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Cardiac arrest following non-bronchoscopic bronchoalveolar lavage: A case report

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Abstract

Background: Pneumonia is common in neurocritical care patients. Non-bronchoscopic bronchoalveolar lavage (NB-BAL) is a generally safe, well-tolerated procedure with similar sensitivity to bronchoscopic bronchoalveolar lavage. This procedure is most often performed by non-physicians, particularly nursing and respiratory therapy, often without advanced training regarding the procedure. Adverse events with NB-BAL are usually minor or transient.

Methods: Here we report the first case of cardiac arrest as a severe complication of NB-BAL in an adult patient.

Conclusion: It is essential for the person performing NB-BAL to have knowledge of thecontraindications, potential complications, and indications to abort the procedure to ensure the safety and well-being of patients.

Keywords: Cardiac arrest; Bronchoalveolar Lavage (BAL); Hypoxia.

Background

Pneumonia is a common cause of fever in neurologically-injured patients. This group of patients is at higher risk for developing pneumonia and failing treatment than other populations [1]. Patients are often continued on antibiotics over 72 hours despite lack of confirmed infection [2]. Non-Bronchoscopic Bronchoalveolar Lavage (NB-BAL) is considered a low risk procedure performed by Registered Nurses (RN) and respiratory therapists to obtain sputum for cell count and culture data to evaluate for pneumonia [3-6]. It has similar sensitivity to bronchoscopic procedures, with only minor or transient adverse events commonly reported [7]. We report the first case of cardiac arrest as a severe complication of NB-BAL in an adult patient.

Case report

A 71-year-old female with past medical history significant for hypertension, diabetes and breast cancer presented to our Emergency Department with acute ischemic stroke. The patient received IV-tPA and had to be intubated in the Emergency Department for airway protection. She subsequently underwent mechanical thrombectomy, after which she was brought to neurocritical care for further management. She had a normal baseline coagulation profile and was started on aspirin 325 mg and Subcutaneous (SQ) heparin for deep vein thrombosis prophylaxis after 24-hour CT head was negative for hemorrhage. The patient remained intubated for airway protection and pneumonia suspected in the presence of profuse secretions and right lower lobe opacity on Chest Radiograph (CXR). NB-BAL was ordered to evaluate. During the NB-BAL, minor bleeding was reported, but there was no other active concern. A repeat NB-BAL was ordered on day 5 for recurrent fever despite broad-spectrum antibiotics. During the procedure, profuse bleeding with blood clots was reported. During the procedure, the patient became hypoxemic with high peak airway pressures on

the ventilator and subsequently developed asystolic cardiac arrest. Advanced Cardiac Life Support (ACLS) was initiated immediately. During ACLS, it was noted that ventilation was difficult. A tension pneumothorax was suspected by the code team and needle decompression attempted, but unsuccessful. Return of spontaneous circulation was achieved after 30 minutes. Post-resuscitation CXR showed left-sided tension pneumothorax along with overlying rib fractures. Chest tube was placed, but ventilation remained difficult. Emergent bronchoscopy was performed which revealed profuse blood clots in the Endotracheal Tube (ETT) causing airflow obstruction. Ventilation improved after exchanging the ETT. Arterial blood gas after exchange of ETT reflected normal parameters.

Discussion

BAL can either be Bronchoscopic (B-BAL) or Blind (NB-BAL). The NB-BAL is generally considered a safe procedure and is typically done at bedside by non-physician staff, such as RNs or RTs [3]. Also known as a mini-BAL or blind BAL, in NB-BAL the suction catheter is advanced blindly into the lung until resistance is met and the catheter placed in wedge position. The catheter is locked into place and 20 mL sterile saline instilled. The sample is then aspirated. This is repeated until adequate sample volume obtained. Commonly reported complications for this procedure include, transient hypoxemia and hypercapnia, arrhythmias, airway trauma with minor bleeding, pneumothorax, transient elevation in Intracranial Pressure (ICP), and transient elevation in blood pressure [6,8,9]. NB-BAL is generally easier, safer, cost effective and can be easily and quickly performed by non-physicians [10,11]. Sensitivity and specificity of NB-BAL is reportedly comparable to bronchoscopic BAL, while having superior sensitivity and specificity to tracheal aspirates [9,12,13].

In this patient's case, severe hypoxemia occurred due to ETT obstruction from blood clots as a result of airway trauma during NB-BAL. The development of pneumothorax was likely sequela of forceful bagging and chest compressions during resuscitation. Post-arrest CXR revealed the presence of rib fractures on the left with underlying tension pneumothorax (Figure 1). Although NB-BAL can routinely cause transient hypoxia, severe hypoxemia with difficulty in ventilation should raise alarm and the procedure aborted immediately. Although extremely rare, such a life-threatening complication may be avoided with adequate instruction and understanding of the consequences. In this case, the patient was reported to have minor bleeding during the first NB-BAL on day 2 which may have been aggravated by repeat NB-BAL on day 5.

Although the policy for NB-BAL varies among institutions, it is important to recognize high-risk patients and carefully weigh the risks and benefits of the procedure. Based on our institutional policy, there is no absolute contraindication to perform NB-BAL. Relative contraindications include severe coagulopathy (platelet count less than 50,000 k/ul, INR more than 1.7 and use of anticoagulation), hypoxemia with FiO_2 of >60%, lung transplant patients, bullous emphysema, severe acidemia, hemodynamic instability, increased intracranial pressure, hemoptysis and serious cardiac arrhythmias. This patient had no contraindication to NM-BAL per institutional policy but did have a report of minor bleeding during the first BAL. There is no specific guideline as to when it is appropriate to repeat NB-BAL from safety standpoint.

Nursing often does not have formal training or mandatory competency assessment prior to the performance of NB-BAL. It is important for those ordering and performing this procedure to be aware of contraindications, complications and indications to abort the procedure. Though repeated samples may be useful to deescalate antibiotics and prevent future resistance, caution should be used in repeat NB-BAL within a few days if the first procedure if there is reported bleeding [14].

Conclusion

Although NB-BAL is considered a minimal risk procedure, it can be associated with life-threatening complications as suggested by our case. It is important to realize this potential risk and use caution while performing this procedure in high-risk patients and in patients with evidence of prior airway trauma or injury. If bleeding is encountered, we recommend stopping the procedure immediately and notifying the primary provider for further evaluation.

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