



ORIGINAL RESEARCH PAPER

Otorhinolaryngology

LARYNGEAL ASSESSMENT OF PATIENTS UNDERGONE EMERGENCY ORAL INTUBATION IN TERTIARY CARE SETTING

KEY WORDS: Endotracheal intubation, Acute Laryngeal injury

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ABSTRACT

Objective: Respiratory failure is the most common reason for admission and over a third of patients require mechanical ventilation. (1) Although 50% to 70% of patients survive their acute illness, many develop persistent disabilities that limit return to their pre-illness functioning. (2-4) Little attention has been paid to the laryngeal consequences of endotracheal intubation and how acute laryngeal injury (ALGI) may impair functional recovery from critical illness. (5). This study aims to see Laryngeal consequences in patients who have undergone endotracheal intubation. Upper airway injury is a recognized complication of prolonged endotracheal intubation, yet little attention has been paid to the consequences of laryngeal injury its functional impact. The purpose of our study was to prospectively define the incidence of acute laryngeal injury and investigate the impact of injury on breathing and voice outcomes. **Subjects And Methods:** This study was a prospective observational study done in department of Otorhinolaryngology in which 50 patients of age 20-70 years admitted in ICU who have undergone endotracheal intubation and attending E.N.T. OPD with history of endotracheal intubation are selected. Only patients, fulfilling inclusion criteria were subjected to detailed clinical history and examination post extubation. **Results:** In our study majority (44%) of patients belonged to age group of 50 years – 60 years. Patients who have been intubated for less than 7 days grade 1 Laryngeal injury is common followed by grade 2 Laryngeal injury. For patients who have been intubated for more than 7 days grade 3 Laryngeal injury is common followed by grade 2 then grade 1. Dysphonia is most prevalent symptom post extubation followed by Pain. **Conclusion:** Acute laryngeal injury occurs in more than half of patients who receive mechanical ventilation and is associated with significantly worse breathing and voicing ten weeks after extubation. An endotracheal tube greater than size 7.0, diabetes, and larger body habitus may predispose to injury. Our results suggest that acute laryngeal injury impacts functional recovery from critical illness.

INTRODUCTION

Endotracheal intubation is the insertion of an artificial airway into the trachea by either the oropharyngeal or nasopharyngeal route. Invasive ventilation is highly effective and reliable in supporting alveolar ventilation. Intubation procedure is associated with occasional adverse events such as pharyngeal/laryngeal/tracheal tissue damage, self-extubation, and aspiration of gastric contents. Many complications occur during or immediately following intubation.

Globally, there are 13-20 million critically ill patients intubated in intensive care units (ICU) annually.

Similar to many medical treatments, the iatrogenic effects of intubation have potential for acute and chronic symptoms, and both short- and long-term sequelae requiring further medical care that extends beyond extubation.

Transient dysphonia, dysphagia, and sore throat are common post-procedural complications after intubation during surgery. (6,7) In contrast, critically ill patients experience longer durations of mechanical ventilation and have a greater prevalence of conditions thought to predispose to laryngeal complications. (8-15)

It has long been recognized that endotracheal tubes (ETT) are forced posteriorly in the larynx by the tongue base and

lordosis of the cervical vertebral column. This deforms the tube into an S-like shape with the posterior glottis acting as a fulcrum. (16) Laryngeal injury during mechanical ventilation occurs at the mucosal interface of the ETT and posterior glottis and can progress to fibrosis, restricted glottic mobility, and ventilation impairment that dramatically impacts quality of life. (17) While laryngeal injury after prolonged intubation has been recognized for decades, several barriers have limited rigorous investigation into risk factors for disease development or linked injury to clinical outcomes.

Because the larynx is rarely examined after extubation in the ICU and laryngeal injury may initially present with minor clinical symptoms, restricted glottic mobility has historically been identified after hospital discharge, leaving critical care specialists who participate in frontline care unaware of the scope of the issue.

METHODS

Type Of Study: Prospective observational study

Sample: 50 cases.

Duration And Place Of Study: The study was done from July 2021 to December 2022 in the Department of ENT, Maharaja Yashwantrao Holkar Hospital, Indore, India.

Inclusion Criteria

Patient age between 20-60 years admitted for endotracheal

intubation in the emergency room and intensive care unit and attending ENT OPD post extubation .Patients giving consent endoscopic examination.

Exclusion Criteria

Patient Age below 20 years and above 60 years with pre existing laryngeal injury or disease, those who were thyroid, cardiac or mediastinal diseases and have undergone different laryngeal operations that include manipulation of the larynx or tracheostomy.

Data Collection

Relevant data collected using a pre-structured proforma, according to which thorough examination with relevant investigation done to aid the diagnosis which is followed by appropriate follow up and routine examination.

Assessment & Diagnosis

Indirect visualization using a rigid endoscope, flexible nasoendoscopy, and flexible bronchoscopy was used in (89%) studies.

Otolaryngologist interpretation of findings was confirmed in (78%) studies. Assessment was done at 1 week and at 2 weeks post extubation in the ENT OPD.

RESULTS

A high prevalence of minor injury and lower prevalence of more severe injury occurred.

Many injuries were self-limiting, Grade 1 injuries i.e. 42%. Overall, erythema was most frequent, with a prevalence of 70%, followed closely by edema with a prevalence of 68% .

The interarytenoid space, the area through which the ETT passes and remains present in situ, had a 85% - 86% prevalence of edema and erythema, respectively.

Intubation granulomas/granulation tissue, the only other injury type reported, had a 27% prevalence. Vocal fold immobility was the most frequently reported and most common of the severe (i.e., Grade 3) injuries, with a 21% prevalence.

There was a 6% prevalence of glottic stenosis and 13% prevalence of subglottic stenosis. A prevalence of 5% or less for both subglottic mucosa edema and arytenoid(s) dislocation were reported.

Symptoms of laryngeal injury identified after extubation were common with voice dysfunction (i.e., dysphonia), dysphagia, and pain being the most frequent. Both voice dysfunction and pain had prevalence of 76% and 74 % respectively. Dysphagia had a prevalence of 20% . Stridor was least frequent with a prevalence of 8% .

DISCUSSION

More than three-quarters of the patients who undergo intubation may experience hoarseness and throat discomfort in the early postoperative period.

Such symptoms can be attributed to simple mucosal edema and congestion associated with intubation. These symptoms usually show a gradual improvement in the next few hours or days.

After 5–7 days, the majority recover from any laryngeal complaints.

Only a small fraction of patients will emerge from intubation injury-free.

Overall, Grade 3 injuries in the form of arytenoid dislocation, stenosis, glottic narrowing are presented when the duration of intubation is for >7 days i.e. 16%. Mild form of injuries i.e.

Grade 1 (34%) are commonly reported in patients with a shorter duration of intubation.

On average, more than twice as many patients will sustain moderate or severe injuries that impact airway, voice, and/or swallowing than will have no injury.

A necessary first step in managing laryngeal injuries is in determining their presence and severity to facilitate appropriate and individualized management.

Regardless of which symptom(s) are present, “wait and see” remains the most common approach to identification and management of these injuries. A reassessment of laryngeal tolerance to prolonged intubation is needed.

Emphasis on the early functional derangements which occur must supplement the well appreciated long-term sequelae.

CONCLUSION

Considering the prevalence of laryngeal injury, dysphonia, and dysphagia and their associated risks for more serious medical complications, practice guidelines are needed for post-extubation screening/assessment in the ICU.

Evidence strongly indicates that intubation duration is associated with prevalence and severity of laryngeal injuries. Injuries are frequent and range widely in severity post-extubation.

Although mild injuries are more prevalent, moderate to severe injuries occur frequently and require timely clinical attention. Presently, no clinical standards of practice address these potentially serious injuries and there is little evidence in this review to offer direction.

Findings suggest new areas for scientific inquiry and highlight long-known and under-identified iatrogenic injury from one of the most common procedures in medicine —endotracheal intubation.

OBSERVATION TABLES

Table 1 : Prevalence Of Laryngeal Injury Grade By Average Intubation Duration

Injury grade	< 7 days	>7 days
0 : No injury present	4 (8 %)	0 (0 %)
1 : Self limited, Soft tissue (e.g. edema, erythema)	17 (34 %)	4 (8 %)
2 : Hematoma, Ulceration, Granulation	10 (20 %)	6 (12 %)
3 : Stenosis, Stenosis with glottic narrowing , Hypomobility/ immobility of the vocal folds and/or arytenoid dislocation	1 (2 %)	8 (16 %)

Table 2 : Prevalence Of Symptoms Reported Post Extubation

Symptoms	No. of Patients	Percentage
Dysphonia	38	76%
Pain	37	74%
Vocal fatigue	15	30%
Stridor	4	8%
Dysphagia	10	20%

Table 3 : Events During Intubation

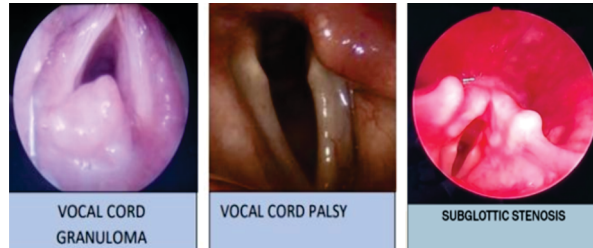
Event	Number of Patients	Percentage
Patients who needed reintubation.	8	16%
Patients with difficult intubation.	19	38%

Patients who needed position change	10	20%
Patients with stylet	6	12%

Figures

MECHANISM OF LARYNGEAL INJURY IN ORAL INTUBATION

The tongue base drives the endotracheal tube into the posterior glottis and direct pressure results in laryngeal mucosal and soft tissue injury at the endotracheal tube interface.



REFERENCES

1. Wunsch H, Wagner J, Herlim M, et al.: ICU occupancy and mechanical ventilator use in the United States. *Crit Care Med* 2013;41(12):2712-2719.
2. Ashiku SK, Kuzucu A, Grillo HC, et al.: Idiopathic laryngotracheal stenosis: effective definitive treatment with laryngotracheal resection. *J Thorac Cardiovasc Surg* 2004;127(1):99-107.
3. Needham DM, Davidson J, Cohen H, et al.: Improving long-term outcomes after discharge from intensive care unit: report from a stakeholders' conference. *Crit Care Med* 2012;40(2):502-509.
4. Gardner AK, Ghita GL, Wang Z, et al.: The Development of Chronic Critical Illness Determines Physical Function, Quality of Life, and Long-Term Survival Among Early Survivors of Sepsis in Surgical ICUs. *Crit Care Med* 2019.
5. Ohtake PJ, Lee AC, Scott JC, et al.: Physical Impairments Associated With Post-Intensive Care Syndrome: Systematic Review Based on the World Health Organization's International Classification of Functioning, Disability and Health Framework. *Phys Ther* 2018;98(8):631-645.
6. Pacheco-Lopez PC, Berkow LC, Hillel AT, et al.: Complications of airway management. *Respir Care* 2014;59(6):1006-1019; discussion 1019-1021.
7. Geraci G, Cupido F, Lo Nigro C, et al.: Postoperative laryngeal symptoms in a general surgery setting. Clinical study. *Ann Ital Chir* 2013;84(4):377-383.
8. Donnelly WH: Histopathology of endotracheal intubation. An autopsy study of 99 cases. *Arch Pathol* 1969;88(5):511-520.
9. Dubick MN, Wright BD: Comparison of laryngeal pathology following long-term oral and nasal endotracheal intubations. *Anesth Analg* 1978;57(6):663-668.
10. Brandwein M, Abramson AL, Shikowitz MJ: Bilateral vocal cord paralysis following endotracheal intubation. *Arch Otolaryngol Head Neck Surg* 1986;112(8):877-882.
11. Colice GL, Stukel TA, Dain B: Laryngeal complications of prolonged intubation. *Chest* 1989;96(4):877-884.
12. Santos PM, Afrassiabi A, Weymuller EA Jr.: Risk factors associated with prolonged intubation and laryngeal injury. *Otolaryngol Head Neck Surg* 1994;111(4):453-459.
13. Massard G, Rouge C, Dabbagh A, et al.: Tracheobronchial lacerations after intubation and tracheostomy. *Ann Thorac Surg* 1996;61(5):1483-1487.
14. Eckerbom B, Lindholm CE, Alexopoulos C: Airway lesions caused by prolonged intubation with standard and with anatomically shaped tracheal tubes. A post-mortem study. *Acta Anaesthesiol Scand* 1986;30(5):366-373.
15. Brodsky MB, Gonzalez-Fernandez M, Mendez-Tellez PA, et al.: Factors associated with swallowing assessment after oral endotracheal intubation and mechanical ventilation for acute lung injury. *Ann Am Thorac Soc* 2014;11(10):1545-1552.
16. Hedden M, Ersoz CJ, Donnelly WH, et al.: Laryngotracheal damage after prolonged use of orotracheal tubes in adults. *JAMA* 1969;207(4):703-708.
17. Gelbard A, Francis DO, Sandulache VC, et al.: Causes and consequences of adult laryngotracheal stenosis. *Laryngoscope* 2015;125(5):1137-1143.