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An Unusual Case for Thoracic Surgeons: Bronchial Rupture in a Child due to Blunt Chest Trauma

Göğüs Cerrahlarının Çok Aşina Olmadıkları Bir Olgu: Çocuk Hastada Künt Göğüs Travmasına Bağlı Bronş Rüptürü

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Abstract

Tracheobronchial rupture is a rare but life-threatening injury encountered after blunt chest traumas. It is especially seen in pediatric patients because of the complete conduction of traumatic kinetic energy and the direct exposure to the airway, due to the increased elasticity of the chest wall and other anatomical structures. We report the case of an eight-year-old boy, who presented with right-sided pneumothorax, following blunt chest trauma. He deteriorated despite a thoracic drain and, during the emergency thoracotomy was finally diagnosed with a main bronchial rupture, and was treated with isolated end-to-end bronchial anastomosis. The repair of right main bronchial rupture was performed with complete preservation of the right lung; the boy was discharged from the hospital on postoperative day 10, and was followed up asymptomatically for the following 32 months. This rare thoracic surgery case of pediatric patients is discussed in light of recent literature for diagnosis and surgical management.

Key words: Blunt trauma, main bronchus, rupture, surgery.

Özet

Künt göğüs travması sonrasında oluşan trakeobronşiyal rüptür, nadiren ortaya çıkan ancak hayati tehdit edici olup, özellikle pediyatrik hasta grubunda göğüs kafesinin ve diğer anatomik yapıların erişkinlere göre daha esnek olması sebebiyle tüm travmatik enerjinin iletimine bağlı olarak ortaya çıkan bir yaralanmadır. Bu yazımızda, künt göğüs travması sonrasında pnömotoraks gelişen, tüp torakostomiye rağmen durumu kötüleşen ve acil torakotomi sırasında sağ ana bronş rüptürü tanısı konulup izole uç uca bronşiyal anastomoz uygulanan 8 yaşında bir olgu sunulmaktadır. Sağ akciğerin tamamı korunarak sağ ana bronştaki rüptürü tamir edilen ve postoperatif 10. günde taburcu olan hasta son 32 aydır şikâyetsiz şekilde takip edilmektedir. Pediyatrik yaş grubunda ortaya çıkabilecek bu nadir göğüs cerrahisi olgusu, tanı zorluğu ve cerrahi tedavi seçenekleri yönünden literatür eşliğinde tartışılmıştır.

Anahtar Sözcükler: *Ana bronş, cerrahi, künt travma, rüptür.*

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Blunt trauma to the chest resulting in rupture of a major bronchus is rare (1). Furthermore, bronchial rupture in children is exceptional (2). Bronchial rupture is usually the consequence of a high-speed motor vehicle accident, but it can also be caused by crushing / twisting injuries or by a fall from a height (3). Tracheobronchial rupture has a mortality of almost 30%, with more than half of the deaths occurring within the first hour of the injury (4,5). It is frequently associated with other thoracic or abdominal injuries that can result in delays in diagnosis or even in a failure to diagnose the tracheobronchial injury (6).

CASE

An 8-year-old boy was involved in a motor vehicle accident. When admitted to the hospital he had severe respiratory distress and cyanosis. A physical examination revealed subcutaneous emphysema on the right side of chest wall with diminished pulmonary sound and, a chest x-ray that showed a right pneumothorax. Other systemic evaluations showed no abnormalities. A computed tomography (CT) scan revealed total atelectasis of the right lung with pneumothorax (Figure 1). The child had no other major injuries. He underwent a right chest tube thoracostomy. A control x-ray, taken immediately after the intervention, still showed a totally collapsed the right lung (Figure 2). On the 6th hour, deterioration of his respiratory conditions occurred, with persistent air leak. On suspicion of bronchial rupture, he underwent emergency surgery. The patient could not tolerate the lateral position and an anterolateral thoracotomy incision was made. At operation, the right main bronchus was found to be completely transected 2 cm distal to the carina with minimal intact peribronchial tissue attachment. End-to-end isolated bronchial anastomosis was performed, using continuous suturing on the posterior and interrupted technique on the anterior side, using 4/0 polypropylene suture. There was no air leak after the operation. The postoperative x-ray revealed full expansion of bilateral lungs, without residual space or effusion. The patient was extubated on the postoperative 14th hour, recuperated all daily activity on day two and was uneventfully discharged on the 10th day postoperatively (Figure 3). Fiberoptic bronchoscopy (FOB) showed complete healing of the tracheal laceration and no evidence of stricture at the bronchial anastomosis one and three months after discharge. The patient is still doing well at his 32-month follow-up.

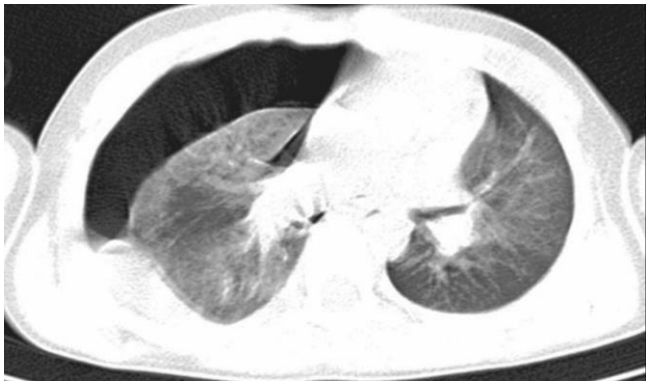

Figure 1: *Thorax computed tomography showing a right-sided pneumothorax on admission*

Figure 2: *Chest x-ray revealing non-expanded lung despite the underwater-seal drainage*

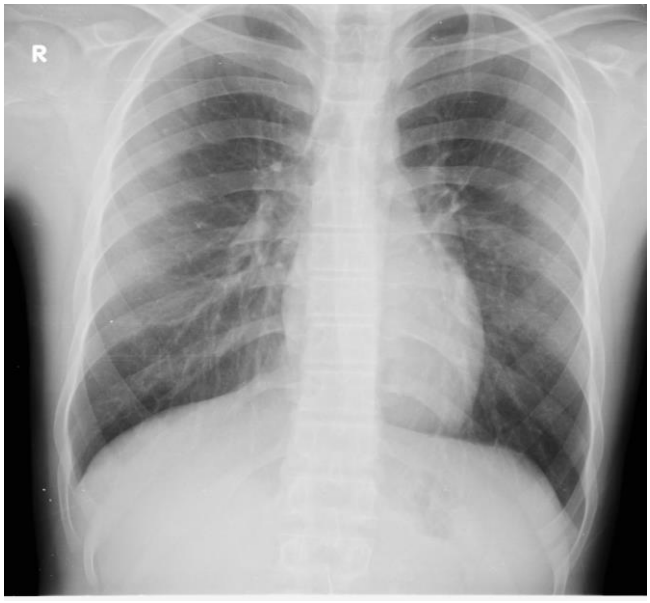

Figure 3: *Chest x-ray on postoperative day 28*

DISCUSSION

Tracheobronchial injuries following blunt chest trauma are rare in children, with remarked incidence between 0.7–2.8% (7,8). Rupture of the central airways is more common in children than in adults, since the child's thoracic cage is more elastic, and as a result, the chest wall is forced against the vertebral spine compressing the trachea and main bronchi during blunt traumas more easily (1,6). The male-to-female ratio in the pediatric age group is 2:1 or higher. High-impact blunt traumas, penetrating trauma with perforating/penetrating instruments or firearms, and iatrogenic injuries may result in tracheobronchial rupture (9). The mortality rate may be up to 30%; half of the mortality is seen within the first hour of the traumatic event (4,5).

Wide range of clinical symptoms and signs may be seen, such as pneumothorax, pneumomediastinum, hemothorax, subcutaneous emphysema, hemoptysis and respiratory distress or cyanosis being the most frequent ones (9). Because of the elastic nature of the thoracic cage, these findings can appear without rib fracture, as in our case.

A continuous massive air leak or non-expanding lung following pleural drainage insertion can be highly suggestive of a tracheobronchial rupture. Chest x-rays and CT scanning are also mandatory. The most specific radiological finding is the 'fallen lung' sign, in which the lung falls away from the hilum toward the dependant portion of the hemithorax (10). This did not occur in our case since minor peribronchial tissue hindered a total split (Figure 2). Up to 10% of patients may have no radiographic evidence of major bronchial injury in the immediate post-injury period (11). The best diagnostic method is FOB (7,12). FOB can also identify the localization and the shape of the rupture. However in the emergency situation, FOB may not be appropriate and urgent thoracotomy can be performed, depending on the patient's clinical condition (12). FOB in our patient could not be performed due to the sudden deterioration.

The rationale of therapy is to achieve rapid and total restoration of the airway. Treatment options vary and may be either conservative or surgical. Small bronchial tears can be treated non-operatively. Just placing a chest tube can fully re-expand the lungs (8). Also anterior tracheal lacerations can be managed conservatively, as intubation through the lesion as a stent, or with tracheotomy through the laceration (13). Total ruptures of the trachea and main bronchus should be managed by primary anastomosis. In our case, we performed end-to-end primary anastomosis and obtained good results, without loss of any parenchyma. Primary anastomosis can also be successfully performed in delayed cases, but the risk of infection and stricture formation is higher than in early cases (8,9). In children the prompt diagnosis of bronchial injury after blunt chest trauma is crucial for appropriate lifesaving treatment and the avoidance of pulmonary resection. A pulmonary resection or pneumonectomy is only justified in cases with associated severe pulmonary contusion. If a major bronchial rupture remains unrecognized then significant morbidity and possible mortality might occur (2,6,9).

In conclusion, a rupture of the main bronchus is a rare, but potentially serious complication of blunt chest trauma, especially in childhood. Delay or misdiagnosis may lead to partial or complete airway stenosis, or even mortality. Radiologically, a major air leak or resistant collapse of the lung, following tube thoracostomy for traumatic pneumothorax, should take the main airway injury into consideration, as well as the 'fallen-lung sign', rapid diagnosis and appropriate surgical intervention is usually lifesaving.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - S.K., S.E., O.V.; Planning and Design - S.K., S.E., O.V.; Supervision - S.K., S.E., O.V.; Funding - S.K., O.V.; Materials - S.K., S.E.; Data Collection and/or Processing - S.K., S.E.; Analysis and/or Interpretation - S.E., O.V.; Literature Review - S.K., S.E.; Writing - S.E.; Critical Review - S.K., S.E., O.V.

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