Contra-Lateral Spontaneous Pneumothorax
as a Complication of Intrathoracic Operations*

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There is a definite trend of reduced mortality and morbidity following thoracic surgical procedures. This is due largely to prevention as well as recognition and prompt treatment of postoperative complications. One of the unusual complications which does occur from time to time is contra-lateral spontaneous pneumothorax. Such a complication following collapse therapy for pulmonary tuberculosis has been repeatedly observed, however, this occurrence following intrathoracic operations is apparently rare. The exact incidence is difficult to determine since it is doubtful if all recognized cases have been reported and, also, it is possible that not all such complication has been recognized. The latter possibility is quite great in view of the nature of spontaneous pneumothorax, since, at post mortem, the pathologist may be misled in his conclusions without an antemortem suspected diagnosis.

So far, there have been eight cases of this type reported in the literature, Stephen's two cases reported in 1936 being the earliest available description of such an incidence. More recent references in the literature are case reports of Gleason and Kent in 1949 (one case), Melick and Gutekunst in 1950 (one case), Beno and Weisel in 1952 (three cases). Out of these eight cases so far reported, five survived and three died as the direct result of this complication. Death in each instance was apparently due to delay in recognition and treatment. This report is being made in order to re-emphasize the potential danger and outline the treatment which, if promptly instituted, can alter the course of this otherwise fatal complication.

Report of Cases

Case 1: J. G., East Orange General Hospital No. 83120, a 13-year-old white male was admitted on November 4, 1950, with symptoms of shortness of breath and cyanosis of 24 hours duration. Diagnosis at the time of admission was spontaneous left pneumothorax.

Family history and personal history were negative except for measles at the age of five and virus pneumonia when seven years old.

History of the present illness dated to about three months prior to this admission when he had a similar episode of spontaneous pneumothorax on the left side which subsided after a few days of bed rest. Two months later, another attack occurred on the left side and again responded to a few days of bed rest.

Physical examination was negative except for a moderate amount of cyanosis and presence of pneumothorax on the left side. Chest roentgenogram (Fig. 1) revealed 78 per cent collapse of the left lung. Over the apex of the left upper lobe, a large cystic area could be outlined. The right lung seemed to be normal.

Laboratory studies were within normal limits. He was treated initially with bed rest and removal of 3 liters of air from the pleural cavity.

Since this was the third episode of spontaneous pneumothorax within a relatively short time, and the chest roentgenograms showed the presence of a cystic area over the apex of the left upper lobe, resection of the cyst was decided upon and carried out on the seventh day after admission.

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Through a postero-lateral incision, the pleural cavity was entered and a giant cyst of the left upper lobe was found, with three small satellite cysts. The large cyst was held out by fine adhesions from the posterior aspect of the pleural cavity, the site of a previous pneumothorax, and was not flattened even after submergence of the lung in saline solution. The cyst was resected and the stump closed by a continuous suture. The lung was re-expanded and the chest closed. Pathological examination of the specimen revealed it to be a cyst with alveolar cell type of epithelial lining.

Postoperative condition of the patient was extremely smooth. In fact, he was ambulatory on the second postoperative day. On the third postoperative day, while getting up from the bed, he experienced a sudden sharp pain over the right side of the chest and became extremely cyanotic. Physical examination revealed the presence of pneumothorax on the right side. Immediately, a needle was inserted in the right pleural cavity (contra-lateral to the operative side) and high positive pressure reading obtained. Four thousand cubic centimeters of air were removed. The patient's condition improved enough to allow a chest x-ray film (Fig. 2). This revealed 90 per cent collapse of the right lung and an area over the apex of the right upper lobe suggestive of a cyst. Conservative therapy by means of repeated needle aspirations led to only a temporary relief of dyspnea. It was obvious that something other than repeated chest aspirations would be necessary in order to overcome the recurring tension-pneumothorax. Eight hours after the onset of the contra-lateral spontaneous pneumothorax, under local anesthesia, a thoracoscope was introduced through the fifth interspace and exploration revealed the presence of a collapsed lung; over the apex of the upper lobe, a giant cyst was seen held to the parietal pleura by multiple fine bands of adhesion. The area of the tear could not be visualized. A catheter (No. 12 French) was inserted in the pleural cavity and connected to a Stedman pump. The suction apparatus was arranged with a water trap and suction maintained at 15 centimeters of water. This was soon found to be inadequate because of continuous leakage of a large amount of air for eight days with no roentgenological sign of improvement in the state of the collapsed right lung. It was then assumed that probably the intrapleural adhesions prevented spontaneous closure of the ruptured area and that the air was leaking into the pleural space as fast as it was being removed. Consequently, right thoracotomy was performed on the ninth day after the original operation on the left side. The right lung seemed to be completely collapsed. A giant cyst was found over the right upper lobe, quite identical to the one removed from the left side. There were several fine adhesions between the cyst and the chest wall. The site of rupture was 3.5 centimeters in length. The cyst was removed and the stump closed with interrupted suture and the lung expanded. His general condition following this second operation was satisfactory and the postoperative course uneventful. He was ambulatory on the second and discharged home on the ninth postoperative day.

The follow-up roentgenogram of the chest showed satisfactory re-expansion of both lungs (Fig. 3). Examination one-and-one-half years following bilateral thoracotomy revealed good physical condition. There has not been re-occurrence of spontaneous pneumothorax.

Case 8: S.M., Mountainside Hospital No. 95896, a 46-year-old Negro male was admitted on June 9, 1962, with chief complaint of shortness of breath on moderate exercise. History of present illness dated to about a year ago when he experienced an attack characterized by sharp pain in the right chest. He was then hospitalized at Morrisstown Memorial Hospital where a diagnosis of spontaneous pneumothorax was made. He was treated by bed rest and discharged after a few days to continue bed rest at home. While at rest, he experienced several similar attacks of dyspnea, however, he gradually improved and for the last three months felt well except for persistent respiratory embarrassment when walking or climbing stairs. About a month before this admission, a roentgenogram of the chest revealed pneumothorax still present, the lung 60 per cent collapsed and a fluid-containing cyst over the right upper lobe. He was then referred to The Mountainside Hospital for observation and treatment. Previous general health had been good. The family history was negative.

The initial physical examination disclosed a well-developed, well-nourished Negro in no acute distress. Temperature, pulse and respirations were normal. The chest showed good expansion on the left side but none on the right. Breath sounds were absent on the right side. No rales or rhonchi were heard on the left.

The initial washings were negative except for the presence of moderate hemoconcentration (Hematocrit 52 volume packed red blood cells per 100 cubic centimeters of blood); sputa and gastric washings were negative for tuberculous bacilli. Roentgenograms of the chest revealed the right lung about 50 per cent collapsed by pneumothorax with a large area of radiolucency over the apex, suspected to be a cyst (Fig. 4).

A needle was introduced in the pneumothorax space and a negative reading obtained (14, —11). Bronchoscopic examination failed to reveal the presence of endobronchial pathology.
On June 16, 1952, thoracotomy was performed on the right side through a posterolateral approach. Exploration of the right lung revealed the presence of a single large thin-walled emphysematous bulla of the right upper lobe. The lung was held down by a pleural membrane. Some pleural fluid was present. The cyst was opened widely and resected by keeping tension on the cyst wall. Thus, an accurate identification of the attachment of the base of the cyst to the lung was made and the stump closed with interrupted fine silk. Decortication of the lung was performed following the standard technique, drainage tubes inserted and the chest closed in routine manner.

Postoperative condition was satisfactory. Portable roentgenogram of the chest made the following morning revealed complete re-expansion of the lung on the operative side. However, at 8 A.M. of the same day (24 hours postoperative), he suddenly became dyspneic. Physical examination revealed the trachea to be deviated to the operative side. No breath sound could be heard over the left chest. Immediately, a needle was inserted in the pleural cavity and 2000 cubic centimeters of air removed. Following the above procedure, his condition improved enough to allow a bed side roentgenogram of the chest which substantiated the clinical impression of contra-lateral spontaneous pneumothorax (Fig. 5). Since the improvement was temporary, two hours later, under local anesthesia, a catheter was introduced through the third anterior interspace and midaxillary line into the left pleural cavity and connected to the underwater drainage bottle. Dramatic improvement occurred following the above procedure. About 24 hours later, his condition again deteriorated. Respirations became labored and pulse thready. Examination revealed the reason for this re-occurrence to be clogging of the drainage tube. This was corrected and his condition improved. On the fourth postoperative day, he experienced a sudden sharp pain over the left chest and within the space of one hour, a large amount of subcutaneous emphysema over the head and neck was noticed, while the drainage tube was apparently in good working condition. He became extremely cyanotic and blood pressure and pulse became unobtainable. Through an anterior-intercostal approach, the left chest was immediately opened and a large amount of air under pressure escaped from the pleural cavity. The heart was found at standstill, cardiac massage was instituted and after about two minutes, cardiac function was restored. The blood pressure came back to normal. Exploration of the left lung at this time revealed the presence of a giant cyst over the left upper lobe. The line of rupture measured about 5 centimeters in length. The latter was kept patent by several intrapleural adhesions. The cyst was excised and the stump closed with fine silk. Two large drainage tubes were inserted in the pleural cavity and the chest closed in routine manner.

After this episode, the postoperative course was entirely uneventful and he was discharged home on his 12th postoperative day.

Pathological diagnosis of the cyst removed from the right, as well as from the left upper lobe, was giant emphysematous bulla.

The follow-up roentgenogram of the chest showed satisfactory re-expansion of both lungs (Fig. 6). Examination six months following bilateral thoracotomy revealed no symptom and he was working full time as a laborer. There has not been re-occurrence of spontaneous pneumothorax.

**Discussion**

Several mechanisms have been proposed with regard to production of spontaneous contra-lateral pneumothorax. Stephens\(^2\) stated that the etiologic factor in each of his three cases was a communication through the mediastinal wall, although the site of tear could not be visualized at necropsy. This view was also shared by Kneopp.\(^4\) However, in the case reported by Gleason and Kent, and three cases reported by Beno and Weisel, a ruptured emphysematous bleb was believed to be the main factor in the production of this complication. In the two cases presented here, a ruptured emphysematous bleb was found to be the only reason for the production of the spontaneous contra-lateral pneumothorax. In both cases, the site of rupture was well demonstrated at the time of exploration.

Symptoms and physical findings are those of a spontaneous pneumothorax; the degree of respiratory embarrassment however, seems to depend on the amount of tension present in the pneumothorax space as well as on the degree of fixation of the mediastinum. The case described by
Gleason and Kent in which left lower lobectomy for bronchiectasis had been performed, dyspnea and cyanosis were only moderate while in the two cases just described, where pulmonary pathology was not of inflammatory nature, the respiratory embarrassment was severe.

In analyzing the eight cases reported in the literature, it is striking that death in each instance was due to delay in recognition and institution of treatment of this condition. Treatment should be carried out on the basis of physical findings alone, if the condition of the patient does not allow time to lose to have roentgenograms of the chest. Emergency treatment is simple and effective. Decompression of the tension pneumothorax by immediate thoracentesis is all that is needed. Roentgenological examination and other diagnostic procedures should be done only after the severe subjective symptoms are relieved. Alexander stated, any diagnostic measure which is not capable of relieving the respiratory embarrassment is contra-indicated.

After the acute episode is overcome, intrapleural catheter drainage and continuous suction should be applied. Thoracotomy may become necessary in instances such as in the case of Gleason and Kent and the two cases here presented.

SUMMARY

1. Two cases of spontaneous contra-lateral pneumothorax following resection of pulmonary cyst are reported.

2. In both cases, ruptured contra-lateral emphysematous bleb was proved to be the etiologic factor.

3. The dangers of contra-lateral spontaneous pneumothorax following intrathoracic operations are that of tension pneumothorax, collapse of the lung opposite to the operative side and mediastinal shift. The severity of respiratory embarrassment resulting from the above depends on the degree of fixation of the mediastinum. If the latter is freely mobile, the respiratory embarrassment may quickly be followed by complete failure.

4. The diagnosis is made on the basis of physical findings of pneumothorax opposite the operative side in a patient presenting an acute respiratory distress.

5. Emergency treatment should be undertaken without delay since the time lost until chest roentgenogram is taken may precipitate irreversible respiratory failure. Treatment is simple and effective. The decompression of the tension pneumothorax by immediate thoracentesis is all that is needed. Roentgenological examination and other diagnostic procedures should be done only after the severe respiratory symptoms have been relieved.

RESUMEN

1. Se referen dos casos de neumotórax espontáneo contralateral, después de la resección que ampollas pulmonares.

2. En ambos casos, se demostró que la causa fue la ruptura de ámpulas enfisematosas contralaterales.
3. Los peligros del neumotórax espontáneo contralateral, consisten en que puede ocurrir el neumotórax a tensión, colapso del pulmón opuesto al que se opera y desplazamiento del mediastino. La severidad de los trastornos respiratorios que resulta de lo anterior, depende del grado de fijación del mediastino. Si éste es libremente móvil, el trastorno respiratorio puede ser sucedido de insuficiencia completa.

4. El diagnóstico se hace sobre los hallazgos físicos de neumotórax opuesto al lado que se opera en un enfermo que tiene grandes trastornos respiratorios.

5. El tratamiento es sencillo y eficaz. La descompresión del neumotórax a tensión, es todo lo que se requiere. El examen radiológico y otros procedimientos de diagnóstico deben intentarse solo cuando los síntomas severos se hayan aliviado.

RESUME

1) Les auteurs rapportent deux cas de pneumothorax spontané contra-latéral faisant suite à la résection d'un kyste pulmonaire.

2) Dans les deux cas, on put démontrer que la rupture d'une bulle emphysemateuse contra-latérale en avait été responsable.

3) Les dangers du pneumothorax spontané contra-latéral faisant suite aux interventions intrathoraciques sont fonction de la pression intrapleurale du pneumothorax, de l'importance du collapsus du poumon et de la déviation médiastinale. La gravité de la gêne respiratoire qui en résulte dépend du degré de fixité du médiastin. Si celui-ci est complètement libre, la gêne respiratoire peut être suivie rapidement d'une insuffisance respiratoire complète.

4) Chez un malade présentant une gêne respiratoire aigue, le diagnostic de pneumothorax du côté opposé au poumon opéré se base sur les constations physiques.

5) Le traitement doit être entrepris d'urgence. Le temps que l'on perdrait à attendre les résultats de la radiographie pourrait amener au stade d'insuffisance respiratoire irréversible. Le traitement est simple et efficace. La suppression de l'hyperpression gazeuse intrapleurale par simple thoracentèse est suffisante. Ce n'est qu'après la disparition des signes graves d'insuffisance respiratoire qu'on pourra faire appel à l'examen radiologique et aux différents autres procédés de diagnostic.

REFERENCES