Penetrating Anterior Neck Injury with Through-and-Through Right Common Carotid Artery (CCA) Injury: A Case Report

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ABSTRACT

Penetrating neck trauma is not uncommon in Thailand. Whether accidental or intentional, the management depends on presenting signs and symptoms. Immediate control of hemorrhage and airway protection of the airway compromise are paramount, followed by timely decisions regarding definitive surgical repair. Traditional management using the three-zone approach has increasingly given way to the “no-zone” strategy, guided by modern diagnostic imaging. This report highlights emergency decision-making for airway and bleeding control, zone-based versus no-zone evaluation with computed tomography angiography (CTA), operative findings of a through-and-through CCA injury, and postoperative care and follow-up.

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บทคัดย่อ

การบาดเจ็บที่คอแบบแทงทะลุ เป็นการบาดเจ็บที่พบได้บ่อยในประเทศไทย ไม่ว่าจะเกิดจากอุบัติเหตุหรือการทำร้ายร่างกาย แนวทางการดูแลผู้บาดเจ็บจะขึ้นอยู่กับอาการและอาการแสดง ประเด็นที่ต้องพิจารณาคือการจัดการด้านทางเดินหายใจและการเสียเลือดฉุกเฉิน ร่วมกับการพิจารณาผ่าตัดซ่อมแซม การดูแลผู้บาดเจ็บจะขึ้นกับตำแหน่งของการบาดเจ็บร่วมกับการใช้การตรวจวินิจฉัยเพิ่มเติม การดูแลหลังการผ่าตัดและการติดตามการรักษาต่อเนื่องมีความจำเพาะ

KEYWORDS

penetrating neck trauma; vascular injury; carotid artery injury

INTRODUCTION

Mechanisms of neck trauma may be blunt or penetrating, vary in energy level , and involve single or multiple structures[1]. The victim can be injured accidentally or intentionally. Penetrating neck injury patients were classically managed by 3-zone approach purposed proposed by Monson DD et al[2] and modified by Roon and Christensen[3]. The anatomical zone of the wound gives a raise in suspicion for injury.

Zone 1, from manubrium to cricoid cartilage, great vessels including subclavian and carotid injury must be ruled out, along with zone 2, from cricoid cartilage to angle of mandible, giving a high suspicious suspicion in laryngotracheal injury as well as cervical esophagus, and the last, zone 3, with distal common carotid arteries and jugular veins in mind[4]. The investigation and treatment strategies by zone were once in common among attending surgeons. However, as the diagnostic investigations continue to improve and be widely used, No-zone approach era becomes known[5]. Most penetrating neck victims will perform computed tomography angiogram (CTA) of the neck to exclude vascular injury, followed by selectively by flexible laryngoscopy and esophagoscopy[6].

The management also depends on whether life-threatening condition presents. Hard signs and overt symptoms, including massive hemorrhage and airway compromise, mandate the patients to be emergently control of such conditions[7]: pressure for bleeding and intubation for airway control. After emergency control, further imaging, especially CTA will be suggested[8]. In more stable patients with soft signs and moderate symptoms, regardless of the zone, diagnostic investigations will guide the management.

The situation in this case report was not uncommon in Thailand. The decisions on emergency airway management and definite treatment strategy, whether mandatory neck exploration or investigation-guided, were worth discussed.

PATIENT INFORMATION

A 40-year-old Thai woman with well-controlled rheumatoid arthritis was struck in the anterior neck by a metallic spike while using a lawn trimmer. The foreign body remained impaled in situ. Her neck progressively swelled; she had mild hoarseness without stridor, active external bleeding, hemoptysis, hematemesis, drooling, or subcutaneous air. She was sent to our trauma center after trauma team consultation. The attending surgeon suggested not to intubate the patient or cervical spine immobilization with conventional hard collar. Patient's head was elevated to protect the airway from collapse and secretion. She had intravenous (IV) access and nothing-per-oral order. IV antibiotics and tetanus toxoid were also administered.

CLINICAL FINDINGS

At resuscitation room, a structured primary survey was performed:

- No exsanguinating arterial bleeding at the wound due to foreign body impalement
- Patent airway with mild hoarseness, cervical spine motion restriction by rigid collar from the previous hospital, impaled object was passed through the collar's space
- Normal chest movement, no chest wall tenderness, equal bilateral breath sound
- No hypotension or active external bleeding
- Good consciousness with oriented to time, place, person; Pupil 3 millimeters with react to light both eyes; no lateralizing signs
- No other external wound, log roll or per rectal examination were not done
- The blood pressure was 108/75 mmHg, heart rate was 82 /minute, respiratory rate was 16 / minute, oxygen saturation was 100% on room air.

After life-threatening conditions were excluded. The neck was examined in-detailed.
The injured site was progressively swelling but not expanding. There was no audible bruit or palpable thrill. The patient's gross motor power was full in all extremities. She denied dyspnea. We decided to remove the rigid collar. The impalement was shown in Fig 1.

Figure 1
The patient's neck with sharp foreign body impaled at the midline of the anterior neck.

DIAGNOSTIC ASSESSMENT

After penetrating neck injury Zone 2 with foreign body impalement was provisionally suspected. Routine laboratory tests were obtained for preoperative preparation. Plain radiography of the neck was sent as Fig 2.

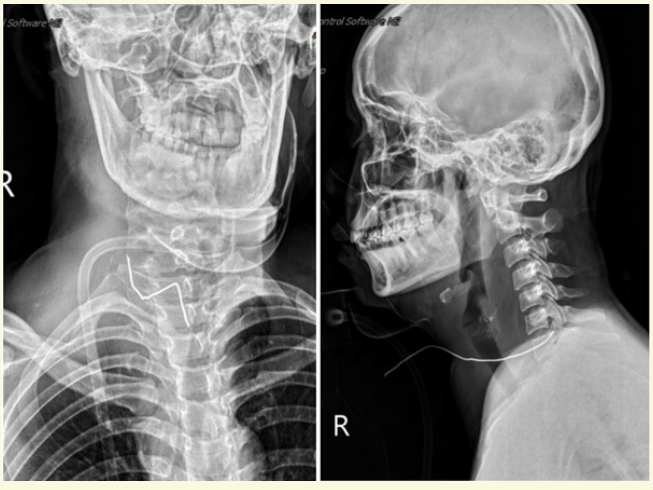

Figure 2
Plain radiograph of the neck demonstrating the impaled object and soft tissue swelling with tracheal shift

The film showed a sharp object stuck at right side of the neck, adjacent to the trachea with soft tissue swelling resulting in trachea shift to the left. The depth was extended to the cervical spine.

After trajectory identification, CTA of the carotid and thoracic great vessels were requested. Findings were shown in Fig 3 and 4.

Figure 3
Axial view of CTA carotid showing the enhancing object through the right CCA

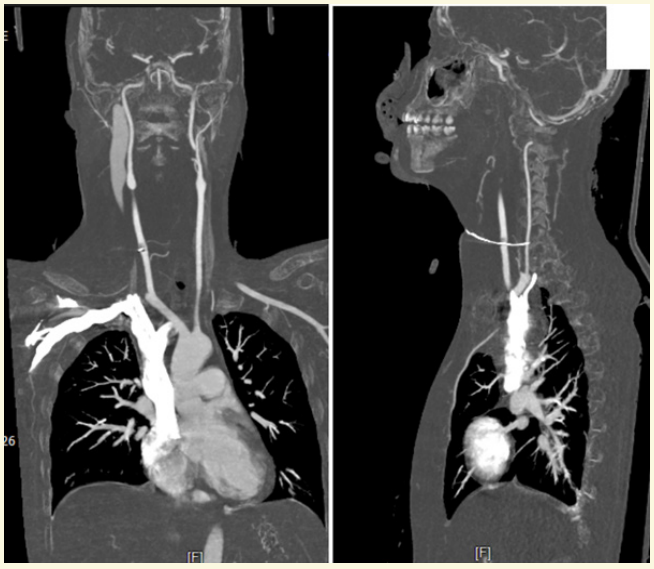

Figure 4
Coronal and sagittal view of CTA showing a sharp object penetrating right CCA with adjacent clot. The trajectory extending toward right vertebral artery and cervical spine.

THERAPEUTIC INTERVENTION

Penetrating anterior neck injury zone 2 with right CCA injury was diagnosed. The plan was removal of the foreign body under general anesthesia (GA) and primary repair right CCA. Prosthetic, PTFE graft and commercial shunt were prepared for contingency. Airway team was requested. Video laryngoscope was applied. Right vocal cord paralysis and left vocal cord pressurization were visualized. Otorhinolaryngology was consulted intraoperatively; tracheostomy was recommended. Meanwhile, intubation was successfully achieved.

The incision was made at anterior to right sternocleidomastoid (SCM) muscle plane. The trachea was identified and found intact. The spike was penetrated laterally to right thyroid lobe. Bleeding from the lacerated thyroid was controlled with continuous 3-0 Vicryl sutures. Dissection proceeded to the right carotid sheath, exposing a through-and- through CCA injury as Fig 5 and 6.

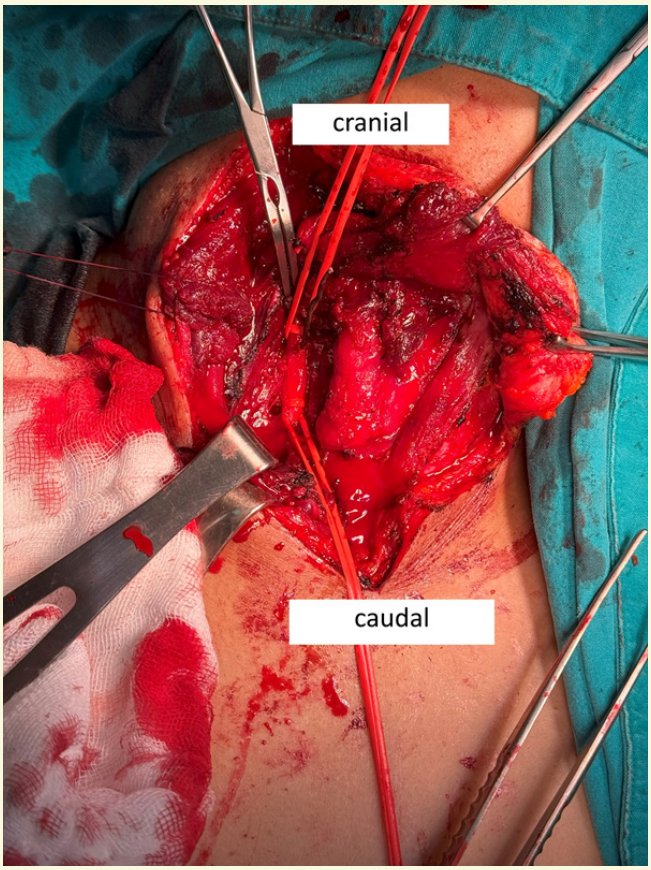

Figure 5 The injury site at right CCA

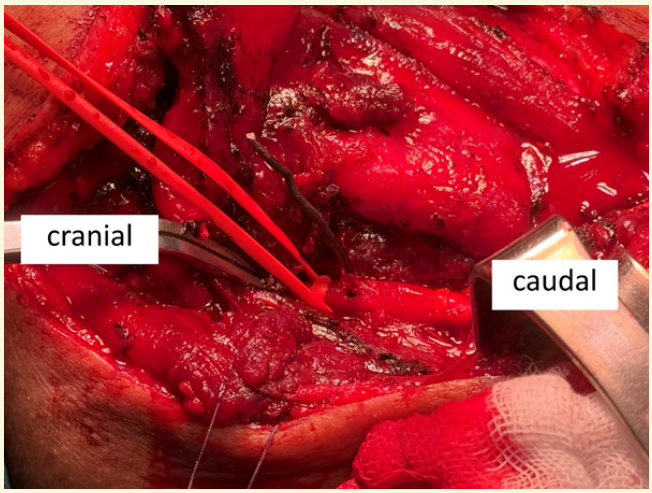

Figure 6 Impaled object with post thyroid repair

Proximal and distal CCA control was obtained with vessel loops, followed by vascular clamps. Total clamp time was 7 minutes for object removal and primary repair of both entry and exit sites. After partial release, blood flow was restored, thrombus was evacuated by flow pressure itself, and pulsatile flow confirmed before definitive knot-tying. Hemostasis was secured, and the wound irrigated with normal saline as shown at Fig 7 prior to layered closure.

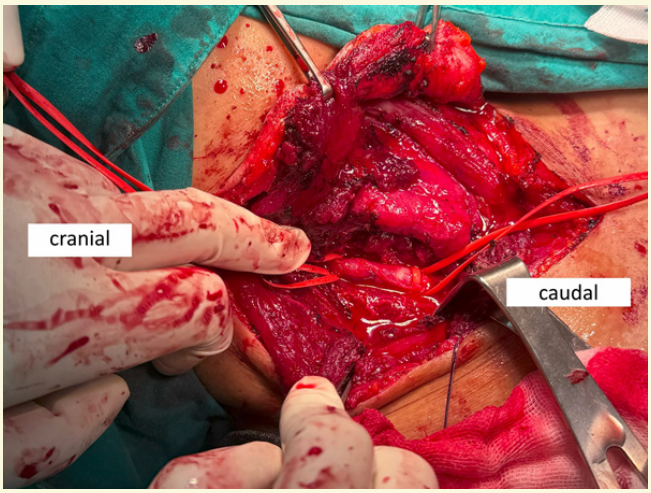

Figure 7
Neck structure after repairing right lobe of thyroid and right CCA

The patient remained intubated for 7 days to ensure wound healing. An open tracheostomy was performed with commercial tube number 7 at postoperative day 8 to ensure complete healing of the collar incision.

She was weaned from mechanical ventilation the same day. Flexible laryngoscopy was done by otolaryngologist consultant. True vocal cord could move but incomplete glottis closure. Occupational therapist initiated voice and swallowing rehabilitation. She was discharged at day 9 with size 5 silver tracheostomy tube. The motor function remained normal.

FOLLOW UP AND OUTCOMES

At postoperative day 14, otolaryngology follow-up showed complete recovery of true vocal cord motion. The patient had normal respiration, a clear voice, and effective swallowing. The tracheostomy was capped for breathing trials and subsequently decannulated. Breathing exercises continued at home. Duplex ultrasonography demonstrated normal carotid flow without stenosis or turbulence. There were no focal neurological symptoms such as weakness, ataxia, or vertigo.

DISCUSSION

Currently, penetrating neck trauma, either low or high energy, is currently was managed using by the no-zone approach[9]. Penetrating neck trauma with controllable overt symptom, or, more stable type, moderate symptoms with soft signs, would undergo CT angiography with selectively bronchoscopy or esophagoscopy[10].

Our patient presented with impaled sharp object with soft signs of marked soft tissue swelling concurrent with high suspicious site of vascular injury. The impaledment site was guided usour suspicion to consider main airway injury as the object stuck at midline anterior neck. The film showed extension at right neck. Together with no hematemesis or drooling, cervical esophageal could be excluded.

After CTA was done, laryngotracheal penetration could be ruled out due to the trajectory away from midline. Bronchoscopy and esophagoscopy then were not mandatory.

The mainstay incisions for neck exploration were collar incision and standard neck exploration at anterior to left SCM[11]. The question had raised due to the appropriateness of the incision at right side of the neck. After cervical esophageal injury was excluded, left side approach was no further required. After discussion with senior trauma surgeons, right neck exploration via right SCM was decided. Incision extension to collar line to be hockey-shape was planned.

Fortunately, the larynx and trachea were safe. Right CCA was encircled meticulously. CCA was clamped only for controlling the bleeding during repair. Intraoperative stroke was concerned[12] according to lowering cerebral blood flow during carotid clamping. Prolonged carotid clamping time more than 18 minutes was an independent factor for early carotid restenosis[13]. On the other hand, carotid shunting might be an alternative option[14].

In this case, primary CCA repair was the procedure of choice over interposition graft due to well-preserve stump after necrotic vessel wall debridement. The graft will be concerned if narrowing of the repaired site occurs.

Prophylactic tracheostomy for traumatic vocal cord paralysis has pros and cons. Such early intervention would reduce duration of mechanical ventilation[15] and incidence of ventilator-associated pneumonia[16]. While the benefits of early tracheostomy were discussed, contamination of carotid suture line and carotid anastomosis disruption were to be considered[17].

This report has a limitation: there was no mentioned about vertebral artery and cervical spine management after object removal. The physician had concerned on postoperative bleeding and cerebellar stroke. The general neurological status was examined. Postoperative duplex carotid ultrasound was done.

In conclusion, penetrating neck trauma with CCA injury is not uncommon and can be life-threatening by vascular or aerodigestive compromises. Timely and systematic management is mandatory.

INFORM CONSENT

The patient was informed consent and her medical record was permitted to be shared without any patient identification

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