

CASE REPORT

Complication of Intraoperative Percutaneous Dilatational Tracheostomy without Bronchoscopy: A Case Report

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A 72-year-old woman who was a candidate for percutaneous dilatational tracheostomy (PDT) using the Ciaglia Blue Rhino single dilator was examined. After dilation, a stoma was created on the guide wire, but the dilator could hardly pass through and pulled in the endotracheal tube with it. Bronchoscopy was therefore performed. The guide wire that was inside the Murphy eye of the endotracheal tube was then removed. So the dilator and guide wire was removed. The endotracheal tube was pulled back slightly and the tracheostomy tube was inserted once again. Fiberoptic bronchoscopy is recommended in cases of a problematic anatomy or when the PDT tube placement is suspicious.

Keywords: percutaneous dilatational tracheostomy; murphy eye; bronchoscopy; intraoperative complication

Tracheostomy is performed through either the open or the percutaneous dilatational technique. Traditionally, tracheostomy was performed as an open surgery in the operating room. In 1985, Ciaglia et al. introduced Percutaneous Dilatational Tracheostomy (PDT) using bronchoscopy [1].

Later, this technique became widely accepted as the preferred method of performing tracheostomy in many healthcare centers across the world [2]. Byhahn et al. introduced the Ciaglia Blue Rhino (CBR) as the modified version of the PDT described by Ciaglia. In this modified version, dilatation is performed in a single step (i.e. it is a single-dilator technique); therefore, it causes less damage to the posterior wall, less intraoperative bleeding and less oxygen desaturation. The CBR is currently the most common technique used for performing tracheostomy [3].

The advantages of PDT include a smaller skin incision, the simplicity of the procedure, leaving less tissue damage, causing less bleeding and infection, reducing the risk of transmission and lower costs [4]. Although the traditional PDT has become more acceptable compared to surgical tracheostomy, it still poses many limitations and risks [2,5].

The complications of PDT include paratracheal tube placement, pneumomediastinum, pneumothorax, subcutaneous emphysema, esophageal rupture, loss of the airway, endotracheal tube cuff rupture, bleeding, stoma infection, tracheal stenosis, hypoxia ($\text{Spo}_2 < 94\%$), hypotension, the inadvertent insertion of the wire into the Murphy eye of the endotracheal tube, air embolism and life-threatening bleeding caused by the rupture of the blood vessels around trachea [2,6-9].

As reported by Sangwan et al., the use of ultrasound and bronchoscopy reduces the incidence of PDT complications [10]. In a retrospective study on 186 patients undergoing PDT through the Ciaglia Blue Rhino technique without bronchoscopy, Chung et al. observed bleeding in three of the patients and found that PDT can be safely performed without the use of bronchoscopy and ultrasound when there is a scarcity of equipment [11].

Performing PDT with bronchoscopy also has its limitations, including interference with ventilation of the lungs (hypoxia and hypercarbia), increased procedure time and increased need for equipment and qualified experts for performing bronchoscopy [2,12].

Similarly, ultrasound is not available in all hospitals and ICUs. The modification of the standard PDT technique in different ways has increased the prevalence of performing PDT without bronchoscopy.

At the ICU of our center, bronchoscopy is not performed during tracheostomy, unless to confirm the appropriate placement of the tracheostomy tube in some patients and to follow up on the complications of bronchoscopy. The present case report describes the inadvertent insertion of the guidewire and dilator into the Murphy's eye of the endotracheal tube during PDT without bronchoscopy in a patient admitted to the MICU.

Case Report

This case report included a 72-year-old woman with stroke and with an indication for tracheostomy and hospitalized at the Medical Intensive Care Unit of Rouhani Hospital in Babol, Mazandaran, Iran. After obtaining written consent from the patient's guardian about the surgical procedure, she underwent Percutaneous Dilatational Tracheostomy through the Ciaglia Blue Rhino single-dilator technique. The patient had a reported history of hypertension for ten years and CABG for two years.

The procedure was performed in the ICU by an intensive care specialist and a trained nurse. Anticoagulants were discontinued 24 hours before the procedure. During the

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procedure, a thoracic surgeon was present inside the hospital.

Bronchoscopy was performed to confirm the appropriate placement of the tracheostomy tube. Five minutes before beginning the procedure, oxygen 100% was administered with an Assist Continuous Mandatory Ventilation. The patient underwent noninvasive blood pressure monitoring, ECG and Spo2 measurement. The patient received an intravenous administration of 2 mg of midazolam and 100 µg of fentanyl. The patient's neck was hyper extended. Five minutes before the surgical incision, after prepping and draping the anterior cervical region, 3 mL of Lidocaine 2% was subcutaneously injected 2 cm below the cricoid cartilage. The ICU specialist stood on the right side and the nurse on the left side of the patient. The endotracheal tube cuff deflated 2ml of air and the tube was pulled back up to number 18 cm at the lip. Hopefully re-intubation equipment was set out prior to withdrawing the tube.

After touching the trachea (about 2 cm below the cricoid cartilage), a 16-g catheter was inserted into the trachea and the guide wire was then placed inside the tracheal lumen. After passing the Blue Rhino single dilator, a stoma was created on the guide wire. But the dilator could hardly pass through and pulled in the endotracheal tube with it. So the dilator was removed. Ventilation was performed through the endotracheal tube, but the tube itself could not be removed. Bronchoscopy was therefore performed. The guide wire that was inside the Murphy eye of the endotracheal tube was then removed. The endotracheal tube was pulled back slightly and the tracheostomy tube was inserted once again and the endotracheal tube was removed. The patient's oxygenation and hemodynamic were normal throughout the procedure.

No PDT complications were observed in the patient's chest X-ray and the tracheostomy tube was positioned correctly.

Discussion

The present case report described the inadvertent insertion of the guidewire and dilator into the Murphy's eye of the endotracheal tube during PDT in an MICU patient. This problem occurred because of the rotation of the endotracheal tube to the left when it was pulled back during the PDT.

Several studies have reported bleeding, stomal infection, subcutaneous emphysema, loss of the airway, hypoxia, pneumothorax and pneumomediastinum as the complications of PDT [7-8].

Normally, when the endotracheal tube curvature bends forward, the bevel tip of the tube sits on the left and the Murphy's eye on the right side of the tube (Figure 1). After intubation, the endotracheal tube curvature bends toward the right (Figure 2) and the bevel tip of the tube toward the left and the Murphy eye then lies posterior to the tube [13].

In the patient examined here, since the nurse was standing on the left side of the patient, the tube was rotated to the left when it was being pulled back (Figure 3) and the Murphy's eye thus lied on the anterior. Therefore, after the inadvertent insertion of the guidewire, the dilator also passed through (Figure 4).

After placement of the dilator, the endotracheal tube was pulled back inward and could hardly pass through, and it could not be removed, indicating that the guidewire was inserted into the Murphy's eye.

PrakashK et al. introduced a patient who, during their

procedure, had a guidewire accidentally entering the Murphy's eye. After the guide wire was inserted, they found out that it had passed through the Murphy's eye and so proceeded to removing it [13].

In the case of our patient, the guide wire was easily inserted, perhaps due to the anatomical shape of the endotracheal tube and the Murphy's eye lying on the anterior side. Nevertheless, the dilator could hardly pass through.

Pattnaik et al. found that, of the 300 patients who had undergone PDT without bronchoscopy, 18 guidewires were kinked. In these cases, they removed the guide wires and another puncture was carried out from a new route and the steps to the placement of the tracheal tube were once again performed [14-15].

We carried out the same procedure for our patient and performed PDT once again from a new route after removing the guide wire and dilator.

Figure 1- The endotracheal tube curvature bends forward



Figure 2- The endotracheal tube curvature bends toward the right



Figure 3- Migration of guidewire into Murphy's eye of endotracheal tube



Figure 4- Migration of dilators and guidewire into Murphy's eye



Conclusion

When pulling back the tracheal tube during a PDT, if the tracheal tube curvature bends toward the left, the introduction of the needle and guidewire into the tracheal tube becomes more likely. The curvature of the tube should therefore be to the right.

Fiberoptic bronchoscopy is recommended in cases of a problematic anatomy or when the PDT tube placement is suspicious.

Limitations

The fiberoptic bronchoscopy performed at the ICU in our center did not allow for imaging; therefore, we have only displayed a schematic of what we observed in the bronchoscopy in this paper.

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References

1. Ciaglia P, Firsching R, Syniec C. Elective percutaneous dilatational tracheostomy: a new simple bedside procedure: preliminary report. *Chest*. 1985; 87(6):715-9.
2. Saritas A, Saritas PU, Kurnaz MM, Beyaz SG, Ergonenc T. The role of fiberoptic bronchoscopy monitoring during percutaneous dilatational tracheostomy and its routine use into tracheostomy practice. *J Pak Med Assoc*. 2016; 66(1):83-9.
3. Massick DD, Yao S, Powell DM, Griesen D, Hobgood T, Allen JN, et al. Bedside tracheostomy in the intensive care unit: a prospective randomized trial comparing open surgical tracheostomy with endoscopically guided percutaneous dilatational tracheostomy. *Laryngoscope*. 2001; 111(3):494-500.
4. Johnson-Obaseki S, Veljkovic A, Javidnia H. Complication rates of open surgical versus percutaneous tracheostomy in critically ill patients. *Laryngoscope*. 2016; 126(11):2459-67.
5. Lothar A, Wengenmayer T, Benk C, Bode C, Staudacher DL. Fatal air embolism as complication of percutaneous dilatational tracheostomy on venovenous extracorporeal membrane oxygenation, two case reports. *J Cardiothorac Surg*. 2016; 11(1):102.
6. Panigrahi B, Samaddar DP, Kumar T. Inadvertent migration of guidewire into Murphy's eye of endotracheal tube during percutaneous dilatational tracheostomy. *Indian J Crit Care Med*. 2016; 20(3): 188-90.
7. Hashemian SM-R, Digaleh H. A Prospective Randomized Study Comparing Mini-surgical Percutaneous Dilatational Tracheostomy With Surgical and Classical Percutaneous Tracheostomy: A New Method Beyond Contraindications. *Medicine*. 2015; 94(47):e2015.
8. Klancir T, Adam VN, Mrcic V, Marin D, Goranovic T. Bilateral pneumothorax as a complication of percutaneous tracheostomy: case report. *Acta Clin Croat*. 2016; 55 Suppl 1:98-102.
9. Brahmabhatt PA, Modi FD, Roy TM, Byrd RP Jr. Common carotid artery laceration and innominate artery pseudo-aneurysm following a percutaneous dilatational tracheostomy attempt. *Respir Care*. 2014; 59(10):e153-5.
10. Sangwan YS, Chasse R. A modified technique for percutaneous dilatational tracheostomy: A retrospective review of 60 cases. *J Crit Care*. 2016; 31(1):144-9.
11. Chung W, Kim BM, Park SI. Simply modified percutaneous tracheostomy using the Cook(R) Ciaglia Blue Rhino: a case series. *Korean J Anesthesiol*. 2016; 69(3): 301-4.
12. Umutoglu T, Bakan M, Topuz U, Yilmaz S, Idin K, Alver S, et al. Comparison of EtView tracheoscopic ventilation tube and video-assisted fiberoptic bronchoscopy during percutaneous dilatational tracheostomy. *J Clin Monit Comput*. 2016; 31(3):507-512.
13. Dubey PK, Sanjeev OP. Keep an eye on Murphy's eye during percutaneous dilatational tracheostomy. *Indian Journal of Critical Care Medicine*. 2016; 20(6):379-80.
14. Pattnaik SK, Ray B. Procedural improvisation to prevent guidewire kinking in Griggs percutaneous tracheostomy without bronchoscopic guidance. *Indian J Crit Care Med*. 2016; 20(6):378-9.
15. Pattnaik SK, Ray B, Sinha S. Griggs percutaneous tracheostomy without bronchoscopic guidance is a safe method: A case series of 300 patients in a tertiary care Intensive Care Unit. *Indian J Crit Care Med*. 2014; 18(12):778-82.