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CASE REPORT

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A laceration of a wired silastic tracheostomy tube: A case report and review of the literature

Kotaro Noda[1] | **Nobuyuki Nosaka**[1] | **Youshun Sai**[2] | **Eiki Nagaoka**[2] | **Michio Nagashima**[1] | **Hirokuni Arai**[2] | **Hidenobu Shigemitsu**[1]

[1]Department of Intensive Care Medicine, Tokyo Medical and Dental University, Tokyo, Japan

[2]Department of Cardiovascular Surgery, Tokyo Medical and Dental University, Tokyo, Japan

Correspondence
Nobuyuki Nosaka, Department of Intensive Care Medicine, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo, 113-8519, Japan.
Email: nosaka-ngy@umin.ac.jp

Present address
Kotaro Noda, Department of Neurology and Neurological Science, Tokyo Medical and Dental University, Tokyo, Japan

Abstract

Fractured tracheostomy tube is a rare, late complication. It typically occurs at the junction of metallic tube. We report an atypical case with laceration of the main trunk of a silastic tube after short period of use (10 days).

KEYWORDS

airway, complications, critical care, equipment, tracheostomy

1 | INTRODUCTION

Fractured tracheostomy tube is a rare complication. Herein, we report a case with laceration of the main trunk of a wired silastic tracheostomy tube immediately after electrical cardioversion in a 66-year-old man. Additionally, we reviewed current literatures on nonmetal tracheostomy tube fracture and provided an updated summary.

Tracheostomy is one of the most common surgical interventions performed in mechanically ventilated, critically ill patients in intensive care unit. Although the procedure is generally safe, multiple early and late complications have been described. A fracture of a tracheostomy tube is a rare, but potentially devastating complication.[1] This is typically seen as a late complication in a patient with long time use of tracheostomy and occurs at the junction between the tube and the neck plate of metallic tubes. We herein present an atypical case with a laceration of the main trunk of a wired silastic tracheostomy tube after short period of use (10 days), which required urgent tube exchange. This report is published with written consent from the patient.

2 | CASE REPORT

A sixty-six-year-old man underwent tracheostomy in our general intensive care unit (ICU) after 14 days of aortic valve replacement surgery who was being managed for refractory pneumonia. A flexible spiral type of silicone tracheostomy tube with an internal diameter of 8.0 mm (GB Adjustfit Tracheostomy Tube; Fuji Systems, Tokyo, Japan) was inserted surgically. Throughout the mechanical ventilator support, an automatic cuff pressure controller (IntelliCuff; Hamilton Medical, Reno, Nevada) had

provided continuous monitoring of optimal cuff pressure set at 30 mm Hg. Ten days after tracheostomy, electrical cardioversion (EC) was performed twice with 100 J of energy for cardioversion of new-onset, hemodynamically unstable atrial fibrillation into sinus rhythm. Approximately ten minutes after EC, his mechanical ventilator sounded an alarm to indicate leakage in the airway, and the automatic cuff pressure controller was unable to keep appropriate pressure in the cuff. Fortunately, his vital signs remained stable without new symptoms (heart rate 79/min, respiratory rate 26/min, blood pressure 91/47 mm Hg, and pulse oximetry 95% under 40% of oxygen). A chest X-ray was obtained, which did not reveal new abnormal findings. Subsequently, our attempt to manually inflate the cuff using a 10-ml syringe was unsuccessful. Accordingly, rupture of the tube cuff was suspected and the tube was immediately exchanged. The patient was preoxygenated to 100%, and the neck was extended. After being noted his pulse oximetry of 100%, the patient was disconnected from mechanical ventilator, and a tube exchanger (Frova Intubating Catheter, Ref. G48303; William Cook Europe ApS, Bjaeverskov) was inserted down the lumen of the tracheostomy tube as a guidewire. The tracheostomy tube was then removed over the exchanger. Subsequently, a new tracheostomy tube (the same size and type as the removed tube) was passed over the exchanger and carefully inserted into the trachea. As a result, the ventilator and the automatic cuff pressure controller functions were restored to normal operation. The patient's vital signs were stably maintained during the procedure under appropriate anesthesia.

Unexpectedly, examination of the removed tracheostomy tube revealed a laceration along the stainless steel ring (Figure 1). No other fracture was detected in the tube including the cuff, and thus, we concluded that the laceration was responsible for the air leakage. The case was immediately reported to the manufacturer.

3 | DISCUSSION

We believe this case raises several prudent considerations regarding complications of tracheostomy tube that is worthwhile to discuss. These include (a) the frequency of tracheostomy tube fracture; (b) material of the tube; (c) fracture site of the tube; and (4) timing of the event. Although the exact frequency is unknown, a fracture of tracheostomy tubes is reported as a rare complication.[1] Moreover, fractures occur less frequently in polymeric tubes (polyvinyl chlorine, silicone, or polyurethane) than metallic tubes.[2] Fracture of pure silicone tube is even more rare (Table 1).[2-16] To date, fracture has not been reported in the product we used in this patient (GB Adjustfit Tracheostomy Tube). Additionally, fracture of other sites (eg, the junction) of the tracheostomy tube has been reported. However, there has been no report of fracture in the main trunk of tracheostomy tube. Furthermore, prolonged usage over the years typically contributes to increased wear and tear caused by mechanical and chemical stresses, but our patient's tube was fractured shortly after its use (10 days). Although it is plausible to consider a manufacturing defect that might have contributed to the fracture with its short time use, we believe it is unlikely as there were no ventilatory complications for as long as 10 days. In short, these facts indicate that our case is extremely unusual.

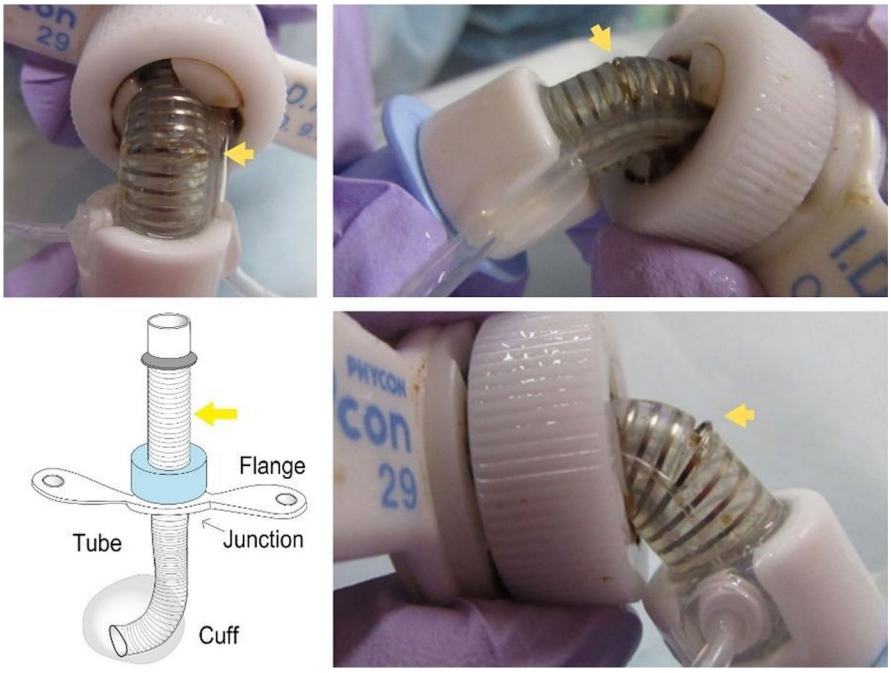

FIGURE 1 The laceration of the main trunk of the wired silastic tracheostomy tube. Yellow arrowheads indicate the site of laceration. A stainless steel ring lining the tube came out from the fractured site

TABLE 1 Summary of previous reports about fractured nonmetal tracheostomy tubes

Authors	Year	Gender	Age	Material	Cause of fracture	Fracture site	Duration
Sood [3]	1973	M	60	PVC	Prolonged use	Junction	5 y
Jensen et al [4]	1988	M	8 months	PVC	Mechanical stress	Junction	1.5 mo
		M	14 months	PVC	Mechanical stress	Junction	6 mo
Bhatia et al [5]	1992	M	68	PVC	Prolonged use	Junction	1.5 y
		M	58	PVC	Prolonged use	Junction	6 mo
		M	63	PVC	Prolonged use	Junction	1 year
Rastogi et al [6]	1993	M	65	PVC	Repeated cleaning and boiling	Junction	24 d
Bhattacharjee N [7]	1994	M	60	PVC	Repeated cleaning and boiling	Junction	3 mo
		M	40	PVC	Repeated cleaning and boiling	Junction	2 mo
Gana PN et al [8]	2000	M	7	PVC	ND	ND	ND
Ng DK et al [9]	2002	M	3	Siliconized PVC	Prolonged use	Junction	1 y
Li AM et al [10]	2005	M	47	PVC	ND	Junction	28 d
Wu, Chang Teng et al [11]	2007	F	14 months	PVC	ND	Junction	8 h
Feng, C et al [12]	2011	F	95	PVC	Prolonged use	Junction	ND
Lynrah ZA et al [13]	2012	M	7	Siliconized PVC	Manufacturing defect	Junction	5 d
		F	8	Siliconized PVC	Manufacturing defect	Junction	ND
		F	5	Siliconized PVC	Manufacturing defect	Junction	2 d
Loh TL et al [14]	2014	F	70	PVC	ND	Fenestrate	2 y
Parida PK et al [15]	2014	M	1	PVC	Manufacturing defect	Junction	3 mo
		F	7	PVC	Various factors	Junction	10 mo
		F	11	PVC	Various factors	Junction	1.8 y
Gupta SC [16]	2016	M	6	PVC	ND	Junction	5 y

Abbreviations: Junction, the junction between a tube and a flange; ND, no data; PVC, polyvinylchloride.

What would be the cause of fracture in our case? We speculated that electrical defibrillation, which preceded the air leakage event, might be responsible for the fracture. The tube we used (GB Adjustfit Tracheostomy Tube) consists of a wired silastic tube. While the stainless wires in the tube provide flexibility and durability, these wires may have transmitted the electrical heat and stress produced by EC, resulting in the fracture of tube. Further investigation is necessary to prove this hypothesis.

In conclusion, complications from disruption of the integrity of the tracheostomy tube are rare. However, the aforementioned complication may occur in association with a potential transmission of electrical heat and stress from EC leading to an urgent ventilatory assessment. Further understanding of this potential complication would assist clinicians at bedside in making appropriate timely clinical decisions.

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CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

KN: drafted the manuscript and involved the airway management of the case. NN: drafted the manuscript and contributed to treating the patient. YS: contributed to treating the patient and involved the airway management of the case. EN:

contributed to treating the patient and revised the manuscript. MN: contributed to the first draft and finalization of the manuscript. HA: contributed to treating the patient and revised the manuscript. HS: supervised the case report, and critically revised and edited the manuscript. All authors: have read and approved the final manuscript.

ETHICAL APPROVAL

Informed consent was obtained from the patient for publication of this case report.

DATA AVAILABILITY STATEMENT

No digital data are available.

ORCID

Nobuyuki Nosaka https://orcid.org/0000-0002-7722-0701

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