Selective contralateral balloon occlusion for successful opening of a persistently collapsed lung in congenital lobar emphysema

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Pulmonary emphysemas are mainly of two types, congenital lobar emphysema (CLE) and pulmonary interstitial emphysema (PIE), which have a different pathophysiology, but both cause severe respiratory distress that may require intensive medical and most of the time surgical therapy, including selective occlusion of the main bronchus of the affected lung as reported in cases of PIE, but not in CLE. We report a case of CLE managed not by treating the affected side but by opening the persistently collapsed lung.

Case

A.B. was a product of a full-term twin spontaneous vaginal delivery, with a birth weight of 3.14 kg, a length of 48 cm, and a head circumference of 36 cm. He was well until the 11th day of life, but then developed progressive respiratory distress, associated with cyanosis, especially during feeding. Chest x-ray revealed hyperinflation of the left lung with mediastinal shift to the right side. CT scan of the chest confirmed the diagnoses of congenital left upper lobe emphysema with atelectasis of the right side. Echocardiography showed moderate atrial septal defect with left-to-right shunt and pulmonary hypertension. The ventilation perfusion scan showed decreased perfusion of the right side. Cardiac catheterization ruled out scimitar syndrome. The patient was sick and required mechanical ventilation until a left upper lobectomy was performed.

The postoperative course was complicated by failure to tolerate extubation twice during a 10-day period. During that time, the right lung persistently collapsed and the left lung continued to expand causing a mediastinal shift to the right side. During this time, a trial of higher PEEP (10-12 cm H_2O) and intensive physiotherapy failed to expand the collapsed right lung (Figure 1). To open the collapsed right lung we selectively occluded the left main bronchus using a 5 French Miller balloon atrioseptostomy catheter (Edwards Lifesciences LLC, Irvine, CA 92614-5686 USA). The catheter was introduced through the endotracheal tube to the left main bronchus. To facilitate the introduction of the catheter to the left main bronchus we turned the face of the child to the right side while he was laid on his left side and the catheter tip was bent so it was directed during introduction to the left side. The procedure was done under sedation and muscle relaxant therapy. The position of the catheter was confirmed by chest

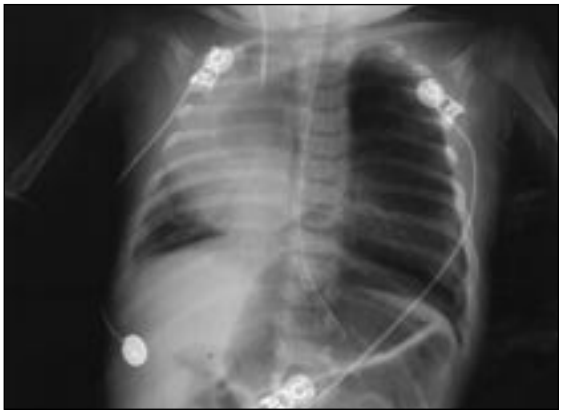

Figure 1. Chest radiograph showing collapsed right lung

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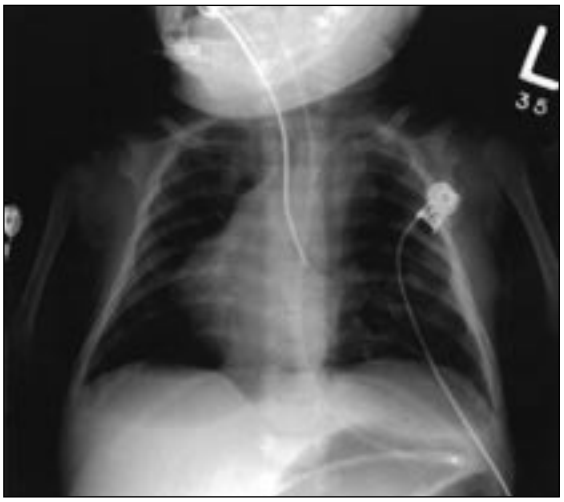

Figure 2. Chest radiograph showing position of catheter.

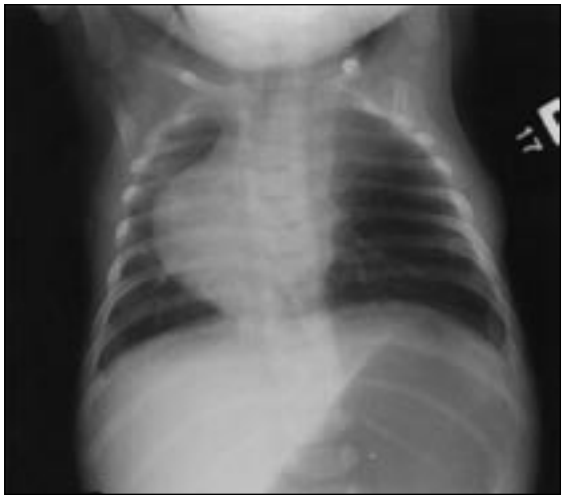

Figure 3. Chest radiograph 12 hours after removal of catheter.

x-ray (Figure 2), then the balloon of the catheter was inflated with 1.5 mL of air to cause silence in the left side. The balloon was left inflated for 4 hours, deflated for 1 hour and then inflated for 4 hours and so on for 36 hours duration.

The right lung stayed open after the removal of the catheter. The child was extubated 12 hours following catheter removal while the right lung remained well expanded (Figure 3) . The baby stayed in the PICU for 2 days after extubation and then was transferred to the regular inpatient area, stayed there for 1 week and then was discharged home in good condition.

Discussion

Opening a collapsed lung per se is a challenge, which requires intensive physiotherapy and sometimes intubation, but when the collapsed lung is associated with hyperinflation of the other lung, which keeps expanding, leading to external compression of the other lung, then the usual methods may fail to expand the collapsed lung. To treat the collapse, relieving the external pressure is extremely important to achieve that goal, which we did by selectively occluding the main bronchus of the hyperinflated side.

The selective occlusion of one bronchus is usually used to treat a lung affected by PIE,[1-7] but has never been reported as a treatment for CLE in children or adults. The pathophysiology of PIE is different from CLE and the aim of selective occlusion is to rest the diseased lung and give time for ruptured airspaces to heal. In addition, selective occlusion was applied to treat persistent pneumothorax and severe chronic emphysema in an adult patient by using fibrin glue and a polyglycolic acid mesh.[8] Nevertheless, selective occlusion has never been used to open a collapsed lung in CLE, which we showed to be an effective modality of treatment for this rare entity.

Treating a persistently collapsed lung by selective occlusion of the bronchus of the hyperinflated side is a relatively safe and effective method especially in postoperative lung collapse of the normal side in patients of CLE.

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