

# Clinicobacteriological profile of tracheostomy wound site

Divya H R<sup>1</sup>, Swetha M<sup>2\*</sup>, Veenapani M K<sup>3</sup>, Anuradha K<sup>4</sup>

{<sup>1</sup>Assistant Professor, <sup>3</sup>Professor and HOD, Department of ENT}, {<sup>2</sup>Assistant Professor, <sup>4</sup>Professor and HOD, Department of Microbiology}, Mysore Medical College and research institute, Mysore, Karnataka, INDIA.

Email: [drrajithks25@gmail.com](mailto:drrajithks25@gmail.com), [swethasada@yahoo.com](mailto:swethasada@yahoo.com)

## Abstract

**Aims and Objectives:** To study the pattern of bacterial colonization in the oropharyngeal and tracheostomy wound site on the first and third day of hospitalization. **Materials and Methods:** All those subjects who required tracheostomy for various reasons were included in the study. A detailed history, clinical examination, treatment data and underlying comorbid illnesses were collected. Samples from oropharynx and tracheostomy wound site were collected from 30 patients on the first and third day using sterile cotton swabs. Swabs will be inoculated onto blood agar and MacConkey agar and organisms were identified. **Results:** The study included 30 patients who underwent tracheostomy. Commonest condition requiring tracheostomy was OP poisoning followed by trauma. Acinetobacter and klebsiella were the commonest organisms isolated from the tracheostomy stoma site on the first and third day of procedure, MRSA growth was more on third day But was not found to be statistically significant. Acinetobacter and klebsiella were the commonest organisms isolated from the throat on the first day and Pseudomonas, klebsiella and MRSA were the commonest organisms isolated from the throat on the third day, But was not found to be statistically significant. **Conclusion:** Pathogens isolated from swabs of stoma site had no changes when compared on first and third day of the procedure, so single swab can be taken on third day to identify the pathogen. Swabs from stoma helps in detection of specific pathogen so that corresponding antimicrobial agent can be administered to the subject.

**Key Words:** Tracheostomy wound, Oropharynx, Bacteria.

## \*Address for Correspondence:

Dr. Swetha M, No – 44, Vishwamanava double road, Kuvempu Nagar, Mysore, 570009, Karnataka, INDIA.

Email: [swethasada@yahoo.com](mailto:swethasada@yahoo.com)

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## INTRODUCTION

Tracheostomy is a channel between the trachea and the skin in the midline of neck. It is commonly done in ventilator dependent patients in ICU, to bypass an obstructed airway and lastly to remove secretions from tracheobronchial tree.<sup>1</sup> The standard tracheostomy (ST) technique was first described in 1909,<sup>2</sup> it is one of the most frequently performed operation in critically ill patients.<sup>3</sup> Though tracheostomy provides many benefits

for long term ventilator dependent patients, it has also been associated with some complications such as bleeding, pneumothorax, stoma infection etc.<sup>4</sup> Wound infection is related to tissue destruction by surgical procedure. The incidence of tracheostomy stoma infection varies among different institutes.<sup>5</sup> Several studies have shown that trachea becomes rapidly colonized with numerous bacterial species following tracheostomy.<sup>6</sup> At the beginning of patients hospitalization, oral normal flora and pathogen of community acquired pneumonia are the most predominant, but in patients with advanced disease who are also hospitalized for more than 5 days, gram negative bacilli and staphylococcus aureus widely colonise in upper respiratory tract and oropharynx.<sup>7,8</sup> Therefore hospitalization causes the colonization process of pathogenic bacteria existing in patients oropharynx regardless of using the broad spectrum antibiotics. Recognition of these bacteria, the way in which microbial flora changes in different times of illness can give a general view on the etiology of such infection.<sup>9,10</sup>

## MATERIALS AND METHODS

The present prospective study was carried out in Krishna Rajendra hospital, Mysore Medical College and Research Institute for a period of 6 months.(from January 2017 to October 2017) A total number of 30 subjects who required tracheostomy for various reasons were enrolled in the study. Subjects below 18 yrs of age and those having congenital anomalies of upper respiratory tract were excluded from the study. The study was approved by local ethical committee. A detailed history of the subject regarding demography(age, sex, occupation),underlying illness with comorbidities and treatment data (antimicrobial therapy) were recorded. A complete clinical examination was done. After taking informed consent from patient’s nearest relatives, tracheostomy was performed under aseptic precautions. Open surgical technique was done. A vertical or horizontal skin incision measuring 2-3cm was made midway between the sternal notch and thyroid cartilage.<sup>11,12</sup> After division of the skin and underlying platysma, blunt dissection is continued longitudinally. Separation of the strap muscles and lateral retraction exposes trachea and overlying thyroid isthmus. The isthmus may be mobilized and retracted superiorly or divided.<sup>13</sup> Nearby vessels can bleed substantially and hemostasis is achieved with electrocautery or suture ligation. Pretracheal fascia and fibrofatty tissue are cleared. Lateral tracheal stay sutures at third or fourth rings can provide lateral traction and stabilization and help to define the stoma.<sup>11</sup> Before opening the trachea the choice of tracheostomy tube should be made. In general incision was made from second to fourth tracheal rings. A vertical midline incision between silk stay sutures, placed either side of the incision line is ideal.<sup>14</sup> Appropriate sized cuffed portex tracheostomy tube is placed in stoma. Dressing and Tracheostomy care is done as routine. Using sterile cotton swabs, samples from throat and tracheostomy wound site was collected from each subject on the first and the third day of tracheostomy. Samples were then inoculated onto blood agar and Mac Conkey agar which was incubated aerobically for 24 hours at 35<sup>0</sup>C. The plates were read the following day but extended to 48 hours if there was no bacterial growth within 24 hours. The bacterial isolates were identified and confirmed using standard microbiological methods.

**Statistical Analysis:** Data was entered in MS excel sheet and analysis was done using SPSS 17.0 software. student ‘t’ test was used for determining significant difference between samples.

## RESULTS

The study was carried out on 30 patients who underwent tracheostomy.

**Table 1:** Age and sex distribution of cases

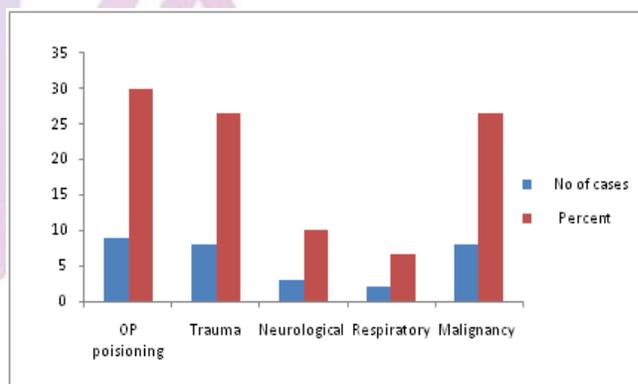
Age group (years)	Males		Females		Total	
	No	Percent	No	Percent	No	Percent
≤20	0	0	1	25	1	3.3
21-30	3	11.5	0	0	3	10
31-40	3	11.5	2	50	5	16.6
41-50	10	38.4	1	25	11	36.6
51-60	2	7.6	0	0	2	6.6
>60	8	30.7	0	0	8	26.6
<b>Total</b>	<b>26</b>	<b>100</b>	<b>4</b>	<b>100</b>	<b>30</b>	<b>100</b>

In our study, age of the patients ranged from 18 years to 85 years and majority were males and in the age group 41-50 years.

**Table 2:** Underlying causes requiring tracheostomy in our study

Underlying cause	No of cases (30)	Percent
OP poisoning	9	30
Trauma	8	26.6
Neurological	3	10
Respiratory	2	6.6
Malignancy	8	26.6

In our study commonest condition requiring tracheostomy was OP poisoning followed by trauma.



**Figure 1:**

**Table 3:** Isolates obtained from stoma

Organisms	D1	D3
Acinetobacter baumani	10	10
Pseudomonas aeruginosa	6	6
Escherichia coli	5	5
Klebsiella pneumoniae	10	10
Enterobacter sps	-	-
Providentia sps	-	-
Proteus mirabilis	1	1
Citrobacter sps	1	-
Staphylococcus aureus	1	2
MRSA	1	5
No growth	9	2

Acinetobacter and klebsiella were the commonest organisms isolated from the tracheostomy stoma site on the first and third day of procedure. There was increase in

MRSAgrowth on the third day compared to day one, but the difference was not found to be statistically significant using student 'T' test.

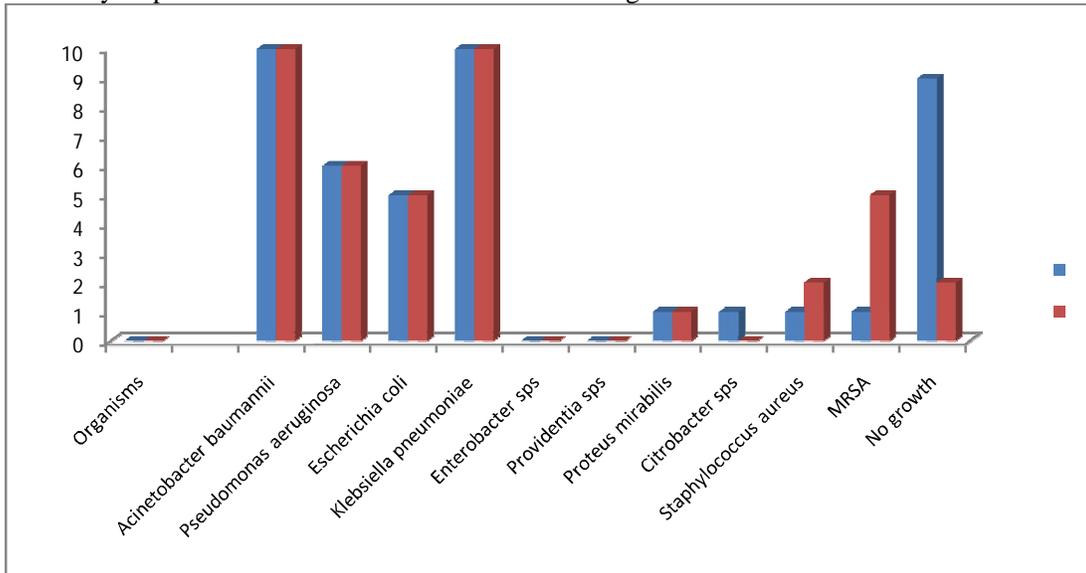


Figure 2:

Table 4: Isolation of organisms in throat swab

Organisms	D1	D3
Acinetobacter baumannii	9	3
Pseudomonas aeruginosa	4	9
Escherichia coli	2	3
Klebsiella pneumonia	10	9
Enterobacter sps	1	1
Providentia sps	1	-
Proteus mirabilis	2	1
Citrobacter sps	-	-
Staphylococcus aureus	1	-
MRSA	2	9
No growth	6	1

Acinetobacter and klebsiella were the commonest organisms isolated from the throat on the first day and Pseudomonas, klebsiella and MRSA were the commonest organisms isolated from the throat on the third day of procedure. But the difference was not found to be statistically significant.

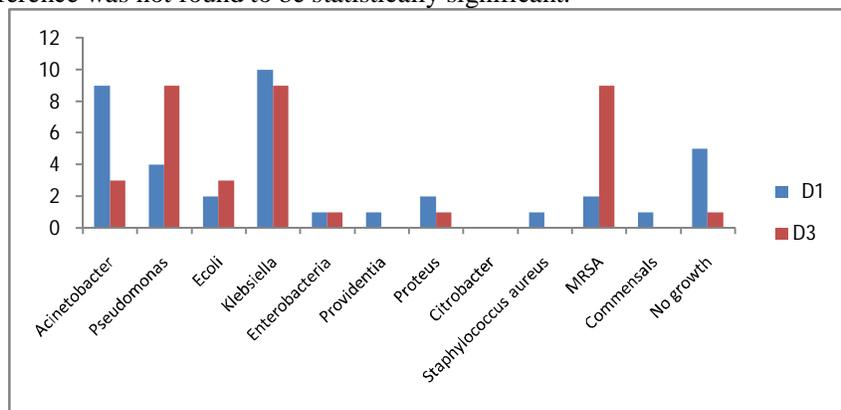


Figure 3:

## DISCUSSION

The normal trachea is protected from bacterial colonization, so that the trachea of healthy individuals harbors either no bacteria or oral flora in sparse numbers.<sup>15,16</sup> Tracheostomy eliminates the filtering mechanisms of the upper airways, reduces the effectiveness of the cough reflex, and interferes with the glottis closure to the extent that aspiration occurs on regular basis.<sup>17,18</sup> Wound infection is one of the tracheostomy complications and can be severe enough to cause patient mortality.<sup>19</sup> The tracheostomy site is constantly exposed to contaminated oral/pulmonary secretions, making it an ideal site for bacteria to initiate an infection. Infections can be local and minor, or much more widespread and life-threatening. Several different types of infections related to tracheostomy are reported in the literature, some are much more common, while others are unique and rare.<sup>20,21,22</sup> Stomal infection, including cellulitis, usually occurs after the first 24 hours and is a common complication. It occurs in approximately 5% of tracheotomies.<sup>20</sup> These minor infections can be the beginning of more severe and aggressive infections such as necrotizing infections and osteomyelitis. Prevention begins with aggressive and timely wound care, frequent dressing changes, regular tube changes, and humidification of inspired air.<sup>21</sup> Trivial stomal infection can be managed locally. However, wound infection can extend into the mediastinum, causing mediastinitis and life-threatening sepsis that necessitate administration of broad-spectrum antibiotics.<sup>23</sup> The main findings of the present study are Organisms isolated from the stoma site after the tracheostomy on the first day and third day had no statistically significant differences. *Acinetobacter* and *klebsiella* were the commonest organisms isolated from the tracheostomy stoma site on the first and the third day of procedure. Stoma site infection is common in hospitalized patients with a frequency that parallels the degree of underlying illness in a given individual. If the subjects had undergone tracheostomy operation, their wound should be cared intensively or percutaneous dilatational tracheostomy should be chosen to reduce the incidence of stoma infection.<sup>19</sup> We had also collected the throat swab from same subjects who had undergone tracheostomy. Organisms colonizing the oropharynx of patients in the intensive care unit (ICU) play an important role in the development of nosocomial infection. Thus, routine throat swab specimens of ICU patients are recommended to screen for potential pathogens.<sup>24</sup> *Acinetobacter* and *klebsiella* were the commonest organisms isolated from the throat on the first day and *Pseudomonas*, *klebsiella* and MRSA were the commonest organisms isolated from the throat swabs on the third day of procedure, but there was no statistically significant

difference. Pathogens detected from throat swabs paralleled those organisms isolated from stoma site in our study. Isolates of stoma site and throat swabs showed that there was little correlation between the bacteriologic findings from the tracheostomy wound site and oropharynx. The throat swab taken at admission may indicate patients at risk for infection. However, throat cultures taken routinely thereafter do not provide additional information that is diagnostically or therapeutically helpful. Therefore, throat swab cultures are not necessary for routine bacteriological monitoring.<sup>24</sup> In conclusion pathogens isolated from swabs of stoma site had no changes when compared on first and third day of the procedure, so single swab can be taken on third day to identify the pathogen. Swabs from stoma helps in detection of specific pathogen so that corresponding antimicrobial agent can be administered to the subject.

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