

## ORIGINAL ARTICLE

**Short-Term Complications of Emergency and Elective Tracheostomy; A Comparative Study**Zaheer Ul Hassan<sup>1</sup>, Farhan Akbar<sup>2</sup>, Tarique Ahmed Maka<sup>3</sup>**ABSTRACT****Objective:** To compare short-term complications in elective and emergency tracheostomy.**Study Design:** Comparative cross sectional.**Place Duration of Study:** The study was conducted in the Department of ENT, Head and Neck Surgery at Combined Military Hospital (CMH) Peshawar from 21<sup>th</sup> October 2018 to 20<sup>th</sup> October 2019.**Materials and Methods:** In this study 60 patients undergoing tracheostomy were included. Patients were divided into two groups, each with 30 participants. Patients in group A had elective whereas group B had emergency tracheostomy. Short term complications including hemorrhage, surgical emphysema, cardiac arrest and stomal infection were noted in both groups. Chi-square test was applied as test of significance to compare the two groups.**Results:** Emergency tracheostomy is associated with significantly increased risk of hemorrhage and surgical emphysema ( $p$  value being  $<0.05$ ). There was no statistical difference in occurrence of stomal infection and cardiac arrest between the two groups.**Conclusion:** Tracheostomy performed in emergency is fraught with complications. Our study validates the fact that emergency tracheostomy is associated with significantly increased risk of postoperative hemorrhage and surgical emphysema.**Key Words:** *Cardiac Arrest, Hemorrhage, Stomal Infection, Surgical Emphysema, Tracheostomy.***How to cite this:** Hassan Z, Akbar F, Maka TA. Short-Term Complications of Emergency and Elective Tracheostomy; A Comparative Study. *Life and Science*. 2021; 2(2): 54-58. doi: <http://doi.org/10.37185/LnS.1.1.117>This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.**Introduction**

The term tracheostomy appeared in literature in the 16th century. In 1546, Brasavola performed tracheostomy in a case of enlarged tonsils to relieve airway obstruction. The word tracheostomy was first time used by Heister in 1739. The procedure became popular in 19th century. In 1860, the New Sydenham Society published the yearbook, enclosed some 38 papers dedicated to indications and techniques of

tracheostomy.<sup>1</sup> In 1909, Chevalier Jackson refined in detail the technical aspects of the tracheostomy.<sup>2</sup> With the evolution of intensive care units, along with the emergence of intermittent positive-pressure ventilation, a new indication for tracheostomy evolved. Earlier to this development, the tracheostomy used to be as an emergency management for upper-airway obstruction.<sup>3</sup> Indications of tracheostomy can be divided into five main groups; upper airway obstruction, respiratory failure, respiratory paralysis, retained respiratory secretions, and reduction in dead space.<sup>4</sup> Tracheostomy is an emergency procedure and has various complications which are generally preventable, if the procedure is prudently performed together with strict post-operative management.<sup>5</sup> During tracheostomy, the most common risks includes bleeding, airway loss, injury to adjacent structures while intraoperative bleeding can be fatal. Post tracheostomy, infection and subcutaneous abscess also occur.<sup>6</sup>

<sup>1</sup>Department of ENT

Combined Military Hospital (CMH), Peshawar

<sup>2</sup>Department of ENT

Combined Military Hospital (CMH), Rawalpindi

<sup>3</sup>Department of ENT

Combined Military Hospital (CMH), Mangla

Correspondence:

Dr. Tarique Ahmed Maka

Department of ENT

Combined Military Hospital (CMH), Mangla

E-mail: [tariqmaka@yahoo.com](mailto:tariqmaka@yahoo.com)

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The complications of tracheostomy can be divided into early, intermediate and delayed types. Early complications include primary hemorrhage, injury to the trachea & larynx, injury to para-tracheal structures, apnea, air embolism, cardiac dysrhythmias and cardiac arrest. Intermediate complications include subcutaneous emphysema, pneumothorax & pneumomediastinum, wound infection, tube displacement, tube blockage/crusts, secondary hemorrhage, tracheal necrosis and swallowing problems. Late complications are difficult decannulation, granuloma formation, trachea-cutaneous fistula, tracheoesophageal fistula, laryngotracheal stenosis and tracheostomy scar.<sup>7-8</sup>

In our tertiary care center tracheostomy is a common procedure and this study is designed at comparing short term complications of emergency and elective tracheostomy. Short term complications are defined as early post procedural complications occurring up to 7 days after surgery.<sup>9</sup>

The ideal tracheostomy tube can be stiff enough to sustain an airway, however supple to limit tissue injury and maximize patient ease. The tracheostomy tubes can be classified into various types according to material (metallic or nonmetallic), presence or absence of cuff and fenestrations.<sup>10</sup>

Tracheostomy care must be carried out through humidification, moisture exchangers, hot-water humidifier, cold-water humidifiers, heat and nebulization, suctioning and care of tracheostomy cuff.

### Materials and Methods

This prospective comparative study was conducted from 21st October 2018 to 20th October 2019. Approval from 'Institutional Ethical Committee' was obtained. After informed consent, sixty patients undergoing tracheostomy were observed. Sample was done by the non-probability convenience sampling technique. All the patients undergoing tracheostomy in the study duration were included. Patients were allocated into two groups, group 'A' with patients undergoing elective tracheostomy and group 'B' that underwent emergency tracheostomy. Patients over 14 years were included in the study. Patients of both genders were included. All patients with bleeding diathesis and nasogastric tube in place prior to tracheostomy were excluded.

Data was analysed on SPSS version 15. Continuous variables like age, height and weight were presented by mean and standard deviation (SD). Categorical variables like gender, severity of symptoms and hemorrhage were presented in frequency and percentage.

Chi-square test was applied to compare the frequency of hemorrhage, surgical emphysema, stomal infection and cardiac arrest in both groups to determine whether the difference was of statistical significance or not. *P* value of less than 0.05 was taken as significant.

All the elective tracheostomies were performed with the following protocol: a 6 cm horizontal incision was made mid-way between the cricoid cartilage and supra-sternal notch, thyroid isthmus was retracted upwards and tracheal stoma was made at 2nd & 3rd tracheal rings by making a window. Portex Blue line cuffed tube of appropriate size was used in all cases. Measures include limiting the stomal, avoiding cartilage fracture, preventing mechanical irritation of the tube on the trachea, preventing infections and keeping cuff pressure to 20 mmHg or less. Flanks of the tracheostomy tube were stitched with the neck skin with silk 2/0 thread and neck tapes tied. Neck wound was closed in two layers.

Postoperative care includes monitoring in the ICU, empiric antibiotics and empiric steroids to minimize inflammation. Cuff was inflated for first 12 hours and was deflated 5 minutes every hour during this period. Suction of the tracheostomy tube was meticulously done every 15 minutes for first 24 hours and then as required. Humidification of the inspired air was done by placing wet gauze over the tracheostomy tube. First change of the tracheostomy tube was done on the 4th post-operative day. New disposable tube was used for every tube change. Surgical wound was dressed with a sterile gauze measuring 5 mm in thickness and 2 cm in length and width, twice daily. Swab for culture and sensitivity were sent on the 3rd and 7th post-operative day if pus around the stoma was observed. Emergency tracheostomy was performed as the situation permitted. Same post-operative protocol was followed as mentioned above for elective tracheostomy.

Hemorrhage was measured by counting the number of gauze pieces soaked post-operatively during first

24 hours. 2 X 2 cm gauze pieces were used. Soaking of 2 to 3 gauze pieces was considered mild hemorrhage, 4 to 6 was considered moderate hemorrhage and 7 to 8 was taken as severe hemorrhage. Surgical emphysema was measured by observing for swelling and crepitus in the neck. Stomal infection was studied by checking for presence and absence of pus from the stoma site and confirming it with culture and sensitivity report. Strict vital monitoring was carried out during the procedure and cardiac arrest was observed that was successfully resuscitated. Complications of tracheostomy among the two groups were studied on the operation day, first post-operative day, third post-operative day and on the seventh post-operation day.

**Results**

The total number of participants were sixty with males n=47 (78.33%). The patients were included varied from 14 to 72 years of age. Mean for age was 43 years and Standard Deviation was 5.7 as shown in table 1.

	Male	Female
Group A	24	6
Group B	23	7

The frequency of hemorrhage is shown in table 2.

	Mild	Moderate	Severe
Group A	24 (80%)	5 (16.6%)	1 (3.3%)
Group B	14 (46.6%)	10 (33.3%)	6 (20%)
P-value	< 0.05	< 0.1	< 0.05

Mild: Soakage of 2 to 3, Moderate: 4 to 6 and Severe: soakage of 7 to 8 gauze pieces

Among the 30 patients in Group A there was no case of cardiac arrest, whereas only 1 out of 30 patients undergoing emergency tracheostomy (group B) had cardiac arrest during surgery (table 3).

	Absent	Present	P-Value
Group A	30(100%)	0 (0%)	< 0.1
Group B	29 (96.6%)	1(3.4%)	

Surgical emphysema was reported in n= 2(6.6%) patients in group A and n= 12(40%) patients in group B as shown in table 4

Stomal infection occurred in 5(16.6%) patients in

**Table 4. Percentage of Surgical Emphysema**

	Absent	Present	P-value
Group A	28 (93.3%)	2(6.6%)	< 0.05
Group B	18 (60%)	12(40%)	

group A, whereas 7(23.3%) patients in group B as shown in table 5.

Chi square test was applied in both groups to test the

**Table 5: Percentage of Stomal Infection**

	Absent	Present	P-value
Group A	25(83.3%)	5(16.6%)	< 0.05
Group B	23 (76.3%)	7(23.3%)	

significance of hemorrhage, cardiac arrest, surgical emphysema and stomal infection. Statistical significance was found with mild and severe hemorrhage, cardiac arrest, stomal infection and surgical emphysema.

**Patient outcome**

In our study, one patient in group A with severe hemorrhage was reopened in operation theatre and a bleeding vein was ligated. The number of patients with severe hemorrhage taken back to the operation theatre in group B was six, four had bled from the thyroid isthmus, and two patients with severe hemorrhage were managed conservatively. However, mild hemorrhage was treated in all cases conservatively. The cases of surgical emphysema were managed conservatively in both groups by removing the suture's approximating the skin incision. One patient had gone into cardiac arrest in group B and was efficaciously resuscitated.

**Discussion**

Every surgical procedure has different types of complications and must be considered when evaluating the risks and benefits of a certain management plan. During tracheostomy, common short-term complications comprise hemorrhage, loss of airway and injury to adjacent structures.<sup>11</sup> The severity and frequency of these incidences depends on numerous factors including, experience, skill of the surgeon, patient physiologic factors and anatomic variations. Complications of this procedure have been decreased with developments in operational expertise and improvements in intensive care.<sup>12</sup> Comparison between emergency tracheostomy and elective tracheostomy has been

performed are limited as most of the studies are centered on comparing complications of percutaneous dilatational tracheostomy (PDT) and surgical tracheostomy.

In our study there was male predominance. Shahabi et al reported the same finding, with male female ratio 3:1. The rate of severe hemorrhage is 3% in group A and 20% in group B as compare to hemorrhage rate of 6%.<sup>13</sup> The reason is that Shahabi et al have given combine rate of primary hemorrhage in the emergency and elective tracheostomy whereas this study has calculated the rate of haemorrhage separately for emergency and elective tracheostomy.<sup>13</sup>

Freeman et al<sup>14</sup> have reported hemorrhage rate, surgical emphysema and stomal infection in elective tracheostomy as 4%, 5%, and 8% respectively. These findings are in agreement with our results. Muhammad et al<sup>15</sup> reported in their study minor hemorrhage occurring in 60% cases and major hemorrhage in 2% cases. The results of our study are similar where group A had 40% mild hemorrhage and group B had 80% patients with minor hemorrhage. Severe hemorrhage occurred in 1% patients of group A and 6% patients of group B.

Delgeurov<sup>16</sup> in a meta-analysis comprising of 10000 patients reported hemorrhage in 143 patients and cardiac arrest in only 3 cases. The obvious difference of the complications rates between this study and our study is large sample size and inclusion of non-randomized retrospective studies. The commonest complication was hemorrhage in this study, a fact validated in our study as well. Asmatullah et al<sup>17</sup> have studied on complications of emergency tracheostomy and described hemorrhage as the most common complication followed by surgical emphysema. Our study has similar findings yet the rates of these complications vary. The reason is all tracheostomies were performed by senior registrars and level III & IV residents whereas in their study all tracheostomies were performed by ENT specialists.

A tracheotomy is labeled as a clean contaminated wound. The criteria of infection of tracheostomy stoma depend on the individual study and the post-operative care available. However, Stauffer et al has documented the incidence rate of stomal infection to be as high as 36%.<sup>18</sup> Generally the incidence of the purulence and cellulitis has been described at 3 to

8%. The rate of stomal infection in our study was 6% in group A and 23% in group B. Stomal infection commonly reveals as an indolent infection, mild cellulitis or granulation tissue.

The rate of mild and severe hemorrhage was significantly different between group A and group B. This finding is consistent with results of Waldron et al.<sup>19</sup> However, these findings are contradictory to those of Goldenberg<sup>20</sup>, mainly because of the larger number of sample size. Surgical emphysema is seen as a common complication in emergency tracheostomy.<sup>16</sup> In our study the occurrence of surgical emphysema reached statistical significance between group A and group B. This finding is in contradiction to the findings of Waldron.<sup>19</sup> Ameye et al<sup>21</sup> reported that in emergency tracheostomy surgical emphysema does occur more frequently a finding that was confirmed in our study.

## Conclusion

Controlling the air way in an emergency situation has always challenged the intensivists and surgeons alike. Surgical tracheostomy, besides its complications, still remains the gold standard for securing a difficult air way. Developments of alternate methods of tracheostomy like percutaneous dilatational tracheostomy (PDT) and mini tracheostomy has led to discussion, regarding the safety and use of traditional tracheostomy.

Although emergency tracheostomy is associated with higher rates of short-term complications yet emergency tracheostomy is still the only definitive way of securing the airway where alternate methods have failed.

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