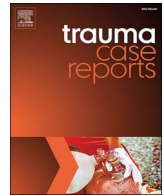


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Case Report

Thyrohyoid membrane transection caused by a stab injury

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ABSTRACT

Background: The thyrohyoid membrane is located between the hyoid bone and thyroid cartilage. Transection of the thyrohyoid membrane can be fatal.

Case presentation: A 54-year-old man presented to the emergency room after attempting to commit suicide by cutting his neck. An endotracheal tube was inserted through the thyrohyoid membrane, which had been cut almost completely. After a tracheostomy, temporary wound closure was performed due to coagulopathy caused by hemorrhagic shock. Several hours later, a hyoidthyroidopexy was performed. Damage control surgery was applied to this patient's neck injury. The tracheostomy tube was removed postoperatively and he was discharged without complications.

Conclusion: Damage control surgery could be an option for airway injury with blood clotting problems due to massive bleeding after securing a patent airway.

Background

In neck trauma, damage control surgery (DCS) includes management of hemorrhage and infection, temporary wound closure, resuscitation, and subsequent re-exploration and definitive repair of the injured organs [1]. Transection of the thyrohyoid membrane is rare. A prompt diagnosis and securing airway patency are essential in the patient with these injuries. When disseminated intravascular coagulation occurred, affecting the neck wound, we attempted DCS after securing the airway.

Case presentation

A 54-year-old man was brought to the emergency room after trying to commit suicide by cutting his neck with a knife. There was a 15-cm-long transverse laceration in the upper neck. The initial vital signs were unstable: systolic blood pressure, 60 mmHg; pulse rate, 144 beats/min; respiration rate, 38 breaths/min; body temperature, 36.4 °C; and oxygen saturation, 100%. Immediately, an endotracheal tube was inserted into the opening in the thyrohyoid membrane and mechanical ventilation was initiated (Fig. 1A). A tracheostomy was performed below the stab wound (zone I) (Fig. 1B). The wound was explored and hemorrhage controlled in the resuscitation room. The thyrohyoid membrane was nearly transected. The large blood vessels were intact relatively, but diffuse exsanguination persisted from the wound due to coagulopathy. Gauze was packed in the wound and the skin was approximated with continuous sutures as DCS (Fig. 1C). The vital signs improved after the DCS. CT showed separation of the hyoid bone and thyroid cartilage (Fig. 2A). After his physiological condition improved, the packed gauze was removed and a hyoidthyroidopexy was performed (Fig. 1D). After controlling the bleeding, the skin was closed with a tracheostomy. Postoperatively, he recovered well.

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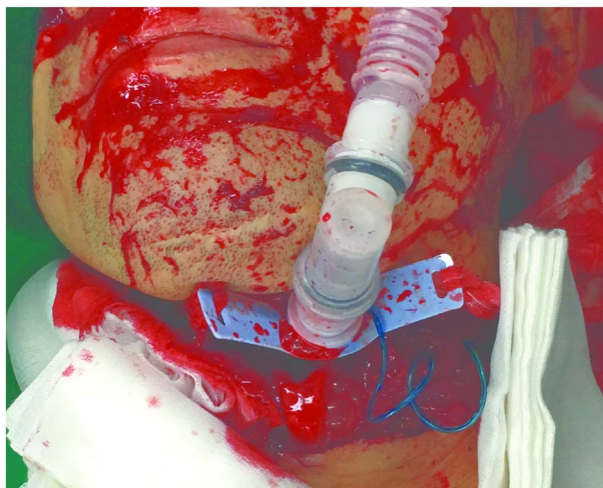


Fig. 1. (A) Immediately after arriving in the emergency room, an endotracheal tube was inserted into the opening in the thyrohyoid membrane, and mechanical ventilation was initiated. (B) After a tracheostomy at the 2nd to 3rd tracheal cartilage levels, the wound was explored and bleeding was controlled in the resuscitation room. (C) Damage-control surgery with temporary wound closure was performed due to coagulopathy. (D) A hyoidthyroidopexy was performed in the operating room.

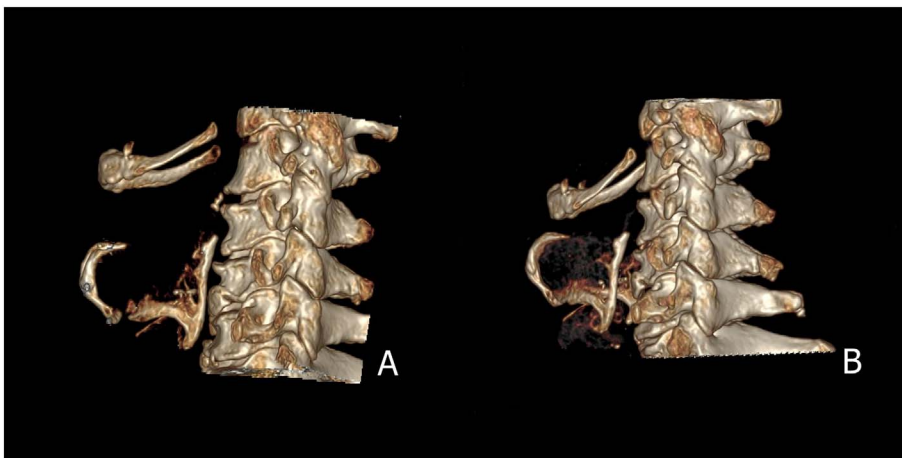


Fig. 2. CT showed separation of the hyoid bone and thyroid cartilage after the injury (A) and a well-approximated hyoid bone and thyroid cartilage after the hyoidthyroidopexy (B).

After the hyoidthyroidopexy, postoperative CT showed a well-approximated hyoid bone and thyroid cartilage (Fig. 2B). The tracheostomy tube was removed 7 days postoperatively and he was discharged without complications 10 days postoperatively.

Discussion

Penetrating laryngotracheal injuries are rare, and transection of the thyrohyoid membrane is rare. Despite improvements in emergency medical services, airway injuries have high mortality rates (26.8–30%) in patients who reach the hospital alive [2]. Factors associated with this high mortality rate include not only the associated organ and vascular injuries but also failure to achieve airway patency [2]. A prompt diagnosis and securing airway patency are essential in the patient with a neck injury.

The anterior cervical region is divided into three zones anatomically. Structures in zone II include the carotid arteries, jugular veins, larynx, esophagus, trachea, thyroid gland, and some nerves. Therefore, injury of zone II is very dangerous [3]. The thyrohyoid membrane is a thin layer between the hyoid bone and thyroid cartilage, and is located in zone II. When this membrane is injured, the patient is at risk of death from respiratory failure. We present this extremely rare case of a nearly transected thyrohyoid membrane. To secure a patent airway, an endotracheal tube was inserted into the opening in the thyrohyoid membrane; this played a very important role in determining the fate of this patient. As early treatment, it is essential to secure an airway rapidly and to ensure respiration and circulation [4]. Aggressive airway control can reduce mortality [5]. An endotracheal tube introduced through the distal end of the open wound is one method for rapid airway control [2]. A tracheotomy is recommended for all proximal injuries and a distal tracheotomy is useful for the repair of proximal lesions [6]. In this patient, we first secured the airway by rapidly inserting an

endotracheal tube through the distal end of the open wound located in zone II. Then, a tracheostomy was performed in zone I.

In neck trauma, DCS includes management of hemorrhage and infection, temporary wound closure, resuscitation, and subsequent re-exploration and definitive repair of the injured organs [1]. Traditionally, DCS was limited to abdominal penetrating injuries, but it has recently expanded to include other injuries, including injuries in the maxillofacial and neck regions [7]. Our patient was in hemorrhagic shock on arrival at the trauma bay. A massive transfusion was required. Disseminated intravascular coagulation occurred, affecting the neck wound; therefore, we selected DCS after securing the airway.

In this case, the patient fortunately injured only the thyrohyoid membrane without injuring any large blood vessels or nerves, and he recovered without complications, such as dysphonia, airway stenosis, web formation, or neuropathy.

Conclusions

Damage control surgery could be an option for airway injury with blood clotting problems due to massive bleeding after securing a patent airway.

Abbreviations

DCS damage control surgery

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