

Evaluation Of Early Complications Of Open Surgical Tracheostomy

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Date Submitted: 14/3/2017

Date Accepted: 18/4/2017

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Abstract

Background: Tracheostomy is a surgical technique that could be performed for either as an emergency or an elective indicated considerations, and it might associated with a number of complications, however the frequencies and severity of these complications will depend upon the intermingle of various contributing factors.

Objective: The aim of the study was to evaluate and analyze the frequency of various elements of early complications associated with open surgical tracheostomy component in our set up.

Patients and methods: A series of 112 consecutive open surgical tracheostomy procedures conducted at Al-Yarmouk Teaching Hospital from February 2016 to February 2017. The data collection were included the following parameters; emergency or elective tracheostomy procedures, and according to their particular indications, as well as were performed under general or local anaesthesia, all the fore mentioned data were evaluated and analyzed in correlation with the frequency and the severity of various elements of early complications.

Results: There were (63.4%) males and (36.6%) females, with mean age of 46.851 years, about (56.25%) were emergency tracheostomies, and (43.75%) were elective type, in (54.46%) of them the indication was to relief upper air way obstruction. The overall frequency of an early complications in emergency tracheostomy was (30.35%), and was (8.92%) in elective modality. The commonest early complications was bleeding (11.6 %), followed by tubal obstruction (8.03%).

Conclusion: The frequency of the overall early complications of open surgical tracheostomy was detected at higher rate in emergency than in elective procedures, also the most common element of the early tracheostomy complication encountered was bleeding and being primarily revealed in an emergency indicated tracheostomy, followed tubal obstruction with more existing frequency in elective tracheostomy cases

Key words: Tracheostomy, emergency, elective, early complications

INTRODUCTION

Tracheostomy is defined as a surgical procedure that necessitate an opening in the wall of the trachea and exteriorising it to the skin of the anterior neck,⁽¹⁾ and there was an evidences that an first attempts to performed this life saving method had been made by the ancient Egyptians in scriptural time as 3600 BC.⁽²⁾

Tracheostomy nowadays is a common surgical technique that is either as a conventional open surgical or percutaneous dilatational, elective or as an emergency procedure, used for multiple indications.⁽³⁾ The usual indications are to relief an upper air way obstruction, prolonged ventilation, as a part of other surgical procedure, as well as for removal of secretions (tracheobroncheal toileting).⁽⁴⁾

Currently, tracheostomy is considered as an affirmed surgical technique performed for securing the air way in critically ill patient who is in need of prolonged assisted ventilatory support.⁽³⁾

Along with any other surgical techniques, tracheostomy is not an exception, it might accompanied with a number of various complications, such complications are categorised as immediate complications which includes "anaesthetic complications, bleeding, apnoea, cardiac arrest, air embolism, and local damage", intermediate complications, such as "subcutaneous (surgical) emphysema, tubal occlusion or displacement, pneumomediastinum or pneumothorax, infection, dysphagia, tracheoarterial or tracheoesophageal fistulae, as well as tracheal necrosis", and late complications which may includes "tracheal stenosis, tracheocutaneous fistula, difficult decannulation, and disfiguring scar and keloid".⁽⁴⁾

The rates of these complications that were cited from various studies revealed it ranged from 4-31% for percutaneous dilatational tracheostomy, and 6-66% for the open surgical tracheostomy.⁽⁵⁾ However the majority of these complications can be avoidable through a meticulous awareness to each particular details of the surgical technique, and may be negligible if carried out by an experienced and efficient surgical team especially in non-complicated elective tracheostomy procedure,⁽⁶⁾ however it might raised up to 2-5 times more in cases of an emergency.⁽⁷⁾

The aim of the study was to evaluate and analyze the frequency of various elements of early complications associated with open surgical tracheostomy component in our set up.

PATIENTS AND METHODS

After the ethical and the scientific committee approval, a cross sectional prospective study enrolled a series of 112 consecutive open surgical tracheostomy procedures were performed by the ENT surgical team conducted by the specialized ENT surgeons or under their supervision, at Al-Yarmouk Teaching Hospital in a period from February 2016 to February 2017.

The data collection were included emergency or elective tracheostomy according to their indications either were performed under general or local anaesthesia, as well as depend upon the sort of the Portex tracheostomy tube was used (non-cuffed or cuffed tube), and the type of the surgical skin incision (vertical skin incision in emergency procedure and horizontal skin incision in elective type) was performed according to each particular indication.

For academic and analytic purposes, the early complications elements had been constituted of both immediate (per-operative) complications parameters and intermediate complications parameters within the first few days after the operation.

All the aforementioned data were evaluated and analysed in correlation with the frequency of various elements of early complications that might be detected as consequences of this surgical procedure.

The post operative tracheostomy care was carried out by the well trained ENT ward nursing staff, under the supervision of the ENT surgical team.

RESULTS

Among 112 patients aged from 15 to 74 years whom underwent open surgical tracheostomy procedures, there were 71 males (63.4%), and 41 females (36.6%), with mean age of 46.851 years, about half of them (56.25%) 63 patients had been subjected to emergency tracheostomy and the remaining 49 patients (43.75%) underwent elective type, while 73 (65.18%) of the cases were done under local anaesthesia, and the other 39 (34.82%) cases, the general anaesthesia was used.

According to each particular indication, about 61 (54.46%) tracheostomy procedures were performed for relief of upper air way obstruction, and 27 (24.2%) of them were done as a part of other surgical procedures, while the remaining 24 (21.42%) of the cases were performed for the need for prolonged and assisted ventilotry support, so only 51 cases (45.53%) were in need of a cuffed Portex tracheostomy tubes, while the non-cuffed tubes were used in the remaining 61 (54.47%) cases.

The commonest early complications detected was bleeding in 13 patients (11.6 %), followed by tubal obstruction in 9 patients (8.03%), the distribution of the various elements of early complications that had been detected to be associated with the tracheostomy procedure within the current study evaluation were shown in table 1.

Table 1: Distribution of elements of early tracheostomy complications among the patients sample

Elements of early complications	Number of patients	Percent
<i>Immediate complications</i>		
Bleeding	13	11.6%
Apnoea	2	1.78%
Local damage	7	6.25%
<i>Intermediate complications</i>		
Tacheostomy tube obstruction	9	8.03%
Surgical emphysema	4	3.57%
Infection	3	2.67%
Tracheostomy tube displacement	1	0.89%
Dysphagia	5	4.46%

The overall incidence of an early complications in emergency tracheostomy was (30.35%), while in elective procedure was (8.92%), and the most common element of an early complications detected in case of emergency tracheostomy was bleeding (84.61%), and in regard to elective procedure was tubal obstruction (44.46%), the correlation between the various elements of the immediate and the intermediate early associated complications with the different parameters of the components of the tracheostomy procedure such as the types of the surgical procedures such as an emergency or elective procedure, or according to each particular indications which included upper air way obstruction, and prolonged ventilation, or as a part of other surgical procedures, and also either they were done under local or general anaesthesia, all these study parameters were evaluated and detailed in table 2.

Table 2: Correlation of elements of early tracheostomy complications with various study parameters

Elements of early complications/number of patients	Types of procedures		Types of indications			Types of anaesthesia	
	Emergency	Elective	UAWO	PV	PoSP	Local	General
Immediate complications							
Bleeding/13	11 84.61%	2 15.38%	7 53.84%	5 38.46%	1 7.69%	10 76.92%	3 23.07%
Apnoea/2	2 100%	0 0%	1 50%	1 50%	0 0%	2 100%	0 0%
Local damage/7	6 85.71%	1 14.29%	3 42.85	0 0%	4 57.72%	5 71.42%	2 28.58%
Intermediate complications							
Tracheostomy tube obstruction/9	5 55.55%	4 44.46%	5 55.55%	1 11.11	3 33.34%	6 66.66%	3 33.34%
Surgical emphysema/ 4	4 100%	0 0%	3 75%	0 0%	1 25%	4 100%	0 0%
Infection/3	2 66.66%	1 33.34%	1 33.34%	0 0%	2 66.66%	3 100%	0 0%
Tracheostomy tube displacement/1	1 100%	0 0%	1 100%	0 0%	0 0%	1 100%	0 0%
Dysphagia/5	3 60%	2 40%	1 20%	1 20%	3 60%	3 60%	2 40%

UAWO=upper air way obstruction, PV= prolonged ventilation, PoSP= part of other surgical procedure

DISCUSSION

A numbers of an early complications associated tracheostomy had been reported in many literature, together with the description of various techniques and ways that aimed to minimized the occurrence of the frequencies of these morbidities, so the intention of the current study was targeted to formulating the prospective strategy, as endeavoured along with other researches,^(8,9) planning to avoiding or at least minimizing the incidence of these complications, as

well as for establishment an effective and beneficial management of tracheostomy complications both in emergency and elective procedures.

The overall early tracheostomy complications rate in the current study was 30.35% in emergency cases, and 8.92% in elective procedures, and these observations were in agreement with what had been reported in Muhammed R et al study,⁽³⁾ who concluded that early complications of emergency tracheostomy were

common than elective tracheostomy, although there were some variation in their percentages rates values, and this dissimilarity was attributed to the skilful and the experience of the different members of the conducted surgical team, together with varying and distinct nature of the individual indications in each study location.

The most common element of early tracheostomy complications detected in the current study was bleeding (11.6%), that defined as a bleeding source the cannot be controlled within few minutes as what could usually happened with any surgical procedure, and along with other study,⁽⁸⁾ it was considered as a significant amount of blood loss when it more than 20 ml in suction bottle, and its incidence was revealed more in emergency than in elective procedures, and this observation was agreed with several other international studies.^(3,8,10-14)

The most common sites of bleeding was detected either from the cut edges of the thyroid gland isthmus and the anterior jugular vein, which was managed by ligation or bipolar cauterization of these offending sources of the bleeding, and these observations and modalities of management was also noted by Rashid M et al,⁽¹⁴⁾ who reported in their study another method to avoidance of this blood vessels bleeding complication through "gentle blood vessels retraction in the surgical field", or the source of the minor bleeding in the current study was either from the edges of skin incision, where it stopped by the application of firm pressure packing over the skin edges, and this method was agreed by Prowse S and Kelly G study,⁽¹⁵⁾ or it might occurred during the procedure of the tracheostomy tube replacement, and this source of bleeding was also detected by Rohail A study.⁽¹²⁾

The most probable factors that contributed to this complications in our study were related to the nature of the pathologies which were mostly due to head and neck trauma emergencies attributed to various causes, that lead to difficult technical surgical dissection which resulted in an unambiguous operative field structures identification, also related to some anatomical structural variation, and definitely to the expertise of the operating surgical team.

It is worth to mention that bleeding during the tracheostomy procedure even it was of in mild form could be considered as life threatening condition when it impeded to recognition of the trachea or secured the air way, therefore it was essential to had immediate and active intervention to control the bleeding sources preceded by secured the airway methods, and thus

avoid the serious problems that attributed to blood aspiration.⁽¹⁶⁾

As generally accepted concept, if tracheostomy was performed under controlled situation, associated with careful and thorough attention to particular surgical details and the maintenance of bloodless surgical field throughout the surgery, the incidence of bleeding would be very low.⁽⁴⁾

Another element of early tracheostomy complication was apnoea and it detected in (1.78%) of cases. It usually in cases occurred when there was retaining of CO₂ in the air way that predisposed to "CO₂ narcosis" secondary to chronic upper air way obstruction, as in cases of laryngeal neoplasm, and then when an immediate and abrupt relief of an upper air way obstruction owing to the tracheostomy, this consequently lead to sudden CO₂ wash out, as a cause to the development of the apnoea.

Local damage as an immediate early tracheostomy complication had been occurred in (6.25%) of an emergency cases resulted in the tear of the anterior tracheal wall, and injuries to various structures in the perilaryngeotracheal area, attributed to the drawback of difficult surgical dissection, however it was managed by adequate suturing of the defect, also Imperato F et al,⁽¹⁷⁾ had been encountered the same complication in their study.

Thick mucus secretion caused by the fact that the application of the tracheostomy tube will lead to a significant irritation of the tracheobronchial mucosa resulted in a problem of tubal obstruction and this problem was observed in (8.03%) of our cases, especially secondary to the conditions when relief of an upper air way obstruction was indicated, while Elish AA and Jaafar W^[18] in their study recorded a rate of 3%, and the tubal occlusion was usually related in addition to the mucous plug or blood clot, also secondary posterior tubal impingement on the tracheal wall, or even partial tracheostomy tube displacement into the superior mediastinum.

Inadequate tracheostomy tube fixation, surgical emphysema, and the postoperative cough, all these contributing factors were blamed for the incidence of (0.89%) tracheostomy tube displacement in our cases. This potentially life threaten accidental tracheostomy tube dislodgment complication was also encountered in other studies,^(10,12) as agreed with our findings, as it attributed either to unsatisfactory tight secured tracheostomy tube, or to the increased the distance between the anterior tracheal wall and the anterior cervical skin due to various causes.

Another element of an early complication was surgical or subcutaneous emphysema (3.57%), and was affiliated to the air entrapment under the neck skin as resulted either from tight sutured wound, over sized tracheal opening done, or the application of improper tracheostomy tube sized, and it was detected more frequently in emergency situations with un-cuffed tubes, and these observations were agreed with many other studies.^(12, 13, 19)

Dysphagia was reported in (4.46%) of cases, and was due to overinflated cuffed tracheostomy tube due to its pressure effect on the oesophagus, and also resulted from laryngeal tethering with difficult movement during the swallowing, and these contributing factors were agreed with Ding R and Logemann JA study^[20] observations.

Some cases due to an improper surgical field sterilization especially in emergency indicated situations, as well as inadequate postoperative nursing care, not forgotten the bad general medical conditions of some patients especially in Intensive Care Unit, all these factors were attributed to local wound infection which accounted about (2.67%) in the current study, all were managed with proper antibiotics and a strict wound and dressing care, this complication was also reported by other studies^[12,19,24], so the appropriate management was depended upon the aetiology and the regional parameters for the map of the antibiotics resistance criterion.⁽²¹⁾

It is worth to mention that the exact predicted frequency and the severity of these complications rates were variant and its occurrences depends upon the interaction of many contributing factors which might included; specific indications and the types of the tracheostomy procedures, the skilful and the experience of the operating surgical team, the patient's general medical condition, cervical morphological and anatomical factors, the study design, as well as the accurate definition of these different complications, and most importantly is the proficiency of the postoperative nursing care.

Conclusion

The frequency of the overall early complications of open surgical tracheostomy was detected in a higher rate in emergency than in elective procedures, also the most common element of the overall early tracheostomy complications encountered was bleeding and was being primarily revealed in an emergency indicated tracheostomy, followed by the obstruction of the tracheostomy tube with more existing frequency in elective cases.

REFERENCES

1. Hamid AA, Sattar F, Shahedin, Khan NS, Zakinullah. Complications of tracheostomy. J Postgrad Med Inst. 2009; 18:385-90.
2. Patel A, Swan P, Dunning J. Does a percutaneous tracheostomy has a lower incidence of complications compared to an open surgical technique? Interact Cardiovasc Thorac Surg. 2005; 4:563-8.
3. Muhammed R, Khan F, Rehman F, Iqbal J, Khan M, ullah G. Early complications of elective and emergency tracheostomy. J Ayub Coll Abbottabad. 2012;24(1): 44-7.
4. Pracy P. Tracheostomy. In: Scott-Brown's otorhinolaryngology, head and neck surgery. Micheal Gleeson, George G Browning, Martin J Burton et al (eds). 7th ed. Vol 2. Hodder Arnold. London.2008: 2293-2302.
5. Trottier SJ, Hazard PB, Sakabu SA, Levine JH, Troop BR, Thompson JA et al. Posterior tracheal wall perforation during percutaneous dilational tracheostomy. Chest. 1999; 115:1383-9.
6. Howard DJ. Emergency and elective airway procedures: tracheostomy, cricothyroidotomy and their variants. In: Dudley H et al. (eds). Operative surgery: Mc Gregor IA, Howard DJ (eds). Head and neck part 1. Oxford: Butterworth-Heinemann, 1992:27-44.
7. Reilly H, Sadaki CT. Tracheostomy complications. In: complications in head and neck surgery. Krespi YP, Ossoff RH (eds). Philadelphia: W.B. Saunders, 1993:257-74.
8. Durbin GC Jr. Early complications of tracheostomy. Respir Care 2005; 50:511-5.
9. Karvandian K, Mahmoodpoor A, Beigmohammadi M, Sanaie S. Complications and safety of percutaneous dilational tracheostomy with Griggs method versus surgical tracheostomy: a prospective trial with six months follow-up. Pak J Med Sci 2009; 25(1):12-7.
10. Rana S, Pendem S, Pogodzinski MS, Hubmayer RD, Gajic AO. Tracheostomy in critically ill patients. Mayo Clin Proc 2005;80(12):1631-8.
11. Shahabi I, Zada B, Imad, Ali M. Complications of conventional tracheostomy. J Postgrad Med Inst 2009; 189(2):218-20.
12. Rohail A, Malik MF, Gill ZI, Malik WY. Incidence of complications of tracheostomy and their management. Lahor hosp J 2009; 3:30.
13. Yavas S, Yagar S, Muviogola L. Tracheostomy J Cardic Surg 2009; 24(1):11-8.
14. Rashid M, Navqvi SNU, Saeed I, Lumqman U, Janjua Os. Indications and early complications of standard tracheostomy. PJMHS 2011; 5(3):417-20.
15. Prowse S, Kelly G. The oozing tracheostomy-a novel application of floseal. Clin Otolaryngol 2011;36(1):94
16. Singh N, Fung A, Cole IE. Innominate artery following tracheostomy. Otolaryngo Head Neck Surg 2007; 136(suppl.1):568-72.
17. Imperato F, Diurno F, Passannanti M. Early and late complications after elective surgical tracheostomy. Med Gen Med J 2004; 6:32.
18. Elosh AA, Jaafar W. A comparative study of complications of surgical tracheostomy. BioMed Cent J 2007; 1:11.
19. Cardone G, Lepe M. Tracheostomy: complications in fresh postoperative and late postoperative settings. Clin Pedia Emerg Med J 2010; 11(2):122-30.

20. Ding R, Logemann JA. Swallow physiology in patients with trach cuff inflated or deflated: a retrospective study. *Head Neck* 2005; 27(9): 809-13.
21. Fischler L, Erhart S, Kieger GR, Frutiger A. Prevalence of tracheostomy in ICU patients. A nationwide survey in Switzerland. *Intensive Care Med* 200; 26:1428-33.