

RECENT TRENDS IN THE TREATMENT OF PULMONARY TUBERCULOSIS

Rest and relaxation are the basic principles in the treatment of pulmonary tuberculosis, but in the past fifteen or twenty years, especially in the last ten years, the local application of these principles by surgical and semi-surgical means is responsible for the definitely better prognosis for a person developing disease now than even fifteen years ago. At this institution since pneumothorax was first begun in 1914 we have been increasingly progressive in collapse therapy. On December 31, 1937 a cross-section of our patient population revealed in those with pulmonary tuberculosis some form of collapse therapy was being actively used in 75 per cent and including those in whom pneumothorax had failed and no other collapse treatment instituted the total reached 90 per cent. Of the 75 per cent, pneumothorax was used in 50 per cent (15 per cent having had intra-pleural pneumonolysis and 15 per cent having bilateral pneumothorax), in 5 per cent. phrenic nerve surgery, in one per cent paraffin packs and in 25 per cent thoracoplasty. The question might be raised as to whether this enthusiasm for collapse therapy is justified. In an attempt to answer this and to justify our convictions in this paper I will review in retrospect 130 cases of pulmonary tuberculosis admitted to this institution during 1929 and 1930, and in the light of experience and judgement acquired since then, attempt to estimate what the prognosis of the former group would be if treated according to our beliefs of today. It is fully realized that one cannot be dogmatic about the prognosis for those treated recently, but this study was done in the hope that it would be of interest, perhaps of some value and at least indication of the trend of treatment in the last ten years.

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Refinements in diagnostic procedures and in surgical technique, are to a great extent responsible for the increased use of collapse therapy in the treatment of lung tuberculosis in recent years. The search for tubercle bacilli in the gastric contents when the sputum is negative or none is expectorated is now a very important laboratory procedure. This was originally suggested by Meunier in 1898 (1) and first used in this Sanatorium in October 1929, but not extensively at that time and not at all in the admissions of this series. In 212 consecutive tests done on 181 individuals with pulmonary tuberculosis during 1932-34 (2) in this sanatorium 16 per cent had positive sputum on ordinary smear and 33.1 per cent were found to have positive sputum in stomach contents. This procedure is very useful in managing collapse therapy, especially determining the effectiveness of collapse when sputum has apparently disappeared. Its greatest value to us has been in making a decision regarding pneumothorax in small lesions when sputum is not present. Recently in one patient with apparent cavitation but no sputum, the finding of tubercle bacilli in the gastric washings swung the balance in favor of thoracoplasty. Culture of sputum on various media has been more commonly used in the past few years, and although it is more accurate it is not of as great value because of the length of time necessary to determine the result. The sedimentation rate and the differential white blood count are now being used more widely, but are of greatest value in estimating activity of disease and the patient's progress.

Roentgenograms of the lungs with the chest in different positions have become popular and the antero-posterior film often

reveals apical honey-combing or definite cavitation, not obvious in the ordinary postero-anterior view. When the latter shows seemingly equal involvement of both apices such films are not infrequently of value in deciding on which side pneumothorax should be attempted and are also helpful when double pneumothorax is under consideration.

A few remarks must be made about the changes in the use and technique of pneumothorax, phrenic-nerve operations and thoracoplasty. As far as pneumothorax is concerned, at least two changes of importance have taken place. First, an ineffective or inadequate collapse is discontinued sooner than was customary ten years ago, and secondly it is being used for smaller lesions, for which in the past bed rest was considered adequate.

Although it is some years since Jacobaeus originally advocated intra-pleural pneumonolysis it did not achieve deserved recognition until the past six or seven years. It is much less formidable than the "open" method and is a most effective adjunct to pneumothorax treatment.

Evulsion of the phrenic nerve was suggested in 1911 by Steurtz (3) to relax a tuberculous or bronchectatic lower lobe when pneumothorax could not be obtained. Phrenic crushing was occasionally done in the early 1920's, but was not commonly performed until the 1930's. The advantages of crushing the nerve are that it is not an irremediable measure and can be repeated or followed by a permanent phrenicectomy if desired. A disadvantage, however, is that it does not give the amount of diaphragmatic elevation or lung relaxation which can usually be obtained by an evulsion. In 1929-30, and

previously, the evulsion was used routinely before thoracoplasty, but now according to Alexander (4), "It is the opinion of many surgeons, including myself, that phrenic paralysis is not of value as a test of the ability of the lesions in the opposite lung to remain quiescent after a thoracoplasty for the more diseased lung". However, Alexander still thinks it is of use for small thin-walled cavities anywhere in the lung when pneumothorax has failed. On the other hand, most thoracic surgeons on this continent prefer to treat such cavities, at least the apical ones, more radically without delay.

In 1929, although fewer patients received pneumothorax for small lesions, yet the total was greater because more ineffective pneumothoraces were persevered with and fewer had thoracoplasty at as early a stage in their disease. So the greatest change has been the much wider applicability of thoracoplasty. This has occurred mainly because of the technical changes in the operation, multiple stages as suggested by Alexander in 1926, but not used extensively until the past seven or eight years, the resection of longer lengths of rib combined with the removal of the transverse processes and the earlier use of the supplementary operations. It is also recognized that an individual may lead a useful life with considerably less functioning lung than was formerly thought possible, and that a "selective" thoracoplasty with a moveable diaphragm conserves the healthy portion of the lung to a much greater extent than the old type of operation preceeded by permanent diaphragmatic paralysis. The combination of extra-pleural or extra-fascial pneumonolysis with thoracoplasty is being stressed in many centres and the wax

pack is returning to favor in selected cases where the amount of disease or condition of the patient, or the contra-lateral lung does not permit of thoracoplasty. Bilateral thoracoplasty, thoracoplasty with contra-lateral pneumothorax or wax pack are being performed more commonly in addition to the increasing use of bilateral artificial simultaneous pneumothorax.

"Oleoathorax is a form of treatment of which the virtues have been much debated". (Alexander) (5). At present it is not used at all in this institution.

With these innovations and changes in the management of pulmonary tuberculosis in mind I will review the 130 cases previously mentioned, making an effort to determine the effect that present day treatment would have upon their prognoses.

The cases under consideration were admissions to a 285-bed sanatorium during a portion of the two-year period 1929-1930, the only qualification being that the main tuberculous lesion was in the pulmonary parenchyma. The series consists of 68 males and 62 females, aged 9 to 59. In 61 the pulmonary disease was far advanced, in 54 moderately advanced and in 15 minimal. Disease was bilateral in 96, exudative or predominantly so in 87, and proliferative in the remaining 43. In 29 there were tuberculous foci elsewhere in the body and 7 had non-tuberculous complications.

Fifteen had minimal disease, proliferative or mainly fibrotic in nine and exudative in six. In none was any form of lung collapse attempted. All but one of those with proliferative lesions did well and have had no recurrence, and all but one of those with exudative disease had an increase at a later date which necessitated pneumothorax. In other words, only one of those with exuda-

tive disease did well on unaided bed rest and only one of the other group did poorly on the same regime. All who did not do well were females between the ages of 14 and 26. None had positive sputum on ordinary smear, one had a positive culture, but none had examination of the gastric contents for bacilli. All would have had this test according to 1938 standards and in most, especially those who had a positive gastric analysis, pneumothorax would have been started. Pneumothorax should be seriously considered for a minimal lesion particularly in females in their 'teens or early twenties. One of the seven with exudative disease did improve and is now classified as "cured".<sup>x</sup> Were she to be admitted at the present time with the same lesion pneumothorax would likely be attempted. This one cure without pneumothorax, however, is over-balanced by the unfavorable results of medical treatment alone in the other six. The complications of pneumothorax in treating minimal disease are negligible and the benefits in small exudative lesions, especially in young people, undoubted.

Fifty-four (41.5 per cent) of the 130 had moderately advanced disease. In 30 artificial pneumothorax was obtained (5 bilateral, simultaneous) and in 5 it was unsuccessful. Of these 30, three later had thoracoplasties preceded by phrenic evulsions. Of the 5, in which pneumothorax was impossible, two had phrenic evulsions and one thoracoplasty, making a total of 33 with active collapse treatment. In 7 others pneumothorax was begun at a later date when disease had increased and in the remaining 12 no treatment was attempted.

x National Tuberculosis Association classification.

How would these 54 cases be managed today? In 7, for which pneumothorax was started or attempted at a later date when disease had increased, 5 were girls in their 'teens or early twenties. All 5 had negative or no sputum on admission and no doubt some of them would have had a positive gastric analysis, and in some it is likely that antero-posterior chest films would have revealed breaking down not seen in a film taken in the ordinary position.

Of the 30 who had pneumothorax 7 would now have had thorascopic investigation, and judging from the films internal pneumonolysis could have been successfully performed in at least 5. In one of these pneumonolysis would likely have prevented a "mixed" empyema which necessitated a thoracoplasty and resulted in death. In 3 phrenicectomy preliminary to thoracoplasty would not have been done at present, and two who had thoracoplasties would have had the operation sooner, i.e; their pneumothorax, which was ineffective, due to dense adhesions around the diseased area, would have been discontinued at an earlier date. At the present time an ineffective pneumothorax is dropped as soon as the ineffectiveness becomes apparent. This lessens the chance of complications, more recent lesions are less resistant than they would be when older, and therefore more compressible or collapsible, and the patient is in better condition for more radical measures. The older teaching was that thoracoplasty should never be done if the trachea was in the mid-line, but the experience at this institution is that operation is easier and convalescence less stormy in those with less chronic disease. The longer the disease and toxemia

have been present the less the vital capacity and the greater the damage to vital organs especially the heart. Paradoxical respiratory was a complication with the extensive thoracoplasty for disease that was not chronic but now this complication can be minimized by the careful operating in small stages. Two others of the group under consideration had they been admitted in 1938 would have been considered suitable for thoracoplasty. One is improved at present, working at home but infective, the other, in whom pneumothorax was unsuccessful, had a cavity 3 centimeters in diameter in the right apex which unexpectedly cleared and he has been working for six years.

In summing up this group who had moderately advanced disease treatment would not have been the same in 22 of the 54, probably of definite advantage in 18, but not necessarily in the remaining 4.

Sixty-one, or 46.9 per cent, had far advanced tuberculosis and because most had gross bilateral disease the choice of collapse measures in treatment was limited almost to the extent that they would be today.

Of these, 61 far advanced cases, pneumothorax was induced in 22 (6 bilateral, simultaneous) and was unsuccessful in 12. Of these 34, 7 later had thoracoplasties preceded by phrenic operations, 5 in whom pneumothorax was entirely unsuccessful had phrenic evulsions and two had phrenicectomies in combination with pneumothorax.

Today pneumothorax would have been attempted in one other not tried in 1929, and tried at an earlier date in 3 others. Four of those who had thoracoplasty would have had it sooner and the operation would likely have been done in 9 others in whom pneumothorax



was unsuccessful and an extra-pleural pneumonolysis with a wax pack in a tenth. One with a large apical cavity and a little active disease on the other side, obtained a "cure" by a phrenic evulsion. Of the 9 who should have had thoracoplasty according to present-day standards, 5 are living but unimproved and 4 are dead.

In at least two, intra-pleural pneumonolysis would have been attempted, likely successfully, judging from the radiographic appearance and in one of these thoracoplasty was eventually necessary for a "mixed" empyemata - and it is probable that such a measure at an opportune time would have prevented this catastrophe. Preliminary phrenic operation to thoracoplasty would now have been omitted.

Between 20 and 30 per cent of this far advanced group would have received more active surgical and semi-surgical treatment today than 9 years ago, and this change we think is justified by our experience. Tuberculosis is a serious disease with a high mortality and often requires drastic measures to control it. The attitude toward disease in the contra-lateral lung in relationship to thoracoplasty has changed and such lesions are being considered much more favourably. Confidence in the good lung to hold up under the strain is often justified even though the disease may be slightly active or show definite caseation. According to G. Sayago (6) "One may be somewhat tolerant of exudative foci that are demonstrable only by radiograph", and experience here is in agreement with this statement.

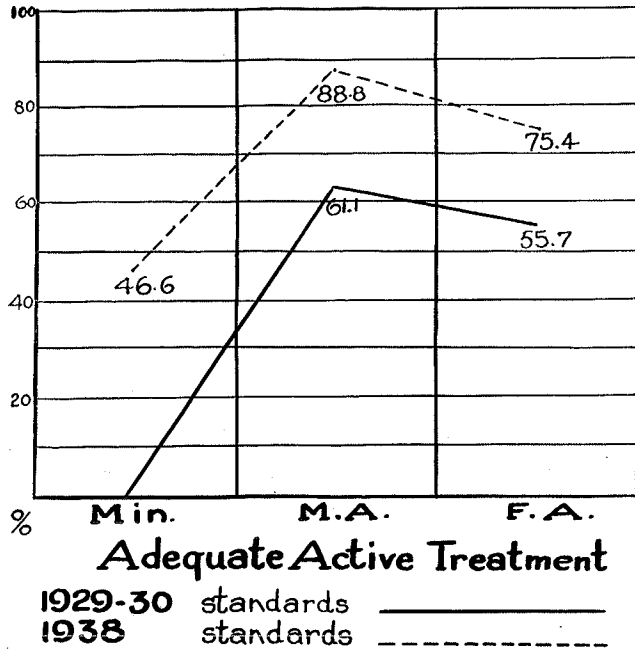


FIGURE I

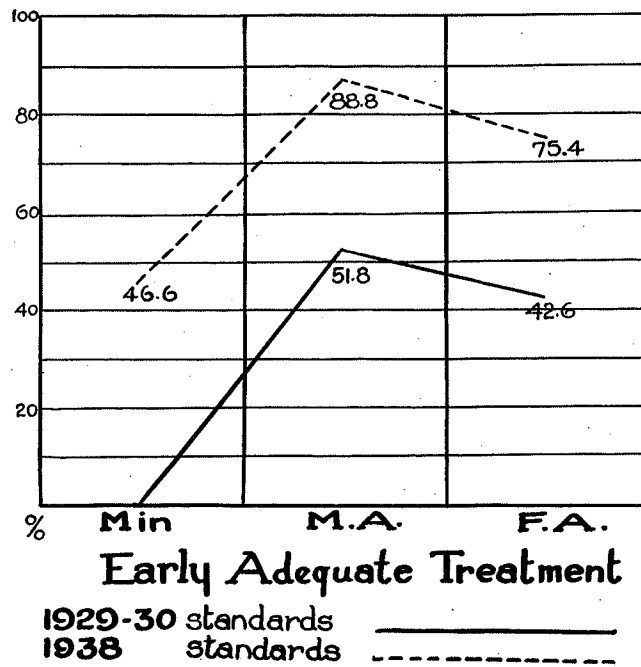


FIGURE II

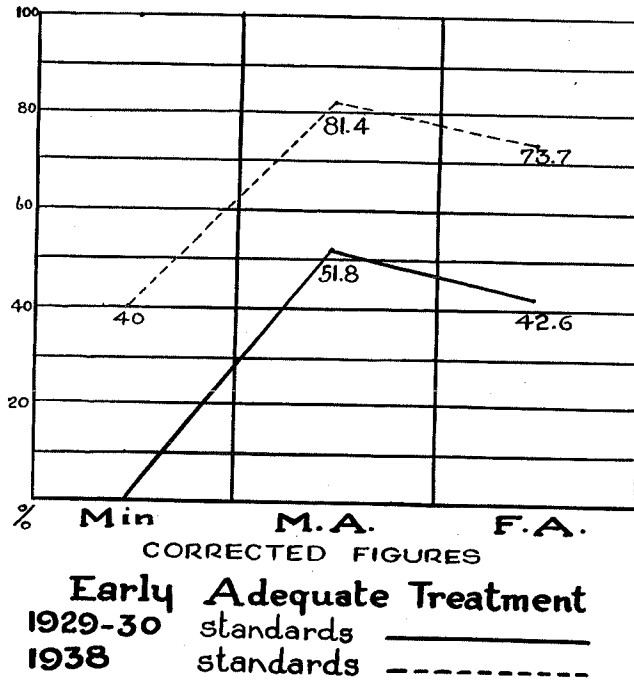


FIGURE III

The above is a graphic comparison of the proportion of the 130 cases who received some form of collapse therapy and those who would have if they had been admitted to this institution in 1938. In Figure I the continuous line gives the percentages actually receiving active treatment and the same line in Figures II and III shows the number in each group receiving early active or adequate treatment. The interrupted line in Figures I and II indicates the proportion who would have received active treatment in 1938. The

same line in Figure III gives the percentages in each group which would have derived definite benefit from the proposed treatment had it been successful. This discrepancy is explained by the fact that one individual in the minimal group, and 4 in the moderately advanced group, who received no treatment but would have according to 1938 standards, are well and working, and one in the far advanced group who became cured following phrenicectomy would have had a thoracoplasty. These have been deducted from "1938 standard" figures and the difference may be seen by comparing the interrupted lines in Figure II and Figure III.

These Figures attempt, therefore, to portray the difference in the attitude of 1930 in assuming that patients with small amounts of disease would improve without active assistance and many of those who did not respond to lesser measures were not favorable candidates for thoracoplasty and the present idea that early active assistance is the better treatment. This is most accurately portrayed by the comparisons in Figure III which reveal that (by subtracting the 1930 figures from those of 1938) 40 per cent of the minimal group and approximately 30 per cent of each of the other groups would have received definite benefit from such changes in treatment.

#### CONCLUSIONS

There is no doubt that the pendulum of treatment in pulmonary tuberculosis is swinging sharply toward surgery, and if the results of this study are in any way valid this trend is justified. It is true that 6 individuals who got a good result from bed-rest alone or lesser measures, would today have been subjected to pneumothorax or thoracoplasty, but the 41 who have not done well and probably would have done better with more vigorous treatment definitely

outweigh any possible risks to the above-mentioned minority. Many with far advanced bilateral disease, which would have been left alone a decade ago because of the amount of disease or activity on the better side, are receiving bilateral surgical treatment today. One individual has been doing a full day's work for eight months with a permanent phrenicectomy and an eight-rib thoracoplasty on one side (1929) and a wax pack (1936) on the other. Another has a wax pack on the left side, preceded by two phrenic crushing operations, a 50 per cent generalized pneumothorax aided by an internal pneumonolysis on the right and is ready for discharge having spent less than three years at the Sanatorium.

Pulmonary disease in adolescents and older youths is being considered much more seriously than a few years ago, because lesions which appear to be slight and improve on rest alone, often prove unstable, necessitating another and usually more prolonged period of rest. The smaller the lesion the fewer the adhesions and therefore the greater the likelihood of a selective pneumothorax. The smaller the lesion the less likely are complications, the shorter the course of treatment and the greater the probability of arresting the disease. If this study demonstrates nothing else it does show the seriousness of even small lesions in young females and the need for early consideration of pneumothorax. It may improve and indeed become arrested without the employment of active measures, but of the 15 young females with small lesions, minimal or moderately advanced, in whom pneumothorax would probably have been attempted all subsequently had increases in disease. Males in their 'teens with small lesions are not seen as frequently but when present such disease also merits close study.

The third question which has been discussed is that of early thoracoplasty. When pneumothorax has been entirely unsuccessful, it can be proceeded with immediately if the case is suitable, but when a partial pneumothorax is obtained what is to be done? In some cases even though there are a number of uncuttable adhesions, when pneumothorax renders sputum negative and the symptoms become less or disappear, there is some justification for persisting with the collapse though thoracoplasty is often ultimately necessary, but when it has become evident that the pleurae over the disease area are firmly adherent it is worse than useless to maintain the collapse. The reasons for this have been previously stated.

#### SUMMARY

1. A detailed study of 130 cases of pulmonary tuberculosis has been made and an attempt made to show the difference between the actual treatment received in 1929-30 and the 1938 management of the same problems.
2. Treatment would likely have been changed in 36.15 per cent (47 persons) and if successful of definite benefit in 31.63 per cent (41 persons).
3. Phrenic nerve operations would not have been done as a preliminary to thoracoplasty and not any oftener as a single measure than in 1930.

4. Pneumothorax would have been tried in certain of the minimal cases, attempted sooner in a number of the moderately advanced cases, thoracoplasty when performed would have been done at an earlier date in both the moderately and far advanced groups and performed more often in the latter. It is submitted, that such treatment would have definitely enhanced the chances of good results in the individuals concerned.

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