3%) had complications which is similar to the study conducted by Karuga G et al¹¹. 14 cases of surgical tracheostomy technique (53.8%) and 10 cases of endoscopic percutaneous technique (50.0%) were reported having complications after procedure with no statistical difference (p=0.515) between two techniques in terms of complications which is similar to the previous studies conducted by Silvester W et al³⁵, Gysin C et al³⁶ and Kilic D et al³⁷. In the study group, 22 cases (47.8%) were decannulated successfully, out of which majority were endoscopic percutaneous technique (80.0%) and 6 cases of surgical tracheostomy (23.1%) were decannulated successfully, which is similar to the study conducted by et al³, Xin G et al¹⁵ and Silvester Kawale MAW et al³⁵.

V. Conclusion:

In my study patients undergoing tracheostomy was studied over a period of two years at Regional Institute of Medical Sciences, Imphal. Commonest factor to undergo tracheostomy was prolonged intubation in Intensive Care Unit (ICU) followed by carcinoma of larynx, carcinoma oral cavity. While some cases of surgical tracheostomy were done as an emergency procedure, all percutaneous endoscopic technique were done

electively. Lower respiratory tract infection appears to be the most common complication following a procedure, but there was no statistical difference between two techniques in regard to their complications. Older age group appears to be at a higher risk of developing complications following tracheostomy. Decannulation procedure was done mostly for endoscopic percutaneous technique following prolonged intubation in intensive care unit (ICU). Thus, the most common factor for undergoing tracheostomy is prolonged intubation followed by carcinoma of larynx. Also, there is no difference between surgical tracheostomy and endoscopic percutaneous tracheostomy technique in terms of complications.

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