

Original Article

Tracheostomy in Non-malignant Disorders

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Abstract:

Background: Tracheostomy is a surgical procedure, often a life saving measure in a variety of clinical conditions. It is one of the commonest procedures carried out on the critically ill patient. The most common causes of non-malignant airway obstruction are head and severe facial trauma, cerebrovascular accident, coma, respiratory burn and presence of foreign bodies in airway etc. Tracheostomy is an increasingly utilised adjunct in the ICU management of patients. Effective tracheostomy management involved the multi-professional team in a co-ordinated approach.

Objectives: To study the indications of tracheostomy in non-malignant disorders.

Study design: Cross-sectional study.

Study setting and period: Department of Otolaryngorhinology and Head- Neck surgery (Unit-1,2,3), General Surgery, ICU, Casualty, Neurosurgery, Thoracic surgery, Burn & Plastic Surgery and relevant OPD in Dhaka Medical College Hospital from 6th September 2015 to 5th March 2016.

Methods: A hospital based cross-sectional study. Fifty patients admitted to hospital, underwent tracheostomy for non-malignant factors. Purposive samplings technique was used. Detail demographic data were collected from the informant and recorded in structured case record form. Clinical examination and relevant investigation were done meticulously. All collected questionnaire checked very carefully to identify the error in the data. Data processing work consist of registration schedules, editing computerization, preparation of dummy table, analyzing and matching of data.

Result: A total of 50 patients of non-malignant pathology causing airway patency loss in different ward unit of DMCH were selected. In this study, maximum numbers of patients (36%) were between 51-70 years age groups with mean age was 47.23±11.57 years. It was observed that, frequency of non-malignant aetiology for tracheostomy gradually increases with age. Study show that, 51-70 years was most frequent age group (36%). Out of 50 cases 82% were

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male. Present study show that socioeconomically majority patients were poor class (52%), highest percentage of patient comprised of day labourer (30%). Head trauma (12%) and cerebrovascular accidents (9%) were the most common etiological factor trauma was the major aetiological group (50%), followed by, central drive problems or neurological disease (38%) and elective tracheostomy was done.

Conclusion: Head and facial trauma, cerebrovascular accident, coma, respiratory burn and presence of foreign bodies etc. are common aetiological factors. It was found that tracheostomy is safer alternative to intubation when a prolonged artificial airway is required.

Key words: Tracheostomy, Non-malignant airway obstruction, Tracheobronchial stenosis

Introduction:

Tracheostomy is a utilitarian surgical procedure of access; therefore, it should be discussed in light of the problem it addresses: access to the tracheobronchial tree. The trachea is a conduit between the upper airway and the lungs that delivers moist warm air and expels carbon dioxide and sputum. Failure or blockage at any point along that conduit can be most readily corrected with the provision of access for mechanical ventilators and suction equipment. In the case of upper airway obstruction, tracheostomy provides a path of low resistance for air exchange¹.

The upper respiratory tract has developed a number of reflexes to protect itself from 'foreign material'. In the pharynx—Mechanoceptors cause activation of pharyngeal dilator muscles, whilst irritants can cause bronchodilatation. In the larynx—Mechanical stimulation via the superior laryngeal nerve causes cough, laryngeal closure and bronchospasm². The neurones central to the repetitive and involuntary movements of respiration are concentrated in the medulla oblongata. The pons undoubtedly contributes to the fine-tuning and modification of the respiratory rhythm but is no longer considered to be the dominant pneumotaxic centre². Any abnormalities in this event lead to severe respiratory difficulty. Tracheostomy is ultimate emergency treatment option for ventilatory resuscitation of patient.

Obstruction of the central airway, trachea and primary bronchi is a common problem in

medical and surgical settings. The incidence of this disorder seems to be rising due to the epidemic of lung cancer; however, the growing number of benign obstructive pathologies also contributes to this trend, primarily due to the use of artificial airways⁴.

The most common causes of non-malignant central airway obstruction are post-intubation and post-tracheostomy tracheal stenosis, followed by the presence of foreign bodies, benign endobronchial tumors and tracheobronchomalacia. Other causes, such as infectious processes or systemic diseases, are less frequent. Despite the existence of numerous classification systems, a consensus has not been reached on the use of any one of them in particular³.

There are significant benefits for the patient having a tracheostomy but altering the physiology of respiration also has its own drawbacks. The advantages of a tracheostomy tube are that they reduce the upper airway dead space by up to 150 ml (50%). This means that there is a significantly reduced effort in breathing compared to the naso-or oropharyngeal route. There is consequently significantly reduced airway resistance and increased alveolar ventilation [alveolar ventilation= tidal volume - dead space volume⁵⁻⁷.

Elective tracheostomy formation in the ICU is an increasingly common procedure in the management of patients who are predicted to have difficulty in weaning from mechanical ventilatory support. Those having a delayed emergence from coma, cranial nerve

dysfunction, high spinal cord injuries, significant neuromuscular weakness or chronic lung pathology are all typical ICU patient groups requiring tracheostomy insertion due to prolonged ventilatory support. Other indications include the provision of airway protection from serial pulmonary aspiration in patients with predictable dysphagia or in those having previously failed a trial extubation. Tracheostomy is also required when the upper airway is known to be obstructed most commonly seen in ICU as a direct consequence of maxillofacial surgery and trauma².

Patients with tracheostomies tend to have fewer days of mechanical ventilation because of the improvements in the respiratory physiology, as alluded to earlier. This is especially true in trauma patients. They have a lower risk of laryngotracheal injury than patients with ET tubes, largely because of anatomical factors. They have improved secretion clearance as suction is easy and less strength is required for expectoration. This may be linked to the lower incidence of pneumonia and respiratory infections seen, especially in trauma victims⁸. The most significant benefit from a patient's point of view is that they can communicate more easily, either by articulating or mouthing words or by using a speaking valve and/or fenestrated tube.

Objectives of the study:

General objective: To find out the indications of tracheostomy in non-malignant disorders.

Specific objectives:

- To know the frequency of Head-Neck trauma and non-malignant diseases in our country that requires tracheostomy.
- To know the demographic pictures of tracheostomy for non-malignant disorders.
- To know the statistics of ICU patients undergoing tracheostomy for nonmalignant disorders

Methods:

A hospital based cross-sectional study. Fifty patients admitted to hospital, underwent tracheostomy for non-malignant factors. Purposive samplings technique was used. Detail demographic data were collected from the informant and recorded in structured case record form. Clinical examination and relevant investigation were done meticulously. All collected questionnaire checked very carefully to identify the error in the data. Data processing work consist of registration schedules, editing computerization, preparation of dummy table, analyzing and matching of data.

Inclusion Criteria:

- Age: 1 month -80 years.
- Compromised airway due to any causes except carcinoma from any organ.
- Patients willing to be included in this study.

Exclusion Criteria:

- Patient age <1 month and > 80 years.
- Patients diagnosed as a carcinoma from any origin.
- Patient who does not wish to be included in the study.
- Follow up cases.

Ethical measures: When patient meet the criteria of inclusion, prior to starting the study, the aims and objectives of the study along with its procedure and benefits or drawbacks was explained to the patient &/or guardian in details in an understandable way. In case of any query, they were answered appropriately. When the guardian satisfied, then an informed consent was obtained from the guardian and the patients. They had the freedom to withdraw from the study at any time.

Results:**Table I :***Socio-demographic characteristics of the patients (n=50)*

Variables	Frequency	Percentage
Age (years)		
< 10	2	4.0
10-30	7	14.0
31-50	10	20.0
51-70	18	36.0
>70	13	26.0
Mean±SD	47.23 ± 11.57	
Sex		
Male	41	82.0
Female	9	18.0
Income classes		
Poor class	26	52.0
Middle class	17	34.0
High income class	7	14.0
Occupation		
Business	11	22.0
Service holder	8	16.0
Worker	15	30.0
Retired	3	6.0
Farmer	7	14.0
House wife	6	12.0
Living area		
Rural	18	36.0
Urban slum	3	6.0
Urban non-slum	29	58.0

In this series, the maximum numbers of patients (36%) were between 51-70 years age groups, next (26%) were >70 years. Mean age was 47.23 ± 11.57 years. Frequency of non-malignant aetiology for tracheostomy gradually increases with elderly. Out of 50 cases 82% were male and 18% were female. Male – female ratio was 4.55:1. Socio-economically patients are grouped into three classes. Among the patients the poor class (52%) comprising the major percentage of the patients, followed by middle class (34%) and remaining are upper class (14%). The highest percentage of patient comprised of worker (30%), businessman (22%) and service holder (16%). Eighteen (36%) patients came from rural, (58%) from urban non slum and (6%) from urban slum areas.

Table gives impression that head trauma (12%) and cerebrovascular accidents (9%) was the most common etiology for tracheostomy. Coma (in any situation where the Glasgow Coma Scale score is less than 8, the patient is at risk of aspiration as the protective reflexes are lost. That includes other than head trauma and CVA e.g. encephalitis, meningitis, Guillain- Barre syndrome, post operative septicemia, and spinal injury).

Table II :*Non-malignant indication for tracheostomy (n=50)*

Indication	No. of patients		Total
	Male	Female	
Head trauma	11(26.82%)	1(11.11%)	12
Cerebrovascular accidents	7(17.07%)	2(22.22%)	9
Respiratory tract burn	3(7.31%)	1(11.11%)	4
Coma	6(14.63%)	2(22.22%)	8
Gunshot wounds to the neck	1(2.43%)	0(0.0%)	1
Poisoning (swallowing of corrosive fluid)	0(0.0%)	1(11.11%)	1
Severe facial fractures	2(4.87%)	0(0.0%)	2
Foreign body	3(7.31%)	0(0.0%)	3
Severe chest injury	4(9.75%)	1(11.11%)	5
Postoperative case of ICSOL	1(2.43%)	1(11.11%)	2
Infection in chest& respiratory failure	2(4.87%)	0(0.0%)	2
Brain absces	1(2.43%)	0(0.0%)	1

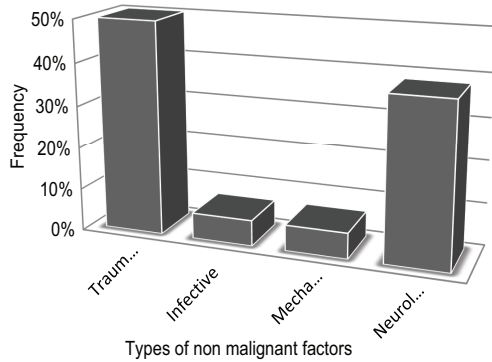


Fig.-1: Distribution of cases according to aetiological factors of tracheostomy (n=50)

Figure gives impression that traumatic factors are major causes for non-malignant tracheostomy, present (50%) of cases. Followed by, central drive problems or neurological disease (38%).

Table III :

Tracheostomy management in the intensive Care Unit (ICU)

Indication	Frequency	Percentage
Head trauma	7	14.0
Cerebrovascular accidents	9	18.0
Respiratory tract burn	1	2.0
Coma	8	16.0
Infection in chest & respiratory failure	1	2.0
Brain abscess	1	2.0

Those having a delayed emergence from coma, cranial nerve dysfunction, significant neuromuscular weakness or chronic lung pathology are all typical ICU patient groups requiring tracheostomy insertion due to prolonged ventilatory support. Elective tracheostomy formation in the ICU is an increasingly common procedure in the management of patients who are predicted to have difficulty in weaning from mechanical ventilatory support. Present study shows that frequency of ICU cases was (27%) underwent

tracheostomy for non-malignant disease. Among them head trauma were (14%), cerebrovascular accidents (18%) and coma (16%) was the most common etiology for tracheostomy.

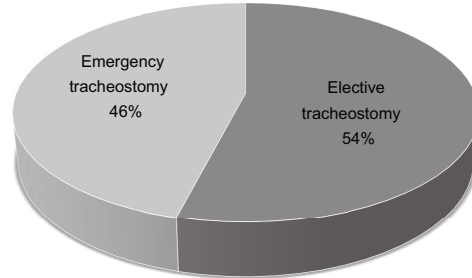


Fig.-2: Distribution of cases according to mode and nature of tracheostomy (n=50)

Present study shows that, 27(54%) patients underwent elective tracheostomy and 23(46%) patients were emergency tracheostomies. Elective tracheostomy occurs most commonly in the second stage of ICU management. Typically this means the patient will already have physiological consequences of mechanical ventilation and enforced immobility for a period of 3–14 days prior to instituting the tracheostomy. The common indications of elective tracheostomy were head trauma were (14%), cerebrovascular accidents (18%) and coma (16%).

Table IV :

Complications of tracheostomy.

Complications	Frequency	Percentage
Haemorrhage	4	8.0
Injury to trachea and larynx	1	2.0
Subcutaneous emphysema	2	4.0
Tube blockage	3	6.0
Tube displacement	2	4.0
Wound infection	1	2.0
Stomal recurrence	0	0.0

Few complications were observed in present study. Haemorrhage (8%) and tube blockage (6%) was the most common complication.

Discussion:

A total of 50 patients of non-malignant pathology causing airway obstruction in different ward/unit of DMCH were selected. According to the questionnaire, history of all the 50 selected cases were taken, the clinical examination was carried out meticulously. In this series, the maximum numbers of patients (36%) were between 51-70 years age groups, next (26%) were >70 years. Mean age was 47.23 ± 11.57 years. It was observed that, frequency of non-malignant aetiology for tracheostomy gradually increases with elderly. Male – female ratio was 4.55:1. Here Male was predominant both in elective (M:F=6.5:1) and emergency tracheostomy (9:1)¹⁰. Present study show that socioeconomically majority patients were poor class (52%), highest percentage of patient comprised of worker (30%).

Tracheostomies have been performed since ancient times and the first known reference can be found in Rig Veda, the sacred Hindu scripture which dates back to 2000 BC. In 1620 Habicot published the first book on tracheostomies¹⁵. It is a frequently performed procedure, historically has had a high rate of complications. It is one of the life saving procedure; here is very wise aphorism is that if a tracheostomy comes into ones mind then it is the time to do it. It has been found that in intensive care unit approximately 13% of patients will have a tracheostomy at any one time¹³.

Present study gives impression that head trauma (12%) and cerebrovascular accidents (9%) was the most common etiology for tracheostomy. Choudhury A et al demonstrated that common indications of elective tracheostomy were Intracranial Space Occupying Lesion(ICSOL) (26.67%) & Head injury (26.67%) in their study¹⁰.

Present study gives impression that traumatic factors are major causes for non-malignant

tracheostomy, present (50%) of cases. Followed by, central drive problems or neurological disease (38%). Another study reported that indications for a tracheostomy are obstruction of the upper airway - e.g., foreign body, trauma, infection, laryngeal tumour, facial fractures. Impaired respiratory function - e.g., head trauma leading to unconsciousness, bulbar poliomyelitis.¹

Present study shows that, 27(54%) patients underwent elective tracheostomy and 23(46%) patients were emergency tracheostomies. Elective tracheostomy occurs most commonly in the second stage of ICU management. Typically this means the patient will already have physiological consequences of mechanical ventilation and enforced immobility for a period of 3–14 days prior to instituting the tracheostomy. The common indications of elective tracheostomy were head trauma were (14%), cerebrovascular accidents (18%) and coma (16%). Choudhury A et al demonstrated that common indications of elective tracheostomy were ICSOL (26.67%) & Head injury (26.67%) where as commonest indication of emergency tracheostomy was laryngeal carcinoma (53.33%)¹⁰.

There are many complications associated with performing a tracheostomy. Most of them can be avoided with a meticulous surgical approach and dedicated post-operative care, administered by a multidisciplinary team. The complications can be intra-operative (including the first 24 h), early postoperative (1–14 days) or late (>14 days). The incidence of overall complications depends on individual departments and ranges from 5 to 40%^{11,19}. The most commonly occurring complications are haemorrhage, tube obstruction and tube displacement. The incidence varies depending on the papers quoted. Death occurs in 0.5–1.6% and is most often the result of tube displacement. Emergency

tracheostomy carries a two to five fold increase in the incidence of complications over an elective procedure¹¹. Few complications were observed in present study. Haemorrhage (8%) and tube blockage (6%) was the most common complication. Study in BSMMU demonstrated the frequency of complication for elective tracheostomy was 9.99% and emergency tracheostomy 33.35%. Here complications were 3.33 times more common in cases of emergency tracheostomy than elective tracheostomy¹⁰.

Elective tracheostomy in the ICU is an increasingly common procedure in the management of patients who are predicted to have difficulty in weaning from mechanical ventilatory support. Those having a delayed emergence from coma, cranial nerve dysfunction, high spinal cord injuries, significant neuromuscular weakness or chronic lung pathology are all typical ICU patient groups requiring tracheostomy insertion due to prolonged ventilatory support. Other indications include the provision of airway protection from aspiration in patients with predictable dysphagia or in those having previously failed a trial extubation. Tracheostomy is also required when the upper airway is known to be obstructed most commonly seen in ICU as a direct consequence of maxillofacial surgery and trauma².

Conclusion:

Tracheostomy is an increasingly utilised adjunct in the ICU management of patients predicted to have difficulty in weaning from mechanical ventilation and those at risk of serial pulmonary aspiration. Most common causes of non-malignant airway obstruction are head and severe facial trauma, cerebrovascular accident, coma, respiratory tract burn and presence of foreign bodies in airway etc. Effective tracheostomy

management must involve the multi-professional team in a co-ordinated approach haemorrhage, tube displacement, tube blockage like complications and the prevalence and consequences of silent aspiration found in the majority of tracheostomy patients presents significant risk to morbidity and mortality. Management must exploit the benefits associated with tracheostomy while minimizing the potential risks. Appropriate maintenance and planning can minimize the complications.

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