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Case Report

Tracheal Injuries After Blunt Chest Trauma: Rare Cases

Chaudhry Aqeel*, Ahsan Cheema, Thabet Y Alghazal, Sama M Al Sulaiman, Yousif A Al Qahtani, Safa Al Zayed, Suha Albader and Ikram Chaudhry

Department of Thoracic Surgery, King Fahad Specialist Hospital, Dammam, Saudi Arabia

ARTICLE INFO

Article history:
Received: 13 July, 2020
Accepted: 23 July, 2020
Published: 4 August, 2020

Keywords:
Blunt chest trauma
trachea
surgery

ABSTRACT

Airway injuries due to blunt chest trauma are rare but life threatening. We herein report two cases of tracheal injuries due to road traffic accident. Both patients were intubated and mechanically ventilated and transferred to our tertiary care hospital for surgical repair. A 20-year-old male was ejected out of car and sustained fracture of femur which was fixed under spinal anaesthesia and later after two months he presented with shortness of breath and stridor he was endotracheally intubated and mechanically ventilated. His computed tomographic scan of chest (CT) showed stricture of intrathoracic trachea. Second case was 35-year-old female front seat passenger sustained neck injury in road traffic accident. She presented with cervical subcutaneous emphysema and respiratory distress. She was intubated and mechanically ventilated. Her CT scan of chest showed fracture of first tracheal ring. Both patients were operated with uneventful postoperative course.

Introduction

Incidence of tracheal injuries after blunt chest trauma is nearly 0.3% to 25%. Among all tracheobronchial injuries 15% to 17% of victims sustain a lethal tracheal rupture which carries very high mortality [1]. Best outcome depends upon the early diagnosis and prompt treatment. Thirty percent of the victims die at the site of the accident whereas 60% of patients are diagnosed late [2]. Cervical tracheal injuries can occur from driving motor bike, car, snow skate boarding and striking cables [3]. Direct impact from dashboard or steering wheel can lead to cervical tracheal injuries due to compression of trachea against the cervical spines while the neck is in extended position. Tracheal injury patient can present clinically with expanding subcutaneous emphysema, hemoptysis, cough, pneumomediastinum, change of voice and respiratory difficulty. Patients who diagnosed late can present with complications such as mediastinitis, sepsis, respiratory insufficiency, tracheal stenosis, or bronchiectasis [4, 5].

Case Presentation

Case 1

A 20-year-old male was front car seat passenger he was ejected out of car in that road traffic accident. He was admitted in a peripheral hospital with small lacerations on forehead and abdominal wall and fracture of left femur. On arrival he was fully conscious, alert and Glasgow coma scale was 15. Hemodynamically he was stable with heart rate of 92bmn, blood pressure 120/70mmhg and respiratory rate 22/min. His basic blood investigations were within the normal limits. Physical examination showed hematoma of left thigh. Chest x-ray was normal and there were no signs and symptoms of airway injury. His fracture was fixed under spinal anaesthesia and he was discharged after two weeks. Eight weeks later he was admitted with respiratory distress stridor and drowsiness. His arterial blood gas analysis showed very high PCO_2 (80 mmHg) andPO_2 (64 mmHg). He was intubated with great difficulty using pediatrics endotracheal tube due to narrow lumen. A CT scan of thorax

**Correspondence to: Chaudhry Aqeel, Department of Thoracic surgery, King Fahad Specialist Hospital, Dammam 3134, Saudi Arabia; E-mail: muhammadaqeel685@gmail.com*

http://dx.doi.org/10.31487/j.SCR.2020.08.06

showed a supra carinal tracheal stricture with maximum diameter of 3.9 mm (Figure 1A).

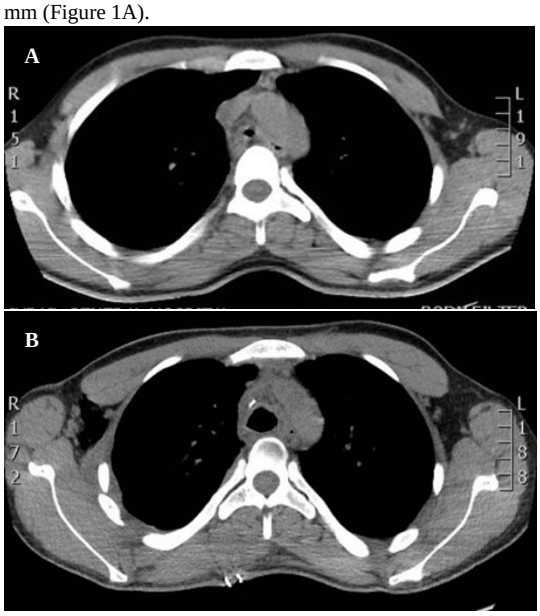

Figure 1: A) Preoperative CT scan of Thorax showing supra carinal tracheal stricture after blunt trauma. **B)** Postoperative CT scan of Thorax showing normal tracheal lumen.

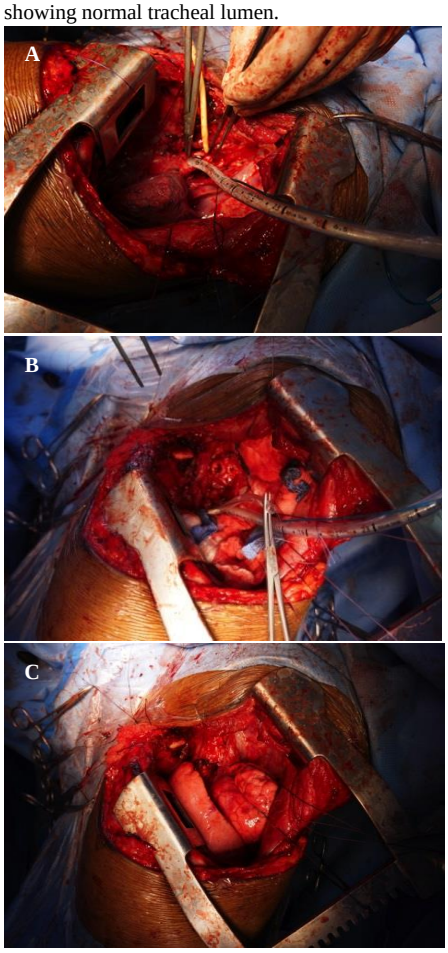

Figure 2: A) Tracheal stricture divided, and endotracheal tube inserted into the left main bronchus for ventilation. **B)** Trachea stricture resected. **C)** Lung inflated after restoration of tracheal anatomy by end to end anastomosis.

Right thoracotomy approach was used, and we found a tight fibrotic supra carinal tracheal stricture 3 cm above carina (Figure 2A). Stricture was resected and tracheal integrity was restored with End to end anastomosis using 3-0 polyglycolic acid interrupted sutures with knots outside (Figures 2B & 2C). Chin guard stiches were placed, and patient was extubated on table and transferred to intensive care unit in stable condition and normal arterial blood gases. Chin guard stiches were removed after 6 days and patient was discharged for further follow up in outpatient clinic. His post-operative CT scan thorax showed good tracheal luminal diameter (14 mm) at anastomotic site (Figure 1B). He resumed back to his normal life.

Case 2

A female age 35 years, front seat passenger sustained neck in road traffic accident. She was admitted in peripheral hospital with progressive swelling of neck and breathing difficulty. She was hemodynamically stable and well oriented in space and time. On physical examination she has no abnormal findings except massive subcutaneous cervical emphysema. Her arterial blood gas analysis showed low Po_2 of (50 mmHg) and Pco_2 (60 mmHg). She was endotracheally intubated and mechanically ventilated. A CT scan of thorax showed fracture of first tracheal ring and subcutaneous emphysema (Figure 3A). Patient was transferred to our hospital for further care.

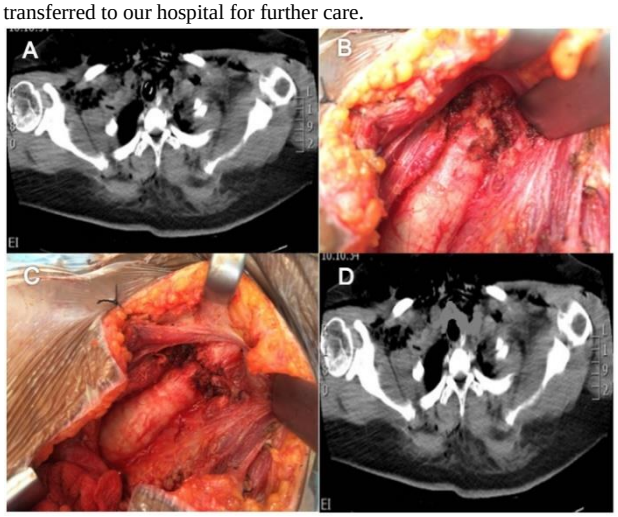

Figure 3: A) CT Scan Neck showing subcutaneous emphysema and fracture of first tracheal ring. **B)** Operative view showing funnel shaped trachea due to fracture of first ring. **C)** Second tracheal ring anastomosed to cricoid cartilage by modified technique. **D)** Post-operative CT scan Neck showing the anatomical continuity of the trachea.

We approached the cervical trachea through a collar incision after raising the skin flaps, strap muscles were separated in midline and we found the total collapse of the first tracheal ring with funnel shaped airway (Figure 3B). Thyroid isthmus was divided for better exposure of upper cervical trachea. Multiple traction sutures were placed in fractures parts of first tracheal ring using 2-0 vicryl. The second tracheal ring as anastomosed to cricoid cartilage using interrupted 4-0 polydioxanone sutures keeping knots outside (Figure 3C). Collapsed parts of first tracheal ring was pulled out by traction sutures we placed earlier, prior to tying the knots to prevent the intraluminal entrapment of fragmented cartilaginous tissues. The patient was extubated next day, and subcutaneous emphysema resolves progressively. She was discharged on fifth day for

further follow up in outpatient. She remained asymptomatic, check bronchoscopy and postoperative CT chest showed no granulation tissue and restoration of tracheal lumen (Figure 3D).

Discussion

Due to its anatomic position and structural configuration tracheal is well protected and airways injuries are uncommon but can be very lethal in short time due to compromise of airway. Almost sixty percent of victims remain undiagnosed and thirty percent die at the site of accident. There are two proposed mechanisms of airway injury. According to one theory the injury occurs due to increased intrathoracic pressure caused by compression of upper chest against the closed glottis, or trachea is compressed against the vertebral column.

Second proposed mechanism is that the sudden deceleration sheer force can cause tracheal injury at two fixed points the cricoid cartilage and the carina. One hypothesis is that because of trauma lateral diameter of chest decreases and anteroposterior diameter increases, and lungs are pulled out laterally leading to disruption of bronchus and trachea [6, 7]. The most common site of tracheobronchial injuries after blunt chest trauma is 2.5-3 cm from carina. This largest diameter of airway so more sheer force is exerted in this area as per law of Laplace. Tracheal rupture occurs when intraluminal tracheal pressure with closed glottis exceeds than the elasticity of membranous trachea [8]. When trauma victims present with dyspnea, hemoptysis, mediastinal or subcutaneous emphysema, pneumothorax, change of voice, an airway injury should be ruled out. As sixty percent of patients are diagnosed late clinical presentation can be sometimes misleading particularly in patients with complete transection in whom the damaged area may be held together by supporting tissues only providing adequate airway specially when there is no other associated major vascular and mediastinal injuries. Such patients can present latter with tight fibrotic tracheal stricture leading to life threatening situation.

The best diagnostic imaging modality is CT scan of neck and chest. Early Fiber-optic bronchoscopy is essential for diagnosis and to locate and estimate the magnitude of injury in addition to securing the airway. Tracheal resection and reconstruction is technically very demanding procedure for thoracic surgeons. The most important surgical aspect in tracheal surgery is to perform minimal circumferential dissection, limited to fibrotic and devitalized tissues only; this helps to avoid stricture formation at anastomotic site by preserving good blood supply. The incidence of restenosis and dehiscence after tracheal reconstruction is almost 5% to 6%. Postoperative restenosis can be treated endoscopically by dilatation, laser, electrocautery, cryotherapy or stent. First twelve hours are very crucial to diagnose and manage the tracheobronchial injuries because outcome is excellent within this period. Mortality for tracheal surgery varies from 4%-30% [9, 10].

In conclusion we present two cases of tracheal injuries in blunt chest trauma. First case of late intrathoracic tracheal stricture managed by resection and end to end anastomosis. The second case with fracture of first tracheal ring repaired by modified technique. Both cases were followed up in outpatient clinic and subsequent bronchoscopic examinations were normal, there was no tracheal narrowing or granulation at anastomotic site.

Abbreviation

CT: Computed Tomographic Scan

Conflicts of Interest

None.

Funding

None.

Consent

Consent from the patients and IRB approval was taken for publication.

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