

## An Unusual case of isolated trachea injury causing partial respiratory tract obstruction: A case report and Literature Review

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**Abstract:** We are presenting a case of a isolated accidental bullet injury to trachea in a three year old child. The bullet was partially occluding the trachea, which was a challenge for inserting the endotracheal tube for maintaining the airway without causing the dislodgement and tracheal obstruction. Special care was observed for intubation. Then the patient was operated. During surgery the bullet was removed and the trachea was repaired.

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**Key Words:** Trachea, intubation, obstruction

### Introduction

Fire arm injuries are common in most developed countries and very rich families. These Fire arms are mainly for the self protection from the burglars. Sometimes they might be used for suicide, orhomicide purpose as they are easily available. If by chance they get mishandled by children they can cause accidental injuries to them or the surrounding people. Bullet injuries to neck and chest are lethal. We are presenting an unusualcase of accidental neck bullet injury, selectively injuring the trachea.

### Case

Three years old Saudi male child was presented in Emergency department in Saudi German Hospital, Aseer Region. The child was crying and had normal voice. While his brother was shooting a bird accidentally shot him in the neck. He had a gun shotinjury a the midline of the neck 2 cm above the suprasternal notch at 17.30 evening arrived to the hospital at 1800 He was crying continuously, but not breathlessness.

Primary survey revealed patient was haemodynamically stable. There was a entry wound of bullet in the midline near suprasternal area of neck in zone two. There was no exit wound. No hematoma or subcutaneous emphysema was noted. Carotids were wellfelt bilaterally. Airentry equal bilaterally. Peripheries warm no evidence of cardiopulmonary compromise was observed. He was conscious and welloriented in time space and person with Glasgow Coma Scale of 15/15. Whole body examination showed only an entry wound of bullet in the neck in the midline No other injuries were seen, X-ray showed bullet in

zone 2of neck (Photo 1) as the injury was in zone II. The decision of surgery was taken.

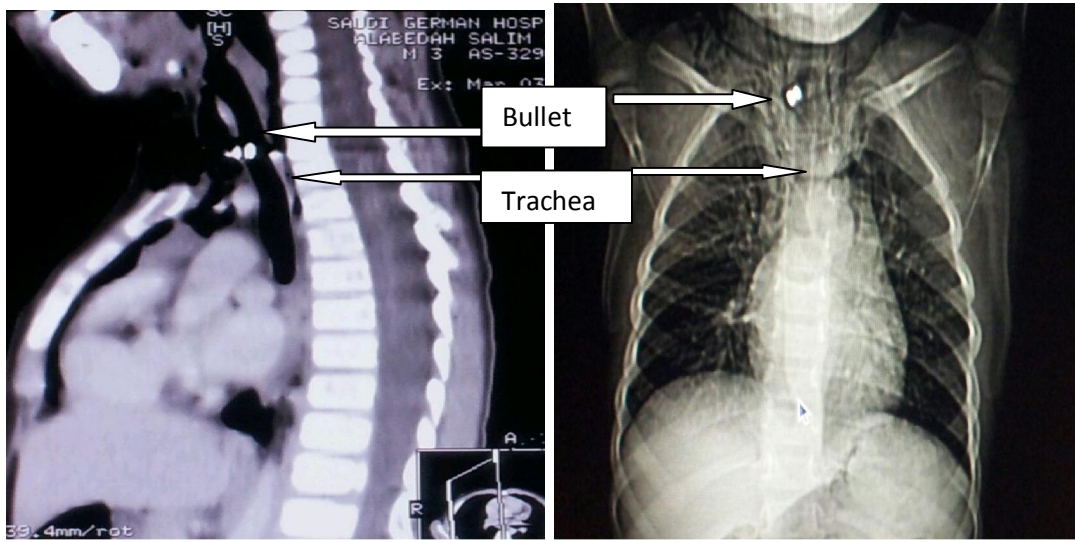
To study the structural damage the patient was subjected to CT scan of chest and the neck. Just after the CT scan patient showed clinical deterioration, he became tachypnic he had developed subcutaneous emphysema in the neck region. The patient was immediately intubated with a small endotracheal tube directed to posterior tracheal wall to avoid dislodgement of the bullet which was logged in anterior tracheal wall.

CT showed that the bullet was half in the tracheal lumen and half outside in the area of isthmus of the thyroid. There was no damage to the vascular structures in the neck.

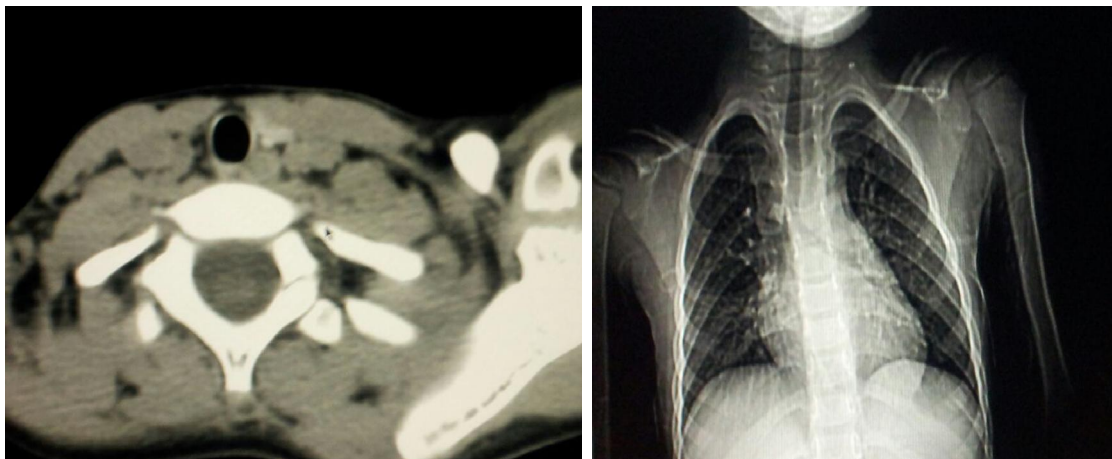
Patient was operated immediately. Local exploration revealed an isolate tracheal injury to the isthmus and anterior tracheal wall obstructing the airway partially. No other damage was found.

During operation the bullet track was enlarged, the hemostasis was achieved. The bullet was removed and the bullet tract was excised. The endotracheal tube was pulled out proximally to inspect the posterior tracheal wall, which was seen to be intact. The cut portion of thyroid and the isthmus was bleeding. Complete haemostasis was achieved. The tracheal rent was primarily repaired with 4/0 vicrylinterrupted sutures. The cut edges of thyroid isthmus was reapproximated using 4/0 vicryl. The incision was closed with subcuticular stitches.

Post operative period was uneventful. Post operative chest x-ray and CT scan showed normal (Photo 2). The child stood the surgery well and he was discharged on the 4<sup>th</sup> post operative day.



**Photo 1: Preoperative**



**Photo 2: Postoperative x-ray chest**

### Discussion

The incidence of Homicide, suicide and accidental injuries in USA is very high while surprisingly the suicidal injuries are reported high in Switzerland.

The mortality rate from firearm violence has remained essentially unchanged since just before the return of the twenty-first century average rates 7.3/100,000 population.[3]

Fire arms are frequently regarded more as toys than weapons and are thought to be owned by up to 4 million households in the UK. They generate a large number of firearm injuries in England and Wales due to their frequent use. They are usually accidental

injuries to boys caused by themselves or other children. Most injuries are relatively minor but fatal injuries do occur. Eye, neck and abdominal injuries are most common but there is also potential for serious brain and chest trauma [4].

The overall mortality from penetrating neck trauma is as high as 11%. Injuries to vital structures may be fatal in two-thirds of all cases [5].

There are different ways the fire arm injuries can occur, like Criminal and terrorist attacks or the shots fired by the Police, Sometimes there are attempted suicide and Accidental injuries due to fire arms [1].

The significance of the injury or death depends on their placement and projectile path. Of the bullet injury

.The head and torso are the most vulnerable areas, with incapacitation due to CNS disruption or massive organ destruction and hemorrhage [2].

### ***Mechanism of bullet injury***

Typically, firearms are divided into two groups by their muzzle velocity: low velocity (less than 1,000 feet per second) and high-velocity (more than 1,000 feet per second). Most handguns are low-velocity weapons, with muzzle velocities between 300 and 800 feet per second. A typical shotgun has a muzzle velocity of 1,200 feet per second, and a 30-30 rifle has a muzzle velocity of 2,200 feet per second [6].

The energy imparted into tissue by a penetrating projectile is determined by its kinetic energy (KE):  $KE=1/2MV^2$ . Since the velocity is squared in the equation, high-velocity projectiles impart significantly larger amounts of energy into the tissue impacted. In other words, a projectile with twice the velocity will have four times the kinetic energy of a lower-velocity projectile [6].

### ***The effect of bullet in the tissues of neck***

Firstly, the projectile crushes structures along its track, similar to other forms of penetrating injury. Temporary cavitation causes shearing and compression, sometimes tearing structures (as with solid abdominal viscera) or stretching inelastic tissue (the brain is particularly susceptible), analogous to blunt trauma [7]. As tissues recoil and hot gases dissipate, soft tissue collapses inwards with the permanent cavity being the resultant defect [8].

### ***Vulnerable Vital structures in neck based on Neck zones***

Zones of neck trauma-zone I, II, III.

The lateral neck is divided into three zones; this system is useful in the evaluation and treatment of penetrating neck injuries [9-10].

*Zone 1* extends from the clavicle to the cricoid cartilage and includes the thoracic inlet. This region contains the major vascular structures of the subclavian artery and vein, jugular vein, and common carotid artery, as well as the esophagus, thyroid, and trachea.

*Zone 2* extends from the cricoid to the angle of the mandible and contains the common carotid artery, internal and external carotid arteries, jugular vein, larynx, hypopharynx, and cranial nerves X, XI, and XII.

*Zone 3* is a small but critical area extending from the angle of the mandible to the skull base. This region contains the internal and external carotid arteries, jugular vein, lateral pharynx, and cranial nerves VII, IX, X, XI, and XII. As per the above zoning criterion present case falls into zone 1 injury [9-10].

If in the neck the platysma is violated, the chance of severe injury to deeper neck structures increases.

Immediate surgical exploration of the neck is required in the following instances, regardless of the site of injury—airway compromise, extensive subcutaneous hematoma, pulsatile hematoma, active bleeding, and shock [9].

The trachea, esophagus, carotid and vertebral arteries, cervical spine and spinal cord, phrenic nerve and brachial plexus are all vulnerable with injury with neck trauma [9]. Each of these is a vital structure, and any delay in diagnosis and treatment can have devastating consequences [11].

### ***Management***

Surgical management of head and neck gunshot wounds, according to Motamedi is generally divided into three stages: (1) debridement, fracture stabilization, and primary closure; (2) reconstruction of hard tissues, provided soft tissue coverage is adequate (3) rehabilitation of the oral vestibule, alveolar ridge, and secondary correction of residual deformities and dental implants [12].

Tracheal injury if small can be repaired immediately primarily. If there is major tracheal injury with tissue loss then surgical debridement with tracheotomy should be done. Followed by planned tracheal repair [13].

### ***Conclusions***

All gunshot injuries are usually serious injuries. They need emergent management. Injuries to respiratory and cardiocirculatory systems need immediate attention, resuscitation, evaluation and treatment to avoid morbidity and mortality

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