A Novel Nasal CPAP Mask Assembly Maintained Spontaneous Ventilation and Oxygenation in a Deeply-Sedated Pediatric Patient with a Large Pneumothorax during CT Scan-Guided Chest Tube Insertion

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Background: Patients under monitored anesthesia care (MAC) often receive IV sedation and nasal cannula (NC) O₂. Over-sedation or airway obstruction may cause desaturation. A nasal TSE-PAP mask assembly has been shown to improve oxygenation by delivering nasal CPAP, BiPAP or positive pressure ventilation (PPV) in obese adult patients with OSA under MAC or during induction of general anesthesia(1-6). It has rarely been used in pediatric patients(7). We used it to maintain spontaneous ventilation in a sedated pediatric trauma patient during chest tube insertion.

Case Description: A 14 y/o, 5’, 42 kg, boy, with a large right pneumothorax sustained from a fall while skate boarding, presented for CT scan guided chest tube insertion. Besides right 4th and 5th rib fracture, he had left radial/ulnar fracture. He complained of dyspnea with exertion and was NPO > 12 hrs. His mother gave consent to use a nasal mask if needed and to take photographs for case report.

He was pre-oxygenated with NC O₂ (3 L/min) with a face tent(1) and his O₂ saturation (Sat) was 100%. He received lidocaine (20 mg) and propofol (30 mg bolus and 100 mcg/kg/min infusion). Several minutes later, he became apneic and needed constant jaw thrust to maintain a patent airway.

An infant face mask (size #2) with fully inflated air cushion was secured over his nose with head-straps and connected to an extended long breathing circuit and the anesthesia machine (Photo 1-2). Small PPV was delivered 3 times to ensure patent nasal airway and to maintain 100% O₂ Sat.

The APL was adjusted to deliver 2 cm H₂O CPAP with O₂ (3 L/min) and air (0.8 L/min). He resumed spontaneous ventilation as indicated by capnography and by the movement of an inverted reservoir bag (Photo 3). Small PPV was delivered 3 times to ensure patent nasal airway and to maintain 100% O₂ Sat.

Deep sedation was maintained with propofol (100 mcg/kg/min) and O₂ Sat was 99-100% without further airway manipulation. He tolerated the complicated 1 ½-hr procedure well without moving.

The interventional radiologist was very impressed with this technique. The patient was transported to ICU without problem. His mother was elated that he woke up comfortably.

Discussion: This nasal CPAP mask assembly uses a pediatric face mask and the existing anesthesia equipment. It maintained spontaneous ventilation and oxygenation in a deeply sedated pediatric patient with a large pneumothorax during chest tube insertion. It avoided constant airway manipulation in a CT scan suite. It provided CPAP during re-expansion of the collapsed lung and may improve patient safety.