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Tracheal rupture developing after blunt thoracic trauma

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ABSTRACT

Tracheal and bronchial injuries are life-threatening traumas that usually develop after traffic accidents or a fall from heights. The most common cause is motor vehicle accidents. Tracheobronchial injuries develop in 1% - 2% of blunt thoracic traumas. The mortality rate is 30% in these patients and deaths usually occur within the first hours. Sixty five percent of surviving patients are diagnosed in later periods where complications are frequent. In conclusion, clinical evaluation and diagnostic tests should be performed immediately and carefully. In this study, a patient who developed tracheal rupture after blunt cervical and thoracic trauma was presented.

Keywords: Blunt Cervical Trauma; Blunt Thoracic Trauma; Tracheal Rupture

1. INTRODUCTION

Tracheal and bronchial injuries usually develop as the result of traffic accidents, a fall from heights, being crushed, stab wounds or gunshot wounds. Tracheobronchial injuries may also develop due to elevated intrathoracic pressure and rib fractures during cardiopulmonary resuscitation. Tracheobronchial injuries develop in 1% - 2% of thoracic traumas. Approximately, 15% - 27% of tracheobronchial injuries are tracheal ruptures which have high morbidity and mortality rates [1]. Because of the protective surrounding structures, mobility, elasticity and cartilage support of the trachea, it is difficult to injure. Tracheobronchial injuries may occur in varying degrees and in different localizations from a simple tear to total rupture [2]. The "fallen lung" sign may be radiologically observed in total bronchial ruptures. Computed tomography has proved to be beneficial in the detection of pathologies in patients with thoracic trauma [3]. In tracheobronchial injuries, the best diagnostic method is bronchoscopy. Treatment is the primary repair of the tracheobronchial tree with the preservation of pulmonary tissue. In tracheobronchial injuries, delay or the oversight of diagnosis can lead to death or potentially fatal complications such as respiratory insufficiency, mediastinitis, sepsis, airway stenosis, bronchiectasis, recurrent pulmonary infections and premanent pulmonary dysfunction. Tracheobronchial injuries are an important issue to be discussed due to the high mortality rates, the difficulties in diagnosis and the continuing controversy with regards to treatment methods.

2. CASE REPORT

A 25-year-old male patient was admitted with the complaints of hoarseness and swelling in the cervical region following a blunt cervical and thoracic trauma due to an in-vehicle traffic accident. The Patient had no history of any disease. On admission, the patient was conscious, in good general condition, oriented, cooperative and his Glasgow Coma Scale score was 15. His blood pressure was 118/75 mmHg, RR was 18/min, heart rate was 76 bpm and SO_2 was 84%. On inspection, there were superficial abrasions and lacerations of 2 cm on the frontal midline region and of 1 cm on the dorsal aspect of the nose and a swelling on the anterior of the neck. Respiratory sounds were equal in both hemithorax. On palpation, there were crepitations consistent with subcutaneous emphysema in the anterior aspect of the neck. Respiratory sounds were normal on auscultation. Other systemic examinations were normal. With intravenous contrasted cervical tomography, extensive air densities were observed in the skin and subcutaneous soft tissues

in the paratracheal and retropharyngeal regions and an image consistent with tracheal rupture was observed at the level of the 7th cervical vertebra and first thoracic vertebra **(Figures 1-3)**. On bronchoscopy, granulation tissue at a 9 - 11 o'clock level, 1 - 2 cm distal to the vocal cords and a covered rupture area were observed. There was no air leakage at this point and the wound was left for secondary recovery. The patient was hospitalized at the Department of Thoracic Surgery for follow up and treatment. The thorax tomography obtained a day later revealed pneumomediastinum and subcutaneous emphysema findings. The patient improved clinically and was discharged 7 days later.

3. DISCUSSION

Thoracic traumas account for approximately 25% - 31% of all traumas. Tracheobronchial injury occurs in 1% - 2% of blunt thoracic traumas [1,4]. In literature, various information regarding the localization of tracheobronchial injuries is available. While there are studies indicating that injuries are most common in the trachea, some others indicate that injuries are more common in the left bronchus and its branches. Injuries can be transverse, longitudinal and complex [5,6]. In our blunt thoracic trauma case, the tracheal rupture was located 1 - 2 cm distal of the vocal cords.

Various mechanisms have been suggested for tracheobronchial injuries. Hood *et al*. suggested that sudden chest compression was the most important mechanism. With rapid impact trauma, the antero-posterior diameter of the thorax decreases and the transverse diameter increases. With this effect, the lungs are separated from eachother and bronchial rupture occurs due to the created tension force at fixation points such as the carina and cricoid. In addition, rupture may occur as the result of increased intrabronchial pressure due to the compression of the tracheobronchial system between the sternum and coulumna vertebralis [7]. Respiratory distress and subcutaneous emphysema are the most common findings in patients with tracheobronchial injury. In tracheobronchial ruptures, mediastinal and cervical emphysema can be seen without pneumothorax development if the mediastinal pleura is durable [8,9]. Our patient had subcutaneous emphysema without penumothorax. We associated the absence of respiratory distress with the perforation being partial and covered.

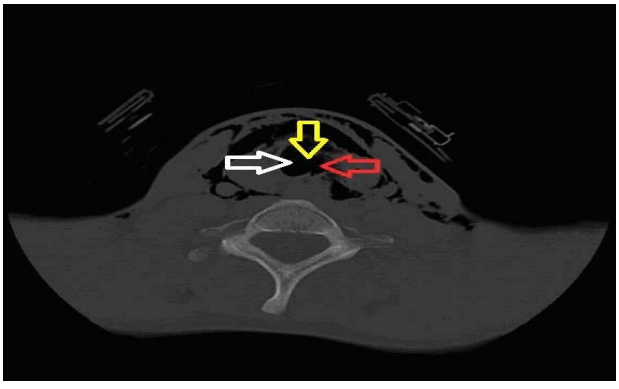

Figure 1. With intravenous contrasted cervical CT imaging. White arrow; trachea, yellow arrow; tracheal rupture area, red arrow; air density in the paratracheal area.

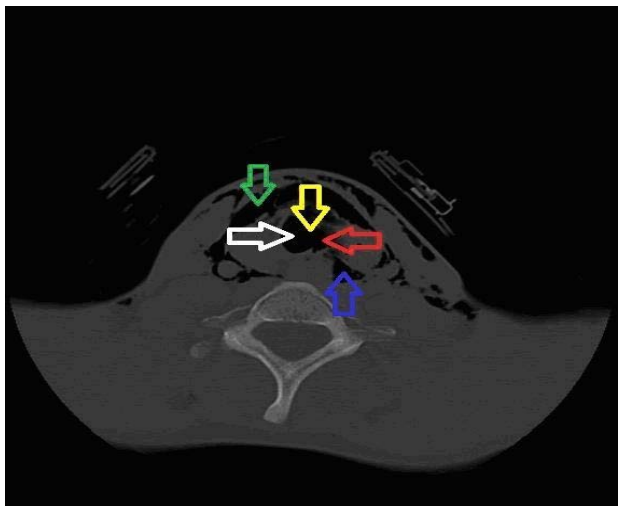

Figure 2. With intravenous contrasted cervical CT imaging. White arrow; trachea, yellow arrow; tracheal rupture area, red arrow; air density in the paratracheal area, green arrow; air density in the subcutaneous soft tissues, blue arrow; air density in the retrofarangial areas.

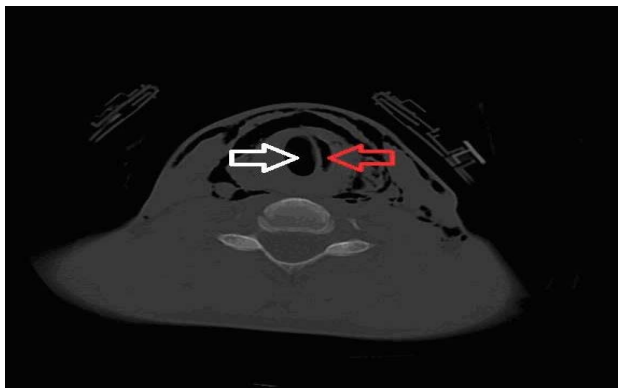

Figure 3. With intravenous contrasted cervical CT imaging. White arrow; trachea, red arrow; air density in the paratracheal area.

Complications such as total rupture can occur in cases with partial tracheal and bronchial rupture during intubation. In bronchial ruptures, intubation in the healthy side of the bronchus should be performed with a double lumen tube. Our patient did not require intubation.

In tracheobronchial injuries, definite diagnosis can be made with bronchoscopy. However, 3-dimensional spiral tomography is also important for diagnosis. Diagnosis is difficult if the mediastinal pleura is intact. Bronchoscopy

may give 20% - 40% false negative results and this ratio increases if the bronchial injury is associated with other organ injuries. Fiberoscopy is preferred in patients with head-neck and cervical injuries. This also increases the ratio of false negativity. So bronchoscopy should be repeated if the suspicion of rupture continues [5,8]. Our patient had a nasal fracture in addition to the tracheal rupture. On bronchoscopy, granulation tissue and covered rupture site were observed at a 9 - 11 o'clock level, 1 - 2 cm distal to the vocal cords.

Treatment of tracheobronchial injuries is divided into two methods: surgical and conservative. Care should be taken to preserve lung parenchyma during operative procedures and bronchoscopic techniques should be performed. Conservative treatment is sufficient if the bronchoscopic trauma is at a perimeter less than 1/3 of the trachea or bronchus, if air leakage is prevented with tube drainage and if total lung expansion is obtained. Conservative treatment methods include intubation, tracheostomy and patient monitorization [8]. Our patient did not have primary repair. The wound was left to recover secondary. Secondary repairs are required due to delays in diagnosis in 17% - 27% of patients. Patients on average apply to hospitals within 1 - 3 months. The lungs can be expanded by a successful primary anastomosis even if there is a delay in diagnosis and on average can become functional at the end of 2 - 6 months [10,11]. In some patients, stenosis may develop at the anastomosis site following primary repair of the ruptured area. Endoscopic dilation [bronchoscopic dilation, laser, cryotherapy, electrocautery and stent implantation] may be performed in patients who develop anastomotic stenosis [12].

In conclusion, the early diagnosis of tracheobronchial ruptures, which may vary from simple tears to total ruptures and present with different clinical signs, is important. Clinical evaluation and diagnostic tests should be performed carefully and rapidly. Tracheobronchial rupture should be suspected in all patients who have massive air leakage after blunt thoracic trauma, mediastinal or subcutaneous emphysema with penumothorax and non-expansed lungs. Bronchoscopic evaluation should only be performed under conditions where emergency surgery can be performed. This life-threatening condition may be controlled with intubation or tracheostomy. In addition, care should be taken on the follow-ups after discharge in patients with thoracic trauma and intervals should be frequent within the first 3 months after trauma. Thus, the injuries overlooked on the initial assessment may be recognized at a later period.

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