e-ISSN: 2319-9865
p-ISSN: 2322-0104
Research and Reviews: Journal of Medical and Health Sciences

Successful Management of Complete Tracheal Disruption after Blunt Trauma: A Case Report.

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Short Communication

Received: 18/07/2013
Revised : 31/08/2013
Accepted: 01/09/2013

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Keywords: Blunt trauma, Contrast Enhanced CT, Fibreoptic bronchoscopy, Subcutaneous Emphysema, Tracheobronchial Injury.

ABSTRACT

We present here a case of 22 years old male who sustained road traffic accident, crushed between two vehicles, suffering complete transaction of the trachea extending from C7-D1 level to D3-4 level. Patient sought immediate medical assistance at the nearest medical centre with complaints of respiratory distress and subcutaneous emphysema; referred to a tertiary care hospital. Fibreoptic bronchoscopy was performed; airway was secured by placing the endotracheal tube tip distal to the distal tracheal disruption site. It was an interesting and challenging case, as patient had only airway trauma and no other injury. Surgical repair was done on 8th day of injury. Patient developed chest infections and septicemia, treated as per sepsis guidelines and using mechanical ventilation. He responded to treatment, recovered and was extubated on 40th day. Tracheal stenosis at the site of repair was observed on Fibreoptic bronchoscopy and CECT (Contrast enhanced computer tomography) chest.

INTRODUCTION

Tracheal rupture is an uncommon life threatening complication of chest trauma [1]. The incidence of tracheobronchial injury is less than 1% of all trauma patients [2, 6]. Tracheal rupture constitutes approximately 15-27% of all tracheobronchial injuries and is associated with higher morbidity and mortality [3]. Early recognition of tracheal rupture is necessary to decrease morbidity and mortality. Traumatic tracheal injury treatment requires high level of awareness and suspicion for diagnosis and advanced airway management skills [6]. Surgical repair within first 24 hours after injury is most desirable to prevent scar tissue formation and late complications like pneumonia, bronchiectasis and stenosis [8].

Case History

A 22 year old well-built male with no pertinent medical or surgical history, shifted from a tertiary care hospital with history of road traffic accident two days back. The injury occurred as the upper part of chest was compressed between two vehicles. Patient presented with complaints of respiratory distress and subcutaneous emphysema immediately after injury to the nearest medical centre, from where he was referred to a tertiary care centre. Fibrotic bronchoscopy was performed; airway was secured by placing the endotracheal tube tip distal to the distal tracheal disruption site. After 2 days, patient was referred to our institute. In emergency department, on examination; Patient was unconscious and the Glasgow Coma Scale was $E_1V_TM_3$, with endotracheal tube in place and was on Ambu ventilation. Subcutaneous emphysema was present over neck and left chest wall. Copious mucopurulent secretions from endotracheal tube were present. There were no abdominal and external injuries. Patient was febrile on touch, temp 101°F, and BP 90 mm of Hg systolic, Pulse 120/minute, SpO_2 (Oxygen saturation) 99%. Both Pupils were normal in size and normally reacting to light. Chest on auscultation revealed air entry was present on both sides, but decreased on left side, bilateral crepts present, left Intercostal's drain in situ with the column moving. Per abdomen examination revealed soft abdomen, no guarding or rigidity. Non Contrast CT head revealed a normal study. X ray chest shows tip of endotracheal tube in right bronchus.

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p-ISSN: 2322-0104

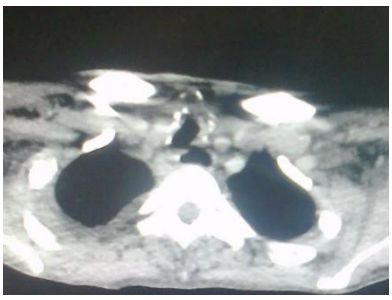
At the time of receiving the patient in Intensive care unit, patient was conscious, oriented to time place and person, haemodynamically stable. Pt was put on SIMV mode of ventilation, with tidal volume 500ml, RR 12/min, PEEP 5 cm of H_2O, PSV 6 and FiO2 of 40%. Patient was given adequate analgesia and sedation with morphine and midazolam infusion.

CECT chest was done on 3rd day of injury, showed defect anteriorly for 8 cms, craniocaudal dimensions below thyroid gland level from C7D1 to just above carina, D3-4 level and endotracheal tube tip lying in the right bronchus. Fibreoptic Bronchoscopy performed at the previous centre and subsequently at our centre revealed complete disruption of thoracic trachea just above carina, D3-4 level, and tracheal ring loss present. Endotracheal tube pulled gently outside under bronchoscpic view just keeping the tip of endotracheal tube above carina. X ray chest anterioposterior view showed inhomogeneous patch in right upper lobe, suggestive of Consolidation and /or Contusion. Upper GI endoscopy performed at previous centre was normal.

The patient's relatives were also briefed about the complexity of the case and case details were provided to them that they could seek medical expertise from other medical institutes. However, the patients relatives refused to take their patients to other centre and insisted that patient should be operated in this hospital only.

After making all the preparations, the patient was taken up for tracheal repair on 8th day of injury. A Combined cervicothoracic tracheal repair and anastomosis under General Anesthesia was planned. Tracheal rent indentified in middle and lower trachea involving approximately 5-6 cm length and involving entire anterior and a portion of right lateral wall. Posterior wall found lacerated, no through & through tear or leak found. Midline Sternotomy done. Superior incision given parallel to inferior at level of hyoid bone. Two silk and multiple vicryl sutures taken through superior and inferior ends of trachea and secured. All sutures pulled with head in flexion to achieve tracheal anastomosis. Superiorly based pericardial flap taken and sutured to cover the anastmotic site. Right chest drain inserted. Sternotomy closed using steel wire. Cervical incisions closed. Two guardian sutures were placed piercing chin skin to provide flexion of neck & chest. Surgery lasted for 6 hours. Patient was not extubated at the end of surgery and shifted to intensive care unit and planned to extubate next day under Fibreoptic bronchoscopy. Ryle's tube was put and enteral feeding started in due course.

After through oral and endotracheal tube suction, patient was extubated slowly over Fibreoptic bronchoscope visualizing the site of repair. Immediately after extubation, saturation dropped to 50% in one minute. Patient was ventilated with bag and masks ventilation, and immediately intubated orally with endotracheal tube. Patient put on ventilatory support. Patient was in sepsis, the tracheal and blood cultures were positive for acinetobacter brumanii. Appropriate antibiotic cover was given according to culture sensitivity. Central venous line was inserted through right internal jugular vein. X ray chest shows bilateral infiltrates. Patient responded well to treatment and slowly weaned from ventilator by using SIMV to CPAP modes and then a successful T piece trial. Fibreoptic bronchoscopy done through endotracheal tube before extubation revealed subglottic stenosis at the site of surgical repair, 2 cms above carina. The patient was finally extubated on the 40th day of injury.

CECT of neck and chest after extubation revealed moderate to severe tracheal stenosis at the level of D3, the transverse diameter of trachea at stenosis is 8 mm, and maximum diameter is 26 mm. Patient was given regular nebulisation with levo-Salbutamol and budecort, aggressive chest physiotherapy and steam inhalation.

Patient was haemodynamically stable, all investigations within normal limits and maintains saturation 92-94% on nasal prongs with oxygen flow 2 liter/min and shifted toward after 47 days of stay in intensive care unit.

DISCUSSION

Tracheal injury due to blunt chest trauma is a rare occurrence with an incidence of <1% [1, 2]. Tracheal rupture has a reported mortality of 20-50% ; the mortality of people who reach hospital alive was estimated to be less than 9% in recent years [7]. Majority of the tracheobronchial tears up to 80% are found within 2.5cm distance to the carina as in our case report [3, 8].

Clinically, the diagnosis should be suspected if dyspnea, sternal tenderness, subcutaneous emphysema, hemoptysis, cyanosis, flailing chest, shock, coma, hoarseness, aphonia, and stridor are present. Subcutaneous emphysema was the most common presentation related to Traumatic airway Injury in blunt trauma, followed by oral bleeding and hoarseness. A high-level of suspicion in blunt thoracic trauma and use of bronchoscopy confirm the diagnosis of tracheobronchial disruption. Although tracheobronchial rupture is rare, it is important to recognize it early and treat it quickly [5, 9].

The absolute priority in the initial resuscitation of any trauma patient is to secure a patent airway, provide adequate ventilation and oxygenation [6]. Maintaining spontaneous respiration is especially important until the level of the tear has been determined by direct laryngoscopy and bronchoscopy. Once the level has been determined, the airway algorithm recommends placing the endotracheal tube below the tear to avoid increasing the pneumomediastinum and subcutaneous emphysema with positive pressure ventilation [5, 9]. Early bronchoscopy is of great help in diagnosing the injury and to help in securing the airway [1, 2]. Bronchoscopy remains the gold standard for diagnosis of tracheal rupture and should be obtained in all patients with suspected tracheobronchial injury [1, 6]. Computer Tomography is being used with increasing frequency to facilitate detection of chest injuries and has proved useful in diagnosing thoracic injuries [9].

Kirsh and associates postulated three specific patterns of Tracheobronchial Injuries (TBI) based on the mechanism of injury in blunt trauma. The first involves rapid compression of the chest and the anteroposterior diameter of the thorax with a simultaneous widening of the transverse diameter. This produces lateral motion resulting in traction on the trachea at the carina. The second mechanism involves an increase in the intratracheal pressure that occurs against a closed glottis. The intraluminal pressure then exceeds the tracheal elastic strength, which results in rupture at the membranous and cartilaginous junctions. In the third mechanism, rapid deceleration results in shearing forces at fixed points along the trachea, including the cricoid cartilage and the carina, leading to disruption [10].

The treatment of disruption of trachea is reconstruction by end to end anastomosis; if possible. Repair of major tracheobronchial disruption should be a priority and must be done within 24 hours unless the patient has severe associated injuries such as abdominal injury causing hemodynamic instability, in which case, the abdominal component should be controlled first[5]. In our case, there was no other injury expect tracheal tear, surgical repair was delayed due to patient being referred from another hospital and experience in managing the tracheal injury was limited due to their rarity. Rupprecht et al. reported that reconstruction of the tracheobronchial tree within the first 24 hours, showed no degree of later pulmonary dysfunction and late reconstruction was associated with a decrease between 30- 50 % of vital capacity and 80 % of diffusing capacity [4].

Most people with TBI die within minutes of the injury, due to complications such as pneumothorax and insufficient airway and to other injuries that occurred at the same time [3]. If the condition is not treated early, pneumonia, bronchiectasis and stenosis may occur as late complications [7]. Late Airway stenosis is well recognized complication of repair of tracheobronchial injury [9]. In this case also tracheal stenosis observed at site of surgical repair by Fibreoptic bronchoscopy and Contrast enhanced CT chest. Most late deaths that occur in TBI are attributed to sepsis or multiple organ dysfunction syndromes (MODS).

CONCLUSION

Successful treatment of a tracheobronchial disruption includes prompt diagnosis, early airway access and repair under appropriate surgical approach. Delay in diagnosis of tracheobronchial injury is the single most important factor influencing the mortality and morbidity. Tracheal rupture should be suspected in cases with diffuse subcutaneous emphysema, pneumomediastinum, bilateral pneumothorax and active air leak from the chest tube. Early bronchoscopy remains the gold standard for diagnosing the site, nature, extent of tracheobronchial injury and securing the airway; it should be done by experienced clinician whenever tracheobronchial injury is suspected. Late complications of tracheobronchial injury include stenosis, recurrent pneumonia and bronchiectasis. Early diagnosis and surgical repair of tracheal injury generally leads to good recovery.

e-ISSN: 2319-9865
p-ISSN: 2322-0104

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