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ENT

KEY WORDS: Bacteria, Tracheostomy, Postoperative, Infection, Surgery, Intubation.

A CROSS-SECTIONAL STUDY OF BACTERIAL FLORA OF LOWER RESPIRATORY TRACT DURING AND AFTER A WEEK OF TRACHEOSTOMY IN TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Introduction: Tracheostomy is used to describe the creation of an opening on the skin surface which leads into the trachea playing a pivotal role in airway management. **Objective:** The objective of this study was to find out bacterial flora of lower respiratory tract during and after a week of tracheostomy in tertiary care teaching hospital. **Material and Methods:** This cross-sectional study done on 80 patients of either gender going for tracheostomy at Government Medical College, Saharanpur. **Results:** Our study revealed male predominance over female. Patient with age group of 30-39 (26.25%) were more in numbers going for tracheostomy. The most common diagnosis was head & neck surgery (32 cases). Most common indication for tracheostomy was upper airway obstruction (49 cases). 7.5% of bacteria were present on Day 0 while 80% of bacteria were present on Day 7. **Conclusion:** Colonization of respiratory tract post-tracheostomy is very much likely to occur and monitoring of patients with regular tracheal aspirate culture is the most important investigation to identify it. Tracheal colonization present at the time of tracheostomy is not significant and does not significantly correlate with the tracheal colonization post tracheostomy.

INTRODUCTION

Tracheostomy is used to describe the creation of an opening on the skin surface which leads into the trachea playing a pivotal role in airway management.[1] Being a surgical procedure, it is not without complications. It is one of the oldest surgical procedures but still Post-tracheostomy lower respiratory tract infection exist very commonly in the current era.[2] Tracheostomy has been practiced for centuries for the relief of respiratory tract obstruction. Its use has increased very markedly since the introduction of intermittent positive pressure respiration (I.P.P.R.) in the treatment of poliomyelitis.[3] Indications for tracheostomy can be broadly outlined as respiratory obstruction, respiratory failure, respiratory paralysis, retained secretions and reduction of dead space.[4]

It has several advantages like improved physical and psychological comfort, decreased risk of inadvertent extubation, accelerated weaning from mechanical ventilation, decreased time of ICU stay before transfer to step-down facilities along with reduced risk of developing ventilator-associated pneumonia.[5,6] It facilitate weaning by reducing dead space and airway resistance, and by improving secretion clearance. This reduces the likelihood of tube obstruction by insisted mucus, makes the patient more comfortable, requiring less sedation and reducing the likelihood of aspiration through improved glottic function.[7]

The normal trachea is protected from bacterial colonization, so that the trachea individuals harbors either no bacteria or oral flora in sparse numbers.[8] These defense mechanisms are partially bypassed following a tracheostomy and direct exposure of the lower airways to the pathogens may occur. Colonization by the hands of the healthcare workers increases the risk of nosocomial colonization during suctioning, manipulation of the ventilator circuits and bronchoscopy.[10,11] Bacterial colonization of the oropharynx followed by aspiration of contaminated oropharyngeal secretions and leakage around the endotracheal tube in to the lower airways also results in colonization of the lower respiratory tract. The presence of an invasive medical device (Endotracheal tube & Tracheostomy tube) is an important contributor to the colonization of the oropharynx and the tracheobronchial tree.[12]

Tracheo-bronchitis is common in patients with tracheostomy and observed rates of 60% have been reported in two adult studies.[13] Hence with an aim to find out the nature of bacterial flora this study was planned out to find antibacterial sensitivity of bacterial flora in lower respiratory tract during and after a week in patients going for tracheostomy.

MATERIAL AND METHODS

This cross-sectional study was done at Government Medical college, Saharanpur, India following approval from Institutional Ethics Committee. The duration of the study was 06 months from August 2019 to January 2020. A total of 80 patients were enrolled for the study after straining them through inclusion and exclusion criteria.

Inclusion criteria

1. All patients of either gender between the age group of 20 and above.
2. Patients undergoing tracheostomy in preintubated in ICU and without Pre –intubation.
3. All the patients undergoing tracheostomy irrespective of Indications.
4. Patients who were willing to give written informed consent.

Exclusion criteria

1. All patients of either gender below the age group of 20.
2. Those patients who had undergone emergency tube change at night were excluded from the study because of inadequate time to collect the sterile sample in emergency.
3. Patients admitted for known infective conditions of the chest and underwent tracheostomy.
4. Community acquired pneumonia, TB & patients who developed lung infection during stay at hospital and subsequently underwent tracheostomy.
5. Ventilator associated pneumonia, Nosocomial Pneumonia.
6. Patients who were not willing to give written informed consent.

Thus after applying the exclusion criteria 80 patients (68 males and 12 female subjects) were finally included in the study. The patients were selected consecutively and were included once they met the inclusion criteria. Data including primary diagnosis, indication for tracheostomy and intubation status prior to tracheostomy was noted.

Methodology

Open surgical tracheotomy was performed in the major OT of our institutions under strict aseptic precautions. During the surgery, just after tracheotomy, a sterile suction catheter was introduced into the trachea and tracheal suctioning was done to clear the secretions. Using aseptic precautions, the tip of the suction catheter was cut and placed in a sterile container. The container which was sealed and transported to the microbiology lab for bacteriological analysis. This was labelled as Day 0 culture.

Standard post tracheostomy care including regular tracheobronchial suctioning using separate sterile suction catheters, 2 hourly deflation of the cuff for 10 min to reduce the risk of tracheal necrosis and granuloma, Stomal dressing, provision of humidified air were done for all patients post-surgery. Tracheostomy tube change was done every 2-4 days after tracheostomy under strict aseptic conditions. On the seventh post-operative day, tracheal suctioning was done with a sterile suction catheter, its tip cut, put in a sterile container and send for bacteriological analysis. This was the Day 7 culture. Bacterial Cultures were done and the isolates were identified using grams staining and standard biochemical reactions.

Statistical Methods

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD and results on categorical measurements are presented in Number (%). Chi-square test has been used to find the significance of study parameters on categorical scale between two or more groups. P value <0.05 were considered statistically significant.

RESULTS

Following result was obtained during the study period.

During the study Period, out of 80 Patients undergoing for tracheostomy it was observed that 68 (85%) were Male whereas 12(15%) Patients were female as depicted in figure no 1.

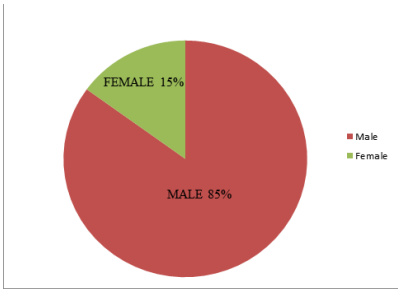

Fig 1: Gender Distribution of Patients

- Our study results revealed that out of 80 Patients, it was observed that at majority of Patients were in the Age group of 30-39 (26.25%) followed by Age group of >70 (22.50%) while Patients with age group of 60-69 was minimum (8.75%). as represented in Table no 1. In our study at government hospital 2 was 4.09, d.f was 1 and p value was 0.0581, which indicates that there was no association between age group and gender while mean age group was Mean ± SD: 61.12±19.35

Table 1: Gender wise Age group distribution of Patients with Tracheostomy (n=80)

GOVERNMENT HOSPITAL			
Age group(years)	Patients		Total (%)
	Male (%) (n=68)	Female (%) (n=12)	
20-29	10 (30.23)	02 (27.34)	12 (15.00)
30-39	18 (23.25)	03 (29.68)	21 (26.25)
40-49	11 (6.86)	02 (19.53)	13 (16.25)
50-59	08 (16.86)	01 (11.71)	09 (11.25)
60-69	05 (16.86)	02 (16.86)	07 (8.75)
>70	16 (16.86)	02 (16.86)	18 (22.50)
Total	68 (100)	12 (100)	80 (100)
Grand Total (%)	85.00	15.00	80
X^2= 4.09 d.f =1 p= 0.0581 (Mean ± SD: 61.12±19.35)			

- In our study it was observed that most common diagnosis for tracheostomy was head and neck malignancy which constituted around 32 cases followed by Deep neck abcess (16 cases), Cerebrovascular accident (13 cases) while bilateral vocal cord palsy was diagnosed in only 1 cases as depicted in figure no 2.

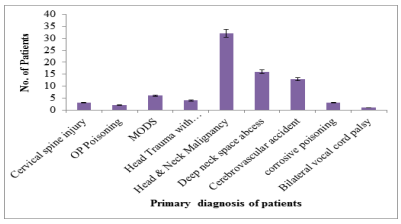

Fig 2- Diagnosis of patients

- Similarly our results revealed that most common indication for tracheostomy was upper airway obstruction constituting 49 cases followed by head and neck surgery (22 cases), while prolonged intubation was indicated in less no patients for tracheostomy i.e only 9 cases as depicted in figure no 2.

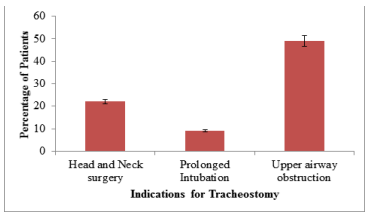

Fig 3- Indications for Tracheostomy

- On bacteriological analysis our study report revealed that Bacterial growth pattern on Day 0 culture were absent in 74 cases while Bacterial growth were presented in 6 cases which constituted E. coli in 3 cases, Acinetobacter baumanni in 2 cases and Klebsiella pneumoniae in 1 cases as depicted in table no 2.

Table 2: Bacterial growth pattern- Day 0 culture

BACTERIAL GROWTH	FREQUENCY (n=80)	Percentage (%)
Absent	74	92.50
PRESENT	06	
Acinetobacter baumanni	02	2.5
Klebsiella pneumoniae	01	1.25
E. coli	03	3.75
Total	80	100

- Similarly, the bacteriological analysis report revealed that Bacterial growth pattern on Day 7 culture were absent in 16 cases while Bacterial growth were present in 64 cases which constituted Klebsiella as the most bacteria (25%) cases and followed by Acinetobacter baumanni (21.25%),

Pseudomonas aeruginosa (13.75%), Staphylococcus aureus (11.25%) while the least commonly observed bacteria was Enterobacter & Coagulase negative Staphylococcus (1.25%) as depicted in table no 3.

Table 3: Bacterial growth pattern- Day 7 culture

BACTERIAL GROWTH	FREQUENCY (n=80)	Percentage (%)
Klebsiella	20	25
Acinetobacter Baumanni	17	21.25
Pseudomonas aeruginosa	11	13.75
Staphylococcus aureus	09	11.25
Diphtheroids	02	2.5
Enterobacter	01	1.25
Citrobacter	03	3.75
Coagulase negative Staphylococcus	01	1.25
No growth	16	20
Total	80	100

On comparison of bacterial growth in tracheal suction between Day 0 and Day 7 there was significant variation regarding the presence of bacteria on day 7 in comparison to day 0 which was statistically significant as depicted in table no 4.

Table 4: Comparison of day 0 with day 7 culture

BACTERIAL GROWTH IN TRACHEAL SUCTION CATHETER TIP SAMPLE CULTURE	ABSENT		PRESENT		P Value
	Frequency	Percentage (%)	Frequency	Percentage (%)	<0.002*
Day 0	74	92.5	06	7.5	
Day 7	16	20	64	80	

*P value less than 0.05 is considered significant

DISCUSSION

The normal trachea is protected from bacterial colonization, and in healthy individuals trachea is considered sterile with no bacterial colonisation.[8] Tracheostomy, bypassing the natural barriers, eliminates the filtering mechanisms of the upper airways, reduces the effectiveness of the cough reflex, and interferes with glottic closure which may all contribute to bacterial colonisation in these patients. This study is a qualitative assessment of the tracheal flora in patients with tracheostomies.

The present study reports revealed that out of 80 patients going for tracheostomy Males (85%) were predominant than female (15%) which almost similar to the findings of Aswin Mukundan et al who also reported male predominance in their study.[14] One of the most obvious reason for male predominance could be due to because they are more prone to cerebrovascular accident along with cancer because of tobacco eating habits. Similarly our study reports revealed that patients with middle aged group were mainly going for tracheostomy which accounted 26.25 % for the age group of 30-39, 16.25% for the age group of 40-49 while old age group constituted around 22.50% for the age group of >70 which could be because of the fact that old age group patients are diagnosed more with carcinoma and respiratory problems. Our findings were in concordance with the findings of Aswin Mukundan et al.[14]

In our study most common diagnosis was head and neck malignancy (32 cases) followed by Deep neck space abcess (16 cases) while least commonly diagnosed case was bilateral vocal cord palsy. Similar findings were observed in the study done by Aswin Mukundan et al[14] & Hemanth Rao M et al[15] who reported CNS system as most common involvement. Our study result revealed most common indications for tracheostomy was Upper airway obstruction which constituted 49 cases. Not much more of the study has been done to reveal the indications of tracheostomy. Our study revealed that bacterial growth on day 0 was only 7.5% while bacterial growth on day 7 was only 80% which was statistically significant. The most common bacteria was Klebsiella (25%) followed by Acinetobacter Baumanni (21.25%) while least found bacteria was Enterobacter (1.25%). These findings were contradictory to the findings of Aswin Mukundan et al[14] & Panduranga m kamath et al[16] who reported pseudomonas aeruginosa as the common found bacteria.

CONCLUSION

Colonization of respiratory tract post-tracheostomy is very much likely to occur and monitoring of patients with regular tracheal aspirate culture is the most important investigation to identify it. Patients on tracheostomy therapy are at high risk for contracting lower respiratory tract infections which is predominantly due to Gram Negative Bacilli like *Pseudomonas aeruginosa, Klebsiella pneumonia.* Factors causing colonisation are many, but it is important for us as clinicians to identify this emergence early and treat the patients promptly. This is most important than ever in this era of multi resistant strains of bacteria. Oropharyngeal colonization does not significantly correlate with the colonization of the trachea after tracheostomy. Tracheal colonization present at the time of tracheostomy is not significant and does not significantly correlate with the tracheal colonization post tracheostomy.

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