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ORIGINAL ARTICLE

Study of Incidence of Various Complications of Tracheostomy Following Prolonged Endotracheal Intubation

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Abstract

Background: Endotracheal intubation is necessary to establishing and maintaining a patent upper airway. However, this procedure is associated with complications that need to be detected early and managed appropriately. This study was undertaken to determine and understand the common complications seen in patients undergoing tracheostomy following prolonged endotracheal intubation. **Objectives:** To determine and analyze various complications in patients undergoing tracheostomy following prolonged endotracheal intubation. **Methodology:** 40 patients requiring artificial/assisted ventilation were observed during the period of the study for indications, duration of ventilation, complications of tracheostomy following prolonged endotracheal intubation, tube change, and decannulation. **Results:** The common complications observed were vocal edema, self extubation and Angle of mouth / lip ulceration. Many of the complications encountered after delayed tracheostomy can lead to morbidity and mortality, hence early tracheostomy and good endotracheal tube management can reduce complications and its late sequelae. **Conclusion:** Endotracheal intubation is a life-saving procedure but nevertheless, prolonging the same may be associated with its own set of complications and side effects.

Keywords: Prolonged intubation, Tracheostomy, Tracheostomy complication

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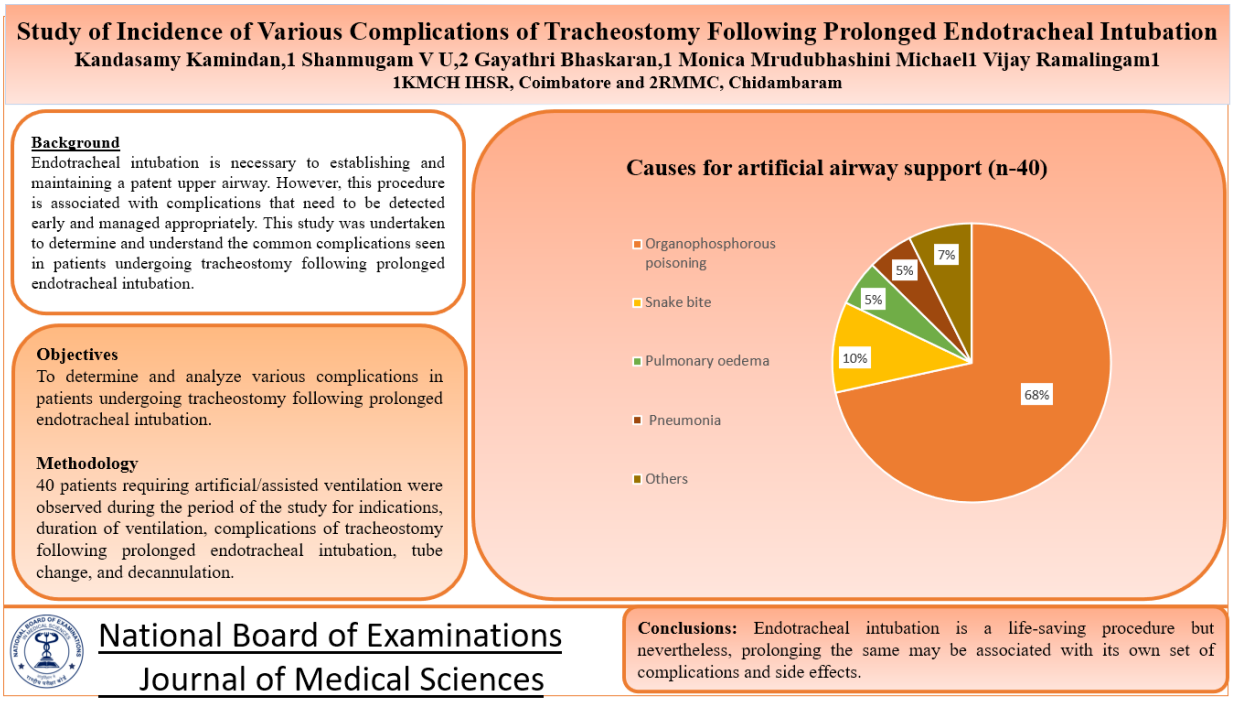
Graphical Abstract



Introduction

Establishing and maintaining a patent upper airway is a vital step in the basic life support and maintenance of airway is the most fundamental aspect of such support [1]. Different techniques available for maintaining artificial airway are Endotracheal Intubation (ET), Tracheostomy, Cricothyroidotomy, Percutaneous Tracheostomy, Surgical Tracheostomy and Laryngeal airway mask. Endotracheal intubation is one of the commonly performed procedures in the emergency department to ensure airway integrity, assurance of oxygenation, Ventilation and prevention of aspiration. It is predominantly done to correct hypoxia or hypercarbia and prevent impending hypoventilation.

However, this procedure is associated with complications like ulcerations, dysphagia, infections, intermittent aphonia, trauma, Vocal cord paralysis etc. [2]. This makes it imperative to either extubate the patient promptly or maintain patency of the airway through other methods.

Studies assessing the complications arising from prolonged ET from USA by Dauna Lundy et al. [1] and Michelle Gill et al [2] reported development of subglottic stenosis and granulomas in patients with long-term intubation and a success rate of 50%. Boubaker Charra et al. [3] from Morocco concluded that patients undergoing tracheostomy leads to decreased ventilation duration and delayed infections in comparison to endotracheal intubation.

Yamanaka et al. [4] from Osaka, Japan also reported incidence of voice hoarseness in 49% patients undergoing ET along with arytenoid dislocation.

Though there is adequate literature to establish the incidence and prevalence of complications in patients with prolonged intubation, there is a dearth of evidence for the same in our region.

This study was therefore conceptualized to determine the immediate, intermediate and long-term complications in patients undergoing tracheostomy following prolonged endotracheal intubation.

Materials and Methodology

This was a hospital-based study conducted in a tertiary care setting in Chidambaram, Tamil Nadu, India from 2016 to 2018.

Patients admitted in our institute for various medical/surgical conditions and requiring artificial airway and ventilatory support were considered for the study. They were intubated with appropriate size endotracheal tube with cuff, and underwent tracheostomy on or after 7 days, as their condition required prolonged mechanical ventilation.

Exclusion criteria:

Patients under the age of 12 and patients who were tracheostomized in other centres were excluded from the study.

Sample Size:

A total of Forty patients admitted and undergoing artificial airway management and ventilatory support were included in this study after ascertaining the inclusion and exclusion criteria.

Sampling

Purposive sampling

Data collection methodology

The study was conducted after the approval of the Institutional Human ethics committee clearance. Written informed consent was obtained from patients/relatives prior to performing the procedure and collecting data for this study. The general and systemic examination was done for the patient followed by examination of oral cavity/throat/neck, Direct laryngeal examination, Video Laryngoscopy, Endoscopic examination of trachea through stoma using topical 10% Lidocaine anesthetic spray, Radiological examination of the neck were done at the time of first tube change, discharge, and before decannulation. All the observations were documented and tabulated.

Study variables for ET like indication, duration, condition of the patient at time of intubation (unconscious/sedated), indication for tracheostomy, complications encountered in patients undergoing tracheostomy following prolonged ET were documented.

Patients were intubated with Portex cuffed endotracheal intubation tube and Portex cuffed tracheostomy tube was used for patients for tracheostomy.

Patient requiring tracheostomy underwent routine pre-operative check-up and was taken up for surgery with anaesthetic concurrence. Patient was positioned supine with neck extension and the neck was painted and draped. Surface marking done, Vertical incision made along the midline between lower border of the cricoid cartilage and a cm above the sternal notch. The soft tissue and strap muscles were separated. There were minor bleedings encountered, which were coagulated with bipolar cautery and ligatures when necessary. The thyroid isthmus was retracted upwards using a single hook retractor. The trachea was identified by saline bubble aspiration technique. Tracheotomy was done using a 11 number scalpel and Bjork's flap was fixed with soft tissue. At this point, the endotracheal tube was deflated and slowly withdrawn till the tracheotomy site by the Anaesthetist. A Portex tracheostomy tube

with cuff of appropriate size was chosen, inserted and cuff inflated. The position of the tube was checked by auscultation method. Then the endotracheal tube was completely withdrawn and removed. The tracheostomy tube was safely secured. The cuff was inflated for a period of twelve hours postoperatively. After 12 hours the cuff was deflated for ten minutes every 4th hour. The tracheal stoma was dressed using betadine gauze and changed every 8th hour. The cuff was completely deflated when the patient no longer needed ventilatory support and changed to Fullers metal tube of appropriate size. As and when the patient was comfortable with phonation and clearing out secretions, corking was done for 48 hours. After successful corking tolerance, the Fuller's tube was removed, and the tracheal stoma was closed under local anaesthesia.

The collected data was entered into Microsoft excel and analyzed using appropriate statistical software. Results were expressed in proportions and percentages.

Results

This study analyzed data of a total of 40 patients.

Majority (45%) of patients were of age 41- 50 years of age (Median age – 39 years) with a male predominance (85%).

The common clinical conditions requiring airway support were as depicted in Figure 1.

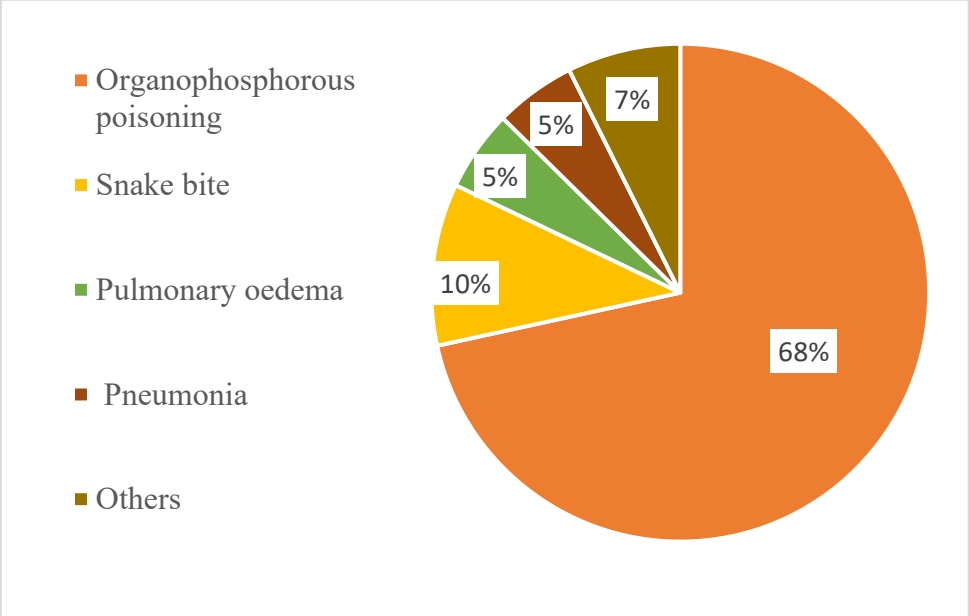


Figure 1. Causes for artificial airway support (n-40)

The most common indications in those patients requiring ET and tracheostomy were 'Imminent respiratory failure' (75%) and 'expectant prolonged endotracheal intubation' respectively.

In our study of 40 patients the median (IQR) days of intubation was 10 (8, 12).

There were Twenty-two instances of complications seen in patients who underwent tracheostomy following prolonged ET.

The common complications were as shown in Figure 2.

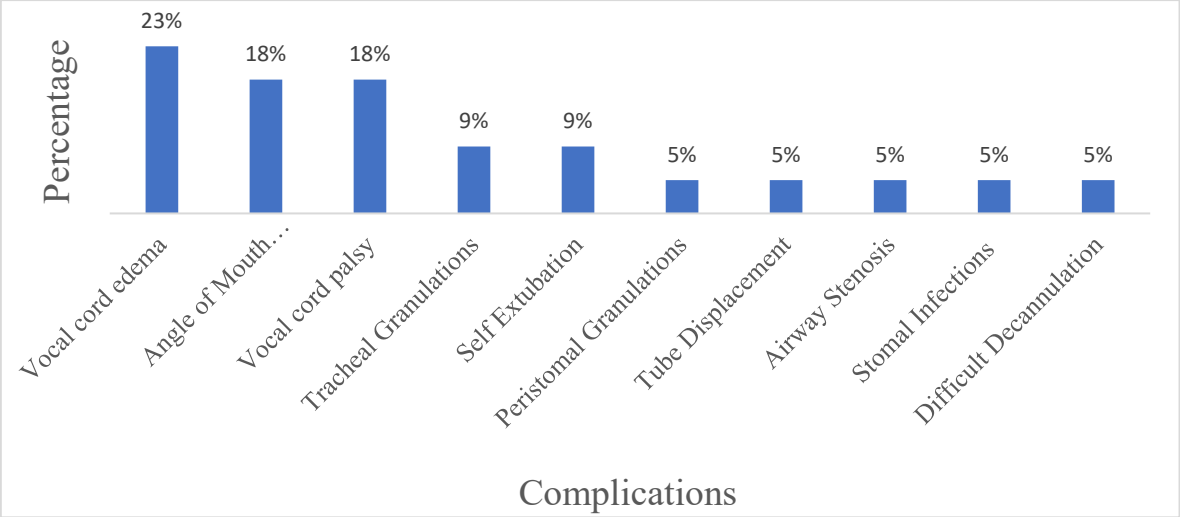


Figure 2. Complications (n-22)

Discussion

This hospital based cross sectional study analyzed the various complications seen in patients with delayed tracheostomy following prolonged ET.

ET is one of the commonly employed methods of maintaining a patent airway. However, study by Austin et al concluded that prolonged ET was reversible and avoids complications of tracheal stoma but also carries serious risk of injury to larynx along with blockage and displacement of tubes [5].

The median age of participants in our study was 39 years with most (45%) of the patients in the age group of 41- 50 years.

This was a lower age group compared to the studies in other countries that reported average ages ranging from 56 – 58 years [6,7].

We observed male preponderance in our group of 40 patients, which was comparable to most studies [6-9].

The clinical diagnosis of the patient who required prolonged endotracheal ventilation followed by Tracheostomy was varied, the most common clinical diagnosis in our study was organophosphorus compound poisoning which points to the kind of problems prevalent in this part of the world that requires attention.

Imminent respiratory failure was the most common indication for endotracheal intubation in our study. John L Stauffer et al. [6] and Astrachan et al. [9] in their research work also observed that the respiratory failure being the common indication for intubation.

We observed that median (IQR) days of intubation was 10 (8, 12) for the 40

patients included in our study. Chopra et al [10] in their study from North India, observed 20 patients had complications following more than 7 days of intubation. John Stauffer et al. [6] had the least mean duration of intubation - 5.4 days. Stacey L Halum et al [7] in their study keenly noted that 35% were intubated for less than 7 days, 31% were intubated for period of 1-2 weeks and 35% were intubated for more than 2 weeks. A Ashoor et al. [8] documented duration of prolonged intubation from 13 to 42 days.

This variation may be attributed to the difference in the kind of presentation and the decision to decide the time duration of intubation being predominantly clinical and experience based.

Ventilatory dependence and prolonged endotracheal intubation were the indications for tracheostomy in our study which was similar to the findings in the other studies [7,8].

Average number of days a patient remained with tracheostomy tube was 34 days (11 – 93 days) in this study, whereas it was 24.4 days in John Stauffer et al. [6] and 64 days in Stacey Halum et al. [7] study. This again indicates the wide variation in the number of days and requires an evidence-based consensus statement to decide on the most appropriate duration for maintaining a patient on tracheostomy to prevent complications.

Complications and management

The complications developing during the study were appropriately managed.

The most common complication in the patients in our study was vocal cord edema (23%). Other Indian study by Chopra et al [10] observed 15% of the patients had vocal cord edema while John Stauffer et al. [6] and Austin [5] reported 2% and 5% respectively.

Nine percent of the patients self-extubated in the ICU and were re intubated and none of the incidents were fatal. Self-extubation, even though simple can lead to catastrophe if the patient is not under continuous monitoring. This was similar to the findings of Austin et al. [11] whereas Astrachan et al. [9] found staggering 21% of the patients self-extubating during their stay in ICU.

John Stauffer et al. [6] had observed 15% of the patient had lip ulceration, which was comparable to our study in which we observed 18% of the patients had an angle of mouth or lip ulceration due to constant pressure from the endotracheal tube itself.

Peristomal granulations were noted in 5% of our study group. This percentage was comparable with the study by Ashoor et al. [8] in which 2.4% of the patients had granulation. Prescott [12] documented 6% of their study population developed granulation during the first 4 weeks, 12% during 2–4 weeks and 13% later than 4 weeks which was higher than what was observed in our study.

Another noticeable complication was tracheal granulations due to the contact friction on the trachea. 10% of the patients had tracheal granulations, which settled after decannulation. Chopra et al. [10] had similar experience with 5% of the patients in his study.

With strict dressing protocol we could limit the stomal infection to about 5%, when suspected of infection, swabs were taken for culture / sensitivity and patients were treated with culture directed antibiotics. Astrachan et al. [9] noted 8% of the patients had stomal infection and John Stauffer et al. [6] had 36% of the patients presenting with stomal infections.

Tracheostomy tube displacement was noted in 5% of the study population post tracheostomy during their stay in the ICU, which was promptly noted and re-insertion done without any difficulty. T E Dane et al [12] in his study noted 10% of the patient needed re-insertion of displaced tube.

The serious and life-threatening complication that was documented in our study was subglottic stenosis (5%). These patients did not tolerate trial decannulation, following which patients were subjected to rigid bronchoscopy and computed tomography of neck. Patient diagnosed with subglottic stenosis, Graded by Cotton-Myer grading system and were managed accordingly.

Even though complications like lip ulceration, self extubation and subglottic stenosis were not directly related to tracheostomy, they were still significant complications of prolonged endotracheal intubation. Hence, we were compelled to include the same in our results as they were observed in the patients who underwent tracheostomy and presented post decannulation in case of subglottic stenosis.

Conclusion

Endotracheal intubation is a life-saving procedure but nevertheless, prolonging the same may be associated with its own set of complications and side effects.

Many of the complications encountered after prolonged endotracheal intubation and tracheostomy can lead to morbidity and mortality, hence prompt diagnosis and management is essential.

Early tracheostomy reduces the number of days on intubation hence facilitates early weaning and early decannulation, thereby minimizing the complications following prolonged endotracheal intubation and its late sequelae.

This study indicates the need for a robust evidence based consensus statement on the duration of ET as well as more studies with larger sample and prolonged period of evaluation for better understanding of the evolution of complications, diagnosis and management.

Limitations

Follow up schedule was a major hindrance to the study.

Declaration of Ethical Issues

The authors hereby declares that there were no ethical issues involved in the publishing of this article in any journal.

Declaration of Conflicting Interests

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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References

1. D. S. Lundy, R. R. Casiano, D. Shatz, M. Reisberg and J. W. Xue, Laryngeal injuries after short- versus long-term intubation. Journal of voice: official Journal of the Voice Foundation, 1998;12(3):360-365.
2. M. Gill, M. J. Madden and S. M. Green, Retrograde endotracheal intubation: an investigation of indications, complications, and

patient outcomes. The American Journal of Emergency Medicine, 2005;23(2):123-126.
3. Boubaker Charra, Abdelhamid Hachimi, Abdellatif Benslama and Said motaouakkil, Tracheostomy versus prolonged intubation in medical intensive care unit patients," Signa Vitae 2009;4(1):21-23.
4. H. Yamanaka, Y. Hayashi, Y. Watanabe, H. Uematu and T. Mashimo, Prolonged hoarseness and arytenoid cartilage dislocation after tracheal intubation. British Journal of Anaesthesia, vol. 2009;103(3) 452-455.
5. [5] R. T. Austin, "Tracheostomy and Prolonged intubation in the Management of Trauma," Injury: The British Journal of Accident Surgery, vol. 2, no. 3, pp. 191-98, 1971.
6. J. L. Stauffer, D. E. Olson and T. L. Petty, Complications and consequences of endotracheal intubation and tracheotomy. A prospective study of 150 critically ill adult patients., The American Journal of Medicine, 1981;70(1):65-76.
7. S. L. Halum, J. Y. Ting, E. K. Plowman, P. C. Belafsky, C. F. Harbarger, G. N. Postma, M. J. Pitman, D. LaMonica, A. Moscatello, S. Khosla, C. E. Cauley, N. C. Maronian, S. Melki, C. Wick, J. T. Sinacori, Z. White, A. Younes, D. C. Ekbom, M. G. Sardesai and A. L. Merati, A Multi-Institutional Analysis of Tracheotomy Complications. The Laryngoscope, 2012;122(1):38-45.
8. A Ashoor, Fachartz Fuer and Ali Al-Momen, Tracheostomy Two years Prospective Study. Bahrain Medical Bulletin, 1999;21(3):91-93.
9. D. I. Astrachan, J. C. Kirchner and W. J. Goodwin, Prolonged intubation vs. tracheotomy: complications, practical and psychological considerations. The Laryngoscope, 1998;98(11):1165-1169.
10. H. Chopra, A. S. Khurana, U. Malhotra, N. Mathur and U. S. Sidhu, Incidence and types of post extubation complications following endotracheal intubation and tracheostomy. Indian Journal of Otolaryngology and Head and Neck Surgery 2000;52(4):364-365.
11. R. T. Austin, Tracheostomy and prolonged intubation in the management of trauma. Injury 1971;2(3):191-198.
12. T. E. Dane and E. G. King, A prospective study of complications after tracheostomy for assisted ventilation. Chest, 1975;67(4):398-404.
13. Divatia J V and Bhowmick K, Complications of Endotracheal Intubation and Other Airway Management Procedures, Indian J. Anaesth, 2005;49(4)308-318.
14. G. R. Sellery, A. Worth and R. E. Greenway, Late complications of prolonged tracheal intubation. Canadian Anaesthetists' Society journal, 1978;25(2):140-143.
15. V. F. Blanc and N. A. Tremblay, The complications of tracheal intubation: a new classification with a review of the literature. Anesthesia and analgesia, 1974;53(2):202-213.