therein. That method necessitated three needle punctures of the cecum. Dr. Paul Gronnerud, head of the department of operative surgery, Chicago Polyclinic, said that the operation would be ideal if it could be accomplished with only one needle puncture. I have done this and the accompanying illustrations, with their legends, fully explain, without further comment, how this may be done; the procedure is exceedingly simple and easy.

The members, A and C, of the instrument and the needle puncture in Figure 8 have been magnified for the purpose of clearness.

Fig. 5.—This shows the inverted appendix, K, within the triangular snare.

Fig. 6.—The member A is being withdrawn. When it is entirely withdrawn, the member C is likewise withdrawn leaving the condition shown in Figure 7.

Fig. 7.—This shows the relation of the appendix, K, and the ligature, L, after the withdrawal of the needle, also the formation of the first loop, M, of the knot.

THE OPERATIVE TREATMENT OF PULMONARY TUBERCULOSIS.

REPORT OF AN EXCISION OF OVER ONE-HALF OF THE RIGHT LUNG.

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In no region of the body does a deposit of tubercles invariably indicate surgical treatment. For the most part the treatment of localized miliary tuberculosis is non-operative. Most of the cases of Pott's disease, a large proportion of tubercular joints, many superficial types of tuberculosis, and many cases of tuberculosis of internal organs are best treated without recourse to the knife. In nearly every situation, however, there is a residuum of cases in which other measures fail, and in which operative intervention is desirable.

Heretofore a marked exception has been made in regard to pulmonary tuberculosis, and, in general, surgical treatment is here considered dangerous, unwarranted and harmful. If one compares the forms of surgical procedure that have been brought to bear against tuberculosis of the lungs with those operations used for tuberculosis of other organs, it becomes evident that the methods that have failed in pulmonary surgery are precisely the methods that have proven ineffective in treating tuberculosis elsewhere in the body.

The operations that have been used in the treatment of pulmonary tuberculosis comprise chiefly the incision and drainage of abscesses, caseous areas, tubercular or bronchiectatic cavities, or imperfect resections of portions of diseased tissue, especially at the apices of the lungs. These operations have been followed by drainage, permitting an added mixed infection and the invasion of the adjacent tissues of the chest wall by the tubercle bacillus.

The results have been almost uniformly bad, just as they have been after incision or incomplete excision with drainage for tuberculosis of the kidney, intestine or other organs. On the other hand, excellent results have been obtained by nephrectomy for tuberculosis of the kidney, and by thorough excision without drainage for tuberculosis of the intestines, testicles and other parts of the body. In cases in which the recognized forms of treatment prove effective against the smaller tuberculous areas, but impotent against associated massive lesions of the lungs, operative measures, bolder and more thorough than those heretofore used may, in selected cases, be

Fig. 8.—This shows that the appendix has been ligated and the knot slipped into the cecum. N is a mattress suture for closing the needle puncture.

warranted by the desperate plight of the patient.¹ Occasionally even a half-hearted pneumotomy is useful.

A few years ago a middle-aged colored man with a large putrid empyema was admitted to the Samaritan Hospital. After a drainage operation his cough and expectoration increased, the sputum contained large quantities of tubercle bacilli and, finally, signs of a pulmonary abscess developed. The opening of the chest was enlarged, and a drainage opening made through the caseous pulmonary tissue into the abscess. Cough and expectoration decreased, the man gained in weight and left decidedly improved, although not cured.

In the following case, while the outcome was disappointing, the feasibility of delivering one or more lobes of the lung through a posterior opening in the chest

Fig. 1.—Extirpated lobe of the lung showing massive caseous tuberculosis, thickening of visceral pleura and remnants of universal, very dense pleural adhesions. Weight 770 grams.

wall and the controlling of the blood vessels by ligatures applied directly to the hilum without recourse to the cautery was demonstrated. The entire right lung weighed 1,090 grams and 770 grams of pulmonary tissue were removed at the operation without alarming hemorrhage. The remaining 320 grams of the right lung became atelectatic, but the left lung proved adequate to maintain the respiratory function. The patient improved sufficiently to be out of bed; but pulmonary edema from exposure was fatal fourteen days after operation.

The case was one of advanced pulmonary tuberculosis.

1. In Th. Gluck's monograph presented before the Thirty-sixth German Surgical Congress (Archiv. f. klin. Chir., lxxxiii, 581) is recorded a resection of the lower lobe of the right lung for tuberculosis in a child of five years. The child had disease of the right femur and ankle, and a right purulent hemorrhagic pleurisy. The extent of the resection and the technic are not described, but the child was alive several months later. In bronchiectasis the sclerosis and shriveling of the functionless tissue are favorable to pneumectomy, and a few successful operations have been recorded for this condition. Gluck reports a resection of the left upper lobe and a total resection of the left lower lobe of the lung for bronchiectasis multiplex foetida, the patient surviving the operation for seven months. Heidenhain (Archiv. f. klin. Chir., lxi, p. 391) reports a resection of the greater part of the left lower lobe of the lung on a patient of forty-three. Four operations were done on the same patient and the lung tissue removed in pieces. Although the hemorrhage was profuse, the final result is reported as satisfactory. The quantity of lung tissue removed was about the size of a fist and contained a carcinomatous nodule. Riedinger (v. Bergmann's System of Practical Surgery, 1904, vol. II, p. 518) mentions the case of a boy of eight years on whom he did repeated operations for the removal of multiple bronchiectatic foci; almost the entire upper left lobe of the lung and the upper portion of the lower lung were finally resected with marked improvement. Murphy's article on the "Surgery of the Lung" (THE JOURNAL A. M. A., July 23 and 30, and August 6 and 13, 1898), contains an elaborate review of the experimental and clinical work done prior to 1898, and this together with Tuffier's "Chirurgie du Poupon" records a number of partial resections of the lobes of the lung for tumor and for other conditions.

restrained by hygienic and dietetic treatment. There was massive caseation of the lower right lobe. The necropsy indicated the feasibility of the operation and of the removal of even the entire lung.

Mr. N., aged 20; tailor; single; family history obscure; previous health good. During the winter of 1907, he first became ill with increasing cough, dyspnea and evening fever. Three months later, having lost about 36 pounds, he applied to a medical dispensary where a diagnosis of advanced pulmonary tuberculosis was made, and with the belief that he could live but a few weeks he was referred to a special hospital for the treatment of tuberculosis. Here it was noted that the man was very ill and had marked dyspnea, and a temperature of 102 or 103 F. The lower half of the right chest was flat on percussion, and on aspiration about one-half ounce of turbid fluid was evacuated. No empty bed, however, was available in the hospital, and an immediate ejection of the patient from his boarding-house was demanded. I then first saw the patient, and had him admitted to a surgical ward of the Samaritan Hospital, where for sixty-two days he was treated by forced feeding, out-of-door life, and moderate doses of creosote.

The lower lobe of the right lung continued flat, with diminished resonance, and without breath sounds. An aspiration needle introduced into the chest in this region penetrated the lung, showed no respiratory oscillations (indicating pleural adhesions) and on removal, the point of the needle contained caseous material. The condition, therefore, was arrested pulmonary tuberculosis, with massive caseation of the lower right lung, which evidently would soon liquefy and cause death.

Mr. N. and his friends desired surgical procedure, and it was determined to attempt the removal of the entire lower right lobe. On June 14, 1907, he was anesthetized by scopolamin-morphin, reinforced during the operation by small quantities of chloroform, and a rectangular flap, containing segments of four ribs, was turned up from an area below and internal to the

Fig. 2.—Pneumatic shield for the temporary production of negative pressure within the chest during operations on the lung. The shield offers a means of combating crises that result from pneumothorax, and enables the production of a rapid operative emphysema. The shield has an inflated rubber rim, a large glass window, an attachment (A) connected with an aspirating tank, and an arrangement (B) for releasing or regulating the partial vacuum.

apex of the scapula. The pleural cavity was found to be absolutely obliterated, and the thickened pleura was everywhere densely adherent to the lung. With the greatest difficulty the lung was separated from its pleural attachments. Below it was difficult to separate the lung without lacerating the diaphragm, and to the left the adhesions were so marked that the separation was made through the lung substance for fear of tearing into the pericardium. The lower lobe of the right lung was isolated to its hilum and delivered through the chest wall (Fig. 1).

With the delivery of the lung and the traction on its root the breathing improved. The hilum of the lung was clamped in segments and the lung tissue divided, step by step, with the application of further clamps. Catgut ligatures were then introduced with a needle into the hilum, the stump ligated in sections, and the clamps removed. There was very little bleed-

ing from the pulmonary vessels. The main bronchus was ligated, and a flap formed of pulmonary tissue sewed over its lumen. The portion of lung tissue adherent over the pericardium was now removed. The lowest segment of the rib was excised and a drain of plain and iodoform gauze was introduced into the enormous cavity. During the ninety-five minutes of operation, the breathing was at all times irregular and tumultuous, especially during the separation of the pleural adhesions, and this with the weakening heart action and the fall in blood pressure led to frequent delays.

The portion of lung removed was solid from caseation and weighed 770 grams. On the evening of the operation the temperature reached 105 F., but the following day fell to 99 F. For two days the blood pressure was so low that the radial pulse was imperceptible, after which the pulse gradually improved. The patient's appearance was better than the low blood pressure would indicate. After the fourth day, the patient was kept constantly in the open air. There was little or no cough, and the patient showed rapid improvement. The pulse at times dropped below 100, and the respiration to 28. On the ninth day the patient was permitted to be in a chair.

On the night of the tenth day following the operation there was a severe thunder storm, and apparently, with almost inconceivable oversight, an attendant neglected the patient on the porch; in the morning the day nurse found the bed drenched, and the patient with marked dyspnea, loud râles, and difficult, frequent and ineffective cough. The pulmonary edema progressed, and on the fourteenth day the patient died.

A limited postmortem examination showed that the skin wound had healed firmly, except for a small area in the lower part used for drainage. The rib ends adjacent to the wound were denuded and bathed in pus. The portion of the right lung remaining in the body, although attached to the chest wall by firm adhesions, was atelectatic and congested. It weighed 320 grams. The middle lobe showed miliary tubercles and areas of caseation; the upper right lobe, small miliary tubercles and puckered cicatrices at the apex. It is believed that the process in the upper lobe was easily within the range of spontaneous absorption. The left lung weighed 590 grams, showed congestive edema and mucopurulent bronchitis, but was nearly free from gross evidence of tubercular disease.

The experience in this case suggested the following:

(1) The continuance of life and respiratory action, although all of the right lung was thrown out of function by the operation, indicating the feasibility of removing the entire right lung with a continuance of life, provided the patient could survive the immediate shock. (2) The possible desirability of omitting immediate drainage to avoid early mixed infection and better to maintain a negative pressure within the thorax. (3) The desirability of removing all segments of ribs within the wound area to permit early, partial obliteration of the chest cavity, and to avoid secondary necrosis. (4) In the present operation the flap ran from the fifth to the ninth rib; in the removal of the entire lung the incision should be placed higher, and it might prove desirable to slide the scapula forward and reflect the rhomboid muscles from the scapular attachments, giving a more direct access to the root of the lung. (5) The possible value of a pneumatic shield (Fig. 2) made of glass or of metal, containing a glass window and having an inflated rubber rim capable of close approximation to the chest wall. Such a shield placed over the wound would enable one immediately to overcome sudden catastrophies from pneumothorax or atmospheric pressure operating on the great vessels and heart, and would enable a closure of the wound with the maintenance of a negative pressure within the chest, and permit observations as to the influence of negative pressure on intrathoracic hemorrhage. The shield enables the production of an immediate operative emphysema.

While we have found that a lobe of a lung of the lower

animal may be made to occupy even twice the normal space by the negative pressure produced by the shield, the safety of such an abrupt traumatic emphysema as a means of filling pulmonary cavities in human practice has not been ascertained. Such an emphysematous lung does not completely collapse but remains distended. The gradual production of an emphysema is constantly observed in pulmonary tissue free to expand but yet incapable of filling the normal thoracic cavity.

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A CLINICAL STAIN FOR THE SPIROCHÆTA PALLIDA.*

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The great objections to the staining methods commonly employed in searching for the *Spirochæta pallida* are the large amount of time they require and the uncertainty of the complicated stains. Therefore, a simple staining method that is reliable and short would not only tend to further research on this most important protozoön, but would also make microscopic evidence of the presence of the *Spirochæta pallida* of great diagnostic value clinically. In about twenty-five primary lesions which I have examined for Schaudinn's organism, and in all of which the clinical diagnosis was positive, I have every time demonstrated its presence. Two cases of doubtful nature were also proved positive on microscopic examination, while many other cases were entirely negative. Usually, the spirochete can be found with but a few minutes' search and can be differentiated from other organisms of a like morphology with but little difficulty. In recent cases in which the patients have not yet been treated with mercury, the spirochete can be demonstrated in the circulating blood, but it disappears soon after mercurial treatment has been inaugurated.

Three different solutions are used in this stain and they must be kept separate as when mixed they tend to decompose in about sixty hours.

Solution 1:

Rectified Grübler methylene blue.....	0.5
Potassium carbonate	0.5
Water	50.0

Solution 2:

Potassium cyanid	1.0
Water	50.0

Solution 3:

Potassium iodid, 1 per cent. solution.

Equal quantities of these solutions should be used and mixed intimately. If used as a rapid clinical stain, a small drop of the mixture should be put on a clean slide that is free from fat. A small platinum loopful of the material to be examined—best, serum or pus from a primary lesion—should be intimately mixed with the stain, preserving, however, the drop form as much as possible. Allow the staining to proceed for one minute. Then drop on a clean cover-slip, thus spreading the fluid equally and examine at once with an oil-immersion lens. Everything here stains blue, but the *Spirochæta pallida* stains slightly lighter and can be easily seen.

The stain may be employed, however, with smears made in the regular manner. The smear should be

* From the Pathologic Laboratory of Rush Medical College.