Non invasive respiratory support in a multi-trauma setting: A case report

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Abstract

Introduction: Non invasive respiratory support has been used in a wide variety of settings. This case report illustrates the benefit of such support in a complex multi-trauma patient.

Case presentation: A 42 year-old male restrained driver was brought to the trauma bay with multiple injuries. These included: aortic transection, frontal lobe hemorrhages, bilateral pneumothoraces, multiple rib fractures, diaphragmatic rupture, C7 fracture, and pubic rami fractures. After surgical repair, the patient was transferred to the Kessler Burn Trauma ICU sedated and ventilated. Serial bronchoscopies were performed to improve aeration of his left lung over the next week. The patient was extubated on POD # 9 but required reintubation the following day due to lung collapse. A regimen of non invasive positive pressure ventilation was initiated to avoid reintubation for repeated bronchoscopies. The therapy was successful and the patient progressed to room air after one week.

Conclusion: Studies have strongly supported the use non invasive respiratory support for reducing morbidity and mortality of specific groups of patients in acute respiratory failure. In this case report it was used successfully in an acute multi-trauma patient. Non invasive respiratory support should be considered for the prevention and treatment of acute respiratory failure in even the most complex patients.

Key words: multi-trauma, non invasive respiratory support, atelectasis, diaphragmatic dysfunction

Introduction

Over the years there has been an evolution of literature supporting the use of non invasive respiratory support (NRS) to manage a wide range of respiratory pathologies. Clinicians are working to develop protocols and guidelines to prevent ventilator associated pneumonia (1). The use of NRS may have a role in even the most complex patients. We wish to describe the management of a multi-trauma patient and how he benefited from a non invasive ventilation protocol.

Case report

PF was a 42 year-old male restrained driver in a two car motor vehicle accident who was brought by ambulance to the trauma bay. The patient was intubated by the emergency department physicians for airway protection and underwent diagnostic imaging. His injuries on exam included: Ascending aortic transection, left sided thalamic and frontal lobe hemorrhages with diffuse axonal injury, bilateral pneumothoraces, left hemothorax, left diaphragmatic rupture, C7 transverse

Reference

(1)
process fracture, right 1-3 rib fractures, left 1-10 rib fractures and subsequent flail chest, and bilateral pubic rami/acetabular fractures. He was taken to the OR emergently and underwent total endovascular aortic repair with a carotid-carotid bypass, and exploratory laparotomy for spleenectomy and repair of his diaphragmatic laceration. Bilateral chest tubes were placed. Post-operatively, the patient was taken to the ICU and placed on airway pressure release ventilation (APRV) and later, changed to pressure regulated volume control (PRVC) ventilation. Neurosurgery placed and ICP monitor at the bedside. Three days post-operatively, PF was noted to have worsening aeration of his left lung. Fiberoptic bronchoscopy was performed and large amounts of thick, bloody mucous was removed and some improvement in his chest x-ray was noted. On POD #5, portable chest x-ray showed a near total opacity of his left lung (figure 1). Again, a bronchoscopy was performed and thick, bloody secretions were cleared from the patient’s lung. Follow up CXR showed drastic improvement (figure 2). Over the next few days, the ventilator settings were weaned and the patient was extubated on POD #9. CXR the following day,
however, showed collapse of the lung (figure 3). He was intubated electively and bronchoscopy performed to remove the obstruction. Bronchoscopic findings however were minimal despite his poor radiographic picture (figure 4). The dilemma at this point of the patient’s care was how to keep his left lung inflated. The patient tolerated extubation but would quickly collapse his left lung. Keeping him intubated for serial bronchoscopies seemed less than ideal. On POD # 12 the ICU team started the patient on intermittent positive pressure ventilation (nPPV) at 10cm of H2O and 5cm of H2O of PEEP for 2 hours, 4 times daily in addition to Dornase and aggressive pulmonary toilet. This therapy was continued for one week. Subsequent chest films (figures 4 and 5) showed adequate expansion of the left lung and the patient did not require any more intubations for bronchoscopies. PF progressed to tolerating room air throughout the day with CPAP at night for comfort.

Discussion

Non invasive respiratory support (NRS) has been shown to be an effective means of providing ventilatory support to certain groups of patients in acute respiratory failure. This is most often provided through either non invasive positive airway pressure (nCPAP) or non invasive positive pressure ventilation (nPPV). The goals of NRS are to 1) reduce the work of breathing 2) reduce atelectasis and improve gas exchange and 3) reduce left ventricular afterload. Previous studies have examined the use of NRS as either a preventative measure or a curative treatment.

Thoracic and abdominal surgeries negatively impact pulmonary function. Anesthetics decrease muscle tone and increase lung retractile forces and surgery itself affects diaphragmatic function and induces pain. Arozullah et al (2) developed a risk index for predicting post-operative pulmonary complications. Depending on the number of risk factors present, patients have a 0.5% to 31% risk of respiratory failure. Studies have shown NRS to be useful after abdominal surgery to reduce atelectasis formation (3, 4). Antonelli et al. (6) showed that in organ transplant recipients, NRS reduced to rate of intubation and the incidence of ICU mortality. A meta-analysis of patients with COPD in acute respiratory failure showed that nPPV is effective at reducing morbidity and mortality (7).

PF had a number of injuries that contributed to his respiratory failure. He had bi-
lateral pneumothoraces treated with chest tubes, a flail chest from numerous rib fractures, and a diaphragmatic injury that was surgically repaired. Once extubated, the patient would quickly form atelectasis leading to opacification of his left lung field. nPPV with PEEP was effectively used to reduce his work of breathing and maintain patency of his airway until his injuries had begun to heal. Previous studies have looked at specific groups of patients that may benefit from NRS. The patient in this case report presented with injuries that were well compensated for with NRS. Its application was based on the patient’s altered lung physiology. Chidini et al. (8) presents criteria for NRS application, contraindications to its use, and how to initiate the therapy. NRS has been shown to reduce morbidity and mortality in various situations. Physicians should consider its application in acute respiratory failure before more invasive measures are warranted.

References

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