DISEASES OF THE CHEST

Closed Intrapleural Pneumonolysis

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In the early stages of his pioneering work with artificial pneumothorax, Forlanini realised that effective collapse of tuberculous lungs was frequently prevented by the presence of adhesions between the visceral and parietal pleurae. He stated that in time the adhesions would often stretch sufficiently to allow a satisfactory collapse, but it was soon found that in many cases cavities remained open after months of pneumothorax treatment. Early attempts to remedy the situation and allow complete collapse of the diseased areas consisted of opening the chest and severing the adhesions under direct vision (open intrapleural pneumonolysis), but not for many years was this method developed to the point of reasonable safety and freedom from complications.

It remained for Jacobaeus, in 1913, to devise a method of severing adhesions under direct vision, but without opening the chest. He utilised two cannulas, inserted through neighboring intercostal spaces, one resembling a cystoscope, by means of which the adhesions were brought into direct view, the other providing a means of introducing the galvanocautery. With a few technical modifications this is the method used most widely today.

Intrapleural pneumonolysis by the Jacobaeus technic soon established itself as a valuable procedure in the collapse therapy of pulmonary tuberculosis and its use has become widespread. Unlike most other surgical procedures, it is not in itself a collapse measure; it merely serves to improve the collapse resulting from a previously established artificial pneumothorax.

During the past three years, 130 patients at the Texas State Sanatorium have been subjected to thoracoscopy. In eight of these cases it was found that the adhesions were of such extent or thickness that it seemed inadvisable to attempt to sever them. It has been the policy here not to attempt wide dissection of extensive adhesions in cases in which the disease is essentially unilateral; in these it is felt that thoracoplasty offers less risk and a better prognosis. In cases with extensive contralateral disease, sufficient to contraindicate thoracoplasty, more chances have been taken. In 122 patients the adhesions were severed, in whole or in part. The operations were done by two thoracic surgeons, Dr. J. Emerson Dailey of Houston and Dr. Robert Shaw of Dallas, using the Coryllos thoroscope and cautery unit.

The 122 patients in whom pneumonolysis was done represent roughly ten per cent of those given artificial pneumothorax during the same period of time. Duration of the pneumothorax before operation varied from one to eight months. Follow-up of patients was brief because of time limitations governing the stay of patients in the sanatorium.

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<td>Thoracoscopies</td>
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<td>Cavity closed, negative sputum</td>
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<td>Apparent cavity closure, but sputum positive</td>
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As is often the case, the figures fail to tell the complete story (Table 1); they do compare rather favorably with those of other authors. In several cases, apparent closure of cavities and conversion of the sputum resulted from the pneumothorax alone; these are included in the above table with all operated cases in which, on discharge, the cavity was closed and sputum absent or negative for tubercle bacilli. Inclusion of these cases increased slightly the incidence of favorable results. Pneumonolysis was decided upon in these cases because it was felt that the collapse could be made more selective thereby and the incidence of complications, especially fluid and empyema, lessened. On the other hand, results in some cases in which adhesions were only partially cut, could have been improved if the patients had remained in the hospital long enough for a second stage to be done. It is frequently found that
these partially severed adhesions will stretch considerably and that at a later date they can be completely divided with excellent results.

In fourteen of the cases in which the cavity was apparently closed, but the sputum remained positive, there was sufficient disease present in the contralateral lung to account for the failure to obtain sputum conversion. In some of these the pneumonolysis resulted in a selective collapse which allowed us to institute bilateral pneumothorax at a later date to control the contralateral disease.

**Complications**

The incidence of serous effusion into the pleural space was high; almost all cases developed a small amount of fluid which in most instances was absorbed spontaneously and rapidly. In the early cases of the series we felt that the presence of fluid was of little moment, and aspirations were not resorted to unless the amount was large or absorption was unusually delayed.

The result of this policy was the development in a large number of cases of a non-expansile lung. At present, we believe that fluid in amounts larger than that which fills the costo-phrenic angle should be aspirated, if still present a few days after operation, and that aspiration should be repeated often if the fluid tends to reform. The result has been that the incidence of non-expansile lungs in the more recent cases has been greatly reduced. We feel very strongly that an expansile lower lobe is greatly to be desired except in cases of extensive disease in which it is doubtful that reexpansion of the lung in the future can ever be safely accomplished.

Some cutaneous emphysema has developed in practically every case. The only harmful effect has been the discomfort to the patient. When large amounts of air escape through the trocar wounds, earlier and more frequent pneumothorax refills must be given to prevent reexpansion of the lung.

There have been seven cases of tuberculous empyema following pneumonolysis, none of mixed infection. In some of these it is probable that a bronchopleural fistula was present though none was persistent or definitely proven. Just how much the operation should be blamed for the development of tuberculous empyema is debatable; certainly in some of the cases it was not a causative factor as tubercles could be plainly seen on the pleural surface of the lung at the time of operation. The incidence of tuberculous empyema is perhaps as high in simple pneumothorax cases, if extensive disease was present before collapse was instituted.

There have been three cases of oblitative pleuritis following pneumonolysis, in all of which it is probable that the operation was the causative factor. Hemorrhage into the pleural space was a definite factor in two of these cases. In one, a moderate amount of frankly bloody fluid was aspirated, and in the other well over a litre; in both cases the bleeding stopped spontaneously. In the third case bleeding was not a factor.

In no case has a pleuro-cutaneous sinus developed at the site of the trocar wound, nor has wound infection occurred.

There was one death in the series, possibly related to operation. This was a result of spontaneous pneumothorax occurring a week after all adhesions suspending a large apical cavity had been cut. The cavity was apparently blocked and failed to close. Death occurred four days after the spontaneous collapse developed, in spite of almost continuous aspiration of huge quantities of air.

This failure of some cavities to close after all surrounding adhesions have been cut occurs in a small number of cases, but is one of the most discouraging results of treatment. Often, instead of collapsing, the cavity becomes larger and further collapse of the lung fails to reduce its size. The cause is apparently a tuberculous endobronchitis; the resultant edema produces a stenosis of the bronchus draining the cavity which acts in the manner of a check-valve. Air enters the cavity during inspiration but remains trapped and the cavity is thus unable to close. In two such cases which were recently bronchoscooped, a tuberculous bronchitis was quite evident. These “check-valve,” “balloon” or “blocked” cavities, as they are variously called, are a source of great difficulty to anyone employing collapse therapy; the recent interest in direct cavity drainage and aspiration by the technic of Monaldi offers hope for a more effective mode of treatment than has heretofore been available.

Contralateral spread of the disease was
infrequent, and in no case did it seem directly due to operation.

**Summary**

One hundred and thirty consecutive cases in which thoracoscopy was done are presented.

In eight of the cases it was not deemed advisable to attempt to sever the adhesions.

In one hundred and twenty-two either a partial or complete pneumonolysis was done.

In five of the cases the adhesions were cut in two stages.

At the time of discharge, the sputum was negative or absent and no cavity was visible in 48 patients, or 39.3 per cent of the patients who were subjected to pneumonolysis.

In 29 patients (23.8%) no cavity was visible after operation but the sputum remained positive. In fourteen of these it is probable that the sputum was coming from disease in the contralateral lung.

The cavity remained open and the sputum positive despite operation in 34 (27.9%). It is probable that some of these cavities could have been closed by further severance of the adhesions at a later date, had the patients remained in the sanatorium.

Eleven or 9 per cent of the patients remained under observation less than a month and the results in these cases are not included.

There was one death, which occurred twelve days after operation, possibly related to the procedure; the immediate cause of death was spontaneous pneumothorax. No other case of spontaneous collapse occurred.

Tuberculous empyema developed at sometime during the postoperative course in seven patients.

There were two cases in which definite hemorrhage into the pleural space occurred in these two and in one other in which bleeding was not a remarkable feature obliterative pleuritis occurred.

At least a “drop” of fluid developed in practically every case. Before a policy of early and frequent aspirations was followed, a large number of non-expansile lungs resulted. The incidence of this complication was greatly reduced by earlier aspiration of effusions.

Contralateral spread of the disease following pneumonolysis occurred in a few patients but in none was there any evidence the operation was a causative factor.

Subcutaneous emphysema of variable degree developed in practically every case.

**Conclusions**

In about ten per cent of pneumothorax patients, indications for closed intrapleural pneumonolysis have been found.

In something more than half of these (63%) cavity closure can be expected.

The operation is a definite aid in collapse therapy.

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**Air Embolism: Its Cause and Treatment**

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There are few more dramatic or regrettable situations in medicine than the occurrence of an air embolus. At first thought, it might seem a rare and unimportant condition to be dismissed lightly, until we consider that the health of every diver or tunnel worker depends on his knowledge of its prevention, that every chest surgeon must constantly be on guard against its occurrence, and that the life of every pneumothorax patient may depend on his doctor’s awareness of the fatal consequences of an air embolus.

In earlier days, our medical literature took no cognizance of the entity except in reference to Caissons disease or the “Bends”. This interesting disease is peculiar to the man working under high atmospheric pressures who is restored to a lower pressure too quickly. The nitrogen of the air is forced into solution in the blood and tissue fluids of the victim by the increased pressure where it remains until he is brought into a diminished pressure when it comes out of solution again, and if done too rapidly, forms bubbles of nitrogen in the blood vessels and tissues all over the body.

The symptoms and signs depend on the location of these bubbles; only in the brain