

Mispositioned Pigtail Catheters in Patients with COVID-19 Pneumonia

Arash Samarghandi^{1*}, Michal Senitko¹, Dena Khorsandi² and Eugene Shostak³

¹Department of Pulmonary, Critical Care and Sleep Medicine, University of Mississippi, Jackson, MS, United States

²American University of Integrative Science (AUIS), Barbados

³Department of Cardiothoracic Surgery, New York Presbyterian Weill Cornell Medical Center, New York, NY, USA

***Corresponding Author:** Arash Samarghandi, Department of Pulmonary, Critical Care and Sleep Medicine, University of Mississippi, Jackson, MS, United States.

Received: October 24, 2021; **Published:** November 29, 2021

Abstract

Pigtail catheters have emerged as an effective and less morbid alternative intervention to conventional large bore chest tubes for management of pleural effusions and pneumothorax. Pneumothorax and catheter mispositioning are the most common complications associated with pigtail catheters. Here, we describe two rare cases of pigtail catheter mispositioning causing bronchial damage in patients with COVID-19 pneumonia. As pigtail catheters are convenient and simple bedside procedures. However, one should be aware of their complications. Catheter mispositioning into the main bronchus is a rare complication of pigtail catheter insertion that to our knowledge has never been reported in the literature.

Keywords: Pigtail Catheters; COVID-19; Pneumonia

Introduction

Thoracostomy tubes are commonly used to facilitate management of a pneumothorax and pleural effusions. Ultrasound guided percutaneous catheters and other small bore chest tubes are associated with less pain and discomfort to the patient with similar efficacy when compared to conventional large bore surgical chest tubes [1,2].

Ultrasound guided “pigtail” catheters are placed by using modified Seldinger technique. Various complication have been described in medical literature such as pneumothorax, parenchymal lung injury and malposition of the tube causing injuries to other structures in the mediastinum [3,4].

Here, we describe two cases of a rare mispositioning of the pigtail catheter from two different institutions, both causing an airway damage in patients with COVID-19 pneumonia.

Case 1

78-year-old female with medical history significant for Bechet’s disease, chronic obstructive lung disease (COPD) and hypertension presented to Emergency Room with respiratory distress and fatigue that progressively got worse over two days. She was found to have acute hypoxic respiratory failure and chest radiograph showed bilateral interstitial infiltrates. SARS-CoV-19 PCR was positive. She was treated with remdesivir, dexamethasone and supportive therapy with high flow nasal cannula. On day 10th of hospital course, she was transferred to ICU and got intubated due to worsening respiratory condition. During ICU course she received fentanyl, propofol and midazolam infusions for sedation and ventilation using lung protective strategy. Prone positioning and paralytics were used intermittently as PaO₂/FIO₂ ratio was below 100 mmHg. 20 days into hospital stay, she developed tension pneumothorax that led to severe oxygen desaturation. Point of care ultrasound indicated absence of lung sliding in right upper lung zone. Chest radiograph was not done due to

hemodynamic instability of the patient. A 14 french pigtail catheter was placed via Seldinger technique in the 3rd intercostal space mid clavicular line emergently. Procedure was uneventful with no reported difficulties during insertion of the guidewire or the dilator. Following the procedure there was improvement in oxygen saturation and hemodynamic instability. Post procedure x-ray (Figure 1) showed small apical pneumothorax.

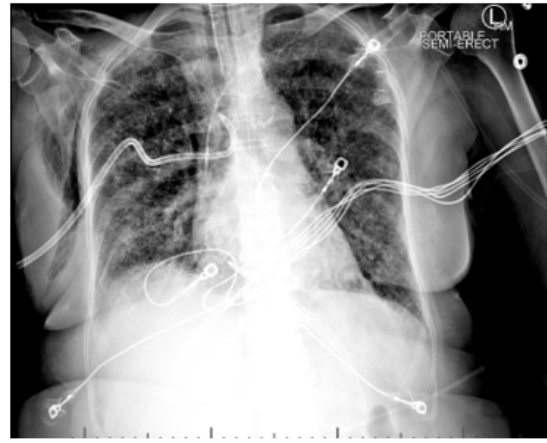


Figure 1 (Case 1): X-ray of chest post procedure, showing pigtail in the right main bronchus.

However, shortly after, continuous leak was observed in the chest tube chamber. Bedside bronchoscopy detected the tip of the catheter in the right main bronchus (Figure 2). A bronchoalveolar lavage later revealed *Cryptococcus neoformans* organism. Computerized tomography of the chest (Figure 3 and 4) demonstrated that the catheter crossing the lung parenchyma and extending into right main bronchus without any associated vascular injury.

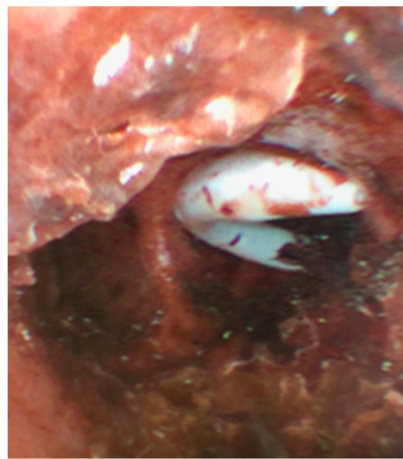


Figure 2 (Case 1): The tip of the pigtail catheter in the right main stem bronchus shown via bronchoscopy.

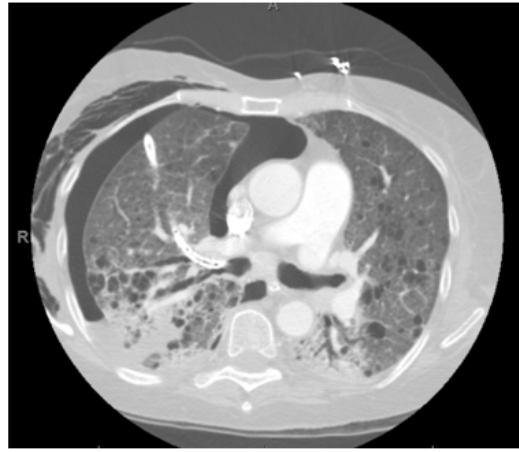


Figure 3 (Case 1): CT chest (transverse view) showing pigtail catheter in right main bronchus.



Figure 4 (Case 1): CT chest (coronal view)- red arrow showing pigtail in the right main bronchus.

A large bore (32 F) surgical chest tube was placed in the right thoracic cavity and pigtail drain was removed. Her respiratory condition remained unchanged with the continuous leak through the surgical chest tube over the next two weeks. Endoscopic or surgical repair was not feasible due to poor respiratory status. Unfortunately, her clinical condition continued to worsen due to multiorgan failure and family decided to withdraw care.

Case 2

65-year-old male with medical history significant for asthma and type II diabetes was admitted to the hospital with SARS-CoV-2 infection. As his clinical condition worsened, he was moved to intensive care unit and intubated for acute hypoxic respiratory failure. Lung pro-

tective ventilation strategy and prone positioning were used for management of ARDS. He also received broad spectrum antibiotics and hydrochloroquine. On day 30th of hospitalization he underwent tracheostomy in light of prolonged intubation. Post procedure chest X-ray showed small apical pneumothorax on the right side. A 14 fr. pigtail catheter was inserted under ultrasound guidance into the 3rd intercostal space mid clavicular line. There were no reported difficulties during the insertion. Post procedure chest X-ray showed persistence of moderate size pneumothorax with continuous air leak (Figure 5). A large bore (28 Fr) chest tube was inserted that led to resolution of pneumothorax with large continuous leak from both drains. Shortly after, patient had episode of oxygen desaturation despite being on 100% FiO₂ associated with significant loss of tidal volume. Bronchoscopy revealed the tip of the pigtail catheter in the right main bronchus. Placement of bronchial blocker was attempted that was successful transiently in controlling the air leak. Unfortunately, few hours later, patient became acutely unstable and developed cardiac arrest with persistent pulseless electrical activity and died.



Figure 5 (Case 2): CXR post procedure, showing the pigtail catheter in the right main stem and persistent moderate pneumothorax.

Discussion

Small bore chest tubes including pigtail catheters are commonly inserted for the management of pneumothorax. Unlike traditional large bore surgical chest tubes, these are smaller in size and afford greater flexibility leading to lower rates of complication, morbidity and better quality of life post-procedure [1,2,5].

However, there are multiple complications that may be associated with pigtail catheters. The most frequent complication associated with pigtail catheter is dislodgement, kinking and blockage of the catheter given their smaller diameter, however other less common ones such as mispositioning, pneumothorax, hemothorax and infection can occur [3].

Because these catheters are inserted via modified Seldinger technique involving a passage of guidewire and dilator into the pleural space, without the ability to directly palpate the lung, the operator must rely on the ultrasound to accurately identify various anatomic structures such as lung, liver, spleen and the diaphragm to avoid any injuries during insertion.

Various case reports have been published describing complications related to insertion of ultrasound guided pigtail catheters. Shen, *et al.* describes a case of misplaced pigtail catheter into the liver for right sided pleural effusion [6]. Lung laceration caused by pigtail malposition has been more commonly described, where the catheter enters the lung parenchyma and causes hemothorax or pneumothorax

[7]. Cardiac puncture caused by chest tube has also been reported, in which the tip of the catheter ended up in left ventricle leading to pulsatile blood coming out of the tube [8,9]. Im, *et al.* described a case of 38-year-old male in whom the removal of the pigtail catheter that was initially placed for right sided pneumothorax in the 1st intercostal space, lead to massive bleeding from the exit site that quickly progressed into hemorrhagic shock. Further investigation by angiography showed right subclavian artery laceration caused by malpositioned catheter [10].

In this case report we present two patients with severe ARDS from COVID-19 pneumonia that resulted in airway injury after placement of a pigtail catheter.

To our knowledge, bronchial perforation due to ultrasound guided pigtail insertion has not been previously described. We postulate that the overwhelming parenchymal inflammation caused by SARS-CoV-2 infection led to this unusual complication. In both cases procedures were performed by experienced providers and we do not believe that these complications can be attributed to technical complications related to insertion.

Nevertheless, there are preventive measures that can be done to limit such complications. Not pushing a dilator further than few millimeters mm past parietal pleura and choosing a lateral position for initial entry into the chest cavity may lower the risk of catheter placement complications. Avoidance of ultrasound guided pigtails and placement of surgical chest tube may be an additional consideration in patients with severe ARDS and high PEEP ventilatory settings.

Conclusion

Pigtail catheters are convenient and simple bedside procedures. They reportedly have less complications and better quality of life compare with larger bore surgical chest tubes. However, one should be aware of their complications including the rare ones. We are reporting two rare cases of catheter mispositioning into the main bronchus, both of which occurred in patients with COVID-19 pneumonia.

Contributors

AS and DK contributed to the writing of the case draft and obtaining consent. MS and ES are senior mentors (attendings) who contributed to professional editing, revising and proofreading.

Funding Support

The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing Interests

None declared.

Bibliography

1. Gammie JS, *et al.* "The pigtail catheter for pleural drainage: a less invasive alternative to tube thoracostomy". *JSLs, Journal of the Society of Laparoscopic and Robotic Surgeons* 3.1 (1999): 57-61.
2. Kulvatunyou N, *et al.* "Randomized clinical trial of pigtail catheter versus chest tube in injured patients with uncomplicated traumatic pneumothorax". *British Journal of Surgery* 101.2 (2014): 17-22.

3. Horsley A., *et al.* "Efficacy and complications of small-bore, wire-guided chest drains". *Chest* 130.6 (2006): 1857-1863.
4. Cafarotti S., *et al.* "Small-bore wire-guided chest drains: safety, tolerability, and effectiveness in pneumothorax, malignant effusions, and pleural empyema". *The Journal of Thoracic and Cardiovascular Surgery* 141.3 (2011): 683-687.
5. Roberts JS., *et al.* "Efficacy and complications of percutaneous pigtail catheters for thoracostomy in pediatric patients". *Chest* 114.4 (1998): 1116-1121.
6. Shen TC., *et al.* "A rare complication of pig-tail catheter insertion". *American Journal of Respiratory and Critical Care Medicine* 189.10 (2014): e64-65.
7. Saqib A., *et al.* "An unusual complication of pigtail catheter insertion". *The Journal of Thoracic Disease* 10.10 (2018): 5964-5967.
8. Anitha N., *et al.* "Intercostal drainage tube or intracardiac drainage tube?" *Annals of Cardiac Anaesthesia* 19.3 (2016): 545-548.
9. Kim D., *et al.* "Iatrogenic Perforation of the Left Ventricle during Insertion of a Chest Drain". *The Korean Journal of Thoracic and Cardiovascular Surgery* 46.3 (2013): 223-225.
10. Kim HJ., *et al.* "Subclavian Artery Laceration Caused by Pigtail Catheter Removal in a Patient with Pneumothorax". *Korean Journal of Critical Care Medicine* 30.2 (2015): 119-122.

Volume 10 Issue 12 December 2021

©All rights reserved by Arash Samarghandi., et al.