

* SPONTANEOUS PNEUMOTHORAX

Its Complications and Treatment

by

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Because of the increase of spontaneous pneumothorax in our clinics and the complications of artificial pneumothorax I wish to report on ten cases that have passed through our hands.

Spontaneous pneumothorax may occur without a gross LESION of the lungs and may remain simple or develop an effusion. The fluid is serous in character and may gradually replace the air. This accident may occur as the result of rupture of an emphysematous bleb, rupture of interstitial emphysema or a tear in the lung as the result of traction on an adhesion.

The onset of a pneumothorax is sudden in about three-fourths of the cases. O.H.P. Pepper in an analysis of 500 cases from the literature in which the onset could be determined accurately, found that in 77 per cent. the onset was sudden and in 23 per cent. insidious.

As the symptomatology differs according to whether the accident is sudden or insidious in its onset the two types will be considered separately. When the onset is acute, the patient is suddenly seized with an agonizing pain in the side which is usually felt at the costal margin. The pain is often referred to as being stabbing or tearing in character. Coincidentally with the onset of the pain there is great difficulty in breathing. Dyspnea is perhaps the most characteristic feature and is so extreme in some cases as to produce a feeling of impending suffocation. It is seen in its most marked form in advanced cases of tuberculosis where in addition to the collapsed lung there is apt to be extensive disease on the opposite side. In many cases there is every evidence of severe shock. The patient is pale, the expression anxious, the pulse rapid and weak, the temperature falls, the extremities are cold and the body is bathed in cold sweat. This picture, however, is subject to many variations; some of the symptoms may be wanting entirely or they may

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vary greatly as to their severity. If the patient survives, the accumulation of air under high tension may increase the difficulty in breathing and in addition there is a feeling of oppression in the chest or distinct pain.

In cases with an insidious onset the symptoms which characterize those with a sudden onset may be lacking entirely or they are so trivial as to escape notice. Another thing which contributes toward masking a pneumothorax with a gradual onset is the fact that it so frequently occurs in patients with advanced tuberculous disease of the lungs. In patients of this type chest pain, dyspnea and tachycardia are nearly always present and may vary in severity from time to time. Under the circumstances a pneumothorax might develop without attracting notice. In addition an exacerbation of one or all of these symptoms could be attributed readily to the primary disease. The number of times that a pneumothorax is discovered accidentally either by physical signs or an X-ray examination, or is first revealed at the autopsy table makes it apparent that it can develop either without symptoms or with symptoms so trivial in character as to escape notice.

COMPLICATIONS

In the various forms of pneumothorax may be found all of the various complications of the underlying lung condition (tuberculosis, abscess, bronchiectasis, etc.), all the complication of pleurisy with effusion, of empyema, and of hemothorax. In addition, certain complications, such as subcutaneous emphysema, should be mentioned.

SEQUELAE—The sequelae of the various forms of pneumothorax are the same as those of pleurisy with effusion and of empyema. A chronic pyopneumothorax, in which spontaneous cure is impossible, with fibrosis of the collapsed lung and thickened pleura preventing expansion, is a condition to be dreaded.

ASSOCIATION WITH OTHER DISEASES—Among the pulmonary diseases associated with pneumothorax in its several forms are:

Emphysema—Pulmonary emphysema has from the first been considered an important cause of pneumothorax. This condition may be associated with extensive general emphysema, the bullae varying in size from that of a pea to that of a pigeon's egg, or with traumatic interstitial emphysema, or with localized pleural blister resulting from the latter or occurring in connection with the contracting scar of a healed tuberculous area. Associated with these forms of emphysema simple spontaneous pneumothorax or hemopneumothorax may develop. The frequent presence

of hemopneumothorax is doubtless due to the tear in a pleura in which circulation is still intact.

Pulmonary Tuberculosis—Since the discoveries of Laennec it has been known that by far the majority of the cases of pneumothorax, over 90 per cent., are associated with tuberculosis. Galliard ascertained that of all cases of tuberculosis under treatment simultaneously in all the hospitals of Feance, 1.054 per cent. had pneumothorax. Pathologists report that pneumothorax is present in 5 per cent. of all fatal cases of tuberculosis. It occurs especially in the acute cases of tuberculosis and practically never in afebrile ones. If all cases in which pleural adhesions are important in the production of pneumothorax are classed as tuberculous, then many of the spontaneous cases also belong indirectly in this group and tuberculosis would explain much more than 90 per cent. of all cases. There is a tendency toward the development of pneumothorax in every case of tuberculosis, but this is prevented by the obliterative pleurisy which precedes a slow subpleural necrosis. For this reason, a perforation of the lung at the apex is exceedingly rare. Pneumothorax in cases of tuberculosis, is usually partial, owing to old adhesions, and it is often definitely circumscribed. Other cases of pneumothorax are due to adhesions resulting from a healed tuberculosis which may later cause a tear in the pleura, to the acute, small rapidly softening subpleural cavities, so small that they are overlooked at autopsy, and to extensive subpleural cavity formation.

Bronchopneumonia—In the streptococcus bronchopneumonia epidemic which complicated the influenza of 1918-19, the cough was, in some cases, usually severe, and rupture of the lungs was not rare. This in turn led to subcutaneous emphysema in 11 out of 1,701 cases reported by Berkley and Coffen, while in 2 of these 11 cases a pneumothorax also developed.

Gangrene of the Lung—Gangrene of the lung, especially that following pulmonary embolism and thrombosis, may be important in the production of pneumothorax. In the few cases of bronchiectasis mentioned above, it was gangrene which weakened the wall of the cavity and allowed it to rupture.

TREATMENT

The first indication is generally that of reducing the marked dyspnoea carried by the sudden abnormal positive pressure in the pleura involved. This is done by removing the excess air with a pneumothorax apparatus with the bottles reversed, and checking with the manometer

until you have a slight negative pressure.—The patient gets immediate relief. Most of the cases however develop a hydro or pyopneumothorax which may be treated as this complication is treated in cases of artificial pneumothorax which is as follows:—

Treatment of Effusion—These effusions apparently do little or no harm unless the amount is so great as to cause symptoms of pressure, and it is often noted that improvement follows their development. *It is better not to aspirate them unless there is a definite indication to do so.* In aspirating the fluids, one should allow air to enter the chest after every 200-300 c.c. of fluid are withdrawn, so that the pressure may not become too low at any time, thus allowing the lung to re-expand. Two needles may be used, one for withdrawing fluid, the other for injection of air and the observation of the pleural pressure. Sometimes these effusions will fill the pleura, gradually replacing the gas. In these cases it is often well to allow them to remain. In such cases it is necessary to examine the patients fluoroscopically at fairly frequent intervals to be sure, on the one hand, that the fluid does not increase to such an extent as to cause harmful pressure and, on the other, that it is not absorbed to such an extent as to allow the lung to re-expand too soon. One of the strong arguments against collapse therapy *has been the occurrence of pyopneumothorax, which is due usually to a mixed infection. As soon as this occurs the pus should be aspirated and the pleural cavity washed with an antiseptic fluid, some of which is usually allowed to remain. Good results may be obtained with 1:1000 gentian violet or 1:5000 acriflavine in sterile distilled water, alone or in combination.* Liquor hexylresorcinolis (1:1000 solution of hexylresorcinol in 30 per cent glycerin and 70 per cent water) is sometimes effective. Replacing the pus with oxygen has been recommended. *Gomenol (5 to 10 per cent) in paraffin oil helps to control some infections. In some cases the pleural cavity is filled with it, replacing the air and creating an oleothorax. However, metaphen in oil with air replacement has given us our best results.* The general condition of the patient will determine how soon the aspiration and treatment should be repeated, and this should be kept up until the secondary organisms can no longer be found on smear and in culture. Two per cent formalin in glycerin, 1 to 2 ounces, has also been left in the pleural cavity after removal of the pus. Good results have been obtained but its use is followed by severe pain from the rapid rise in intrapleural pressure, which should be relieved early by withdrawal of air. The fluid, after the use of formalin-glycerin, becomes sero-purulo-sanguineous. We suspect that bronchial fistula in two patients may have been due to the use of this agent. Purulent effusion developed in 12.3 per cent of Matson's

600 cases. It may be due to a ruptured subpleural cavity, to seepage from a softened area or to an adhesion tearing away a piece of lung. The last constitutes the danger of using too high pressure in trying to increase the collapse.

Surgical Treatment—If after this the patient is not improving and you do not wish to obliterate the cavity with oleothorax treatment. A rib resection is done and the patient's lung is made to expand by blowing water from one bottle to another. *This is the wisest treatment for cases of non-tubercular and lung gangrene origin.*

In the following cases we should like to point out the results of treatment :

- (1) A patient aged 47 with drenching sweats had a thickly walled spontaneous pneumo cavity due to a gangrenous lung breaking down. It contained greenish pus and air. This was opened by Dr. Y. S. Lee of the Surgical Department and the odour of the pus was intolerable. This pus was found to contain streptococci and patient was drained and given polyvalent serum etc. He died.
- (2) A female age 35 with hydro-neumothorax spontaneous in origin—(non tubercular) was treated in the usual way by rib resection and expanding the lung.—She recovered in three weeks and is now as well as usual.
- (3) A young man aged 25, with mixed infection following hydro-pneumothorax was treated with Gentian-Violet for three months keeping the lung collapsed at the same time. He was finally cured by rib resection and expanding the lung.
- (4) A male case 24 years of age—with spontaneous pneumothorax ending in a Ball Valve connection between the pleura and bronchus was cured by filling the pleura with normal saline for two weeks—which closed the valve action and later withdrawing the saline and expanding the lung.
- (5) A young man aged 24 came in with a spontaneous pneumothorax of the left chest 800 c.c. of air was removed every 3rd day. The pulse was 150.—He was given morphia. He was in hospital two weeks and died suddenly at night with a heart beat of 200 per minute. There was no fluid in the pleura.
- (6) A boy aged 6. The Pediatric Department reports as having a spontaneous pneumothorax following whooping cough. *This was left strictly alone* and the air absorbed and child completely recovered.
- (7) A farmer aged 47 was carried 100 li to hospital with pyopneumothorax was given supportive treatment. This patient had a bronchial fistula and coughed up 100 c.c. of greenish pus in first

hour in hospital. 200 c.c. of air was withdrawn-dyspnoea not improved. Patient died in 48 hours.

- (8) A young male 28 years old with Tuberculosis of one lung came in with a marked pneumothorax which had pushed the heart and mediastinum into the right chest. The purulent fluid which formed in pleura was aspirated and air removed and 30 c.c. of metaphen in oil injected at intervals. He completely recovered in one month and the lung became quiescent.
- (9) A similar case to the above-also a young male was treated the same way only using 1-1000 Gentian Violet. He cleared up in 2 months.
- (10) Practically all the cases we see here are males.—But; one was a female 29 years of age who came in with tuberculosis of both lung, one third of one lung and two thirds of the other. 1000 c.c. of air was removed but the ball valve fistula in the bronchus prevented us from keeping the air pressure and infection down. She died after three months with a resected rib for pyo-neumothorax.

PROGNOSIS

The Surgical Department agrees with us that non-tubercular pyo-pneumothorax has an 80% chance for recovery with rib resection and lung expansion.

The big problem is in the tubercular cases where you need the lung collapsed by pressure to control the tuberculosis. Yet a large pyopneumo pleural cavity which goes into chronic empyema is almost hopeless. The solution to the problem is to keep on with our new antiseptics, gomenol and oleothorax where the pleural cavity can be made sterile and the lung kept at rest under pressure.