community and the state in the broader public health program of tuberculosis control.

I have attempted to show some of the ways in which sanatoria are of aid to the county health departments and to suggest a few additional activities that might be undertaken to increase this aid. The sanatorium is the hub about which all tuberculosis activities should revolve. Maybe this symposium to-day will add a little grease to the axle and permit a little more speed forward toward ultimate tuberculosis control.

---

Indications for Collapse Therapy*

WILLIAM DEVITT, M.D., F.A.C.P.,
Allenwood, Pennsylvania

When we think of collapse therapy we think first of artificial pneumothorax. This is the logical operation and, in many cases, the only procedure necessary. The phrenic crush, pneumonolysis, and pneumoperitoneum are only adjuncts to this treatment.

We are getting some wonderful results from thoracoplasty, but this should not be tried unless it is impossible to get the desired results with pneumothorax. There are rare cases in which a one or two stage thoracoplasty may be given the first choice. I have in mind the thick walled, apical cavity, even though it is possible to secure a very satisfactory collapse of all the rest of the lung. In two cases we have found it impossible to make any impression on the cavity even though there were no adhesions present, and the lung was fully collapsed except for the cavity. One felt that the only way it could be closed would be to get it in your hand and squeeze it. This was obviously impossible. And it must be remembered that failure to close the cavity renders all forms of collapse therapy of no avail.

Selection of Cases

All cases are not suitable for pneumothorax, and it is sometimes difficult to know which case will respond. Many cases which we consider unsuitable will respond very readily. Several years ago we saw a man who had been to three very excellent groups of men scattered over the eastern United States. Each group felt it was not worth while making an attempt, because they believed dense adhesions rendered it impossible to separate the pleura. After much missionary work we prevailed on the patient to allow us to try, and I have never seen an easier case.

The Acutely Progressive Case may give very good results at first, but as treatment progresses we are often disappointed to find the case is slipping away from us. This is due to the fact that the resistance in the acute case is very low. He has not had time to build up his resistance with the result that the walls break down and the disease spreads.

The Chronic Case on the other hand, has had a long time to become adjusted, and over the period of months or years has had an opportunity to build up his resistance which is so very important a factor in the curative process. It may not be possible to get a complete collapse because of pleural adhesions yet we are often surprised at the manner in which the patient responds.

The Cases which are not doing well. All men doing tuberculosis work know that a certain number of cases do well if placed on the regular treatment of strict bed rest, food and air. But, here again, it is impossible to tell which case will do well if left to itself, even though there is no cavity demonstrable. The question of resistance also enters in this type. In fact, the question of resistance is the main factor in determining whether the patient is going to get well or is going on to an unfavorable termination.

Therefore, all cases not doing well on the regular treatment should undoubtedly be given the benefit of pneumothorax.

Fibrosis

The fact that the case is one of fibrosis does not interfere with the selection, even though both lungs are involved. When I be-
gan pneumothorax in 1923, if we found medium coarse rales to the third rib on the contralateral side, the case was deemed unsuitable. Today we pay no attention to rales on the contralateral side.

Cavities

It may be stated, as a general rule, that all cavities must be closed. I believe very few cases, far enough advanced to have cavities, will heal unless the cavities close either spontaneously or by other means. It is true that we may in a life time see several cavities which have closed without any outside aid, but they are very rare. I have seen two cases in fifteen years. It may be necessary to assist the pneumothoraces by phrenic crush, pneumonolysis, or pneumoperitoneum or resort may be had to thoracoplasty.

Thoracoplasty

I believe two factors enter into a successful thoracoplasty, and these two factors are so important that we would not consent to operate on a case in which they were not present.

First, is the most careful selection of the case. Here the education of the patient is of prime importance. You should have the confidence of your patient so that when you suggest this operation there should be no hesitancy on the part of the patient to accept it. Years ago many of us allowed the patient to decide when the operation should be done, with the result that many patients were operated upon when they were almost ready for the undertaker. Of course, they died, and it was not the fault of the surgeon. Today if a patient at Devitt's Camp refuses this operation when we suggest it, the operation is not performed at a later date unless the condition of the patient has remained the same.

The other factor which enters into a successful thoracoplasty is a skilled chest surgeon. And even here, I am frank to say, I would rather have a good patient and a moderately skilled surgeon than a poor patient and a more skilled surgeon.

Hemorrhage

It is in cases of hemorrhage that pneumothorax comes into its own. I know of no way to control a hemorrhage except by compression. I know of no drug that has any influence on it, but often 300 or 400 c.c. of air between the pleura seems to have a selective action and the hemorrhage ceases. In attempting this treatment, we must remember that we are dealing with a lung which is already broken, and if our enthusiasm or our fear impels us to exert too much pressure we may cause a larger rupture and do more harm than good. This is especially true if the tuberculous process has worked out near the visceral pleura causing adhesions, because we may pull off part of the visceral pleura. Care should be taken in each case of hemorrhage—worse things can happen than a slight hemorrhage. Of course, if the break occurs in a large vessel your patient will be dead in a few minutes—long before you can get the machine to his bedside. Fortunately, these cases are rare, indeed.

Sometimes it is difficult to know from which side the hemorrhage is coming. It is then a question of using your own judgement; and, after several pneumothorax treatments have been given, if the hemorrhage still persists, it may be necessary to induce pneumothorax on the other side also. In several of our cases this procedure has given us good results.

Bilateral Pneumothorax

It is good practice and good common sense that in bilateral cases both sides should not be started at the same time, except in certain hemorrhage cases which are difficult to control. Sufficient time should be allowed for the stabilization of the circulation, both respiratory and cardiac, before attempting the closure of the contralateral lung. If this precaution is taken, it is remarkable how well most patients handle a bilateral case. After the bilateral collapse has been established we prefer to give refills on both sides the same day. This tends to stabilize the mediastinum, and it is possible in this way to equalize the pressure on both lungs.

In some bilateral cases we find a walled cavity in one lung and a recent spread in the other lung. Matson has suggested closing the recent involvement first, disregarding the cavity. He has found it is often possible to bring enough pressure on the cavity by dis-
placing the mediastinum to get beneficial results. We have tried this procedure in several cases and are well pleased with it.

At the “Camp” we have a case getting pneumothorax on the right side who has had six ribs removed on the left side. This patient is doing very well.

The fact that both lungs are involved is no contraindication. Most cases that have advanced far enough to need collapse have already been infected on both sides. Generally there is a compensatory emphysema taking place in the contralateral lung. The alveolar walls and bronchioles become dilated so that the vital capacity is very little altered. It is true that sometimes the strain of adjustment is so great that the other lung may break down and even go on to hemorrhage. In these cases, it may be necessary to ease up the collapse and institute a pneumothorax on this lung.

**Spontaneous Pneumothorax**

Spontaneous pneumothorax should be converted into an artificial one, and this treatment continued until you have reason to believe that the spontaneous collapse was caused by some factor other than tuberculosis.

**Positive Sputum**

Positive sputum is always an indication for collapse therapy. While it is true that certain cases will become negative after six months of strict bed rest, I see no reason to wait if it is possible to do a pneumothorax. And remember—we should not be satisfied with a negative smear. Often a culture or guinea pig inoculation will prove these so-called negative cases to be really positive.

We must always keep in mind the possibility of a spread to the other lung, or the formation of adhesions. I know of no factor which lessens the value of a pneumothorax as much as adhesions.

**Pleurisy with Effusion**

I believe, that in all cases of pleurisy with effusion the fluid should be aspirated and replaced with air. Often it is not necessary to strive for a complete collapse. But, inasmuch as this sign is very often one of the cardinal symptoms of tuberculosis, it behooves us to treat it as such.

If we allow the inflamed pleura to come in contact, adhesions almost invariably form and all hope of a pneumothorax at a later date is lost. Very often a culture of the pleural fluid will demonstrate tubercle bacilli when the smear is negative.

**Minimal Cases**

Ten years ago it was thought that only advanced cases should receive the benefit of pneumothorax. Today most of us believe the early case is the important one. We believe that minimal cases which have shown no improvement, as shown by stereoscopic x-ray examinations, over a period of two months while on strict bed rest should have collapse therapy. We must remember that the more advanced a case becomes, the more danger we have of adhesions forming which may prevent a satisfactory collapse.

**Miliary Tuberculosis**

Miliary tuberculosis is not a contraindication. It is agreed that some few cases of miliary tuberculosis clear up spontaneously. If these cases are given an early collapse I believe that some of the results will be surprising. It is understood, of course, that this class does not at any time present a favorable prognosis. And it is all the more reason why we should give it all the assistance we can.

We do not believe pneumothorax should be started in the home unless in an effort to control a severe hemorrhage. Even then the patient should be removed to a sanatorium and kept there until the pneumothorax is well established. It should never be carried on unless the operator has, or has close access to, a fluoroscope. All cases should be fluoroscoped before being given refills.

Emphysema and asthma are contraindications unless the cause is found to be bacteria. Then, a vaccine may be of much benefit.

Intestinal and laryngeal involvement is not a contraindication. Homer Fishberg found that in his cases of pneumothorax who died—they all suffered from a severe intestinal tuberculosis, and we have had the same experience. Matson believes that he gets better results on left sided cases. He feels that the right sided case may not do well because of the pressure on the right heart, and the superior vena cava.
Some day I hope to see a standard for pneumothoraces. Today, some institutions are using it in ten per cent of the cases, while others are using it in seventy-five per cent of all cases. It is this fact, I believe, which caused the report at last year's National Tuberculosis Meeting to state that collapse therapy has not shown any decrease in the ratio of deaths between collapse cases and new cases. If taken from the lower brackets it is obvious why this would be so, but if taken from the seventy-five per cent bracket it should show a marked improvement.

It is just as important to collapse an early case of tuberculosis that is not doing well as it is to splint a fractured leg.

Those of us who are members of the American College of Chest Physicians recognize this, and are striving for it. This is also one of the aims of the scheme known as the Pennsylvania Plan, which has been adopted in 17 of our states.

Advances in Thoracic Surgery*

RICHARD DAVISON, M.D.
Chicago, Illinois

THORACIC surgery has made rapid advances in the past few years, and now there need be no more hesitation in operating upon the chest than in attacking any other part of the body. In this paper I will attempt to review the common conditions amenable to thoracic surgery and outline our present concept of their surgical management.

Pulmonary Tuberculosis

Many cases of pulmonary tuberculosis are benefitted by thoracic surgery. Collapse therapy has been the outstanding development in the treatment of this disease within the recent years, and in our clinic every case of pulmonary tuberculosis is considered for some form of collapse treatment. If the diseased areas and cavities can be successfully compressed, many patients recover whereas, when cavities are allowed to remain open, the ultimate outcome is almost always unfavorable. The most satisfactory explanation for the benefit of collapse in my opinion is, that in a compressed state a relatively anoxicemic condition exists which is unfavorable for the development of the tubercle bacillus.

Pneumothorax is the ideal form of collapse and is applicable to the largest percentage of cases. If a free pleural space exists, air can be introduced simply through a needle. This air must be replaced at periodic intervals, and the desired degree of collapse maintained under the guidance of the x-ray and fluoroscope. Both lungs can be partially collapsed simultaneously or alternately. At the expiration of treatment the lung will reexpand and function quite normally, the pulmonary disease frequently remaining healed. Unfortunately, pneumothorax is not possible in every case because of adhesions between the parietal and visceral pleurae and in these cases surgical measures must be instituted.

The most valuable surgical collapse measure is the thoracoplasty. This operation is merely a technical procedure to collapse the lung, and has been developed taking into consideration the architectural structure of the chest wall. At present, after passing through various stages of development, the operation has become more or less standardized. Complete lengths of ribs are resected from the transverse processes of the vertebrae to points close to the cartilage in front. The operation is performed in one, two or three stages, as may be necessary in the individual case, at intervals of several weeks with a resection of three or four ribs at each stage. Supplementary maneuvers such as the removal of the transverse process of the vertebra and mobilization of the apex after the manner of Semb have been adopted in many clinics. While this may seem a drastic procedure, the fact remains that the operation is usually attended with very little shock, the mortality is low, the deformity not marked, and approximately 70 per cent of patients can be