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Accidental Displacement of Nasopharyngeal Airway in a Child on Non-Invasive Ventilation (Case Report)

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ABSTRACT
Effective and prompt pediatric airway management is an essential component of the successful management of acute respiratory failure in children. Applying Non-Invasive Ventilation (NIV) with Nasopharyngeal Airway (NPA) can facilitate managing these children with acute respiratory dysfunction, till the pathophysiological process resolves. Observation of potential complications of NPA is warranted, as displacement into the esophagus occurred in this reported patient. Integrating proper fixation method for these nasopharyngeal airways in children undergoing non-invasive mechanical ventilation may help in maintaining patent upper airway, as well as limiting potential complications of airway adjunct displacement.
Keywords: Displaced nasopharyngeal airway, pneumonia, Non-Invasive Ventilation.

INTRODUCTION

Effective and prompt airway management is an essential component of the successful management of acute respiratory failure. If the airway is not well established, respiratory failure may rapidly progress to cardiopulmonary arrest. Airway management is even more unique in the pediatric population as pediatric airway problems are commonly seen in these patients. It is reported that respiratory distress is the fourth most common complaint in children seen in the emergency department [1].

Maintaining patent upper airway can be lifesaving especially in children with upper airway compromise, such as those with Pierre Robin Sequence. Therefore, airway adjuncts, such as nasopharyngeal airway (NPA), to maintain their patency were included in algorithms for airway management in such patients [2].

Utilization of nasopharyngeal airways can help in providing non-invasive mechanical ventilation (NIV) in children. It was previously reported that using NPA and a continuous positive airway pressure circuit was a practical alternative to a tight fitting nasal or face mask for delivery of continuous positive airway pressure in adults [3]. However, it was also reported that nasal trauma, discomfort, and mouth breathing were the main disadvantages. We hereby report NPA displacement into the esophagus as another potential complication of such airway adjunct in children undergoing NIV in the Pediatric Intensive Care Unit (PICU).

CASE REPORT

This patient was an 11-year-old boy, with genetically-confirmed Neuronal Ceroid Lipofuscinosis. He was admitted to the PICU for pneumonia with moderate respiratory distress, for which he was placed on NIV with moderate mechanical ventilator settings. Due to high upper airway resistance, a nasopharyngeal airway (Fig.1) was inserted into his right nostril, which facilitated NIV.

Next day, during routine clinical care at 10 pm, the nurse noted the tip of the nasopharyngeal airway was not in the nostril. PICU physician also confirmed that the NPA was not visualized in the oral cavity. Urgent Chest X-ray (Fig. 2a) showed radiopaque elongated shape along the esophagus; measuring approximately 11 cm, with the proximal tip at T2 and the distal end at T9 level.

As the child remained clinically stable (same respiratory status, no drooling of saliva and stable vital signs), he was observed closely in the PICU overnight. Next morning, the child underwent upper GI-endoscopy under general anesthesia with endotracheal intubation. The foreign body was removed smoothly by forceps endoscopy from the mid-esophagus, with no complications, as shown on the Chest X-ray in Fig. 2b. On the same day, the child was extubated again to NIV, and managed according to his clinical condition.

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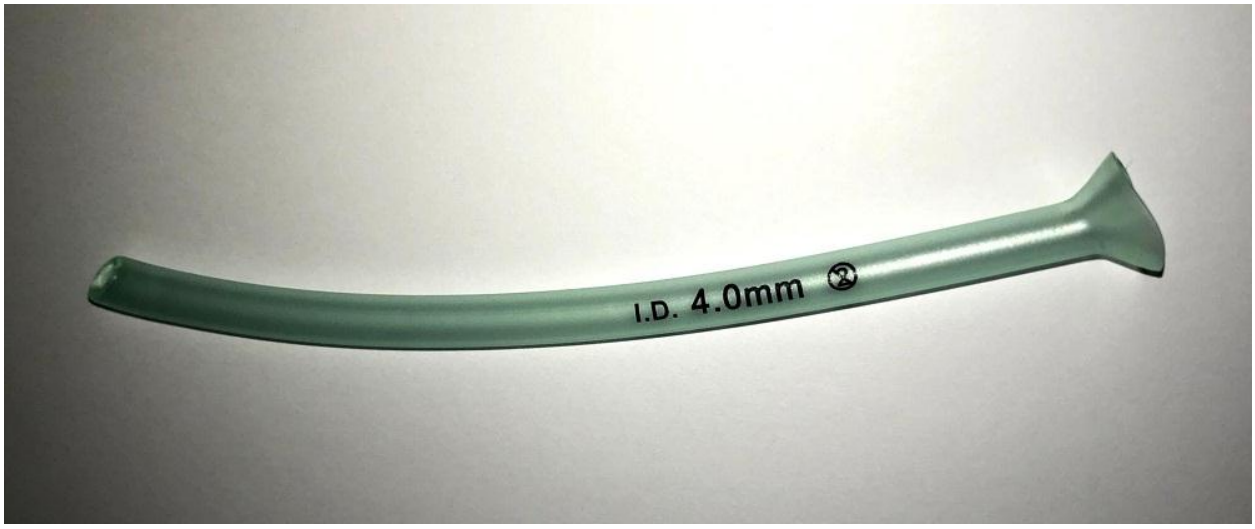

Figure 1: A nasopharyngeal airway similar to the one used in the reported patient

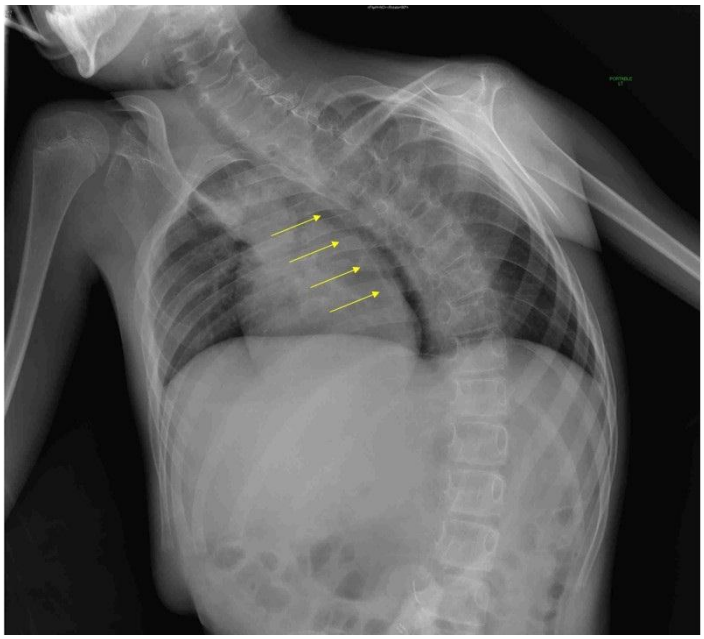

Figure 2a: Chest X-ray showing radiopaque elongated shape (yellow arrows) along the esophagus; measuring approximately 11 cm, with the proximal tip at T2 and the distal end at T9 level.

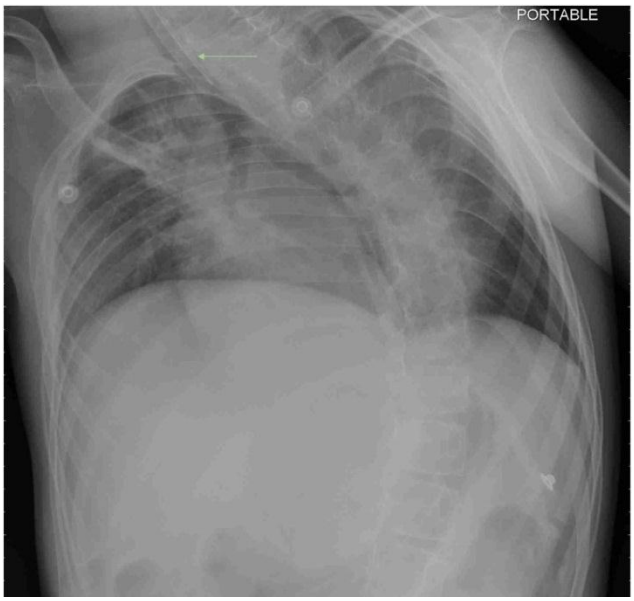

Figure 2b: Chest X-ray post-endoscopic removal of the NPA. Green arrow point to the ETT in place.

CASE DISCUSSION

First steps in airway management include airway positioning maneuvers (such as head-tilt-chin lift, jaw-thrust), airway suctioning, providing supplemental oxygen, and re-positioning of the airway if the previous steps are ineffective. If these steps are not adequate to maintain a patent airway, then an airway adjunct may be helpful. Airway adjuncts can relieve or bypass an upper airway obstruction during airway management[1].

Pediatric patients, especially infants and young children, are more susceptible to upper airway obstruction. This predisposition is related to the differences between pediatric and adult airways. Infants and young children have a relatively larger occiput that causes neck flexion when lying supine. Children also have a proportionally large tongue relative to the size of their oral cavity and larger adenoidal tissue, as well as, more distensible and compliant larger airways which predispose them to airway obstruction. In general, by the age of eight years, the pediatric airway becomes very similar to that of an adult airway[1].

A nasopharyngeal airway, also known as an NPA, nasal trumpet (because of its flared end), or nose hose, is one type of airway adjunct that is commonly used in pediatric airway management. This tube that is designed to be inserted into the nasal passageway to maintain an open airway. The reason for the flared end is to prevent the device from becoming dislodged inside the patient's nose.

The correct NPA size was chosen by measuring the device on the patient: the device should reach from the patient's nostril to the earlobe or the angle of the jaw [4]. The outside of the NPA was lubricated with a water-based lubricant so that it can be inserted into the nostril more easily. The NPA was inserted until the flared end rests against the nostril. Some tubes have a safety pin to prevent inserting the tube too deeply. However, care must be taken to ensure this pin does not stick into the nostril. If the NPA has no pin, it is advised to stop insertion just before as the natural gag reflex occurs, and tape the remaining exposed portion of the NPA to the surrounding facial skin.

NIV remains a valuable, safe, and effective mode of therapy for children with respiratory distress and dysfunction [5]. By definition, NIV is distinguished from other ventilatory techniques that bypass the patient's upper airway with an artificial airway (namely; endotracheal tube (ETT), laryngeal mask airway, or tracheostomy tube) [6]. Applying NIV with NPA in place can facilitate managing children with acute respiratory dysfunction, till the pathophysiological process resolves.

If no small NPA is available for small children, some healthcare providers used to cut similar size and

length endotracheal tube (ETT) to use it as a nasopharyngeal airway instead. However, it is reported that such cut ETT may migrate into the esophagus after displacement of the tube connector during nasopharyngeal oxygenation [7]. Although the flared end of the NPA is designed to keep the airway adjunct in place and hold it from dislodging into the airways or the esophagus, our patient demonstrated that this actually occurred, causing significant complication. Thereafter, further action was taken by implementing institutional guidelines to secure NPA in place, aiming to prevent such incident from reoccurring.

CONCLUSION

Integrating proper fixation method for nasopharyngeal airway in children undergoing non-invasive ventilation may help in maintaining patent upper airway, as well as limiting potential complications of airway displacement.

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