CASE REPORT

Early Percutaneous Dilatational Tracheostomy to Facilitate Ventilator Weaning in a Patient with Blunt Abdominal Trauma and Hemorrhagic Shock: A Case Report

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ABSTRACT

Background: Hemorrhagic shock and the requirement for continuous mechanical ventilation are frequent outcomes of blunt abdominal injuries, a dangerous illness. Long-term endotracheal intubation increases the risk of ventilator-related problems. In critically ill patients, percutaneous dilatational tracheostomy (PDT) has been proposed to facilitate their transition off the ventilator and reduce the risk of pulmonary complications.

Case: A 53-year-old woman presented after falling from around 10 meters in the air. It was discovered that she had suffered blunt abdominal trauma, which caused hemorrhagic shock and extensive brain bruising. An exploratory laparotomy was done in an emergency. This treatment included fixing a left kidney tear, restoring the bladder, and establishing a transverse colostomy because of colon damage. She needed continuous mechanical ventilation in the intensive care unit after surgery. On the seventh day of intubation, an early PDT was performed because the patient was having trouble detaching from the ventilator. Fifteen days after the PDT was implanted, the patient's respiratory state gradually improved, and she was successfully decannulated. She spent 23 days in the hospital overall.

Discussion: In trauma patients who need continuous mechanical ventilation, tracheostomy may result in improved comfort, less sedation, simpler pulmonary toileting, and perhaps a decrease in ventilator-associated pneumonia (VAP). In this instance, successful ventilator weaning without major complications was made possible by early performance of PDT.

Conclusion: Early PDT is a safe and efficient way to help trauma patients who have been on mechanical ventilation for a long time facilitate ventilator weaning. For best results, time and patient selection are crucial.

Keywords: blunt abdominal trauma; critical care; hemorrhagic shock; percutaneous dilatational tracheostomy; ventilator weaning

INTRODUCTION

One of the leading causes of death and morbidity worldwide is blunt abdominal trauma, which primarily results from intra-abdominal bleeding and hemorrhagic shock. Survival depends on early detection and timely resuscitation following an airway, breathing, and circulation (ABC) evaluation.[1] If hemorrhagic shock is not promptly treated, it may lead to tissue hypoperfusion, metabolic acidosis, and multiorgan failure.[2]

Intubation and extended ventilation are frequently necessary for patients who have experienced severe trauma. However, putting the latter into practice can result in problems including ventilator-associated pneumonia (VAP), airway injury, altered sedation levels, and longer ventilator dependency, among other short- and long-term repercussions of translaryngeal intubation.[3]

Percutaneous dilatational tracheostomy (PDT) is a frequent method used in intensive care units to manage airways. It is particularly utilized for people who need continuous ventilation support for breathing. PDT has a benefit over standard surgical tracheostomy as it may be done right at the patient's bedside. It seems to be on par with the other method in terms of safety. Furthermore, the operation usually takes less time, and it may lead to a decreased risk of wound infections.[4]

The optimal timing of tracheostomy remains a subject of ongoing debate. Recent studies suggest that early tracheostomy, commonly performed within 7–10 days after initiation of mechanical ventilation, may reduce the duration of mechanical ventilation and shorten intensive care unit stay in selected critically ill patients.[5,6,7]

This case report describes a patient who experienced hemorrhagic shock after suffering blunt abdominal trauma. The doctors tried early PDT since they were having trouble getting off the ventilator, and it turned out to be rather effective.

Nonetheless, the ideal timing for tracheostomy in trauma patients continues to be a matter of active discussion. Although early tracheostomy correlates with a decreased duration of mechanical ventilation and a shorter intensive care unit stay, evidence regarding optimal patient selection and its influence on clinical outcomes remains inconclusive. This uncertainty underscores the necessity for additional clinical insights, especially in intricate trauma cases necessitating extended ventilatory support.

CASE

After falling roughly ten meters, a 53-year-old woman arrived at our hospital. Ever after the fall, she had not woken up. She was in hemorrhagic shock, hardly conscious, and we suspected abdominal hemorrhage when she came. The patient had a glasgow coma scale (GCS) score of 8 (E2V2M4), a blood pressure of 90/50 mmHg, a heart rate of 120 beats per minute, a respiratory rate of 28 breaths per minute, and an oxygen saturation of 94% with oxygen supplementation when they were admitted. To evaluate her, we immediately started using the common trauma protocols.

On July 21, 2024, she immediately underwent emergency surgery. In the operating room, we discovered that her colon was lacerated, her bladder was torn, and her left kidney was severely wounded. The team did a transverse colostomy and fixed her bladder.

The patient needed mechanical ventilation with a pressure-controlled mode, a FiO_2 of 0.5, and a positive end-expiratory pressure (PEEP) of 5 cmH_2O while she was in the intensive care unit. There, things did not get any easier. Due to her numerous injuries and likely a broad brain contusion, she had difficulty getting off the ventilator. Every attempt at a spontaneous breathing trial failed, even after we restored her organs and raised her blood pressure.

Despite stable hemodynamics, FiO_2 0.4-0.5, PEEP 5 cmH2O, and sufficient oxygen saturation, repeated attempts at spontaneous breathing failed. Due to weak respiratory effort and diminished consciousness, the patient was still unable to maintain spontaneous ventilation.

We carried out a PDT in the intensive care unit on the seventh day of intubation. We employed intravenous sedation and neuromuscular blockade as part of the standard Ciaglia single-dilator approach.[15,16] No pneumothorax, no bleeding, and no damage to the trachea's rear wall occurred. The patient's respiration became much simpler to control after the tracheostomy. We began gradually weaning her off the ventilator since she required less sedation, and it was easier to clear her airway. After fifteen days, she satisfied all the requirements for decannulation: she had a powerful cough, her breathing was stable without the ventilator, she required little suctioning (less than once a day), and her oxygen levels remained high on room air. Under complete intravenous anesthetic, we performed a surgical closure of the tracheostomy, and her vital signs were stable during the process. Following surgery, she was admitted to the high care unit for 24 hours before being transferred to the main ward. She returned home in stable condition on August 12, 2024. She was in the hospital for 23 days in total.

Table 1. Initial laboratory findings

Parameter	Result
Hemoglobin	11.9 g/dL
Leukocyte count	14,540/mm^3
Hematocrit	36%
Platelet count	575,000/mm^3
Prothrombin time	14.2 s
Activated partial thromboplastin time	25.5 s
Albumin	3.11 g/dL
Urea	34.10 mg/dL
Creatinine	0.62 mg/dL
Random blood glucose	132 mg/dL
Sodium	133 mmol/L
Potassium	3.99 mmol/L
Calcium	8.7 mg/dL
Chloride	96 mmol/L

After the first resuscitation, hemoglobin levels were within an acceptable range, but early laboratory results revealed leukocytosis, indicating an inflammatory reaction. At presentation, renal function measures such as creatinine and urea were within normal ranges, suggesting that kidney function was preserved.

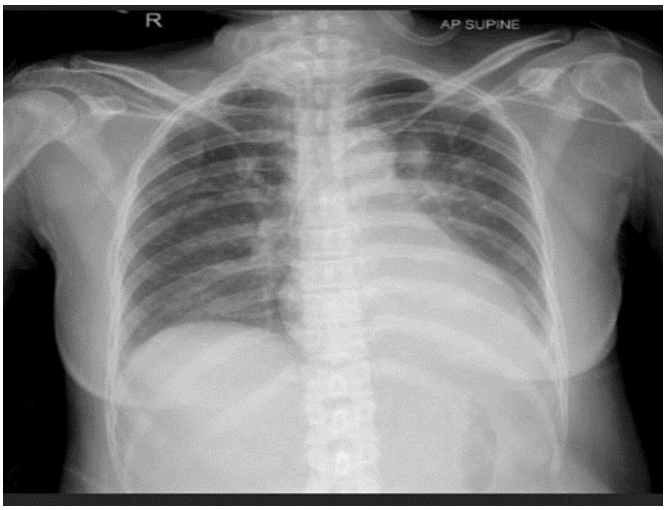


Figure 1. Chest X-ray
Chest X-ray showed no significant pulmonary abnormalities, suggesting that respiratory compromise was primarily related to neurological impairment rather than primary lung pathology.

DISCUSSION

Early tracheostomy is generally characterised as a procedure conducted within 7–10 days following the commencement of mechanical ventilation, although precise definitions differ among studies.[5,7]

In this case, early PDT was performed on day 7 of mechanical ventilation, which falls within the commonly accepted definition of early tracheostomy. The decision was based on repeated weaning failure, decreased level of consciousness due to brain injury, and the anticipated need for prolonged ventilatory support. These factors are recognized indicators for early tracheostomy in critically ill trauma patients.[5,8,9]

Several studies have indicated that early tracheostomy may decrease the duration of mechanical ventilation, the length of ICU stay, and the occurrence of VAP. However, evidence regarding its effect on mortality remains inconsistent, and optimal patient selection continues to be a significant challenge.[5,7,10]

This case highlights that individualized clinical decision-making is based on each trauma patient's needs. What we learn from this is that using PDT may be beneficial for patients who have difficulty getting off a ventilator and have brain problems, even if they have severe injuries and are losing a lot of blood. The thing to remember is that early PDT can be beneficial for trauma patients with repeated weaning failure and neurological impairment.[5,7,10]

Severe trauma patients frequently require extended ventilator stays due to brain damage, systemic inflammation, and issues with several organs.[11,12] Keeping a tube in the neck for an extended period of time compromises the airway, increases the risk of pneumonia, and just makes the patient more uncomfortable.[13,14]

Early tracheostomy can reduce the length of time patients require artificial ventilation and decrease their stay in the intensive care unit, according to a number of meta-analyses. However, the effect on mortality is less evident.[5,10] Early tracheostomy appears to improve lung care and reduce the requirement for sedation in trauma situations.[11,17]

Compared to surgical tracheostomy, PDT offers a few obvious advantages. It takes less time, you can do it at the patient's bedside, and there is a lower chance of infection.[4] In the instance of our patient, nothing went wrong, neither immediately nor later.

Decannulation, the process of removing the tube, depends on a few crucial factors. The patient requires stable respiration, a sufficiently powerful cough, little mucus production, and a respectable neurological recovery.[17,18] In this case, we were able to decannulate 15 days after administering the PDT, demonstrating that we chose the appropriate patient and period.

Stable spontaneous breathing without ve ntilator support, an efficient cough refle x, a low secretion burden, sufficient oxy genation, and satisfactory neurological i mprovement were all indicators of succ essful decannulation.

CONCLUSION

Early PDT may be a safe and effective strategy to facilitate ventilator weaning in selected trauma patients. Careful patient selection and appropriate timing are essential to optimize clinical outcomes.

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