

Conservative Management of Iatrogenic Tracheal Rupture in a 19-Month-Old Child

Tugba Acer-Demir, Esra Elif Arslan

Department of Paediatric Surgery, Baskent University, Ankara, Turkey

Abstract

Up to date, only five cases of iatrogenic tracheal rupture during rigid bronchoscopy have been reported in children. Herein, we report the first case who has recovered with spontaneous respiration without intubation. Rigid bronchoscopy of a 19-month-old girl revealed a foreign body at the right main bronchus. While the bronchoscope was being withdrawn, we identified a 0.5-cm longitudinal mucosal laceration along the right wall of the membranous trachea. As her spontaneous respiration was adequate, she was treated conservatively. For the treatment of tracheal lacerations, while early surgical repair has traditionally been acceptable, evidence supporting conservative treatment is increasing, particularly in paediatric cases. If spontaneous respiration is sufficient, bridging the laceration with an endotracheal tube may not be required.

Keywords: Bronchoscopy, case report, conservative treatment, foreign body, tracheal laceration

INTRODUCTION

Foreign body aspiration is treated through rigid bronchoscopy, which is associated with many complications including laryngeal oedema, bronchospasm, pneumothorax, pneumomediastinum, tracheal or bronchial laceration or cardiac arrest. Herein, we discuss a case of iatrogenic tracheal rupture (ITR) with laceration that occurred during bronchoscopy and was treated conservatively.

CASE REPORT

A 19-month-old girl was admitted to hospital with coughing and wheezing, after falling down while an almond was in her mouth. The patient's medical history and family history were unremarkable. Respiratory sounds were diminished in the right lung. With the exception of leucocytosis (21,500 cells/mm³), laboratory examination results were normal. A chest radiograph revealed hyperaeration in the right lung [Figure 1]. The patient was hospitalised and prophylactic antibiotic treatment was initiated.

Twelve hours after foreign body aspiration, bronchoscopy (by 3.5 size 30 cm Storz bronchoscope – ID: 5 mm, OD: 5.7 mm)

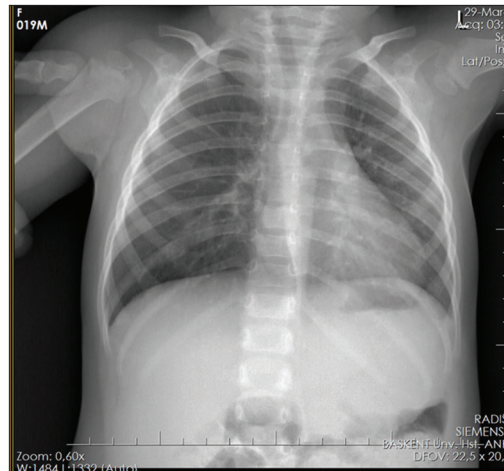


Figure 1: The chest radiograph that was taken during admission

Address for correspondence: Dr. Tugba Acer-Demir,
Department of Paediatric Surgery, Faculty of Medicine, Başkent University,
Fevzi Cakmak Cad, 10, Sok, No: 38/8, 06490 Bahcelievler,
Ankara, Turkey.
E-mail: tugba_acer@yahoo.com

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was performed with ketamine and propofol anaesthesia. In bronchoscopy, the trachea and bronchi were normal at initial evaluation. The foreign body was found in the right main bronchus. There were inflammation and oedema around the foreign body. It was grasped with forceps, but became stuck at the level of the vocal cords so we broke it into pieces and removed the pieces through forceps and suction. One piece moved to the segmental bronchi of the right lower lobe and stuck there. We could not remove it, despite trying. The patient then underwent two episodes of reflexive coughing, at which point, the bronchoscope was withdrawn, and we waited for anaesthesia to deepen by additional ketamine and propofol. After multiple unsuccessful attempts, bronchoscopy was aborted.

As the bronchoscope was withdrawn, we identified a 0.5-cm longitudinal mucosal laceration along the right corner of the membranous trachea at the junction of the cartilage, just superior to the tracheal bifurcation. Bronchoscopy was terminated immediately. As crepitation became apparent in the neck, we intubated the patient. The chest radiograph revealed pneumomediastinum and left pneumothorax [Figure 2], which was drained through tube placement [Figure 3]. The patient was taken to intensive care. The patient extubated herself on day 1 (20 h later). As her spontaneous respiration was adequate, the patient was administered only nasal oxygen. Arterial blood gas parameters were within normal limits. After extubation, air leakage from the chest tube ceased. Initially, rhonchi could be heard on examination, which improved with bronchodilator treatment. The chest tube was removed on post-operative day 5 [Figure 4]; the patient was discharged on post-operative day 8 [Figure 5]. We recommended a follow-up examination and bronchoscopy, but the patient did not attend a follow-up appointment. She had undergone a virtual bronchoscopy (through computed tomography) elsewhere, which was normal. The patient remains well, 4 years later. The subject of the case study's legal guardian provided informed consent for its publication.

DISCUSSION

Subcutaneous and/or mediastinal emphysema, dyspnoea, pneumothorax, haemoptysis, acute mediastinitis, chest pain or hypotension should alert the surgeon to the possibility of ITR.^[1-4] In children, only five cases of ITR during rigid bronchoscopy have been reported^[5-7] with a rate of 0.19%–0.27%.^[5,7] Furthermore, pneumomediastinum (0.2%–1.7%)^[6,8] which is a finding encountered when tracheobronchial laceration occurs is a well-known complication of rigid bronchoscopy.

Typically, ITRs are longitudinal lacerations at the distal posterior trachea, mostly at the right side of the pars membranosa,^[1] particularly at the junction of the cartilage and membranous wall.^[3,4] In the present case, the laceration had a characteristic location and appearance of ITR.

The reported risk factors associated with ITR include female gender, a height of <165 cm, older age, congenital tracheal anomaly, tracheal stenosis, chronic obstructive pulmonary

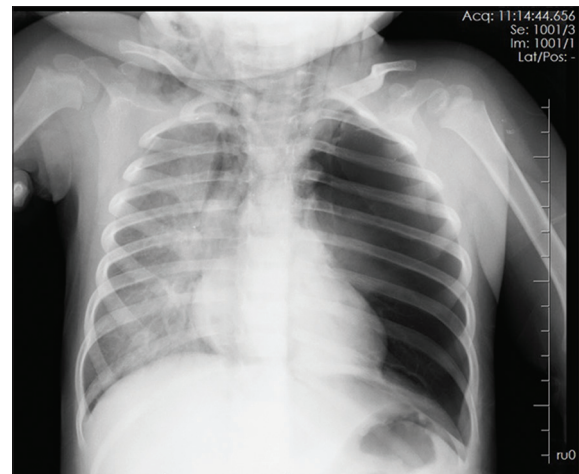


Figure 2: After iatrogenic tracheal rupture, the chest radiograph that revealed pneumomediastinum and left pneumothorax

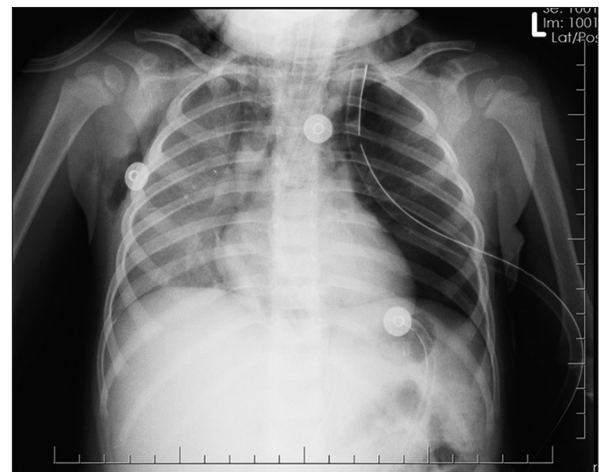


Figure 3: The chest radiograph that was taken just after tube placement

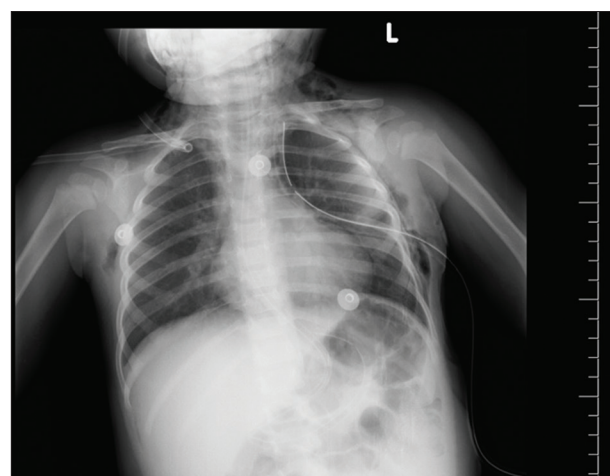


Figure 4: The chest radiograph that was after chest tube removal showed no pneumothorax

disease, inflammatory lesions of the tracheobronchial tree, tracheomalacia, disorders affecting the position of the trachea and chronic treatment with steroids.^[1] We believe that the ITR

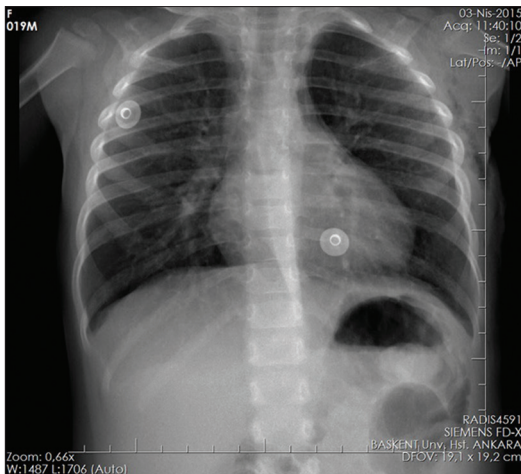


Figure 5: The control chest radiograph that was taken before discharge was normal

in the present case resulted from one or more of the following three factors: (1) angulation of the right bronchus by the bronchoscope which was unavoidable, as we endeavoured to reach the distal segmental bronchiole, (2) reactive inflammation around the foreign body and (3) coughing during the removal of the foreign body from the distal subsegment of the right lower lobe. It is known that coughing, when the expiration ventilation is closed, is a common cause of tracheal injury.^[2,9] Furthermore, spontaneous tracheal laceration due to coughing was described at four children and four adult cases in English literature.^[10] Some authors especially underline avoidance of cough during bronchoscopy to protect airways from trauma or rupture.^[6]

The treatment of ITR has recently been a subject of considerable debate. While early surgical repair has traditionally been acceptable, evidence supporting conservative treatment is increasing,^[1,4] particularly in paediatric cases.^[9] Conservative treatment is suggested for clinically stable patients with non-progressive symptoms and superficial lacerations of <2 cm in length without concomitant air leakage, respiratory difficulty, oesophagus injury or sepsis.^[1,4] Some authors have reported successful conservative treatment results regardless of the size and depth of the laceration.^[2,4]

Conservative treatment includes endotracheal intubation, pleural drainage if necessary and broad-spectrum antibiotic treatment.^[1-4,9] As the laceration (rupture) in the present case was 0.5 cm in length and superficial (mucosal), drainage of the pneumothorax and broad-spectrum antibiotic treatment were sufficient for treatment, and no surgery was needed. Our patient recovered with spontaneous respiration, and we did not need to bridge the laceration. Notably, after extubation, the air leak from the chest tube ceased immediately; thus, we concluded that the lack of positive pressure contributed substantially to the cessation of leakage. If spontaneous respiration is sufficient, bridging the laceration may not be obligatory. Some authors have also advocated management without intubation in patients with sufficient spontaneous breathing.^[2,4] Conti *et al.*^[4] asserted

that if pneumothorax and subcutaneous emphysema are treated properly, ITR has a minimal effect on respiration.

When dealing with a foreign body stuck in an airway, complications of bronchoscopy should be kept in mind. Conservative treatment can be attempted in ITR cases, depending on the clinical condition of the patient and the length and depth of the laceration. If spontaneous respiration is sufficient and air leakage has ceased, bridging the laceration may not be obligatory.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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