Extrapleural Pneumonolysis with Lucite Ball Plombage*

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If the prophylaxis of pulmonary tuberculosis were as effective as prophylaxis in smallpox, diphtheria, or typhoid fever there would be little need to do more than continue the search for a more effective antibiotic agent to combat the disease. Even without streptomycin as an aid the medical treatment of pulmonary tuberculosis will arrest the disease in the vast majority of patients who become sick from pulmonary tuberculosis. When medical treatment fails to arrest pulmonary tuberculosis it is usually because the disease is too far advanced before the patient is presented for treatment. However, when medical means fail to arrest the disease, surgical measures are added as an adjunct to medical treatment. Three types of surgical treatment are available: excisional surgery, cavitary drainage, and collapse therapy. There have slowly been developed some definite indications and contraindications for a particular type of surgery. There is, however, a group of patients whose disease is of such character that it does not clearly fit into definite indications or contraindications for a particular type of surgical treatment. Accordingly, there will always be a difference of opinion concerning the choice of operation and for this reason there will always be a fairly high percentage of surgical failures.

Excisional surgery for pulmonary tuberculosis is predominately reserved for unilateral disease and it has a variable mortality rate and cure rate. Overholt1 reported 88 patients who had 92 pulmonary resections in the treatment of tuberculosis and these were followed from two to 12 years. Of 33 patients with lobectomies 43 per cent are well and have negative sputum; 18 per cent are dead.

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Among 58 patients with pneumonectomies 48 per cent are well and have negative sputum; 41 per cent are dead. Bailey\(^2\) reported 100 patients with pulmonary resections done in the prestreptomycin era who were followed from one to eight years, and 100 patients who received streptomycin and were followed less than three years. In the prestreptomycin group 55 per cent are well and have a negative sputum, and 37 per cent are dead; in the group treated with streptomycin 77 per cent are well and have negative sputa, and 16 per cent are dead. Among 51 patients who had pulmonary resections for tuberculosis the authors\(^3\) found in the prestreptomycin group 50 per cent who are well and have negative sputa, and 30 per cent who are dead; in the group of 29 patients treated with streptomycin 28 are living; 76 per cent of these are well and have negative sputa. There is constant study of the excisional type of surgery in order to develop more rigid and better understood indications and contraindications for operation.

In cavitary drainage it is impossible to give any significant statistics since open drainage is usually secondary to some previous operative procedure and closed or Monaldi drainage is generally used as a palliative procedure or a preliminary to thoracoplasty.

Collapse therapy can be divided into two main groups, reversible or temporary collapse as represented by pneumothorax and temporary phrenic paralysis, and irreversible or permanent collapse treatment as represented by standard thoracoplasty and its modifications and the various plombage operations. The failure of a good pneumothorax to arrest all patients thus treated merely proves that collapse therapy is not an effective method of treatment in all patients with pulmonary tuberculosis. In 608 persons who had pneumothorax and closed pneumonolysis and were followed for one to eight years by one of the authors,\(^4\) 69 per cent of the white were well and had negative sputa; only 24 per cent of the negroes were well, with negative sputa. There were 133 negroes. Allen and Kelly\(^5\) reported 56.3 per cent satisfactory results in 128 patients who were followed for two years after electively ending pneumothorax treatment; twelve of these patients had bilateral pneumothorax. If the selection of patients for pneumothorax were better understood the disease would be arrested in a higher percentage of patients treated.

The standard thoracoplasty has slowly evolved to its present state. One of the authors studied the results of thoracoplasty on 337 patients whose operations were completed before 1942. They were followed from two to nine years and it was found that 40.6 per cent were dead, with 2.7 per cent dying from causes not related to tuberculosis or its treatment. In the remaining 200 patients 89.5 per cent were well and had negative sputa. These, however,
constituted 48 per cent of the original number. It is interesting to note that of the whole group 50 per cent of the white and only 36 per cent of the negro patients were well and had negative sputa. Davison\(^6\) reported a follow-up of from one to 12 years on 888 patients who had thoracoplasties and found 19 per cent dead. In considering the original group 55 per cent are apparently arrested. Kinsella\(^7\) reported a follow-up of from five to 26 years on 613 patients who had thoracoplasties and found 33.1 per cent dead, with 5.5 per cent dying from causes not related to tuberculosis or its treatment. Those living showed 88 per cent well, with negative sputa. It is difficult to calculate the percentage of the original number with negative sputa but it cannot be higher than 66.9 per cent, since 33.1 per cent are dead. Douglas\(^8\) described 102 patients who had thoracoplasties and were followed for five years; he found only 14 per cent dead and 69 per cent well and with negative sputa. As the indications for thoracoplasty are better understood and the operative technique becomes more perfected one can reasonably expect a lower mortality rate and a higher cure rate.

The extrapleural pneumothorax (pulmonary plombage with air) has been severely criticized as an ineffective operative procedure fraught with many and serious complications. Nevertheless in Friedman's\(^9\) discussion of the operation he says, "Perhaps the almost uniformly poor results reported by these investigators following their use of extrapleural pneumothorax reflects their experience with this particular type of procedure and poor choice of patients rather than a condemnation of the particular form of therapy." After giving various statistical figures concerning end results he writes, "In fact, the results by comparison are as good or better than those obtained with other more generally practiced forms of collapse therapy."

Wilson\(^10-13\) developed the lucite spheres as a method of pulmonary plombage in the collapse treatment of pulmonary tuberculosis. Lucite had the advantage of being: (1) nonirritating to tissue; (2) noncarcinogenic and nonantigenic; (3) insoluble; (4) only slightly resistant to roentgen rays; (5) round and easily fitted into any space; (6) light in weight so there would be no erosion or migration caused by weight. Furthermore, if fluid developed the balls would float. His results as reported were gratifying. Grow\(^14,15\) was favorably impressed by the operation in the beginning but he was not enthusiastic about the procedure in 1949. Dolley\(^16\) is in favor of the operation as used in thoracoplasty failures. Trent,\(^17\) Murphy,\(^18\) O'Brien\(^19\) and Walkup\(^20\) are definitely opposed to the operation.

Much of the opposition to extrapleural pneumonolysis with lucite ball plombage originates from the report by Trent.\(^17\) A summary
of his report on 51 patients is indeed discouraging and reveals in nearly all patients the disease was classified as far advanced. All but three patients had bilateral disease. "Thirteen patients were considered unsuitable for any type of surgical collapse...." The early complications amounted to 39.3 per cent of the patients. There were eight operative deaths; three, cavity entered at operation; three, spread of disease; two, dissection of spheres; two, compression of superior vena cava; one, wound separation. The late complications amounted to 31.3 per cent of the patients. They were 11, tuberculous infection about the spheres; four, draining sinus; four, spheres extruded beneath skin; one, migration of spheres into mediastinum. The end results were, improved 19.6 per cent; unimproved, 5.8 per cent; worse, 39.2 per cent; dead, 35.3 per cent.

It seems that criticism directed at the operation is probably unjust. By using lucite ball plombage a collapse equal to or better than thoracoplasty can be obtained by a simple, nondeforming, one stage operation. Therefore, the method of treatment should not be discarded as unsatisfactory without careful consideration of the indications, contraindications, and the surgical technique.

The authors have used the method on 64 patients since June 1947 and a careful study of the patients and the results apparently justifies a report concerning the patients and a continued favorable interest in the operation.

Seventy-two lucite ball plombage operations were performed on 64 patients between June 1947 and December 1948. Eight of the patients had a bilateral plombage operation. Six patients were negroes and 58 were white; there were 40 females. In the group 42 patients were between the ages of 28 and 48 years. In 13 the contralateral lung was under collapse therapy at the time of the plombage operation, four had thoracoplasty, and nine had pneumothorax. The patients were in good general physical condition but some were poor surgical risks when the extent of the disease was considered.

All the operations except two were done under paravertebral block with procaine, 1 per cent, and local infiltration of procaine, 0.5 per cent. The patients were given 3 grains of pentobarbital sodium one hour before operation. On call to the operating room morphine sulfate in doses of 0.125 to 0.25 grains was given, depending upon the size and reaction of the patient. Anesthesia was uniformly good, but since it requires about two hours to inject the anesthetic and complete the operation many patients became tired and had cramps in the arm and shoulder upon which they were lying.

The patient is placed in a true lateral position and a curved
posterior incision is made in the interscapular region. A section of the fourth rib and transverse process is removed in a subperiosteal manner. The extrapleural plane is developed. In the first few patients the lung was freed from the mediastinum as well as from the chest wall, but since this appeared to permit downward displacement of pulmonary cavities the freeing of the lung from the mediastinum was abandoned. Care is taken to free the lung wall forward approximately to the internal mammary artery and posteriorly beyond the sympathetic trunk. The extrapleural stripping is carried to the inferior limit of the disease as indicated by palpation and roentgenogram. The lucite spheres are placed in the extrapleural space without tension. The extent to which the extrapleural space is developed is of the utmost importance and not the number of lucite spheres used. The rib bed is carefully closed with interrupted silk sutures. Silk is used throughout the operation. Under rigid aseptic technique the lucite spheres are sterilized by immersion in aqueous zephiran, 1:1000 for 18 to 24 hours. The lucite balls are rinsed thoroughly in normal saline solution and then placed in a solution of azochloramid, 1:3300, in sodium tetradecyl sulfate, 1:500, in a sterile container on the instrument table. They are removed from the latter solution and placed in the extrapleural space without drying.

The patients are given 2.0 gm. of streptomycin daily in divided doses for from two to five days before operation. They are also given 7.7 gm. each of sulfamerazine and sulfadiazine every four hours for about 48 hours preoperatively. After operation the sulfonamides are discontinued and penicillin is administered in 50,000 unit doses every three hours. The penicillin is continued until the skin sutures are removed on the fifth to seventh day. Streptomycin is continued postoperatively in divided doses of 2.0 gm. daily until the temperature is normal, usually three or four days, and the quantity of the streptomycin is then reduced to 0.5 gm. every 12 hours until the patient is discharged from the hospital on about the tenth to fourteenth day. Whether streptomycin is to be continued after discharge from the surgical ward depends upon the decision of the medical doctor who cares for the patient after his discharge from the surgical service.

The follow-up has been complete but of limited duration, extending from six months to two years. The patients were referred from many sources, including various sanatoriums and private physicians. The presence or absence of tubercle bacilli is at least on repeated direct smear or sputum, but many have had negative cultures of the sputa and gastric contents. Of the group 27 (42.2 per cent) have positive sputa, and 35 (54.7 per cent) have negative sputa. Two (3.1 per cent) are dead. Of the 27 who have positive
sputa 20 have the disease in the contralateral lung and in no instance is it a spread of the disease after operation. Of the eight patients who had bilateral plombage four have negative sputa. In order to make a proper evaluation one must separate the patients with definite contralateral disease from those with an undiseased lung on the opposite side. It also gives a better understanding if one separates the patients with bilateral plombage from those with an undiseased opposite lung. Thus on removing 28 patients from the original 64 there remain 36 with no roentgenographic evidence of disease in the opposite lung at the time of follow-up evaluation. The results then are two dead (5.5 per cent), three (8.3 per cent) with positive sputa, and 31 patients (86.1 per cent) well and with negative sputa. There are six negro patients and three are well with negative sputa and three have positive sputa; one of these has disease in the opposite lung. One of the two deaths occurred three days after operation from profound spread of the disease on both sides. This patient had a spreading lesion that was thought to be controlled by streptomycin. He underwent a rather extensive plombage operation although he should have been refused surgical treatment. The other death occurred from tuberculous meningitis several months after the plombage operation. It was a flare-up of tuberculous meningitis that was treated by streptomycin before the plombage operation. This condition was thought to be cured.

Following operation there were two patients with pneumothorax on the operated side and in each instance it absorbed spontaneously. In one patient there was bleeding into the extrapleural space after operation. He was aspirated on two occasions and received two 500 cc. blood transfusions. When the excess blood was absorbed the lucite spheres were localized in the apex of the thorax where they were formerly placed. No other postoperative complication has appeared, either early or late, nor has there been any infection of the wound or extrapleural space. There has been no migration of the lucite balls and no other spread of the tuberculous disease. At a period not earlier than eight weeks after operation a flare-up of previously existing tuberculous disease in the opposite lung was noticed and in three patients there was a flare-up of disease in the lung below the area collapsed by the lucite spheres.

It is common to find several different tuberculous pathologic reactions not only in the two lungs of one patient, but within the same lobe of one lung. It is not uncommon to find cavitation, areas of fibrosis, and even caseation all within the same lobe of the lung. Under such conditions of disease why should not the reaction to surgical treatment be highly variable? The variability of the path-
ologic process makes it extremely difficult to choose the right operative procedure. Often the choice of surgery is made because of the predominant pathologic process, which in turn may respond well to treatment only to have a supposedly minor area of disease react badly and thus cause failure of treatment to convert the positive sputum.

It is obvious that collapse of the lung will not cure all types of tuberculous pathologic processes in the lung; if this were true no other method of treatment would be necessary. However, where collapse of the lung is thought to be the surgical treatment of choice it is evident that collapse by extrapleural plombage can equal or surpass the collapse produced by any other surgical measure, except a good pneumothorax without adhesions. If the complications can be kept at a minimum or can be eliminated entirely there can be no true criticism of the procedure since it is simpler than all other methods of collapse treatment, except perhaps temporary phrenic paralysis. Treatment by pneumothorax may be complicated by generalized empyema and the possibility of an unexpandable lung at the termination of treatment.

In the event extrapleural plombage with lucite balls is unsafe because of complications or if the end results are not as satisfactory as desired, then a study of the procedure should be made to discover the reasons for complications and for failure to cure the patient. The procedure should not be condemned without a fair trial. The authors have eliminated the complications incidental to the operative technique and to the pleura and the extrapleural space. Early and late flare-up of pre-existing lesions have been kept at a minimum, but with the adoption of certain criteria it probably can be reduced further. Attention has been given to final end results and it is thought that a definite reason for failure has been demonstrated.

Complications incidental to the operative technique, pleura, and extrapleural space have been eliminated with the use of local anesthesia, the posterior operative approach, silk suture technique, and an adequate use of the available chemotherapeutic agents. The posterior surgical approach gives access to the area of disease since the majority of tuberculous pulmonary pathologic processes are in the posterior aspect of the lung. The diseased lung and the pleura are less likely to be entered when they are directly exposed. The desired extent of collapse can be accomplished more readily by the posterior approach. Local anesthesia forces the surgeon to be gentle with the tissues and lessens the chance of spread and flare-up of existing disease. The use of penicillin, streptomycin, and sodium tetradecyl sulfate in azochloramid, together with silk suture technique should eliminate extrapleural space infection.
Pneumothorax caused by a tear in the pleura or spontaneous from the lung has presented no serious problem during or after operation. Failure to accomplish the operation occurred in only one patient.

The plombage with lucite spheres seems safer than the collapse that is maintained with air. The lucite spheres stimulate a thin, strong, dense, fibrous tissue membrane that encases the spheres in individual tissue cells or communicating adjacent cells. The strong, dense, fibrous tissue membrane is likely to prevent erosion of disease beyond its surface. Air does not stimulate a fibrous tissue reaction of this type. In the past other material used for pulmonary plombage has not stimulated a corresponding thin layer of strong, dense, fibrous tissue. With lucite spheres there is no need for repeated needle punctures, for refills of air, or for the aspiration of fluid, thus reducing the chances for contamination of the extrapleural space by the needle, either from without the body or from puncture of the normal or diseased lung. Since lucite material is light it is less likely to migrate or erode the tissue than any other type of plombage material used in the past. Because the lucite balls are encased in a thin, dense, fibrous tissue membrane there can be no migration. However, if infection prevents the formation of this fibrous tissue membrane there can be migration. There can be no migration without infection. Should infection of the extrapleural space occur it seems reasonable that the lucite spheres should be removed promptly before migration or erosion occurs. In the one patient who had postoperative bleeding extensive enough to strip the pleura to the region of the diaphragm, the lucite spheres were located in the apex when the blood had completely disappeared by aspiration and absorption.

A flare-up of disease in areas inferior to the lucite balls has occurred in three patients; in two of these an attempt was made to increase the collapse by the introduction of more lucite spheres, but at operation it was mechanically impossible to accomplish effective additional collapse and neither patient was improved. The inability to increase the extent of collapse should it become desirable after the original operation has led to the conclusion that evidence of disease below the seventh rib posteriorly is a contraindication to plombage. Such patients should be subjected to thoracoplasty since the extent of collapse can be increased should it become necessary. There has been no evidence of a flare-up of disease in the opposite lung resulting from extrapleural plombage. However, there has been no instance in which the lesion in the opposite lung was immediately improved by the plombage operation. The same is true of pulmonary resection for pulmonary tuberculosis. It is not unusual, however, to find that
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thoracoplasty on one side will help a lesion in the opposite lung, probably by causing the mediastinum to shift sufficiently to the unoperated side to relax the lung. It is possible that a more extensive collapse should be carried on in the plombage patient with disease in both lungs. However, the patient with bilateral apical disease probably should have bilateral collapse planned in the beginning; therefore plombage would be superior to thoracoplasty since it is more conservative of lung tissue and the cardiorespiratory function than is thoracoplasty.

It is evident that the end results will either establish or eliminate extrapleural lucite ball plombage as an acceptable operative procedure in the treatment of pulmonary tuberculosis. The series reported surely removes all other criticism directed at the operative procedure.

There is no standard by which end results can be evaluated justly. If all patients subjected to the operation are considered the results are poor; only 54.7 per cent have negative sputa. Nevertheless they are not too different from the results of thoracoplasty (Chart I). If only the patients with unilateral roentgenographic evidence of disease at the time of the follow-up study are considered the results are highly gratifying; 86.1 per cent have negative sputa. In bilateral pulmonary tuberculosis it seems that the greatest failing has been to surgically collapse only one side, attacking, of course, the side with the greater amount of disease. Perhaps if more patients had bilateral collapse there would be a larger percentage with negative sputa. This assumption is not borne out in eight patients with bilateral plombage since negative sputa has been obtained in only one-half of them. Where there is bilateral surgical treatment the question arises as to whether one should expect half as many cured patients or twice as many sick ones. In quoting end results one should distinguish between primary plombage and plombage after thoracoplasty. This paper deals only with primary plombage. Intrapleural lucite ball prosthesis after pneumonectomy should be considered separately. A study of patients who continue with positive sputa after plombage forces certain conclusions.

The lung should not be freed from the mediastinal pleura. If it is so freed the diseased lung can be pushed or can descend into healthy lung tissue without collapsing. Most workers abandoned the Simbs' apicolysis after thoracoplasty for this reason. In reviewing the results of thoracoplasty the authors found a lower percentage of conversion of sputum after Simbs' apicolysis than without it. Perhaps better bronchial drainage is favored if the lung is held suspended superiorly along the mediastinum. The high adherence of the lung along the lateral chest wall should
# RESULTS OF SURGICAL TREATMENT OF TUBERCULOSIS

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Treatment</th>
<th>Number of Patients</th>
<th>Well—Sputum Negative (Per cent)</th>
<th>Dead (Per cent)</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overholt</td>
<td>Lobectomy</td>
<td>33</td>
<td>43</td>
<td>18</td>
<td>2 yrs. to 12 yrs.</td>
</tr>
<tr>
<td>Overholt</td>
<td>Pneumonectomy</td>
<td>58</td>
<td>48</td>
<td>41</td>
<td>2 yrs. to 12 yrs.</td>
</tr>
<tr>
<td>Bailey</td>
<td>Resection—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prestreptomycin</td>
<td>100</td>
<td>55</td>
<td>37</td>
<td>1 yr. to 8 yrs.</td>
</tr>
<tr>
<td></td>
<td>Poststreptomycin</td>
<td>100</td>
<td>77</td>
<td>16</td>
<td>Less than 3 yrs.</td>
</tr>
<tr>
<td>Brantigan and</td>
<td>Resection—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rigdon</td>
<td>Prestreptomycin</td>
<td>21</td>
<td>50</td>
<td>30</td>
<td>1 yr. to 6 yrs.</td>
</tr>
<tr>
<td></td>
<td>Poststreptomycin</td>
<td>29</td>
<td>76</td>
<td>3.4</td>
<td>6 mos. to 3 yrs.</td>
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<tr>
<td>Brantigan</td>
<td>Pneumothorax and Pneumonolysis</td>
<td>608</td>
<td>69</td>
<td></td>
<td>1 yr. to 8 yrs.</td>
</tr>
<tr>
<td>Allen and Kelly</td>
<td>Pneumothorax</td>
<td>128</td>
<td>56.3</td>
<td></td>
<td>2 yrs.</td>
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<tr>
<td>Brantigan</td>
<td>Thoracoplasty</td>
<td>337</td>
<td>48</td>
<td>40.6</td>
<td>2 yrs. to 9 yrs.</td>
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<tr>
<td>Douglas</td>
<td>Thoracoplasty</td>
<td>102</td>
<td>69</td>
<td>14</td>
<td>5 yrs.</td>
</tr>
<tr>
<td>Davison</td>
<td>Thoracoplasty</td>
<td>888</td>
<td>55</td>
<td>19</td>
<td>1 yr. to 12 yrs.</td>
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<tr>
<td>Trent</td>
<td>Plombage</td>
<td>51</td>
<td>19.6</td>
<td>35.3</td>
<td>6 mos. to 34 mos.</td>
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<tr>
<td>Brantigan and</td>
<td>Plombage (All Patients)</td>
<td>64</td>
<td>54.7</td>
<td>3.1</td>
<td>6 mos. to 24 mos.</td>
</tr>
<tr>
<td>Rigdon</td>
<td>Plombage (Unilateral Disease)</td>
<td>36</td>
<td>86.1</td>
<td>5.5</td>
<td>6 mos. to 24 mos.</td>
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be avoided. It produces a U-shaped collapse which is unfavorable.

It has been found impossible to collapse the lung in areas below the apex without freeing the apex of the lung and permitting it to collapse. Therefore, extrapleural lucite ball plombage is indicated only in apical disease.

The earlier tendency was to do a limited plombage, thus conserving all possible lung tissue. In the experience of the authors most patients subjected to thoracoplasty required a six or seven rib operation. The plombage operation, for about the same amount of disease, has not nearly equalled the same amount of collapse. This, perhaps, is a mistake. However, if the extent of collapse is increased one can expect an increase in postoperative complications, particularly a flare-up of disease on either side at the time of operation. The one postoperative death reported was from this cause. The collapse probably should not be carried farther than the third interspace anteriorly and the upper aspect of the seventh rib posteriorly. Thus, extrapleural plombage should be reserved for apical disease. If more extensive collapse is needed thoracoplasty should be used since it can be done in multiple stages, whereas plombage is a single stage operation.

There are certain contraindications to the plombage operation and for the most part these are the contraindications to collapse therapy generally, namely, giant cavities, large tension cavities, tuberculomas, spreading acute disease, and the so-called destroyed lung. Added to these and specifically indicated for plombage is extensive disease from apex to base. Plombage for giant cavities and large subpleural tension cavities is likely to result in erosion of the cavity into the extrapleural space.

It is often difficult to resist the plea of the patient and the referring doctor when contraindications are borderline or slightly but definitely beyond the scope of the plombage operation. Frequently the patient and the referring doctor are unwilling to agree at the outset to bilateral collapse. In treating patients with bilateral disease this results in many failures because when the patient is freed of all symptoms and is clinically well except for positive sputum he will often refuse to undergo the second operation. Since these patients have positive sputum they are classified as failures of treatment. This leads to the question of whether they are failures and whether one can be satisfied with improving the condition of the patient but not converting the sputum.

Perhaps a test of collapse treatment could be made preliminary to insertion of the lucite spheres. The usual extrapleural stripping could be done and the space maintained with air for a few weeks. If the patient has negative sputum the collapse could be held by insertion of the lucite spheres; if the sputum remains positive
the procedure could be abandoned. The difficulty of maintaining the extrapleural space, the repeated needle punctures with possibility of contamination, and the inability to consider the negative sputum of a few weeks as a criterion of good results has caused the authors to decide against this method.

Since the plombage operation is not deforming patients more readily accept operative collapse and therefore it is possible to collapse earlier lesions than are obtainable for thoracoplasty. As the operation proves its effectiveness there will be a greater number of patients treated earlier in the course of their disease. Certainly the end results will then be increasingly better. The first patients in the present series were those with extensive disease and many with a questionable effective collapse on the opposite side produced either by thoracoplasty or pneumothorax. In the same series eight patients had bilateral collapse and 13 had either thoracoplasty or pneumothorax on the opposite side at the time of extrapleural lucite ball plombage.

When a patient persists with positive sputum after plombage it is usually difficult to determine the location of the active disease, although it is perhaps no more difficult than it is after thoracoplasty. As after thoracoplasty, physical examination, roentgenograms, laminograms, bronchograms, bronchoscopy and all available methods may not locate the source of the positive sputum. If the lesion is located under the lucite spheres, resection is the only treatment available at this time. This limited choice of treatment is a great disadvantage when compared with thoracoplasty, since disease under a thoracoplasty can be treated by revision thoracoplasty, open drainage, or resection.

CONCLUSIONS

1) Extrapleural lucite ball plombage has been used 72 times in 64 patients.

2) There have been two deaths, one postoperatively three days after operation from extensive flare-up of disease, and one from recurrent tuberculous meningitis several months after pulmonary plombage. No other complications have developed.

3) In 64 patients 54.7 per cent have negative sputa and none has been made worse. If the patients with bilateral disease are separated from those with unilateral disease the results are better. In 36 patients with unilateral disease 86.1 per cent have negative sputa. The patients have been followed six to 24 months after operation.

4) Factors are discussed that will undoubtedly bring about better end results.
5) Extrapleural lucite ball plombage has a definite place in the treatment of pulmonary tuberculosis and probably will be used more extensively in the future.

CONCLUSIONES

1) Se ha empleado el plombaje extrapleural con esferas de lucita 72 veces en 64 pacientes.

2) Han ocurrido dos muertes, una tres días después de la operación, causada por una extensa propagación y, la otra, debido a meningitis tuberculosa recidiva varios meses después del plombaje pulmonar. No ha habido ninguna otra complicación.

3) De los 64 pacientes, el 54.7 por ciento tienen el esputo negativo y ninguno ha empeorado. Si se separan los pacientes con enfermedad bilateral de los que tienen enfermedad unilateral, los resultados resultan aún mejores. De 36 pacientes con enfermedad unilateral, el 86.1 por ciento tienen el esputo negativo. Se han observado a los pacientes de seis a veinte cuatro meses después de la operación.

4) Se discuten algunos factores que indudablemente causarán mejores resultados finales.

5) El plombaje extrapleural con esferas de lucita tiene un lugar bien definido en el tratamiento de la tuberculosis pulmonar y probablemente será usado más extensamente en el futuro.

REFERENCES