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Management of Traumatic Neck Injury with Tracheal Rupture: A Case Report

Nico Lumintang,[1] Stepvani Megawati[2]

[1]Division of Head and Neck Surgery, Department of Surgery, Faculty of Medicine, Universitas Sam Ratulangi – Prof. Dr. R. D. Kandou Hospital, Manado, Indonesia
[2]Department of Surgery, Faculty of Medicine, Universitas Sam Ratulangi, Manado, Indonesia
Email: nicoalexander@dosenlb.unsrat.ac.id; stepvanimega@gmail.com
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Abstract: Penetrating neck injuries are uncommon but potentially life-threatening due to the complex anatomy and the risk of airway, vascular, or esophageal compromise. Prompt diagnosis and management are critical to avoid severe complications. We presented a case of a 16-year-old male who sustained a traumatic injury to the neck due to a traffic accident. While the patient was riding a motorcycle, he hit a bridge, and his neck hit the bridge iron. The wound, located in the anterior zone II of the neck, resulted in crepitus and subcutaneous emphysema. Imaging confirmed tracheal rupture at the first and second tracheal rings. Emergency surgical exploration revealed a through-and-through tracheal injury, which was repaired with tracheostomy placement. Postoperative recovery was uneventful. The patient exhibited no signs of airway compromise, hemoptysis, or dysphagia. The emphysema resolved completely. Follow-up demonstrated a full recovery with no residual complications. In conclusion, early diagnosis and surgical management of traumatic neck injuries with tracheal involvement are vital to prevent fatal outcomes. This case highlights the importance of systematic assessment and rapid intervention in traumatic neck injuries. Surgical repair, combined with close postoperative monitoring and multidisciplinary collaboration, is essential to ensure optimal outcomes, particularly in cases involving airway trauma.
Keywords: traumatic neck injury; tracheal rupture

INTRODUCTION

Traumatic neck injuries are uncommon but potentially fatal due to the high density of critical anatomical structures in the neck, such as the airway, blood vessels, and nerves.[1] Zone II injuries, in particular, pose significant risks because of their proximity to these vital structures, and timely intervention is crucial to prevent severe complications like airway obstruction, hemorrhage, or infection.[2]

Airway management is often the first priority in such cases. Techniques like video-assisted intubation or surgical tracheostomy have been shown to be effective in stabilizing the airway and allowing for definitive surgical intervention, depending on the severity and location of the injury.[3-4] Imaging modalities, including CT scan and X-ray, play a pivotal role in assessing the extent of the damage and planning surgical repair.[5]

This case report describes a 16-year-old male who sustained a traumatic neck injury resulting in tracheal rupture. The aim of this report is to highlight the importance of rapid assessment, surgical management, and postoperative care in ensuring favorable outcomes in such complex trauma cases.

CASE REPORT

A 16-year-old male presented to the emergency department with a traumatic injury to the neck due to a traffic accident. The patient was riding a motorcycle and hit a bridge, and his neck hit the bridge iron. The injury occurred approximately eight hours prior to admission, and the patient denied any history of active bleeding, hemoptysis, voice changes, or respiratory distress.

On primary survey, the patient was alert with clear airway, stable vital signs (heart rate 98 bpm, blood pressure 107/55 mmHg, respiratory rate 22 breaths/min, SpO2 99% on nasal cannula), and no signs of acute distress. Secondary survey revealed a 2x1 cm open wound on the anterior neck at the level of the thyroid cartilage, with sucking wound, crepitus and subcutaneous emphysema. There was no active bleeding, but the wound edges were irregular, and the wound base was difficult to evaluate. No bubbling was observed.

Initial imaging included X-rays and a CT-scan of the cervical region, which revealed subcutaneous emphysema extending from the cervical vertebrae to the supraclavicular regions bilaterally, without bone discontinuity or malalignment. A CT-scan further identified a rupture of the trachea at the level of the first and second tracheal rings.

The patient underwent emergency surgical exploration under general anesthesia. A horizontal collar incision was made 2 cm below the wound site, and layer-by-layer dissection was performed to reach the subplatysmal plane. The trachea was exposed, revealing laceration involving the tracheal rings. The anterior laceration measured 10x8 cm. A tracheostomy tube (size 7.5) was placed at the site of the injury to maintain airway patency, and the wound was repaired layer-by-layer.

Figure 1. Intraoperative view

Postoperative recovery was uneventful. On the first postoperative day, subcutaneous emphysema had reduced significantly. By the third day, the patient reported no dysphagia, hoarseness, or respiratory symptoms. The patient was discharged in stable condition on the fifth postoperative day and followed up at the outpatient clinic. By the 14th post-operative day, the tracheostomy tube was successfully removed, and the patient demonstrated complete recovery without complications.

The patient underwent prompt surgical exploration and tracheal repair. During the procedure, the trachea was exposed, revealing laceration involving the tracheal ring. The anterior laceration measured 10x8 cm. A tracheostomy tube was placed at the site of the injury to maintain airway stability, and the wound was closed in layers.

Postoperative recovery was closely monitored. On the first postoperative day, subcutaneous emphysema showed significant improvement, and the patient exhibited no signs of respiratory distress, dysphagia, or hoarseness. By the third day, the emphysema had completely resolved, and the patient continued to demonstrate stable vital signs and satisfactory clinical recovery.

The patient was discharged in stable condition on the fifth postoperative day with no signs of complications. By the end of the follow-up period, the patient had achieved full recovery, with no complications such as airway obstruction, voice changes, or surgical wound issues.

The successful outcome of this case underscores the importance of timely surgical intervention, appropriate airway management, and vigilant postoperative monitoring in cases of penetrating neck trauma involving tracheal injury.

DISCUSSION

Traumatic neck injuries are a critical subset of trauma, as they involve densely packed vital structures, including the airway, vasculatures, esophagus, and spinal cord. Injuries to the trachea, such as in this case, are particularly life-threatening and demand rapid assessment and intervention. Effective management strategies are critical to ensuring optimal outcomes in such patients.[6]

Securing the airway is the first and foremost priority in managing penetrating neck trauma, especially in cases with suspected tracheal injury. Techniques such as video laryngoscopy, fiberoptic intubation, or tracheostomy are employed based on the patient's clinical stability and extent of injury.[7] In this case, a tracheostomy was performed, which is often preferred for significant airway compromise or extensive tracheal injuries to maintain patency and facilitate surgical repair. Studies have shown that tracheostomy is particularly effective in reducing morbidity in cases where the injury involves the upper tracheal rings or larynx.[8]

Imaging modalities, particularly computed tomography (CT) scans, are instrumental in assessing the extent of injury. CT provides valuable insights into associated complications such as subcutaneous emphysema, pneumomediastinum, and vascular injuries, which may not be evident on physical examination alone. Simpson et al[9] emphasized that early imaging in stable patients significantly improved diagnostic accuracy and aids in surgical planning. In this case, imaging revealed tracheal rupture and subcutaneous emphysema, guiding the surgical team in their approach.

Surgical intervention remains the gold standard for traumatic or penetrating tracheal injuries. Direct repair of tracheal lacerations ensures structural integrity and prevents complications such as infection, stenosis, or airway collapse. Muscle flap coverage may be utilized for more extensive injuries, providing additional reinforcement and reducing the risk of postoperative fistula formation.[10] The successful outcome in this case highlights the importance of early surgical exploration and precise repair of the tracheal injury.

Postoperative management plays a pivotal role in preventing complications such as airway obstruction, infection, or tracheal stenosis. Regular monitoring of respiratory function and wound healing is essential. Patients with tracheostomies often require meticulous care to prevent occlusion or infection. In this case, the patient demonstrated complete recovery by the 14th post-operative day, underscoring the effectiveness of a structured post-operative care plan.[11]

While surgical intervention is essential for most cases of traumatic or penetrating tracheal

trauma, recent literatures support conservative management in select cases with minor injuries and stable patients. A study of Enciso et al[12] reported successful conservative treatment of tracheal rupture, emphasizing the importance of individualized management based on clinical presentation and imaging findings. However, in this case, surgical exploration was warranted due to the severity and location of the injury.

Effective management of traumatic or penetrating neck trauma requires a multidisciplinary approach, involving trauma surgeons, anesthesiologists, and critical care specialists. Collaboration ensures comprehensive care from initial stabilization to definitive management. The inclusion of radiologists for imaging interpretation and pulmonologists for respiratory monitoring further enhances patient outcomes.[13]

Long-term follow-up is essential to evaluate complications such as tracheal stenosis, vocal cord dysfunction, or persistent respiratory symptoms. Early surgical intervention, combined with meticulous postoperative care, is associated with favorable outcomes. This case exhibited no long-term complications, reflecting the importance of timely and appropriate management.

Future research should focus on refining treatment protocols for penetrating neck trauma, particularly in cases involving airway compromise. Advanced imaging techniques and minimally invasive surgical methods may offer improved outcomes while reducing the risk of complications. Additionally, training programs for trauma teams should emphasize the importance of rapid assessment and decision-making in these critical scenarios.[14,15]

CONCLUSION

Traumatic or penetrating neck injuries, particularly those involving the trachea, pose a significant challenge due to their potential for rapid deterioration and life-threatening complications. Early recognition, accurate imaging diagnosis, and prompt surgical intervention are critical to ensuring favorable outcomes. This case highlights the importance of a multidisciplinary approach, effective airway management, and vigilant postoperative care in achieving complete recovery. Tailored management strategies based on the severity and location of the injury are essential to minimize morbidity and improve patient prognosis. Continuous advancements in surgical techniques and imaging modalities hold promise for enhancing the management of such complex trauma cases in the future.

Conflict of Interest

The authors affirm no conflict of interest in this study.

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