



Tracheostomy Tube Inside the Tracheal Limb of Silicon Y Stent in Patient with Large Tracheal Defect

Mallios D^{1*}, Krassas A¹, Iliadis IS², Galani L^{3,4}, Agiannidou A⁵, Ballian N^{3,4} and Iliadis K¹

¹Department of Thoracic Surgery, HYGEIA Hospital, Greece

²Department of Plastic Surgery, University of Ioannina Medical School, Greece

³1st Department of Internal Medicine & Infectious Diseases, HYGEIA Hospital, Greece

⁴Department of General surgery, MITERA Hospital, Greece

⁵Department of Anesthesiology, HYGEIA Hospital, Greece

Abstract

Iatrogenic Tracheal Injury (ITI) is a life-threatening complication that requires prompt diagnosis, management, and treatment. When suspected on clinical examination bronchoscopy and CT scan confirms the diagnosis. The case of 16 years old man is presented in whom a large posterolateral tracheal wall defect, was diagnosed after percutaneous dilatational tracheostomy. Bronchoscopy confirmed the tracheal defect and a long Y-tracheobronchial silicone stent was inserted to protect the wound and allow healing with tracheostomy tube inside the stent to ensure ventilation.

We believe that this technique is effective and valuable for large tracheal wall lacerations with no severe complications.

Introduction

Iatrogenic tracheal rupture is potentially life-threatening complication of medical interventions. The management of the tracheal laceration is challenging and controversial because there is no precise guidelines for conservative or surgical treatment.

We report our experience with large tracheal defect after dilatational tracheostomy treated conservatively.

Case Presentation

A 16-year-old, un-helmeted, white male prone and unconscious after he had lost control of his motorcycle and went off the road. He was brought to the emergency department via ambulance and immediately intubated due to low Glasgow scale (5/15). Whole body CT scan revealed occipital subdural and epidural hematoma, left temporal contusion, right clavicle fracture, and bilateral lung contusions. Emergent right-sided occipital decompressive hematoma drainage and craniectomy were performed. The patient remained intubated due to fever, hemodynamic instability, seizures and he underwent a percutaneous dilatational tracheostomy 10 days later. During the operation the patient developed severe mediastinal and subcutaneous emphysema and tension pneumothorax in his right hemithorax. Chest tubes were placed in both hemithoraces and flexible bronchoscopy was performed which revealed the presence of tracheal laceration in the middle membranous part of the trachea. After that the distal end of the tracheostomy cannula was placed beyond the site of the tracheal injury and the ventilation has been ensured. The patient became septic and received broad-spectrum antibiotics as soon as the diagnosis of mediastinitis and bilateral VAP pneumonia was established.

The patient was transferred to our hospital for further evaluation and management after hemodynamic stabilization. Immediately the patient underwent rigid bronchoscopy which showed a large posterolateral, middle – inferior tracheal defect (5 cm × 3 cm) approximately 2.2 cm from the carina communicating with the mediastinum (Figure 1). A Y-shaped (14×10×10) long (7 cm) tracheobronchial silicone stent (Novatech SA, La Ciotat, France) was inserted and the tracheostomy tube was placed inside the tracheal limb of the Y- stent lumen to ensure ventilation [1], isolate the mediastinum, protect the wound and allow spontaneous healing (Figure 2).

A controlled bronchoscopy within the first ten days revealed reduction of the tracheal defect and

OPEN ACCESS

*Correspondence:

Mallios Dimitrios, Department of Thoracic Surgery, HYGEIA Hospital, Athens, Greece

Received Date: 21 Jul 2023

Accepted Date: 10 Aug 2023

Published Date: 15 Aug 2023

Citation:

Mallios D, Krassas A, Iliadis IS, Galani L, Agiannidou A, Ballian N, et al. Tracheostomy Tube Inside the Tracheal Limb of Silicon Y Stent in Patient with Large Tracheal Defect. *World J Surg Surgical Res.* 2023; 6: 1491.

Copyright © 2023 Mallios D. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

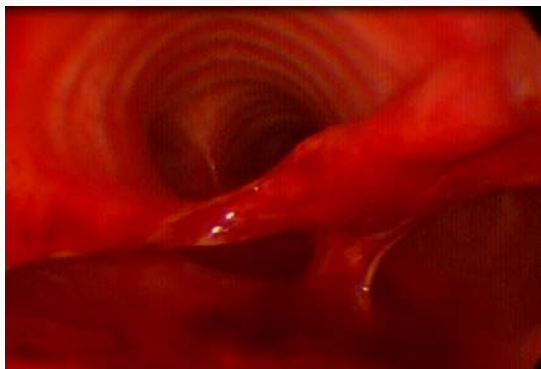


Figure 1: Bronchoscopy view: Reveals posterolateral wall defect with mediastinal communication.



Figure 3: Bronchoscopy revealing that the lacerated membranous wall had healed.

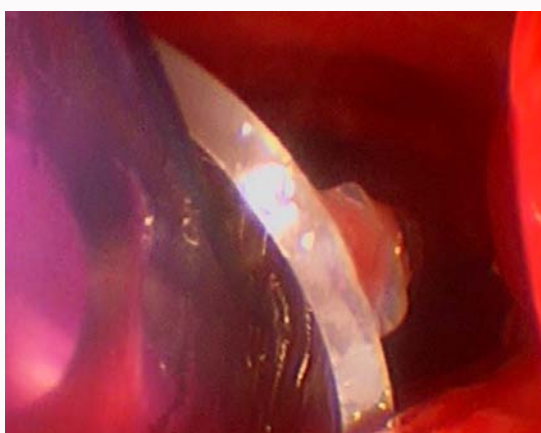


Figure 2: Tracheostomy tube through the Y stent.

macroscopic improvement of the epithelial repair and regeneration of the tracheal surface. It also showed copious amounts of thick, tan endotracheal and endobronchial secretions which were removed during the bronchoscopy with suction as well as with Fogarty catheter aid.

A surveillance rigid bronchoscopy was performed every week in order to note the progress of the tracheal healing and remove the thick tracheobronchial secretions.

The Y-stent has been removed 30 days later when the tracheal defect was completely healed (Figure 3) and his neurological status permitted it. The patient was discharged from our hospital without major complications and gradually returned to daily life without requiring other interventions.

Discussion

The diagnosis of ITI requires a high index of suspicion and it is often missed or delayed. In fact, ITI should be suspected in patients with subcutaneous or mediastinal emphysema, pneumothorax or progressive respiratory insufficiency following airway manipulation. Attention should be paid to difficult or traumatic intubations and complicated tracheostomies.

Computed tomography of the thorax is the preferred diagnostic method to evaluate mediastinal emphysema, and pneumothorax in cases with subcutaneous emphysema.

Tracheobronchoscopy is the gold standard examination in

establishing the diagnosis of post-intubation tracheal ruptures as well as tracheobronchial injuries. This procedure is very important in determining the location, size, depth of the injury and in planning the treatment strategy.

Esophagoscopy and esophagography should be performed to exclude esophageal involvement and tracheoesophageal fistula. Early surgery represents the treatment of choice for lesions of the airway. Nowadays with endoscopic intraluminal sutures on the tracheal tear, minimally invasive access can be achieved [2]. The aim of surgical repair is to restore the tracheal integrity, prevent mediastinitis with the lowest possible additional morbidity and to reduce the risk of subsequent healing complications.

Another minimal invasive option is the application of 1 ml to 2 ml of fibrin sealant onto the lesion through the rigid bronchoscope as described by Cardillo et al. [3].

The treatment strategy of the tracheal laceration (conservative or surgical) as well as the timing and surgical approach remains controversial. Furthermore, delayed diagnosis of tracheal injury after completion of the index operation can increase the mortality.

In some studies, the depth and the length of the tracheal injury is used as a surgical criterion. However, several recent case series showed spontaneous healing of tracheal injuries with conservative management [4].

Herrmann et al. published a large series of 64 patients with a hospital mortality of 15.6% (n=10); of these, 30 patients with a rupture length of up to 4 cm and 24 patients with a rupture length exceeding 4 cm survived (p=0.498). They concluded that there was no association between rupture length and mortality [5].

When mechanical ventilation is mandatory at the time of diagnosis conservative management consists the placement of the tracheal tube distal to the tracheal rupture to ensure satisfactory ventilation.

We think that patients with tracheal laceration independently of anatomical location, size and depth as well as for patients with requiring prolonged intubation, Y-stent placement with the endotracheal tube or tracheostomy tube placed within the stent lumen is a reliable minimally invasive option. This technique is feasible even for injuries close to the carina, in which is not easy to position the cuff distal to the tracheal rupture and to avoid dislocation of the tip tube into the mediastinum. Till now these cases have been treated with surgical repair when the patient's condition permits it, because open

thoracic surgery in patients with poor clinical status, has a mortality rate over 71% [6].

Another common problem is when a full thickness rupture of the membranous tracheal wall is associated with esophageal herniation into the tracheal lumen and leads to respiratory distress.

Published literature [3] suggests that esophageal protrusion into the trachea without evidence of fistula should not be considered as an indication for surgery and can be treated with early endoscopic intraluminal closure [2] or with Y stent placement [1].

Additionally, Y-stent placement with endotracheal or tracheostomy tube through the stent secures airways patency, allows spontaneous healing of the lesion and permits adequate ventilation, while interrupting communication between airway and mediastinum.

Regarding self – expanding, metallic stents, which is another stent alternative, we believe that once the stent is deployed within the tracheal lumen, its intrinsic radial force will interfere with healing and regeneration of the tracheal wall. Expandable metallic stents are associated with numerous potential problems, prompting 2005 FDA warnings of serious complications in patients with benign airway disorders. Metallic tracheal stents are not considered first-choice of treatment and should only be used if everything else fails.

In conclusion, we think that for large tracheal defects, regardless of location and size, silicone Y-stent placement over the tracheal defect and endotracheal or tracheostomy tube within the stent lumen is an, effective treatment for tracheal lacerations without esophageal injury.

This technique is ideal for patients with significant underlying comorbidities.

References

1. Tazi-Mezalek R, Musani AI, Laroumagne S, Astoul PJ, D'Journo XB, Thomas PA, et al. Airway stenting in the management of iatrogenic tracheal injuries: 10-Year experience. *Respirol Carlton Vic.* 2016;21(8):1452-8.
2. Krassas A, Mallios D, Iliadis I, Agiannidou A, Boulia S, Iliadis K. Bronchoscopic repair of tracheal laceration using conventional instrumentation: A novel technique. *Ann Thorac Surg.* 2020;109(2):e141-3.
3. Cardillo G, Carbone L, Carleo F, Batzella S, Jacono RD, Lucantoni G, et al. Tracheal lacerations after endotracheal intubation: A proposed morphological classification to guide non-surgical treatment. *Eur J Cardiothorac Surg.* 2010;37(3):581-7.
4. Fong PA, Seder CW, Chmielewski GW, Welsh RJ. Nonoperative management of postintubation tracheal injuries. *Ann Thorac Surg.* 2010;89:1265-6.
5. Hermann D, Volmerig J, Al-Turki A, Braun M, Herrmann A, Ewig S, et al. Does less surgical trauma result in better outcome in management of iatrogenic tracheobronchial laceration? *J Thorac Dis.* 2019;11(11):4772-81.
6. Carbognani P, Bobbio A, Cattelani L, Internullo E, Caporale D, Rusca M. Management of postintubation membranous tracheal rupture. *Ann Thorac Surg.* 2004;77(2):406-9.