

Percutaneous tracheostomy in a super obese patient: a case report

Abstract

Introduction: Obesity is a growing global epidemic and is associated with morbidity and mortality. Airway management of morbidly obese patients requiring long-term ventilation is scarce. This is the first case report in literature to describe a percutaneous tracheostomy technique performed on a super obese patient (Body Mass Index=87kg/m²).

Case presentation: A 31-year old gentleman, weighing 640 pounds, with a history of congestive heart failure, renal failure and chronic obstructive pulmonary disease, presented to the emergency department with decreased level of consciousness and admitted to the intensive care unit with respiratory failure. He required long-term mechanical ventilation however given his BMI and co-morbidities, the best approach was unclear. After careful inspection of the anatomy, a percutaneous tracheostomy was safely performed in this patient.

Conclusion: Performing a percutaneous tracheostomy is feasible and safe in selected super obese patients whose neck anatomy is favorable-particularly the palpation of the cricoid cartilage and the proximal tracheal rings. Appropriate positioning in these patients, while difficult, is also a sentinel step in the success of this technique.

Keywords: morbid obesity, critical illness, intensive care unit, percutaneous tracheostomy, cricoid cartilage, prolonged mechanical ventilation

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Abbreviations: BMI, body mass index; ICU, intensive care unit; PT, percutaneous tracheostomy

Introduction

Obesity-defined by a body mass index (BMI) of greater than or equal to 30kg/m²-is a rapidly rising cause of all-cause mortality in the United States;^{1,2} its prevalence has more than doubled from 1980 to 2014 affecting more than 600 million adults worldwide.² In the intensive care unit (ICU), approximately 25% of the critically ill patients are obese.^{3,4} Management of such patients can be challenging as they may require prolonged mechanical ventilation and a longer stay in ICU compared to non-obese patients.³

Tracheostomy is a common procedure performed in critically ill ICU patients requiring prolonged ventilation, usually more than 10days.⁵ This procedure is associated with improving patient comfort, reducing the need for sedation, lowering airway resistance and allowing for easier airway care.⁵ Since the advent of percutaneous tracheostomy (PT) technique, which is performed at the bed side in a typical intensive care unit (ICU), majority of patients with prolonged respiratory failure do not require an open technique in an operating room. This is largely due to overwhelming evidence suggesting that PT is as safe as the open technique, in addition to decreased rates of wound infection, bleeding, procedural time and cost.⁵⁻⁷ However, the safety of performing PT in morbidly obese patient continues to be controversial, largely due to difficult anatomy.⁴ Although some studies have shown the safety of the procedure in obese patients with average BMI ranging between 30 and 50kg/m²,^{4,8,9} very few studies or case reports are available on extreme morbid obese patients. As such,

it is unclear whether such patients can be considered for PT. In this case report, we present a successful insertion of a PT tube in a patient with a BMI of 87 at the bedside in the ICU.

Case report

A 31-year-old gentleman presented to emergency room with decreased level of consciousness and subsequent respiratory failure requiring ICU admission and mechanical ventilation. His medical history was significant for congestive heart failure with a grade 3 left ventricular function and chronic renal failure. He had a known history of chronic obstructive pulmonary disease and a previous admission to a medical ward for asthma exacerbation. His major comorbidity however was his weight at 640pounds. Given the height of 6feet he was considered to be in super obese category with BMI of 87kg/m². Secondary to multiple medical issues and failing multiple ventilator weaning trials, it was concluded that he would require significantly prolonged ventilator support and a tracheostomy was performed.

Technique

With the patient's vital signs continuously monitored, the patient was paralyzed and put on complete ventilator support for the purpose of the physical examination. Careful assessment of the patient was carried out with patient's neck fully extended and chest elevated using multiple form paddings. The examination revealed that the cricoid cartilage was palpable and enough space existed between the cartilage and suprasternal notch for tracheostomy tube insertion. While the anterior tracheal wall was not completely palpable, the first and second tracheal ring was. As the potential feasibility for insertion of tracheostomy tube was confirmed, a Shiley XLT tracheostomy tube

(Covidien, Mansfield, MA) with internal diameter of 7.0 millimeter was ordered. Under full paralysis in the carefully positioned patient, with the guidance of fiber-optic bronchoscope, PT was inserted using Ciaglia Blue Rhino Kit (Cook Medical INC., Bloomington, IM) adhering to well described single step dilation with curved dilator technique.⁵ No complications occurred and the patient tolerated the procedure well.

Discussion

As the incidence of morbid obesity in the general population increases, so does the incidence of morbidly obese patients with critical illnesses requiring respiratory support and prolonged mechanical ventilation.^{3,10} There is scarce evidence in the approach in tracheostomy in obese patients. Heyrosa et al.⁹ compared PT to open tracheostomy in obese patients (PT: n=89, mean BMI 42.4kg/m², Open: n=53, mean BMI 42.7kg/m²) and reported similar adverse events between the 2 groups. Aldawood et al.⁴ performed 227 PT (50 in obese patients (mean BMI 33.53kg/m²) and 177 in non-obese patients (mean BMI 23.38kg/m²)) and determined that PT can be performed safely in majority of obese patients. Mansharamani⁸ using a small case series of 13 obese patients (BMI ranging from 30 to 67), reported minimal complications and concluded that bedside PT can be safely performed in these patients. While these studies provide some evidence in the critically ill obese cohort, scarce literature exists on extremely morbid obese patients. Given the rapidly growing prevalence of morbidly obese patients,¹⁰ it is paramount to discuss the management of such issues in the medical literature.

Furthermore, the challenge with providing critical care to severely obese is two folds; patient safety as well as safety of health care staff. In this case, it required seven ICU staff to properly position the patient. The usual soft paddings normally used for this type of procedures were ineffective and multiple hard paddings had to be used to elevate the chest and keep the neck in a fully extended position. For patient's safety and prevention of accidental extubation the patient was fully paralyzed, sedated and ventilated during the examination and subsequently the procedure. Aside from general operability assessment of the patient, careful examination of the neck is crucial in determining the feasibility of the procedure, hence the physical exam under complete anesthesia. As long as the cricoid cartilage and proximal tracheal rings are palpable, PT can be selected in extremely morbid obese patients.

The usual tracheostomy tube will inevitably be too short in super-obese patients. The tracheostomy has to have a long proximal end to be securely positioned between skin and anterior wall of the trachea. The distal length of the tube is determined by the height of the patient; in our case an average length was deemed appropriate. The type of tracheostomy tube required may not be readily available and will have to be specially ordered.

Ultimately, fiber-optic bronchoscopy guidance is of paramount importance for efficient and safe insertion of the PT in super-obese patients as any intra-procedural complications may result in rapid demise of these patients. The actual procedure of inserting the PT using Blue Rhino Kit should be straight forward once above mentioned considerations are given.

Conclusion

This case demonstrates that with adequate preparations and careful clinical examination, PT can safely be inserted in selected extremely morbid obese patients.

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Conflict of interest

The author declares no conflict of interest.

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