Late Extrusion of Pulmonary Plombage*

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A 66-year-old woman in otherwise good health presented with a 2-month history of a rapidly enlarging, painless posterior left chest wall mass. The patient had been admitted 41 years previously to a tuberculosis sanatorium, where she had undergone a left-sided paraffin plombage (we assume that the plomb material is paraffin). Physical examination disclosed a soft, nonmobile, nontender mass measuring approximately 10 × 12 cm beneath the upper one third of the patient’s thoracotomy scar, medial to the left scapula. She denied a recent history of cough, trauma, or fever and chills.

The chest radiograph (Fig 1) revealed deformity and opacification in the upper left thorax, with partial loss of the second rib, invagination of periosteum around the plombage material, and linear scarring and focal bronchiectasis within the lungs. The CT (Fig 2) at the level of the aortic arch demonstrated tremendous left-sided volume loss and postsurgical changes, including rib deformity and new bone formation around the centrally displaced perisoteum. The central pleural cavity contained a fluid-lipid level and surrounding soft-tissue density, with a second component located in the chest wall medial to the scapula.

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Diagnosis: Extrusion of the patient’s plombage through a defect in the chest wall, with layering of serous fluid and liquid wax.

The patient was admitted to the hospital for surgical removal of the extruded plomb material. Operative findings included a defect between the posterolateral aspects of the left third and fourth ribs, through which gritty wax plomb material had extruded. There was no sign of infection. A Gram’s stain of the plomb material was negative for organisms, as were the subsequent culture and sensitivity. The cavity was completely evacuated, filled with an antibiotic solution, and the chest wall closed.

This case provides an opportunity to review the history of tuberculosis and its surgical management. Tuberculosis was one of the most common causes of death in the United States at the turn of the century; tuberculosis mortality rates declined steadily during the 20th century until 1985, at which point rates began to rise again, due to the increasing prevalence of immunodeficiency. Nevertheless, there remain 10 million tuberculin test-positive individuals in the United States, most of whom are elderly and were exposed to the tubercle bacillus during their youth. Tuberculosis remains a major world health problem, infecting one half of the world’s population and accounting for approximately 6% of deaths worldwide.¹

In untreated individuals, the mortality rate is approximately 60%, with a 2- to 3-year course from infection to death.² Today the standard treatment regimen is pharmacologic, including daily doses of isoniazid, rifampin, ethambutol, and in some cases, pyrazinamide. Multiple drugs are necessary owing to the rapid emergence of drug-resistant strains under single-agent regimens. Prolonged courses of therapy are necessary, up to 18 months, owing to the relatively low metabolic activity of the mycobacterium.

In the days of this century prior to the development of effective pharmacologic treatment for pulmonary tuberculosis, surgery constituted a mainstay of therapy. The decline in the rates of surgical therapy can be traced not only to the development of effective pharmacologic treatment, but to the general decline in the incidence of tuberculosis, which amounted to 3 to 5% per year. Whereas some one third of hospitalized patients underwent operation several decades ago, thoracotomy is now performed in less than 2% of patients.³

While the primary focus of tubercular infection is usually found in the lung bases, which enjoy the greatest ventilation and therefore represent the most likely site of deposition of the respiratory inoculum, reactivation tuberculosis tends to occur in the upper lobes and superior segments of the lower lobes, perhaps related to the higher alveolar oxygen concentration. Late complications include cavitation, bronchiectasis, hemoptysis, bronchostenosis, fungal super-infection, and carcinomas associated with scars. Once caseation necrosis and cavitation occur, infectious material may spread transbronchially.

Plombage and thoracoplasty represented surgical attempts to contain the focus of tuberculous infection by collapsing the diseased portion of lung. If the diseased portion continued to be ventilated, its collapse was prevented, enabling tuberculous material to spread throughout the tracheobronchial tree. Collapse of the diseased portion of lung, however, was found to result in the formation of considerable connective tissue, with encapsulation of the disease focus. Within weeks, this resulted in a decrease in sputum production, a reduced number of tubercle bacilli in sputum, and a general containment of the infection.

While the creation of a complete pneumothorax was at first glance the ideal method of collapsing the diseased lung, it usually proved only partially successful. The region of lung least likely to collapse completely was the one most involved by disease, due to the associated parenchymal consolidation and pleural reaction. Moreover, collapse of the entire lung was unnecessary, if only one lobe was involved. To produce and maintain collapse of diseased lung or "pneumolysis," large amounts of inert foreign materials such as paraffin or olive oil were instilled into the pleural cavity, compressing the lung parenchyma and preventing its reexpansion. The procedure was known as plombage.⁴

Various materials were employed to maintain pneumolysis, including gauze, rubber balloons, sponges treated with oils, blood clot, muscle, fat, lucite spheres, and a paraffin mixture (after Baer⁵), the latter constituting the so-called plombe, derived from the French plomber, meaning to fill or stop (originally with lead, as in the filling of a tooth). Often the paraffin mixture, with a melting point of approximately 10° C, would be supplemented with both antiseptic and bismuth carbonate, the latter in order to facilitate radiologic visualization.

A plombage procedure performed without thoracoplasty required only local anesthesia, and was typically performed posteriorly, with excision of a portion of the fourth rib and separation of the lung from the chest wall by blunt dissection. Paraffin was then inserted and the chest wall closed. Complications included perforation of the plombe into the pulmonary or pleural cavity, its extrusion downward into an undesirable site, and infection. Recent reports of late complications have included infection, sputum wax worms, and migration (with one case of fatal mediastinal compression).⁶,⁷ Treatment for such complications may include removal of plombe and decortication.⁸

Thoracoplasty, the removal of a section of the tho-
racic cage with or without plombage, constituted another mainstay of surgical management of pulmonary tuberculosis. Reacting to disappointing 19th century attempts to drain or remove the diseased segment, Spengler suggested the removal of several ribs over the diseased cavity, and Quincke demonstrated at post mortem in 1895 that this method made the cavity smaller and fibrotic. Sauerbruch devised the resection of small portions of all the ribs at their posterior angles, which caused a dropping of the thoracic wall and fixation of the hemithorax, and became the accepted procedure for many years.

American surgeons lagged behind their European counterparts in the surgical management of pulmonary tuberculosis, with the first complete thoracoplasty in the United States performed in 1908. Alexander's book, Surgery of Pulmonary Tuberculosis, published in 1925, spawned a tremendous increase in American surgical management. With time, greater emphasis was placed on preservation of healthy regions of lung and permanent collapse of the diseased portion. Complications of thoracoplasty included paradoxical respiration due to a mobile mediastinum, infection (including empyema), bronchopleural fistula, and severe fibrosis.

In more recent years, extraperiosteal thoracoplasty with plombage involved depression of the periosteum, intercostal muscles, and both the visceral and parietal layers of the pleura, with insertion of wax or other prosthetic device to maintain lobar collapse. The procedure was typically performed in multiple stages, with initial removal of ribs 1 through 3 followed by later removal of segments of ribs 4 through 7. Utilizing this general technique, thoracoplasty became the pre-chemotherapy treatment of choice for unilateral pulmonary tuberculosis, producing success rates of 75 to 90%.

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