

The
Indian Journal of Tuberculosis

Vol. III

New Delhi, March, 1956.

No. 3

INTERNATIONAL CONFERENCE & THE
EASTERN REGION

Tuberculosis has now become an international problem which requires world-wide co-operation for its solution. Further, new developments and discoveries in one country may have repercussions in others. Epidemiological investigations and mass surveys conducted in one country not only throw light on the problems of that particular country, but also provide useful data, which may be of significance in other parts of the region, specially in neighbouring countries with similar conditions. While it is true that in the Americas and in the Western countries tuberculosis mortality and morbidity have shown marked decline in recent years, the problem still remains acute in many countries of the East.

From the point of view of control and management, tuberculosis presents different problems in different regions depending on whether its incidence is low or high. In areas of low prevalence, the problem now is how best to make use of existing institutions as they have become superfluous, how to provide for the care of those who still have disease but do not need institutional care, and how to re-orientate the work of anti-tuberculosis organisations and personnel. On the other hand, in countries with large population and inadequate anti-tuberculosis measures the problem is how to plan to get the best results with the limited means and personnel.

The importance of the XIV the International Tuberculosis Conference to be held in New Delhi early in January 1957 has to be viewed

from this angle. This is the first time that such a conference is being held in the East. It is expected to focus international attention on the problem in this part of the world. A step in the right direction is the proposal to establish one or two regional committees of the International Union Against Tuberculosis in the East. The preliminary discussions with representatives of the national associations of Nepal, Singapore, China, Thailand and India at the time of the last Tuberculosis Workers' Conference- have been encouraging as these countries have shown great interest in the formation of such committees. It is hoped that the proposal to form these committees will take definite shape at the time of the International Conference in India, and that these countries will make full use of the services of the Regional Committee.

Readers will find elsewhere in this issue the various subjects to be discussed at the Conference in New Delhi. It is hoped that authoritative opinion and guidance on them will emerge as a result of the discussions in which some of the best experts in the world will participate.

XIVth INTERNATIONAL TUBERCULOSIS CONFERENCE

Message from Rajkumari Amrit Kaur, Minister for Health, India, and Honorary President, XIVth International Tuberculosis Conference.

New Delhi, March 8, 1955.

I extend a cordial invitation to tuberculosis workers throughout the world to attend the XIVth International Tuberculosis Conference which will be held in New Delhi, India, in January, 1957.

All previous international conferences on tuberculosis have been held either in Europe or in the Americas so that this will be the first one to be held in the East. As tuberculosis is a major public health problem in practically all the countries in this region, this conference has a special significance for it will give an impetus to the antituberculosis movement in this area. It will also give an opportunity for tuberculosis workers in this region not only to come in contact with each other, but also to discuss their problems with specialists of other countries where tuberculosis has been largely controlled. I, therefore, earnestly appeal to tuberculosis workers in the different countries of the world to attend this conference in large numbers and make it an outstanding success.

The National Tuberculosis Association in India is now making necessary arrangements for this Conference. These include tours to different places of interest in India and also visits to important tuberculosis institutions. We shall do our best to make the stay of our foreign friends in India as useful and pleasant as possible.

Some Research in Isolation of Tubercle Bacilli*

By

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Since the introduction of modern antibiotics the volume of culture work has grown immensely, and anything which would lighten the labour involved and make cultures easier would be welcome.

The slow growth of tubercle bacilli and the necessity of keeping cultures for about six weeks makes great demand on incubator space and also time is required for repeated examination of cultures. So far, attempts to find an improved medium which would give more rapid growth have to a large extent failed, an egg medium being the base found most satisfactory. A human blood medium advocated by Tarsh and co-workers (1955) is said to shorten the average appearance of first colonies by 3 days, but 18 days are still required. The slide culture method has only a limited use and is unsatisfactory for most purposes.

Some simplification of existing media may be possible : Jensen (1955) has shown that the addition of potato flour to Jensen-Lowenstein medium is of no significance for the yielding capacity of the medium for pure cultivation of tubercle bacilli. Other simplifications may be found possible.

In the absence of an improved medium is it possible to simplify the technique both as regards the obtaining of the specimen and of preparing it for inoculation of the medium ?

Culture of Gastric Contents compared with Laryngeal Swabs

From about 1930 the culture of gastric contents or the water of gastric lavage has held a high place in the isolation of tubercle bacilli from patients with little or no sputum or with a microscopically negative sputum. With the introduction of the laryngeal swab method there seemed to be available a much easier method involving much less trouble for the patient and much less work for the laboratory technician as no homogenizing or concentration was required ; Wallace (1955) has found improvement of the laryngeal swab technique by treating the swabs with trisodium phosphate and sowing the centrifuged deposit from the trisodium phosphate. In some institutions gastric lavage has been abandoned and only laryngeal swabs are used. Does this involve a loss in efficiency in the finding of tubercle bacilli ? To try to answer this an analysis of the results of simultaneous examinations of cultures of gastric contents and laryngeal swabs carried out between January and October 1955 is here presented.

The examinations were carried out between 7 and 8 A.M. in the laboratory. First two laryngeal swabs were taken and then the contents of the fasting stomach

*Paper presented at the XIIIth Tuberculosis Workers' Conference, Trivandrum, January 5-8, 1956.

were removed, sterile water being run in only if the contents were very small. Cultures were made between 8.30 and 11.00 A.M.

During the period 1,177 simultaneous examinations were made (omitting those where contamination of the tubes of one or other specimen made comparison impossible). The results are as follows :—

TABLE I

Culture Results of Simultaneous Gastric Contents and Laryngeal Swabs

Method	Positive Cultures	Negative Cultures	Total
Gastric contents	105	1072	1177
Laryngeal swabs	70	1107	1177

The number of patients in whom tubercle bacilli were found by cultures by either method was 125. This means that 20 or 15.2 per cent of the positives were found by laryngeal swab alone, but 55 or 44 per cent were found by stomach contents alone. The addition of the laryngeal swabs, therefore, improved the positive findings but the omission of the stomach contents cultures would have caused a serious loss. Lind and Lundin (1955) in a smaller series of 121 cases came to a similar conclusion ; there was a gain of 2 by using laryngeal swabs, but there would have been a loss of 13 if gastric lavage had been omitted.

It seems, therefore, necessary to conclude that the examination of gastric contents cannot be replaced by laryngeal swabs without considerable loss in positive findings.

Sputum Swab Culture compared with Sputum Homogenization Culture

To avoid the labour of homogenizing and concentrating sputum to make sputum culture possible in small laboratories and in the field where electricity is not available, it has been suggested that swabs could be dipped into the sputum and these could then be treated like laryngeal swabs. A parallel study of the two methods has been made over the greater part of one year, all routine specimens of sputum being cultured by both methods.

Of 837 specimens (omitting those in which comparison could not be made because of contaminations) 288 or 34.4 per cent were found positive by homogenization and 241 or 28.8 per cent by swab culture. There were 345 positive specimens and of these positives 83.8 per cent (288) were found by homogenization and 70.0 per cent (241) were found by sputum swab. If the sputum swab only had been used 104 or 30.3 per cent of the positives would have been missed and if homogenization only had been used 57 or 16.5 per cent would have been missed.

It seems, therefore, that the sputum swab method cannot replace homogenization methods, although in the absence of facilities for homogenization and concentration it has a place.

Delay in culturing Laryngeal Swabs

In view of certain tuberculosis surveys now being carried out in various parts of the country by means of x-ray and laboratory examinations, it is of importance and of interest to study what methods and techniques are to be used. Because of its simplicity the laryngeal swab method has been suggested, as being the most practical method under the circumstances. The question arises : is it necessary to carry out to the villages of the survey area culture media so that cultures may be made reasonably soon ? Experience has shown that cultures made under conditions which may not be ideal, lead to many contaminations. For example, in one series of 85 where the only building available in a village was a groundnut barn—and it was in use as it was groundnut harvest season—13 specimens were lost with both culture tubes. During the same period laryngeal swab cultures were done for 106 patients in the Sanatorium and no specimen was lost by contamination of both tubes.

Would it be possible to delay the culturing of laryngeal swabs until more ideal conditions for culture could be found than in the villages ? To test the effect of delay in culturing, a small experiment was carried out in the Sanatorium. A series of 121 unselected patients had laryngeal swabs taken by the usual technique with cotton wool swabs, except that the first swab was labelled A and the second swab B. Within an hour of taking the swabs, one swab from each patient was cultured (oxalic acid-sodium citrate technique), alternate A and B swabs being taken. The alternating was done so as to avoid any possible chance of more first swabs being taken on one day as compared with second swabs, should this be of significance. The remaining swabs were kept at room temperature away from light for twenty-four hours before culture. The work was spread over eight days.

Results

From the 121 patients there were 242 cultures. One second day culture was contaminated, so its corresponding first day culture is omitted in the analysis leaving 120 patients with 240 cultures. Of these, 60 patients had first swabs (A) cultured the first day and 60 had second swabs (B) cultured the first day ; 60 had second swabs (B) cultured the second day and 60 first swabs (A).

The results are given in Table II.

TABLE II

Results of Immediate and Delayed Cultures

	Immediate Cultures			Delayed Cultures		
	A Swab	B Swab	Total	B Swab	A Swab	Total
Positive	11	13	24	10	16	26
Negative	49	47	96	50	44	94
Total	60	60	120	60	60	120

Of the 120 patients 19 gave positive cultures with A and B swabs, eight with A only, three with B only ; three of the positive A swabs were from immediate cultures and five from the next day ; one of the positive B swabs was an immediate culture and two from the next day.

In this investigation there was no significant difference between the swabs cultured on the first day and those on the second day. During the days of investigation the mean maximum air temperature was 82° F. with a range of 76° to 86°, the mean minimum 68° F. with a range of 66° to 71°; the morning mean relative humidity was 83 with limits of 97 and 72 and evening 65 with limits of 79 and 49 per cent. Under these conditions a delay of 24 hours seems to be of no significance. In many places this would allow of the swabs being returned from the field to the laboratory for processing. Further investigation is needed at higher atmospheric temperatures.

An investigation of delayed culturing of laryngeal swabs using a different technique has been reported by Wallace and co-workers (1955). Their investigation was a comparison of cotton wool and calcium alginate wool for the swabs, two swabs being kept for 24 hours at room temperature before being treated with trisodium phosphate for 24 hours, two swabs being treated with trisodium phosphate within two hours and kept for 24 hours before culture and one swab being kept for 48 hours in trisodium phosphate. There was no significant difference between the swabs treated with trisodium phosphate for 24 hours, but there were less positives in those tested with trisodium phosphate for 48 hours.

Another question arises—would one laryngeal swab be sufficient ? This point was investigated by a study of the results taking two laryngeal swabs, each cultured on one tube, from patients in Sanatorium for a period of two years November 1952 to October 1955. Omitting all specimens in which any tube was contaminated we have had 4,633 patient specimens (9,266 culture tubes). Of these a total of 412 showed growth, 258 in both tubes and 154 in one tube and not the other. If only one swab had been taken, it is fair to assume that half of the 154 positives would have been missed, that is 77, approximately 19 per cent. There could be added also a small series in which one tube gave growth and one tube was contaminated : if one swab only had been cultured half of these would have been missed.

There seems, therefore, a strong reason for continuing to culture two laryngeal swabs.

Effect of Light on Culture Work—Comparison of Results of Working in Daylight and Artificial Light

In 1953 Barton reported a seasonal variation in the results of cultures for tubercle bacilli, least positives being found in the hot season and most in the cold season. The reason for the variation was uncertain. One possible reason was the effect of light during the process of culturing in the laboratory. This has now been investigated.

For one year work in the culture room has been done alternate days in day light and artificial light. The specimens included gastric lavage, laryngeal swabs and sputum with a few specimens of urine, pus and other fluids. Sputum specimens from the wards were received in screw capped bottles with dark paper pasted round them.

The room in which cultures were made faces due north,

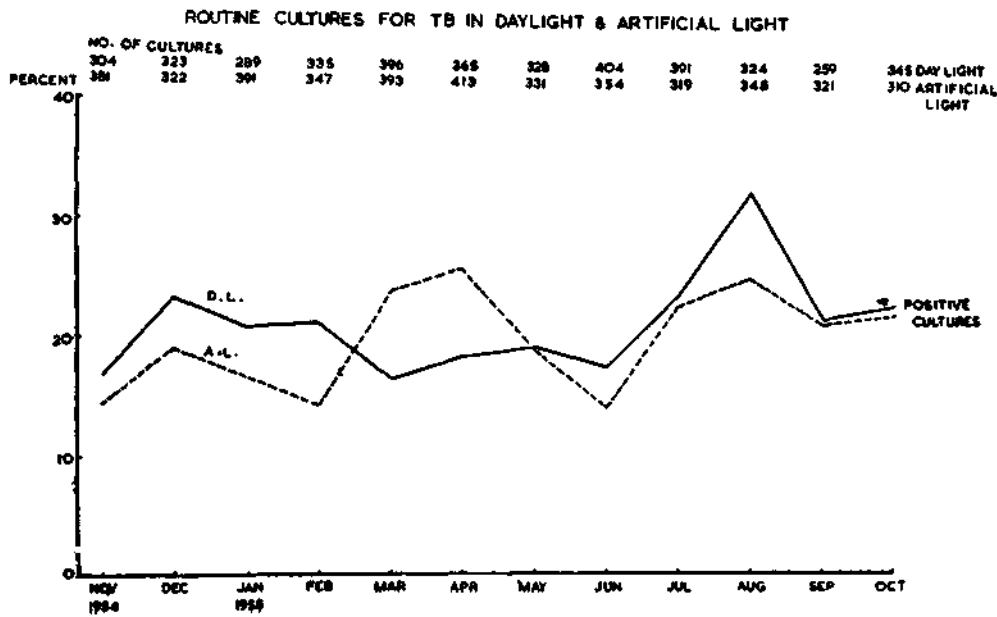
The results are given in Table III and Graph I.

TABLE III
The Effect of Light on Culture Work for Tubercle Bacilli

Cultures made in Day Light					Cultures made in Artificial Light			
Month	Total Specimens	Number Contaminated	Positive Cultures	% of Positives	Total Specimens	Number Contaminated	Positive Cultures	% of Positives
<i>1954</i>								
November	304	35	45	16.7	381	41	49	14.4
December	323	19	63	23.3	322	13	59	19.0
<i>1955</i>								
January	289	45	51	20.9	391	31	60	16.7
February	335	13	68	21.1	347	9	48	14.2
March	396	18	62	16.4	393	22	88	23.7
April	365	11	65	18.4	413	19	104	25.5
May	328	24	50	19.1	331		59	18.9
June	404	22	67	17.5	354	22	47	14.1
July	391	10	89	23.4	319	12	69	22.5
August	328	10	101	32.0	348	23	81	24.9
September	259	3	55	21.5	321	4	67	21.1
October	345	9	76	22.6	310	2	67	21.7
Total	4063	219	792	20.6	4230	203	798	19.8

The percentage of positives is calculated after deducting the contaminated from the total.

GRAPH I.



Viewed as a whole the results are practically the same, but there is some variation between the figures in the different months which is difficult to explain. In the months of March and April only are the figures for artificial light above those for day light and for all the other months the figures for day light are higher than those for artificial light. In both groups the the difference is statistically significant.

March and April are not the two months when there is the strongest light on the front of the laboratory—this is rather later, in May to July and therefore the light factor would not appear to be the reason for the increased findings in these two months. These two months had, however, the highest atmospheric temperature of the year and it is possible that the use of dark curtains reduced the temperature somewhat and that this is at the back of the difference. The slight superiority of positive results throughout all the other months is also hard of explanation ; could the artificial light conditions have caused a slight fall in efficiency of technique ? However, in general, it may be said that daylight as found in conditions under which the cultures were made, did not seem to have an inhibiting effect on the cultures.

Effect of Storage Conditions on Jensen-Lowenstein Medium

It is generally recommended that Jensen-Lowenstein medium should be kept in cold storage after its preparation until it is used. But in some laboratories cold storage space is limited and perforce medium has to be kept at room temperature. Does this make any difference to the culture results ?

For eight months during 1955 a large proportion of sputum cultures were made on two tubes, one of which had been kept in the refrigerator and one which had been kept at room temperature. The period for which the tubes had been kept at room temperature varied from two to seven days.

It is possible to compare the results of 1,044 cultures and the results are given in Table IV.

TABLE IV

T. B. Culture Results on Jensen-Lowenstein Medium kept at Room Temperature and in the Refrigerator

Media kept at	Positive Culture	Negative Culture	Total
Room Temperature	318	726	1044
Refrigerator ,,	332	712	1044

There is a very slightly better result for medium kept at refrigerator temperature but statistically it is not significant. It would seem reasonable to conclude that a short period of storage at room temperature has no serious effect on the medium.

Summary

(1) A brief account is presented of a number of small researches related to the isolation of tubercle bacilli.

(2) With the growing volume of culture work in tuberculosis laboratories there is a demand for simplification of technique.

(3) A comparison of simultaneous cultures of gastric contents and a laryngeal swab show that there would be a loss in positive findings if the cultures of gastric contents were omitted.

(4) Sputum swab culture is compared with homogenized sputum culture in 837 specimens and superior results are obtained with homogenized sputum.

(5) Under certain conditions such as may be found in field work delay in culturing laryngeal swab seems possible, but further research is still needed at higher atmospheric temperature. It is not possible to reduce the number of laryngeal swabs from two to one without loss of positive results.

(6) The effect of light on culture work has been studied over one year and in general appears to have no harmful effect.

(7) Short storage of Jensen-Lowenstein medium at room temperature does not seem to effect the value of the medium.

Acknowledgment

The help of Mr. K.C. George and other members of the laboratory staff is gladly acknowledged in the technical part of this study.

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Pulmonary Resection for Tuberculosis*

**(a six months to six years follow-up of patients
from the Bel-Air Sanatorium)**

By

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This paper surveys the results of 86 patients from the Bel-Air Sanatorium who have undergone pulmonary resection. Seventy-one have been followed-up for from six months to six years.

If we presented the total number of resections done by us at various hospitals, the figures would be more than trebled; however, in view of poor laboratory facilities or because of an inadequate system of follow-up, we have refrained from presenting total figures, and have, instead, confined the statistics to patients operated upon from the Bel-Air Sanatorium.

The most striking change in the trend of our surgical approach has been the drift away from thoracoplasty, and towards resection. For instance, in 1950 we performed 57 thoracoplasties as opposed to six resections; whereas in the first six months of 1955 we performed only 19 thoracoplasties as against 28 resections.

In a recent visit to the United States, we found that in some centres, the operation of thoracoplasty was abandoned in favour of resection. This appears, in many ways, to be a very acceptable point of view.

However, in India we have to face a slightly different facet of the disease. Many of the patients reaching a Sanatorium have bilateral disease and many of these have drug fast organisms.

In resection for tuberculosis, it is impossible to guarantee a firm and permanent bronchial closure. If a broncho-pleural fistula develops, in the presence of drug-fast organism, the situation may be uncontrollable.

Both in conversations and by letters I have discussed the technique of bronchial closure with various American surgeons.

Some of them deliberately crush the bronchus at the point of section, others stress that one should never damage the bronchus; some surgeons divide the cartilages, yet others stress that the cartilage should not be touched; some make it a great point to bury the bronchus stump, and others regard this as unnecessary. In the face of these diverging views they are all agreed on only one point—that each, in his own experience, hardly ever sees a fistula develop after resection.

*Paper presented at the XIIIth Tuberculosis Workers' Conference, Trivandrum, January, 5-8, 1956.

I have seen their technique of bronchial closure and it seems to be no different to the way we close the bronchus. Yet we still get the occasional fistula and they say they do not.

The answer probably lies in the fact that we often have to operate in the presence of drug-fast organism whereas they hardly ever have to do so.

In England, some schools refuse to do a resection if the patients are drug-fast.

We do not subscribe to this view, and feel that if, in such case, a thoracoplasty is not feasible, then we should perform a resection.

Resection is often the only way left to save a patient's life, and we should operate irrespective of the effect such desperate surgery may have on our statistics.

Apart from the dangers of development of a broncho-pleural fistula, a resection is obviously a more sound surgical procedure, causes less deformity and leads to the loss of less functioning lung tissues.

However, as things stand at present, we feel that there is still plenty of room for the old thoracoplasty operation, and the time has not yet come for a complete swing over to resection.

Fig. 1. shows the different operations done by us in the period from 1949 to June 1955.

Year	Thoraco- plasties	R E S E C T I O N S					TOTAL
		Pneumo- nectomies	Lobec- tomies	Segmen- tal	Wedge	Total	
1949	47	1	1	...	...	2	49
1950	57	4	2	...	...	6	63
1951	55	7	3	...	...	10	65
1952	59	13	3	...	1	17	76
1953	30	3	5	1	....	9	39
1954	36	8	5	1	...	14	50
1955							
January - June	19	8	9	7	4	28	47
Total 1949-June 1955	303	44	28	9	5	86	389

Fig. 2 is a graph which shows the fall in the number of thoracoplasties we have performed since 1949, and a corresponding rise in the number of resections.

Fig. 3 shows the age incidence of our resection cases. The peak, in all types of surgery is between the ages of 20 and 30 years. In the 50 to 60 age group the pneumonectomies and lobectomies have fallen in favour of segmental and wedge resection.

Fig. 4 illustrates the different types of resections performed. There is a general fall in the number of pneumonectomies and a corresponding rise in lobectomies and wedge and segmental resections. We have been satisfied with our results of wedge resection and are now extending the scope of this operation.

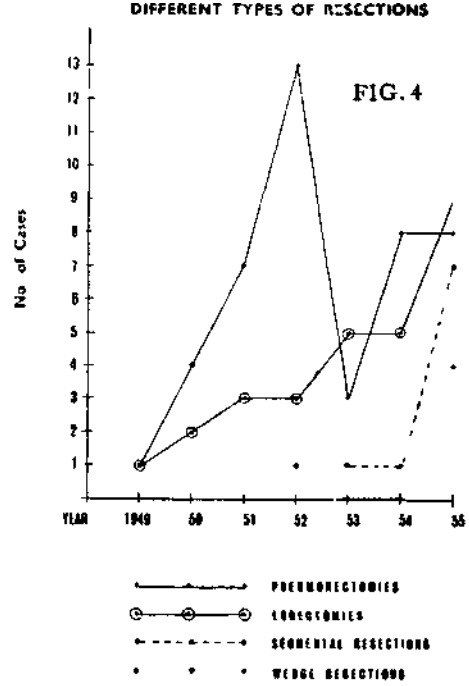
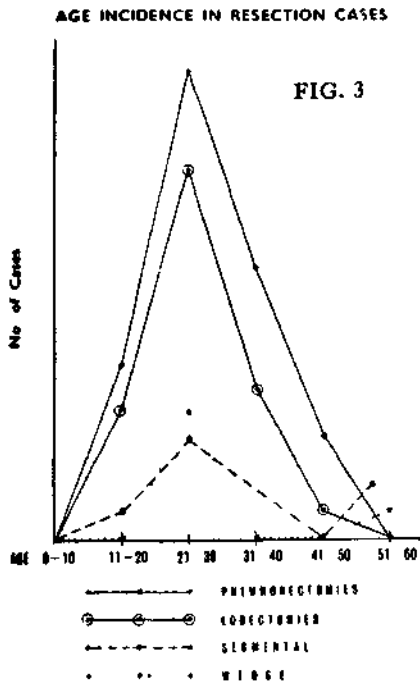
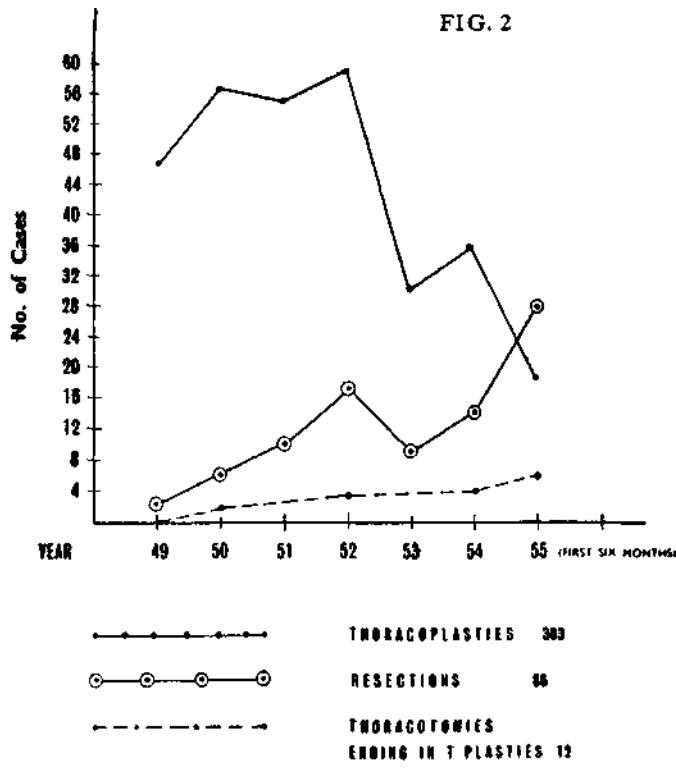


Fig. 5 illustrates the distribution of the different surgical procedures. The right upper lobe is the one most frequently operate upon.

The sputum conversion results (Fig. 6) are better than most of the published figures on thoracoplasty results. Fifty-eight of the patients had positive sputa before operation. Thirteen had negative sputa but smears of the resected specimens all showed tubercle bacilli. Unfortunately cultures and inoculations were not done to prove their viability, although Medlar has shown that we are unable yet to prove, whether an organism is dead or alive.

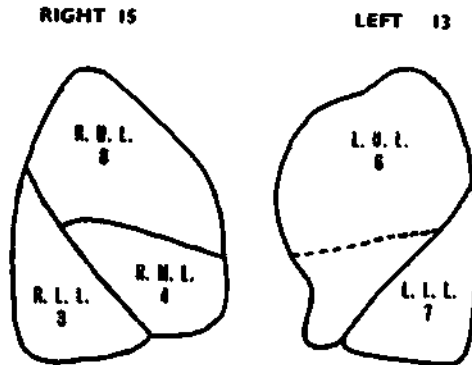
FIG. 6
SPUTUM CONVERSION

PRE-OPERATIVE		
Sputum	+ve	58
Sputum	—ve but secretions	
from resected Lung	+ve	13
POST-OPERATIVE		
Sputum	a) —ve	64
	b) —ve Later +ve Again	
Which Became —ve Again After		
Complementary Therapy		5
	c) Persisted	+ve 2

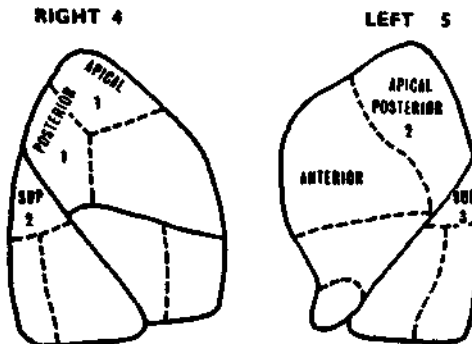
Of the two patients who are still sputum positive, one patient has developed an early fresh lesion in the contra-lateral lung a year after pneumonectomy ; the other patient was our first pneumonectomy for tuberculosis, and has developed a lesion in the remaining lung. She lives in miserable home conditions, surrounded by a family of many members suffering from tuberculosis.

A pertinent point to consider is whether one should undertake a pneumonectomy on a patient who, in escapably, has to return to very bad conditions at home—a state of affairs which is common in India.

FIG. 5
LOBECTOMIES 28



SEGMENTAL RESECTIONS 9



WEDGE RESECTIONS 5

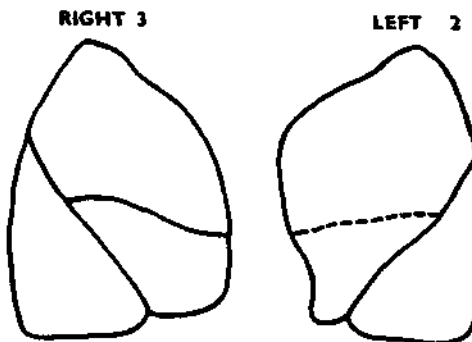


Fig. 7 shows the final results seventy-one patients who were followed up. Of the remaining 15 which we have been unable to follow up, several of these were from outside India, and others had given us their temporary addresses in Bombay and our questionnaires have been returned.

FIG. 7	
TOTAL NO OF RESECTIONS	86
NO OF CASES FOLLOWED UP	71
RESULTS:	
Back to Work : Full-Time	53
Part-Time	13
Still in Sanatorium	3
Deaths Within 6 Mts—6 Yrs	2
POST-OPERATIVE COMPLICATIONS:	
Broncho-Pleural Fistula	6
Fistula-Empyema	2
Empyema-Empyema-Fistula	1
Contralateral Spread	2
Ipsilateral Spread	1

Five patients died in all within the six-year period.

Three died in the first six months after operation. One died from respiratory insufficiency 48 hours after pneumonectomy; the second from an uncontrollable spread of disease one month after pneumonectomy; and the third, who developed cardiac arrest for a prolonged period during operation, died twenty-four hours later.

In the period six months to six years after operation, two patients died; one from a contralateral spread of disease following a bronchopleural fistula, and the second patient died from progression of his disease.

The overall mortality was 5.8%. This figure may appear unduly high, but there are two factors which are re-assuring. The first is that many of the patients operated upon were dismal surgical risks and their only hope for life rested in surgery; the second is that most of our early post-operative deaths occurred in the beginning, and improved surgical technique, and team-work have reduced our operative mortality.

From the Bel-Air Sanatorium we have had no operative deaths since October 1951 and we have not had an operative death in our last overall series of 170 resections for tuberculosis. This, however, is exceptional, and we feel that 2% should be regarded as the operative mortality for resection in tuberculosis.

Three patients are still in hospital.

One patient has a tube draining a non-tuberculous empyema nine months after pneumonectomy, but he will shortly be leaving the hospital. The other two patients are the ones already mentioned, as still having positive sputa from spreads of the disease in the contra-lateral lung following pneumonectomy. One of these has a minimal spread and should be brought under control fairly soon; the other has a gross and progressive spread in the contra-lateral lung and is unlikely to recover.

Results of Resection for Pulmonary Tuberculosis*

By

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On previous occasions our experience in the treatment of pulmonary tuberculosis by resection has been presented^{1,2} but those reports have been concerned only with the immediate problems and results. This presentation is an attempt to assess the late results of such cases. Tuberculosis being for the most part a chronic disease necessitates an appraisal of results of therapy on a long term basis. The most difficult part in any such study is the almost insurmountable task of trying to evaluate, for comparison, what would have happened to this same group of cases had they been treated by any other accepted means. We know that there are many methods and practices that will result in apparent healing of many pulmonary tuberculous lesions. Therefore, any change in method of management must be compared with other procedures. However, the same patient cannot be treated by two different plans and therefore an exact comparison can never be achieved. Only by the use of sufficiently large series to even out the discrepancies will statistics reveal what is the preferable method of treatment. Although our series of resections for pulmonary tuberculosis is not large in comparison with many others, we believe that it is incumbent on those doing this type of surgery in India to make available to the medical profession results in so far as they can be determined, so that in due course sufficient evidence will accumulate for the guidance of all.

Material

In the period from September 1948 to March 1955 pulmonary resection was carried out in 589 instances on the thoracic surgical service of our hospital. (Table 1.)

TABLE 1
PULMONARY RESECTION FOR TUBERCULOSIS
1948 TO MARCH 1955

Total Cases	211
Number of Resections	219
Hospital Fatalities	14
Case Mortality Rate	6.6%
Late Deaths	3
No Follow Up	38

Of that group, 219 resections on 211 cases were for pulmonary tuberculosis. This does not include operations for any other intrathoracic procedure such as decortication unless a resection was carried out concomitantly. All cases have been followed so far as possible up to September 1955. Thus the postoperative observation period

* Paper presented at the XIIIth Tuberculosis Workers' Conference, Trivandrum, January 5—8, 1956.

has varied from six months to six years and six months. We realize that six months is a short time in pulmonary tuberculosis, but studies have shown that most complications occur comparatively early, and we have used this short period in order to obtain as large a group as possible to increase the statistical significance.

Immediate Results

The early or hospital mortality for the first six years in this period has been reported previously. In that group there were 165 resections for pulmonary tuberculosis with an operative mortality of 6.6%. This figure has not been changed by the addition of 46 additional cases done after the date of the previous report and prior to March 1, 1955, the operative mortality rate remaining the same at 6.6%. As indicated previously, we do not believe this mortality rate should decrease appreciably or it would indicate we are not accepting for operation sufficient of the desperate, salvage cases. Although the mortality rate for all resections continues to decrease, that for tuberculosis has not. Upto September 1, 1955, six hundred and fifty-eight pulmonary resections have been done for all conditions with a mortality rate of 6.5% compared with 7.4% for the first 499 cases reported a year ago. However, in the last 125 cases there have been but three deaths or a rate of 2.3%. This indicates a general lowering of the risk of pulmonary resection in general but not for pulmonary tuberculosis, due to the acceptance of ever graver cases. This, we believe, is as it should be.

Follow-up Studies

Patients are referred to our department from a wide geographic range and from various sanatoria and individual physicians. Thus the follow-up of patients is even more difficult than it is proverbially stated to be. In most instances our follow-up information has had to be obtained by mail although in a large number of cases the patients complied with our request to send a recent x-ray of the chest. A questionnaire was sent out to all patients asking specifically about the presence of cough and sputum. Results of sputum examination and whether the test was by smear or culture was requested and the date and result of the last x-ray examination was asked for as well as requesting that the film be sent for study if possible. Some replied to the request for a general statement of their health and activities while many others did not. An attempt was made to find out the state of the patient's activities and whether or not he had resumed employment.

It is obvious that any appraisal based on such general terms and mainly on patients' reports without personal examination and without adequate laboratory studies can be only conjectural. However, the absence of sputa or a negative test and an x-ray of the chest without obvious evidence of tuberculous activity is reassuring that the lesion is under satisfactory control. Only the most general conclusions can be drawn and we have attempted to classify our results only into satisfactory and unsatisfactory groups. The former are those with no cough or sputum or negative sputum plus an x-ray of the chest showing no process that was not present preoperatively. The presence of a positive sputum, an unobliterated empyema space, incapacitating dyspnea or a demonstrably active process radiologically have been named unsatisfactory. We realize the marked discrepancies in any such survey, but know of no practical way to avoid them.

Fatalities

Of the original 211 patients having resection for pulmonary tuberculosis, there were 14 deaths in the early postoperative period leaving 197 that were discharged from the hospital. Of the 197 discharged cases we have not been able to trace 38 which is

regrettable as it greatly reduces the value of the study. We have reports of three deaths after hospital discharge. These all occurred within one year of operation and as far as can be determined were due to contralateral reactivation or extension in one, deterioration of general condition following cavernous sinus thrombosis in the early postoperative period in the second and in the third case all we can find about the patient is that she died of "fever". Patients that leave the hospital in good condition apparently run comparatively little risk of a fatal extension of the disease.

Complications

The late complications of resection for pulmonary tuberculosis are primarily limited to two main lesions. One is reactivation or extension of the tuberculous pulmonary process and the other is empyema either with or without bronchopleural fistulae.

Inasmuch as it is often practically impossible to distinguish between reactivation of a previously present latent process and an extension or spread of the lesion these two conditions have been considered together. As can be seen from Table 2 extension of the disease has been the most frequently encountered late complication.

TABLE 2
COMPLICATIONS

(EXTENSION OF DISEASE)

Reactivation or Extension, Ipsilateral (Now With Negative Sputa, 3)	11
Reactivation or Extension, Contralateral (Now With Negative Sputa, 2)	3
Reactivation or Extension, Bilateral (Now With Negative Sputum, 1)	3

This has been on the side of operation in 11, on the opposite side in three and bilateral in three. The large number of ipsilateral extensions has been due no doubt to our endeavour to preserve as much functioning pulmonary tissue as possible. As will be noted later, five of these patients with ipsilateral extension of the disease have now been treated by removal of the remaining pulmonary tissue on that side.

The other major postoperative complication is the development of empyema. (Table 3).

TABLE 3
COMPLICATIONS

(EMPYEMA)

Empyema, Postoperative Only (No Follow-Up On 4)	11
Empyema Pre and Postoperative (No Follow-Up On 1)	3
Total	14

This is a most distressing complication and especially so if it is accompanied by a bronchopleural fistula and even more so if it follows a pneumonectomy rather than a lobectomy. Empyema following lobectomy can usually be taken care of without great difficulty by a partial thoracoplasty and obliteration of the space. When the same complication follows pneumonectomy, however, it always is a very prolonged procedure to get the space obliterated and even more difficult if a large bronchial fistula is present. Even the most extensive thoracoplasty often leaves a small sinus tract posteriorly which is either extremely indolent in closing or may not close at all without a complete unroofing of the area as carried out in the Schede type of thoracoplasty.

It is always difficult to be sure why some patients develop an empyema and others do not. Of course, the presence of an empyema preoperatively with consequent possible soiling of the chest at the time of operation increases the risk of postoperative empyema appreciably. There are three of our cases that had empyema preoperatively that developed the same complication postoperatively although there had been a surprising number that have not developed this complication even though an empyema was present preoperatively and in several instances there was some soiling of the pleural space. Likewise, certain cases of empyema can be explained on the basis of breaking into the tuberculous lesion in the lung at the time of resection or some other unfortunate occurrence. However, there are other patients that have developed empyema for which we have no idea whatsoever regarding the etiology.

There have been many reports in the literature and numerous discussions regarding the exact method of closure of the bronchus and whether or not it should be reinforced with a flap of pleura or pericardial fat. We are of the opinion that the bronchus should be covered by some such material and make it our practice routinely to do so. However, there have been instances where this could not be carried out and no untoward results have occurred. In other words, we subscribe to the belief that such a procedure is advisable, but we are not able to substantiate our belief by definite statistics. It is our opinion that the development or absence of empyema in those instances where there has been some opportunity for soiling, is very likely on the basis of the patients' resistance to the disease plus the sensitivity of the organisms to the antibiotics. It would appear from our experience that those patients with good general resistance to the disease plus organisms that are still sensitive to the antibiotics have very little risk of developing empyema no matter what the provocation, whereas in those instances where the patient has either a poor resistance or the organisms are fast to all the drugs are apt to develop empyema in the absence of any obvious break in technique.

In three instances empyemas with temporary bronchial fistulae have followed segmental resections where this complication would undoubtedly have been avoided had we been more radical and removed the entire lobe. However, as pointed out above, this type of empyema in the presence of a considerable amount of pulmonary tissue is not difficult to take care of and in all cases these have healed in completely although several weeks to several months have been necessary before the tube could be removed entirely. We believe that this increased risk of empyema following a segmental resection is justified in the attempt to conserve functioning pulmonary parenchyma.

Except for reactivation or extension of the disease and development of empyema other serious but non-fatal post-operative pulmonary complications in this group have been very small (Table 4).

TABLE 4
COMPLICATIONS
(MISCELLANEOUS)

Late Wound Infection, Non-Empyema	2
Contralateral Pleurisy, 1 Year Post-Op.	1
Pericarditis, 4 Months Post-Op. Good Recovery	1
Positive Sputum From Contralateral Cavity, Awaiting Second Resection	1

In two instances there have been late wound infections, in one instance coming on two months after operation and in another instance four years after operation. In neither of these cases was there an accompanying empyema and one is now completely healed and the other one is making satisfactory progress. One other complication of interest was in a patient who developed a pericarditis with effusion four months after resection. This was presumed to be a tuberculous pericarditis although it was not necessary to aspirate the fluid, so it was not examined for acid fast bacilli. He responded to chemotherapy quite promptly and was discharged from the hospital again in good condition. Unfortunately, he is one of the cases that we have not been able to follow up in this present study.

In this group of 197 cases that were discharged from the hospital 26 had a total of 34 complications, a case rate of 12.5% (Tables 4 and 5).

TABLE 5
COMPLICATIONS
(SUMMARY)

Total Complications	34
Total Patients With Complications	26
Complications Case Rate	12.5%

At the present time although some still have a persistent empyema space that has not been completely obliterated, there are only eight known cases with persistent positive sputa.

Multiple Resection

Of the patients in this study five have had two operations on the same side for extension reactivation or spread of the tuberculous lesion. This complication in itself is not too serious as it can usually be taken care of by completing the pneumonectomy so long as the contralateral lung remains stable. All five of these patients

who have had a double resection on the one side have had no serious post-operative complication. They are all now with negative sputa. (Table 6).

TABLE 6
MULTIPLE RESECTIONS

BILATERAL RESECTIONS	3*
Empyema And Fistula (1)	
DOUBLE RESECTION (Completion Of Pneumonectomy) For Ipsilateral Reactivation or Extension, All Negative Sputa Now.	5
*Since Date of Study 2 More Bilateral Resections Completed Without Complication.	

In addition to the cases having two operations on one side there have been three cases in which bilateral resections have been done. Two patients had an uneventful convalescence while the other one developed an empyema on one side and a bronchial fistula still persists.

As the risk of pulmonary resection has become less and less and as the effect of thoracoplasty on the patient's pulmonary function has become more apparent, it has been quite generally accepted that a limited bilateral resective type of operation is more conservative of pulmonary function than is a thoracoplasty which always has to collapse a fair amount of normal lung in order to secure adequate collapse of the abnormal part. Bilateral upper lobe resections are quite readily tolerated and when resections can be limited to one or more segments of one of the lobes the outlook is even better. We believe that the number of cases referred for bilateral resection of comparatively well localized processes will continue to increase. Since the completion of these studies there have been two additional bilateral resections completed one of which necessitated removal of the posterior segment of the right upper lobe which was followed by a left pneumonectomy for residual disease after a seven rib thoracoplasty. As a group, patients with multiple resections have not given us any more concern than those with single operations.

We had hoped that it would be possible in the course of this study to determine the effect of a conversion type thoracoplasty following pulmonary resection. It has been our practice to follow an upper lobectomy or a pneumonectomy by a limited upper thoracoplasty with retention of the first rib and preservation of the transverse processes. By such a procedure an adequate collapse can be obtained which will keep the mediastinum in the midline, prevent the remaining lung from becoming overdistended and yet not result in any deformity. Those that have had lower lobe resections have not had a thoracoplasty as it is quite easy for the diaphragm to rise somewhat and help take up the space. Although one case for which we recommended an upper thoracoplasty following a left upper lobectomy and who did not have this procedure carried out later returned with an active process in the remaining lower lobe which necessitated completion of a pneumonectomy, this is actually the only instance in which this complication developed as far as we know among the limited number who did not have a thoracoplasty as advised. Even though post-resection thoracoplasty seems a logical procedure to us, on the basis of our follow-up statistics we must admit that the question is not solved,

DISCUSSION

Pulmonary resection can now be said to be an integral part of the proper care of patients with pulmonary tuberculosis. It cannot be compared directly with thoracoplasty or any other procedure as far as end results are concerned as resection is carried out in most instances where other procedures are not indicated. It should not be considered as competitive with any other method of treatment although there are, no doubt, cases that can be apparently arrested either by thoracoplasty or resection. Whereas a few years ago the trend was to do a resection where thoracoplasty could not be advised, now the trend is more and more to do a resection as the routine and to reserve thoracoplasty for those cases where resection is inadvisable. If all the major foci can be removed as safely as they can be collapsed, removal would certainly seem to be the logical approach. Although one cannot compare results of thoracoplasty and resection directly, it is interesting to see that the results of resection in tuberculosis are almost as good as those for the "good chronics" with thoracoplasty even though many more extensive cases are treated by resection. Most series of cases report a satisfactory result from thoracoplasty including a conversion of the sputum in between 80% and 90% of patients. Our own results for resection show that 69% are known to be living and apparently well with a negative sputum. (Table 7.)

TABLE 7
SUMMARY

Total Cases		211	
Less Op. Deaths	14		
And Late Death	3		
Leaving		194	
Inadequate Follow-Up	38		
For Study		156	
Cases With Known + Sputa		8	
Known Living And Apparently Well		146	69%
Known Living And Apparently Well	}		84%
Not Counting No Follow-Up Class			

If the rate is determined without taking into consideration the 38 cases that we are unable to follow, then the percentage of good results goes up to 84%. These results are more or less in line with the more extensive series reported from the West. Schlosser and Jarvis in a series of 400 patients treated by pulmonary resection reported a surgical mortality rate of 5% with 27 post-surgical re-admissions for reactivation or complications. They also collected from the literature a series of 2,213 resections, 70% of which were reported as living and well.

It is our belief that more and more of the extensive, desperate cases should be offered the benefit of resection therapy even at the expense of an increased mortality rate and serious complications. It is only by carefully proceeding along these lines that one can accurately determine just how extensive a case may be and still be carried through operation safely under the protection of the antibiotics. We are in complete agreement with the following quotation from Paine⁴:

"We can probably look forward to the time when the backlog of bad risk cases has largely disappeared. In the meantime these patients continue to challenge the ingenuity of the surgeon, sometimes spoiling his surgical statistics but always stimulating his work by the occasional salvage of those cases previously considered to be hopeless".

Summary

During the period September 1948 to March 1955 pulmonary resection was carried out in 219 instances on 211 patients on the thoracic surgical service of the Christian Medical College Hospital. There was a hospital fatality rate of 6.6% and in addition there have been three known late deaths. All these patients have been followed insofar as possible up to September 1, 1955. Thirty-eight patients could not be followed, while 146 or 69% are known to be living and well with negative sputum. The two serious post-operative complications included 14 instances of empyema and 17 instances of reactivation or extension of the disease.

It is believed that as facilities and personnel are available pulmonary resection should be considered more and more a routine treatment for those patients not arresting their disease completely on bed rest and chemotherapy. Thoracoplasty should be reserved for those patients in which, because of the distribution of the disease or other factors, cannot be safely treated by resection.

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Changing Concepts of the Pathologic Basis for Resection in Pulmonary Tuberculosis*

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The concepts regarding the pathogenesis and evolution of the lesions of pulmonary tuberculosis in man which have hitherto been taught and generally accepted, may have to be revised in the light of recent experimental and clinico-pathologic studies. The most careful and complete appraisal of the behaviour of pulmonary tuberculous lesions, based on animal experimentation, and necropsy and surgical material, is that of Medlar¹, which has recently been published in monograph form. This observer had the opportunity of studying the disease in addition, in its non-clinical or pre-clinical state, from autopsy material from a large group of patients who had died accidentally from causes unrelated to their pulmonary infection. This monumental work has revolutionized the thinking of many phthisiologists and chest surgeons. There is no doubt that modern antimicrobial therapy has also influenced this changing attitude.

As a mark of this change, one need only compare present-day indications for resection in pulmonary tuberculosis with those favoured by earlier workers, and present day results with earlier results². For example, in 1946, Sweet³ reported upon 63 patients who had undergone pulmonary resection for tuberculosis. The indications were thoracoplasty failure, destroyed lung, tension cavities, lower or middle lobe cavities, broncho-stenosis and bronchiectasis, etc. Only two were performed for "tuberculoma" "because of the well-recognized difficulty of management of such lesions". Four years later⁴, he reported again on the course of these 63 patients, all of whom had been operated upon prior to the appearance of the effective modern antimicrobial drugs. He found that only 24% of patients who had had lobectomies, and 45% of the patients who had had pneumonectomies, remained continuously well after surgery. The others had died, or developed reactivations, and still had active disease, while some developed reactivations of disease which subsequently became arrested or inactive again. Significantly, a greater per cent of patients who survived pneumonectomy (which, however was associated with a higher operative mortality rate) remained continuously well, than patients who had had a lobectomy only.

On the basis of this rather discouraging study Sweet had concluded that the indications for pulmonary resection should be four in number :

- (1) irreversible broncho-stenosis with chronic infection and secondary bronchiectatic dilatation,

* Paper presented at the XIIIth Tuberculosis Workers' Conference, January 8, 1956.

- (2) lower lobe, or, occasionally, middle lobe cavities.
- (3) persistent cavity after adequate thoracoplasty,
- (4) possibly *tuberculoma* (italics mine).

Cases suitable for thoracoplasty were no longer considered suitable for extirpation. In many quarters, these are still considered to be the standard indications for extirpative therapy.

Beginning scarcely two years later, however, reports in increasing numbers began to appear in the literature concerned with "simple excisions" for "localized necrotic lesions,"^{5,6,7,8,9} by segmental resections, and "wedge resections" in addition to lobectomies.

What has been the rationale behind this enthusiasm for removing localized caseo-necrotic lesions? An examination of the pathological concepts which we were taught in medical school, compared with the concepts which have recently emerged based upon studies of clinicians and pathologists led by Medlar, may help in giving us the answer to this question.

We were taught some ten years ago, that

- (i) the first or primary infection was usually an innocent affair. Progressive pulmonary tuberculosis was supposed to result from "re-infection" of endogenous origin, from a break down of apical pulmonary lymphohematogenous seedings.
- (ii) Old necrotic lesions represented healed, inactive, tuberculosis which ordinarily inspissated (thickened) and calcified, and did not break down. The presence of epithelioid cells and giant cells represented "active" disease.
- (iii) The occasional liquefaction of a caseous focus occurred as a result either of allergic response to tuberculin, or following an acute upper respiratory infection. Such suppuration might then lead to rupture of the fibrous capsule around the old focus, and rupture of a neighbouring bronchus, with emptying of the liquid contents of the focus into the bronchus (sloughing), with consequent open cavity formation. Subsequently, the disease spread by endobronchial dissemination, and this process would continue until the cavity was closed, and the fibrous capsule sealed off again by fibrous tissue.
- (iv) The important component in the primary complex was not the parenchymal lesion, but the lymph node component, because this led to the late, lymphematogenous, post-primary seedings, not only to the apical portions of the lungs, but also to bones, kidneys, etc. Activations of these seedings in later life led to "adult tuberculosis"—which was a disease of the young and poor adult. If no clinical tuberculosis appeared by the age of 35, the individual was probably "immune" to tuberculosis.
- (v) Spread was believed to be due to "endogenous" sources—and ordinarily there was no lymph node involvement in "endogenous reinfection" because there was rather prompt localization of the lesion in an allergic soil. "Exogenous reinfection" was believed to be rare indeed.

These concepts, in brief, were the accepted concepts which provided the rationale for treatment for many years, and are still being taught in many medical institutions. They are being seriously challenged by the new school of phthisio-pathologists, spear-headed by Medlar.

It is beyond the scope of this paper to describe the details of the twenty five years of research which formed the basis of Medlar's concepts of the behaviour of pulmonary tuberculous lesions. These can be best understood by referring to the monograph previously mentioned¹. However, it is the purpose of this paper to briefly review the salient features of his concepts, and to illustrate some of his points from surgical material from this Sanatorium.

In brief, minute tubercle bacilli-laden particles which are inhaled by man may give rise to multiple widely-scattered minute areas of necrotic lobular pneumonia, scattered by chance in any or all parts of the lung. These ordinarily heal by calcification or hyalinization.

When the air-borne particle lands in the upper or posterior portion of the lobes of the lung (apical or posterior segments of upper lobes, superior segment of lower lobe) the initial small necrotic lesion may undergo *liquefaction* and *sloughing* into draining bronchi, and in this manner give rise to progressive pulmonary disease. (Not *all* lesions in such locations progress, but enough do to prompt Medlar to call these "vulnerable areas" of the lung. There is some experimental evidence to indicate that posture has something to do with these "vulnerable areas"). Endobronchial dispersion of the bacilli-laden slough may slowly or rapidly produce dissemination of disease. The rapidity of the rate of necrosis, liquefaction, sloughing, and spread determine the extent of disease, whether minimal, or moderately advanced, or far advanced. The age of the lesion is not related to its roentgenographic extent. Dead tuberculous tissue is very difficult for the lung to dispose of, and the larger the area, the more difficult of disposal. There is *always* a communicating bronchus to these necrotic lesions—although sometimes hundreds of serial sections are necessary to demonstrate it. Tubercle bacilli may be harboured in necrotic lesions long after all non-necrotic components of disease have healed under the influence of modern antimicrobial therapy. These features of necrotic lesions, that is :

- (1) difficulty of disposal,
- (2) bacillary content,
- (3) tendency to liquefy and slough, and
- (4) drainage through connecting bronchi,

Cause the late relapses in the disease. Antimicrobial therapy can eliminate the non-necrotic component of disease—the histologic tubercles, and can cause cavities to shrink or even to disappear roentgenographically, with disappearance of acid fast bacilli from the patients' sputum—but the residual necrotic lesion is not significantly affected by antimicrobial therapy. Most disturbing of all is the evidence of continuing liquefaction and sloughing of some necrotic lesions even after prolonged uninterrupted combined antimicrobial therapy in adequate dosage. Thus the residual necrotic lesion, especially the sizable one, remains a threat to the patient which antimicrobial therapy has been unable to eliminate.

Since in most cases, at some stage, the pulmonary disease is limited to a relatively small area of lung tissue, it would appear that resection of such areas offers, at the present time, the best chance of eliminating these dangerous residuals.

What *sine* constitutes the dangerous residual? Medlar is quick to state that he does not know—that not *size, per se* but subsequent *behaviour*, is the important item. He can only state that small lesions, 2 to 3 mm. in size, if they are located in “vulnerable” portions of the lung, are more likely to liquefy and slough, than if they were located in the basal portions or in the middle lobe. Ultimately, of course, it is the clinician who must weigh experimentally, and clinically observe facts, and decide for or against surgery for caseo-necrotic residual lesions. Most phthisiologists feel that residual necrotic lesions over 1.0 cm. in diameter, on the chest x-ray, constitute a dangerous residual focus.

Clinical Material

Of our 25 cases of resection for pulmonary tuberculosis, one-third were for thoracoplasty failures, one third for caseo-necrotic residual lesions, and one-third for miscellaneous indications, including destroyed lobes or lungs, bronchiectasis, lower lobe cavity, etc. The eight patients in whom the caseo-necrotic residual lesion was the indication for resection had the following things in common :

- (1) The sputum of all had been negative for acid fast bacilli for months or years.
- (2) Previously obvious cavitory lesions had shrunken down to solid-appearing nodules or round dense shadows with less dense centres, often clearly visible only on planigrams.
- (3) All had had long courses of combined, uninterrupted anti-microbial therapy in adequate doses from eight months to two years.
- (4) All but one had had months to years of ancillary temporary collapse measures—either pneumoperitoneum, pneumothorax, or phrenic crush — in spite of which the nodule remained roentgenographically obvious.
- (5) At operation all had *more* disease in the localized area than suspected, or had an additional unsuspected localized area of residual necrotic disease.
- (6) Pathologically, *all* had active disease, as evidenced by caseation necrosis or liquefaction.
- (7) All did well following surgery.

CASE REPORTS

Case 1

M. B., a 21-year old Indian female, with a two year history of pulmonary tuberculosis classified as far advanced, was admitted with extensive involvement of the right upper lobe in December 1953. After eight months of bed rest, pneumoperitoneum, and combined uninterrupted antimicrobial therapy, the upper lobe shrank to a small solid-looking mass, and sputum, previously positive for acid fast bacilli, became repeatedly negative. The upper lobe was removed in August, 1954. The specimen showed three encapsulated areas of liquid pus, from one to two cm. in diameter, and many smaller confluent caseous nodules. Microscopic sections showed areas of extensive caseation necrosis, with a narrow border of fibrosis surrounding these areas. The patient did well post-operatively, and has been followed for one year after surgery, with negative sputum to smears and cultures, although she is no longer taking any antimicrobial therapy.

Case 2

A. B. J., a 22-year old Arabian male with far advanced pulmonary tuberculosis since 1953, characterized by a large (4 cm. diameter) cavity in the superior segment of the right lower lobe, was admitted to the Sanatorium in February 1954. On seven months of antibiotic therapy, pneumoperitoneum, and right phrenic crush, the cavity shrank to a small solid nodule over 1 cm. in size. Surprisingly enough, at the time of resection of this lesion, the right middle lobe was also found to be the seat of significant nodular lesion 5x4 cm. in diameter. The middle lobe, and the superior segment of the lower lobe were removed. The patient did quite well post-operatively. Grossly, the older disease appeared to be in the superior segment, which was almost completely replaced by dense scar tissue, containing enlarged, diseased looking bronchi, and occasional caseous nodules. The middle lobe was the site of many caseous nodules, up to 0.5 cm. in diameter, confluent with one another to make the sizable nodule felt at operation. Sections showed multiple caseous nodules surrounded by loose fibrous capsules within which were tuberculous granulation tissue. The patient's sputum remained negative on smear and culture ; drugs were stopped six months after surgery, and he was discharged to the Persian Gulf eight months after surgery, apparently inactive.

Case 3

C.D.K., a 28-year old Indian female, was admitted to the Sanatorium in February 1954 with a huge cavity in the right lower lobe measuring 5 cm. in diameter. She had a right phrenic crush in June 1954, and pneumoperitoneum and uninterrupted combined chemotherapy for eight months. Sputum became negative for acid fast bacilli ; and the cavity shrank to a small dense shadow. In November 1954, right lower lobectomy was uneventfully carried out. The superior segment was shrunken and replaced by a 2cm. fibrous area containing caseous material, with a small slit-like cavity in its centre. Multiple small caseous nodules up to 0.5 cm. in size were scattered throughout the basal segments. The patient did well, and has been followed up to 10 months post-operatively, sputum negative to smear and culture, although she has been without drugs for four months.

Case 4

K.G., a 22-year old Indian female, with onset of pulmonary tuberculosis classified as moderately advanced, in 1953, was admitted to the Sanatorium in January, 1955. A cavity in the left upper lobe had shrunk on an inadequate pneumothorax of one year's duration into a solid-looking nodule which showed up on several levels on planigraphy. After 18 months of uninterrupted combined antimicrobial therapy, sputum having remained negative for many months, segmental resection of the apico-posterior segment of the left upper lobe was carried out, on January 25, 1955. A 4cm. rubbery nodule when opened exuded green cheesy semifluid pus. On microscopic section of this segment, multiple caseous nodules with narrow fibrous capsules were present. The patient did well postoperatively and has been followed for eight months since surgery. All sputa at this institution were negative, as was culture. A single sputum smear done in another laboratory five months after surgery was reported positive. This was unverified by subsequent studies, by cultures, or by roentgenographic findings. After so many years of negativity, with the major focus removed, we believe that this single report was a laboratory error. We are following her closely.

Case 5

A.B.I., a 19-year old Arabian male gave a two year history of moderately advanced pulmonary tuberculosis, confined largely to the right upper

lobe. He had had right pneumothorax, right phrenic crush, and antimicrobial therapy for eight months. A large solid-looking lesion remained on the x-ray films, although sputa were repeatedly negative for acid fast bacilli, and therefore a right upper lobectomy was uneventfully done in February, 1955. A 6x3 cm. area of confluent caseous nodule occupied over one-third of the right upper lobe. Sections showed these to be thin-walled caseous nodules. The patient did well postoperatively, and was followed for seven months after surgery, with negative bacteriologic findings of sputum, and arrested status.

Case 6

Y. K., a 40-year old Indian female nurse, with moderately advanced tuberculosis since 1951, was admitted for surgery to the Sanatorium in June, 1955. For years, three solid-looking nodules had been observed in the upper right lobe, but only a brief period of chemotherapy had ever been tried because of allergy to Streptomycin. In October, 1954, and in subsequent films, it was noted that one of the shadows had begun to enlarge, and to become hazier. She had a low-grade temperature. Consequently, she was put on bed rest, and INH and PAS were started. Her sputum was never positive. She gained considerable weight on this regime. The nodular shadows regressed to the point where they had been for years. An upper lobectomy on the right was done in June 1955. Three large 1.5 to 1.0 c.m. caseous nodules occupied the apical and posterior segments of the right upper lobe. Because of a small apical empyema due to incomplete expansion of the remaining lobes on the right, a small tailoring thoracoplasty was done two months after the resection. She has done well, but it is too soon to report on her follow-up.

Case 7

H. M., a 21-year old Arabian female with disease dating back to 1953, moderately advanced in extent, had a small cavity in the left upper lobe. This was treated elsewhere with rest, drugs, and an attempt at artificial pneumothorax, which failed. Subsequently, she had a moderately severe hemoptysis, and reactivation of the lesion was noted on x-rays. She was admitted here in December, 1954, and after seven months of bed rest and combined antimicrobial therapy, the apical posterior segment of the left upper lobe was removed. Multiple caseous nodules up to 7 mm. in diameter, in clusters, were found to occupy about one-third of the volume of this segment, and sections showed multiple young tubercles without fibrous tissue reaction surrounding the caseous nodules. This patient also did quite well following surgery. She is still on bed rest and drugs.

Case 5

H. S. B., a 28-year old Arabian male, the onset of whose disease was in 1953, with moderately advanced tuberculosis, and a cavitory lesion thought to be in the right middle lobe, was treated with combined uninterrupted antimicrobial therapy for two years ; pneumoperitoneum for one year, and a right phrenic crush done in October, 1953. The cavity became a solid-looking nodule 1.5 cm. in diameter, which persisted for two years, and there was some suspicion of a tiny area of diminished density in its centre. After having observed this nodule for one year it was decided to resect it. However, the patient refused to consider surgery for an additional year, during which time it remained unchanged. At operation, to our surprise, in addition to the 1.7cm. nodule in the middle lobe, there was a 1.2 cm. nodule in the superior segment of the lower lobe. Both portions of the lung were resected. Grossly, the lesion in the superior segment appeared to be the older, with more fibrosis and some beginning calcification. The patient is still on bed rest and drugs. We might have saved him a year of hospitalization if he had agreed earlier to our plan of therapy.

DISCUSSION

In all these cases we were struck with the finding of a greater amount of disease than was expected judging from the roentgenograms, including planigrams of the chest. In addition, the presence of caseous nodules, which pathologically denote active or potentially active disease, after adequate antimicrobial therapy, bed rest, and ancillary collapse measures, up to two years in duration, was disturbing. This has been the experience of others as well^{10, 11, 12}.

We do not have the facilities here for serial sectioning of such caseous lesions as we have described. Medlar sectioned similar lesions studying hundreds of sections in some instances. He was always able to demonstrate a connecting bronchus with such caseous lesions, sometimes plugged with necrotic debris, and sometimes open.

Similarly, we have not been equipped to study these lesions bacteriologically in great detail. Others who have, however, have found that usually acid fast bacilli are not difficult to demonstrate on smears, but are somewhat difficult to culture, by ordinary methods,^{10, 13, 18}. However, if special methods are used, a much higher per cent of positive cultures is obtained^{19, 20}. The significance of the combination of these findings, that is, invariable connecting bronchus, and high per cent of lesions containing culturable bacilli, cannot be over-estimated. If such lesions of significant size are, indeed the source of reactivation of disease, and if they can be safely eliminated, thus removing the major focus of disease, the future of such patients should be much more firmly assured. Whether one accepts or rejects the view that such residual necrotic lesions of significant size should be removed because of the danger of liquefaction and sloughing via the ever-present connecting bronchus, the concepts of Medlar certainly deserve more detailed study and appraisal. What causes liquefaction and sloughing? And how can it be prevented? Or how can it be encouraged to go on to completion, thus allowing the resulting small cavities to completely heal? What will happen to these large necrotic lesions after prolonged antimicrobial therapy and negative sputum, once treatment has stopped?

Informed opinion in many quarters, especially in the Western countries, based on these investigations, is that large necrotic lesions which are well localized and have remained stable for some months on adequate antimicrobial therapy, in patients who are suitable surgical risks, should be resected.²⁰

We feel that these eight patients represent examples of this type of lesion. These people were all young, with presumably many years of active life facing them. They should be followed very carefully for years, and their course compared to similar cases in whom resection has not been done. Occasionally reports of studies become available in which so-called "tuberculomas" or localized rounded lesions have been followed for many years. Some of these are comparable to our cases—that is, they are "closed" or "inspissated" or "filled" cavities. Others have formed by the deposition of concentric layers of fibrous tissue, apparently with later calcification. The pathogenesis of such lesions is in doubt. Without serial roentgenograms from the initial appearance of such lesions, one cannot often distinguish clinically such lamellated "tuberculomas" from closed or inspissated cavities. Grenville-Mathers²¹ in a study of such lesions observed up to 12 years, roentagenographically found that over half showed activity, either by enlarging, excavating, or actually going on to dissemination. In America, such lesions are often indistinguishable from those due to certain fungi, such as coccidioidomycosis, and histoplasmosis³². This type of lesion has not been observed in India, to my knowledge.

Summary and Conclusions

(1) Recent clinico-pathologic investigations extending over a period of 25 years, have brought into question previously accepted concepts of the pathogenesis and behaviour of lesions of pulmonary tuberculosis.

(2) New concepts have arisen which indicate that not only is the open cavity a menace to the patient, but that "closed" or "filled" cavities of significant size are also probably dangerous, in that the contents of such lesions tend to liquefy and to slough out through connecting bronchi which are always present. They occur after the passage of variable periods of time, and apparently in spite of adequate combined antimicrobial therapy.

(3) Eight cases have been presented in which resections for this type of lesions have been done, and the rationale for advocating resection in such of cases is discussed.

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Mediastinal Emphysema Complicating Pneumoperitoneum

By

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Mediastinal emphysema is considered to be one of the rarer complications of artificial pneumoperitoneum. Stein (1951) in a review of the complications of pneumoperitoneum mentions that only fourteen cases had been reported upto that time. This may well be due to the fact that many cases with this complication are not recognised. This point has been emphasised by Small and Fremont (1951) who mention the routine use of radiography for the demonstration of air in the mediastinum and also an awareness of the "pericardial crunch synchronous with systole" as described by Hammon, in any patient who, following the initiation or continuation of a pneumoperitoneum complains of substernal discomfort or pain in the neck and difficulty in swallowing.

We feel that the incidence of mediastinal emphysema is greater than has been suggested, and an awareness of the possibility of this complication along with its signs and symptoms has resulted in more case reports being published. In 1953 and 1954 in this institution we have initiated 138 pneumoperitoneums and have given 4,346 refills. We have had three cases of mediastinal emphysema.

The signs and symptoms of this complication are :

1. It usually occurs at the beginning of the treatment usually after a refill.
2. Soon after the refill the patient may complain of pain in the mediastinal region or in the back. There may be a feeling of choking with some dysphagia, or pain on swallowing.
3. Physical examination reveals a person who is not in acute distress. There is evidence of pneumoperitoneum and examination of the neck reveals emphysema, this latter sign may be observed a short while after the onset of symptoms. Auscultation of the pericardium may reveal Hammon's sign.
4. Roentgenological examination will reveal the characteristic widening of the mediastinum due to air (Fig. 1) which may also be seen in the neck. If this is not very evident a lateral view may help especially if taken in the supine recumbant position as utilized by Lethman.
5. The symptoms do not last long and there is no need to abandon the pneumoperitoneum which may safely be continued as it is unlikely that the complication will recur.
6. The treatment depends upon the severity of the case. Bobrowitz (1953) advises oxygen and deflation of the pneumoperitoneum. Neither of these two manoeuvres has been necessary in our cases but may be mandatory in severe cases.

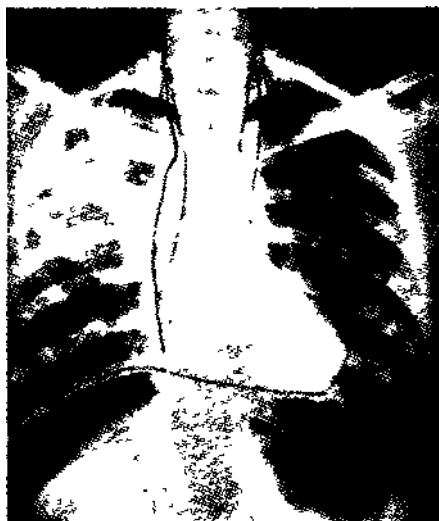


Fig. 1
An X-ray showing typical widening of the mediastinum due to air which can also be seen in the neck.

There are three theories regarding the way in which air may migrate from the peritoneal space into the mediastinum.

The first theory postulates that air may migrate *via* a hiatus beside the oesophagus or aorta but this is not in keeping with the rarity of the complication.

Some observers feel that there may be a small rupture in the diaphragm and several cases have been reported in which a pneumoperitoneum was complicated by a pneumothorax and a rupture seen.

The third theory suggests that air under pressure may rupture into the retro-peritoneal space and find its way into the mediastinum. We believe this is more likely, but why the air does not continue to leak through the weak spot needs to be explained, for all observers agree that the pneumoperitoneum need not be interrupted and in our three cases it was not necessary to deflate the air.

CASE REPORTS

Name.	Age.	Hosp. No.	Sex.	Date of admission.
T.A.	20 years	3784	M.	6-1-1954,

This 20 year old bidi-maker was admitted with the history that in March 1953 he had a haemoptysis. He consulted a physician who examined him and diagnosed pulmonary tuberculosis.

Physical examination revealed a well-built male. The relevant findings were increased resonance and remitus over the right upper lobe posteriorly with bronchial breathing and rales. The left lung was clear.

A p. a. chest x-ray taken on 8-1-1953 revealed a large cavity in the right upper lobe with a spread to the left base. Tomograms of the right upper lobe revealed the presence of three cavities in this lobe. His sputum was positive for A. F. B.

On 13-1-1953 at a Staff Conference a decision was taken to prepare him for a thoracoplasty, on the right side, with chemotherapy and pneumoperitoneum. Accordingly he was given one gram of Streptomycin twice a week and 200 gms. of INAH daily, and a pneumoperitoneum was initiated. He was given his third refill on 25-1-1954 amounting to 1000 ccs. of air and the same evening he complained of pain in throat and neck, but had no difficulty in swallowing. Physical examination revealed air in the neck, the patient was in no distress except for some pain in his neck accentuated by swallowing. Unfortunately no attempt was made to elicit the systolic crunch.

An x-ray taken the same evening revealed air in the mediastinum and neck.

The patient was given some mild sedation and passed a comfortable night. His symptoms gradually subsided in three to four days. There was no need to deflate his pneumoperitoneum and the next refill of 1000 ccs. of air was given on 29-1-1954 without any recurrence of symptoms. His pneumoperitoneum was continued till 9-4-1954. His disease improved considerably and on 29-4-1954 a six-rib extra-periosteal plombage thoracoplasty was done. He obtained a good collapse and was discharged on 20-9-1954 as a much improved case.

Name.	Age.	Hosp. No.	Sex.	Date of admission.
C.S.	30 years	3804.	M.	28-2-1954

This patient gave a history of fever, cough and sputum for the last 18 months. He had a small haemoptysis eight months prior to admission. He was diagnosed as a case of pulmonary tuberculosis and given 50 gms. of streptomycin and some INAH.

Physical examination revealed a fairly well-built apprehensive male. The salient features were bronchial breathing over the left upper lobe with rales. All the other systems were normal. His sputum was positive for A. F. B. and E. S. R. 36.

An x-ray taken on admission revealed multiple calcifications in the left upper-lobe. Tomograms of the left upper-lobe confirmed the presence of a cavity in this lobe.

His tuberculin test was positive and his histoplasmin was negative. It was decided to give him pneumoperitoneum and on March 26, 1953 the pneumoperitoneum was initiated, the patient being given 700 ccs. of air. On March 29, he was given a refill of 900 ccs. of air. That evening about seven hours after the refill had been given the patient complained of pain on chewing and swallowing. Examination revealed subcutaneous emphysema in the neck. There was a slight rise of temperature upto 99°F but no other abnormal finding.

The patient was given some mild sedation and he passed a comfortable night. The emphysema gradually subsided and the pneumoperitoneum was continued, the next refill being given on the 2nd of April.

The patient had no recurrence of his emphysema. He left the sanatorium against medical advice on 14-6-1954.

Name.	Age.	Hosp. No.	Date of admission.
M.S.	35 years.	3809	25-2-1954

This patient was admitted for the treatment of bilateral pulmonary tuberculosis more on the left than on the right which multiple cavities in the left upper-lobe confirmed by tomographic studies. He was put on 1 gm. of Streptomycin twice a week and 200 m. gms. of I.N.A.H. daily. A pneumoperitoneum was initiated on 2-3-1954 and deflated on 4-9-1954.

On 6-9-1954 a five-rib extra-periosteal plombage thoracoplasty was done on the left side under general anaesthesia. He had an uncomplicated post-operative course.

The pneumoperitoneum was re-started on 22-9-1954, 800 ccs. of air being given. During the refill he felt some pain in the neck to the right of the larynx, by evening the pain was worse but bearable and was accentuated on swallowing. Physical examination revealed subcutaneous emphysema over the abdomen and in the neck. Hammon's sign was present. Temperature 99° F., P. 84, R. 20, B. P. 120/80. Other symptoms were normal except for the thoracoplasty on the left side.

He did not need any active treatment and the emphysema gradually subsided. The pneumoperitoneum was continued and the next refill of 900 ccs. was given on 24-9-1954. He is now ready for discharge as an arrested case.

Summary

Three cases of mediastinal emphysema complicating pneumoperitoneum in the treatment of tuberculosis are reported.

The signs and symptoms of this entity are discussed and the theories explaining its occurrence are stated.

It is felt that the incidence of mediastinal emphysema in pneumoperitoneum is greater than previously reported, as many cases with mild symptoms may well be missed.

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XIVth INTERNATIONAL TUBERCULOSIS CONFERENCE

PROVISIONAL PROGRAMME

Saturday, 5th January, 1957.

10.00 A.M.— 1.00 P.M.

Meeting of the Committee of Secretaries.

3.00 P.M.— 5.00 P.M.

Meeting of the Programme Committee and of
the Budget and Finance Committee.

Sunday, 6th January, 1957.

10.00 A.M.— 1.00 P.M.

Meeting of the Executive Committee.

3.00 P.M.— 5.00 P.M.

First Meeting of the Council.

Monday, 7th, January, 1957.

11.00 A.M.— 1.00 P.M.

Inaugural session of the Conference.

3.00 P.M.— 5.00 P.M.

Second Meeting of the Council.

5.00 P.M.

RECEPTION

SCIENTIFIC SESSIONS

Tuesday, 8th January, 1957.

Subject :— “**Diagnostic and Biological Problems of Isoniazid-Resistant Tubercle Bacilli.**”

(10.00 A.M.-5.00 P.M.)

10.00 A.M.—10.30 A.M.

First Report by Dr. Gardner Middlebrook,
U.S.A.

10.30 A.M.— 1.00 P.M.

Co-reports

3.00 P.M.— 5.00 P.M.

Discussion

6.00 P.M.

RECEPTION

Wednesday, 9th January, 1957.

Subject :— “**Clinical and Epidemiological Results of Ambulatory Chemotherapy in Pulmonary Tuberculosis.**”

(10.00 A.M.—5.00 P.M.)

10.00 A.M.—10.30 A.M.

First Report by Professor R. Griesbach,
Germany.

10.30 A.M.— 1.00 P.M.

Co-reports

3.00 P.M.— 5.00 P.M.

Discussion

6.00 P.M.

RECEPTION

Thursday, 10 January, 1957.

Subject :— “**The Incidence of Tuberculosis in Economically Under-developed Countries and the Methods for Evaluating it.**”

(10.00 A.M.—5.00 P.M.)

10.00 A.M.—10.30 A.M.

First Report by Dr. P.V. Benjamin, India.

10.30 A.M.— 1.00 P.M.

Co-reports

3.00 P.M.— 5.00 P.M.

Discussion

6.00 P.M.

RECEPTION

Friday, 11th January, 1957.

9.00A.M.— 1.00P.M.

SYMPOSIA ON :

- (1) “Value of Tuberculin Reactions for Selection of Cases for B.C.G. Vaccination and Significance of Post-vaccination Allergy.”**
- (2) “The Importance of Nutritional Factors in Tuberculosis.”**
- (3) “Cortison in the Treatment of Tuberculosis.”**
- (4) “Role of Voluntary Tuberculosis Associations in Tuberculosis Control programmes.”**

(The names of Speakers will be given later).

3.00 P.M.— 5 P.M. Discussion

5.00 P.M.— 6 P.M. General Assembly and Closing Session of the
Conference.

8 P.M. BANQUET

NEWS AND NOTES

Annual General Meeting

The Annual General Meeting of the Tuberculosis Association of India will be held on April 21, 1956.

The Secretaries' Conference will be held on April 20, 1956.

Membership of I.U.A.T.

The annual membership fee of the Union is Rs. 21/-. Those interested in tuberculosis work in India are requested to enrol themselves as members for 1956 and 1957 by paying Rs. 42/-. Such members need not pay delegates fee to attend the International Conference.

Eastern Regional Committee of I.U.A.T.

Representatives from India, China, Thailand, Nepal and Singapore who met in Trivandrum, S. India, on January 9, 1956, under the Presidentship of Dr. P. V. Benjamin decided unanimously that an Eastern Regional Committee of IUAT be formed.

N.A.P.T. Scholarship

The Tuberculosis Association of India has selected Dr. K.S. Rao, Chief Medical Officer, Chest Clinic, Astodia, Ahmedabad, for award of the NAPT-INDIA scholarship offered to it by the National Association for the Prevention of Tuberculosis, London. Dr. K.S. Rao will reach the United Kingdom in May 1956 and will undergo training in tuberculosis for six months.

This is the second scholarship awarded by the N.A.P.T. Dr. Dip Singh who was selected for the first scholarship completed his training in October, 1955.

Children's Hospital Inauguration

Countess Mountbatten of Burma performed the opening ceremony of a 50-bed Hospital for Tuberculosis Children and a new block of 100-beds attached to the Lala Ram Swarup Tuberculosis Hospital, Mehrauli Road, Delhi, on March 16, 1956.

1956 Health Visitors' Course

The 1956 Tuberculosis Health Visitors' Course started in the College of Nursing New Delhi, on January 2, 1956. Fifteen candidates from different States are attending the course which is of eight months duration. Amongst the candidates are five females.

Seal Sale Collections

The collections made during the Sixth Tuberculosis Seal Sale Campaign, according to figures available, amount to over Rs. 5 lakhs.

CORRIGENDUM

In Vol. III, No. 1, dated December 1955, please note the following two Corrections in the article entitled "Sputum Swab Culture Compared with Sputum Homogenization Culture" by Rev. R.M. Barton:

Page 6, Table III

Please read "Smear+247" and not 'Smear—247'.

Page 6, Table IV

Please read the heading in the Left hand top line as "Smear+" and not 'Smear'.

The Indian Journal of Tuberculosis

ABSTRACTS

Vol. III

MARCH, 1956

Abst. No. 2

Tuberculosis in Europe.—Useful comparisons can be made by going through statistical data from different countries but it is likely that comparability may break down in certain respects, e.g. frequency of tuberculosis. In Netherlands and Denmark, before the war, the rates were the same but after war they diverged, and for 1950-53 period the annual average for Denmark was more than twice as high as in Netherlands : 51 cases per 100,000 population in Denmark against 123 in Netherlands. This difference is not real but is due mainly on account of statistical considerations. This is because in Denmark patients are counted, whereas in Netherlands cases are counted, (e.g. a relapse is considered a new case) and, secondly, because a reportable case in Netherlands would not necessarily be a reportable case in Denmark. For statistical purposes the countries have a different conception of what a case is. Thus figures could be used for comparisons within a country but could hardly be useful for comparisons between two countries.

To lay the basis for greater comparability from country to country and to examine the value of tuberculosis control methods used today and methods which are likely to be profitable in future, the WHO organised a 14-nation Study Group on Tuberculosis Control in Luxembourg.

The group came to the conclusion that mortality figures are reasonably reliable and could be compared from country to country but bear little relation to the tuberculosis problem as a whole. It was thought that the old rule that the number of necessary tuberculosis beds equals about twice the number of annual tuberculosis deaths was out of date.

For recording of cases of lung tuberculosis the Group recommended that a case should not qualify for inclusion in the records unless it has been shown either that the patient harbours the tubercle bacillus or that clear signs of the disease can be seen by x-ray. The Group was in favour of all cases being reported. In order that the tuberculosis problem could be measured the Group recognised the great value of a properly kept national register.

Considering the fact that case finding costs a lot of money (in Germany to discover a case of tuberculosis by mass radiological methods Costs 8 l,200) the Group was of the opinion

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that in countries with low prevalence of tuberculosis, and where mass examinations revealed too few cases to be economically justified, efforts should be directed at special groups particularly those exposed to infection and those liable to infect others—household contacts of tuberculosis cases, hospital personnel, medical and dental students on the one hand and school teachers, food handlers and postal employees on the other, besides those groups in which the prevalence is known to be high—old people, particularly men, in and out patients of hospitals, seafarers and students.

In countries with a medium prevalence of tuberculosis mass examinations would continue to be profitable for years to come according to the study.

As regards treatment of tuberculosis by administration of drugs the Group thought that drugs treatment should be continued long enough for the infection to clear up, in order to prevent a relapse and also to prevent the spread of infection to others.

On the question of bacterial resistance the Group thought that large-scale investigations should be undertaken to elucidate the resistance problem.

It was generally agreed that patients should be relieved of financial worry so that they will not be tempted to go back to work too soon.

In the opinion of the Group a patient should not be considered cured until he has successfully taken up an active life in society again. The suspicion of the discharged tuberculosis patient is one of the difficulties in arranging for his rehabilitation. The Group thought that a good job is a good way of preventing a relapse and the discharged patient who remains under close medical observation is much less dangerous to fellowmen than the undiscovered cases that do not turn up for periodic x-ray.

—(*Tuberculosis in Europe, WHO Press Release EUROJ27, December 16, 1955*).

Tuberculin Tests Amongst School-children.—Applying tuberculin tests during nine consecutive years to school children in a borough near Brussel, the authors noticed a noticeable regression of the tuberculinisation age. 22% of the children born in 1939 (aged 7 to 8

ABSTRACTS

years) were allergic. Only 13% of those born from 1940 to 1943 were positive. 11% among those born between 1944 to 1947 were positive and only 4% among those born in 1948 were allergic.

The recession of the primo-infection age, which has been particularly rapid during the last years, is a corollary of the recession of the contagiousness of patients suffering from phthisis. Among the happy consequences, one notices an important decrease of meningeal and bone localisations. These types were more frequent when younger children were infected. Pulmo-glandular tuberculosis is also rarer because it specially affects subjects aged 4 to 7 years.

Unfortunately extra-family contaminations did not diminish very much. The authors observed 64 conversions of the cutireaction. They were due in great number to undisciplined patients who neglected to treat themselves. No primo-infection had any grave consequences.—

—(*Contribution a la constitution d'un cadastre tuberculinique en Belgique—L'évolution de la tuberculisation de la population scolaire d'un village brabancon, de 1947 a 1955*)—*Jfeursisen, A., et Mme Jeurissen-Lauwers, Acta. Tuberc. Belg : 46 : 5 : 383*).

Abdominal Tuberculosis in Children.—

Lethem discusses the striking decline in deaths from abdominal tuberculosis in the past thirty years. As a cause of death abdominal tuberculosis has all but disappeared from urban districts though it still lingers in rural areas. Lethem attributes this to the provision of safe milk in English towns (nearly 100 per cent) while in the country districts an unknown proportion of raw milk is still drunk. The figures given in this table here reproduced are very striking.

Abdominal Tuberculosis in Children Under Five Years of Age Mortality 1951—1953, England & Wales

	1921		1953	
	Rates per million	No of deaths	Rates per million	No of deaths
London	136	58	4	1
County Boroughs	437	490	1	1
Urban Districts	236	390	1	2
Rural Districts	252	176	12	8
		1,107		12

—(*Monthly Bull. Ministry of Health, 1955, xiv, 144 as quoted in Tubercle : 36 ; 11: 335*).

Protection of Infants Against Tuberculosis.—The author recognises the fact that infants run great risk of being infected by tuberculosis. He thinks that vaccination at birth is safe, practicable, and effective though it does not

obviate the need for segregation and for general hygiene and education. It appears that vaccination is effective in protecting throughout the period of infancy though it is not known whether revaccination may not be necessary at 10—12 years ; this may depend on any exposures in the intervening years. Of all the vaccines which were used by the author, quickest conversion was afforded by the standard Danish BCG. A half-strength vaccine *i.e.* 0.375 mg. per ml, is preferable for this work in infants as it allows of more accurate dosage. The resulting complications are mainly directly proportional to the antigenic potency of the vaccine and to the dose given. The author is of the opinion that until the tuberculous antigen is isolated, vaccination with live attenuated bacilli offers a sound means of protection and because of the urgent need of this protection from the earliest possible moment, vaccination may most profitably be undertaken in the newborn despite the slightly increased risk of glandular complication at this age, provided the vaccine is given in accurate dosage, by an experienced person.

When potent freeze-dried vaccine is available generally the problem of "shortivity" and temperature control will no longer cause difficulty in distribution. A freeze-dried vaccine, free from clumping when dissolved, and containing a known number of evenly distributed and living bacilli, allowing of accurate controlled dosage, will be a great step forward, says the author.

In view of the need for careful follow-up and the difficulty of getting sufficient trained personnel, the author thinks that it would not be practicable to carry out mass vaccination in the newborn at present even if that were desirable. Nevertheless, where facilities exist—*i.e.* in maternity hospitals and where there is experienced paediatric supervision, the author believes that vaccination in the newborn period offers a very real contribution to the protection of infants against tuberculosis and that it might with advantage become an accepted part of "care of the newborn" in maternity hospitals. But, apart from such hospitals, the author thinks that it should at present be reserved for infants who are known to come from, or be going to, tuberculous households, and in these it should be a routine procedure as soon after birth as possible, *i.e.*, during the first week of life. Many such infants are, of course, born at home or in district maternity homes, and not every district has a paediatrician, but there are maternity and child welfare doctors in all areas, and one or more of these from each area could be trained to undertake this special work without its adding greatly to his or her existing clinical commitments, and so all infants at known risk could in fact be satisfactorily vaccinated.

The author concludes with the warning that with the changing pattern of tuberculosis and

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the rapidity of introduction of new antituberculous chemotherapeutics the future vaccination programme of infants may well differ significantly from that which he has outlined.

—(*The Protection of Infants Against Tuberculosis Gaisford, Wilfrid, British Medical Journal, 4948 : 1101 and 4949 : 1146*).

Longterm Unfitness in Tuberculosis.—

The author has presented an assessment of 365 selected cases of longterm working incapacity in disabled pensioners, followed up since 1942, and of whom reliable records were kept from the beginning. The author is studying the influence of occupation on the course of disease with a view to working fitness after the re-examination of the patients.

According to the study the building, metallurgical and textile branches have an unfavourable influence on the working prognosis of tuberculosis patient.

This unfavourable influence manifested itself by a reactivation of the disease on entering the occupations referred to above so that the disability pension was awarded for the second or even third time. Transfer to another occupation was, therefore, recommended following an interval of 4 to 7 years successfully. The phenomenon was not observed in the author's group with other occupations. On the other hand, a favourable working prognosis, without reactivation of the disease, was noted in the group of clerks, porters and wood workers.

The relationship of the form of tuberculosis to longterm working unfitness was studied. Chronic disseminated tuberculosis was found in more than half the cases, infiltrative in one quarter and focal in one sixth of the observed cases. With regard to working prognosis unfavourable figures were shown by chronic disseminated tuberculosis of which 55%, were left in pension. New as the infiltrative form with 50%, and the most favourable conditions were found in focal tuberculosis with 44% remaining in pension.

The influence of collapse therapy on the development of working fitness was also investigated as also the effect of complications by other diseases, including extrapulmonary tuberculosis.

Although the clinical material analysed was selected it points to some extent to the suitability or otherwise of various occupations for tuberculosis patients.

—(*Longterm Unfitness in Tuberculosis, Kvapil, Jfaroslav., Rozhledy v Tuberkulose a v nemocech plicnich : XV : 8 : 351*).

Resumption of -work by Pulmonary Tuberculosis Patients.—The author has given an analysis of 535 patients with pulmonary tuberculosis from the point of view of work resumption. Of these 60% were men, 40% women. The largest numbers were within the age group 21 to 50 years. The number of tuberculous processes found during the two

years under report exceeded those of preceeding years.

In pulmonary processes lesions in the upper fields predominated and there was a preponderance of the right lung. 86% of the patients had within one year negative KB cultures. Of specific complications, tuberculosis of the respiratory passages and the urogenital system predominated. 50% of the patients had active treatment and only 6 % were treated surgically. The most frequently applied treatments were chemotherapeutics with antibiotics, then PNO, thoracoplasty, EPNO and PNP. Mortality comprised less than 1%. 60% of the patients continued work, predominantly heavy manual and clerical work. With regard to the morbidity of tuberculosis in the various kinds of work, light manual work, not involving great physical or mental exertion appeared the most favourable. Of those at work 7% of the men and 7% of the women were on the sick list for longer periods.

The resumption of work by patients with pulmonary tuberculosis following institutional treatment and especially surgical treatment remains an important problem. The possibilities of retraining and of finding suitable, so-called commensurate employment, are not yet quite satisfactory. Also the social conditions of many patients prevent them from staying away from work for the sufficiently long period and cause them to resume work prematurely.

With age there is an increase in the number of pensioners for tuberculosis. The most numerous group of pensioners had tuberculosis for many years, next come pensioners with tuberculosis in a stage of healing, after operation and the like. The finding of 13.6% KB positive patients demands the systematic taking of repeated laryngeal swabs. The incidence of 13% of tuberculosis amongst non-calmetised children of tuberculous parents points to the necessity to intensify the systematic calmetisation of children, especially of tuberculous parents.

In view of the 21.7% of unfavourable living conditions it is necessary to improve the housing of patients with pulmonary tuberculosis, and also improve their social conditions, especially of temporary pensioners. This would obviate the need for tuberculosis patients to take up unsuitably heavy manual work for financial reasons and lower thereby substantially the morbidity of tuberculosis patients due to relapses and progression of the disease.

—(*Resumption of Work by 535 Patients with Pulmonary Tuberculosis, Long, Vladmir, Rozhledy v Tuberkulose a v nemocech plicnich : XV : 8 : 361*).

Tuberculosis among the BCG-Vaccinated.—During the period of two years from October 1949 to the end of September 1951, 10,446 out-patients were vaccinated with dried BCG vaccine. Of these, 2,337 could be followed

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after the vaccination. 37 of these 2,337 were found to show abnormal x-ray shadow.

Of these 37 cases, 6 were found nontuberculous; 7 were vaccinated with BCG in spite of being tuberculous; and the remaining 24 developed tuberculosis after the vaccination.

Of these 24 cases, seven might have been infected with tubercle bacilli prior to the vaccination: they were vaccinated in the pre-allergic stage. Accordingly, it was 17 cases which might have been infected after the vaccination.

The onset of tuberculosis was often found more among the infants, nearly all of whom had contagious tuberculosis within household and developed tuberculosis in spite of the vaccination.

The vaccination, according to the authors should always be performed after the x-ray examination among those of older age having contagious tuberculosis within the household.

The authors found no indication that dried BCG vaccine induced or developed tuberculosis.

—(*Onset of Tuberculosis Among those Vaccinated with Dried BCG Vaccine, Fujimori Takeshige; Oishi, Kazukog; and Yamaguchi, Tomomichi; Rep. Med. Res. Probl. Jap. Anti-Tbc. Ass. 3: 3: 342*).

Roentgenography of Pulmonary Apex.—

Out of the 118 cases which showed an obscure form of pathology on routine film, 52 (44.1%) were found to have positive pathology on apical roentgenogram. Among these 52 cases, there were only four which cast no questionable shadow on routine film while proved to have pathology on apical roentgenogram. In contrast with this, out of 80 cases which cast no pathological shadow on apical film, 14 showed pathology on routine film. This suggests that the apical roentgenography, according to the authors, may sometimes obscure the pathology. However, it seems that the combination of apical roentgenography will be of help in determining the type of pathology as in finding the pathology.

The majority of shadows were found at the central clavicle among the cases of which pathology was more easily detected by apical roentgenography, where the shadows were at the median clavicle among the cases of which pathology was more easily confirmed by routine roentgenography. By apical roentgenography, the majority of shadows moved down by one dorsal intercostal space or so. This shows that the dorsal pathology can be more easily detected by the authors' method of apical roentgenography.

It may therefore be said that different kinds of apical roentgenographies should be perform-

ed when any questionable pathology is observed on routine film.

(*Roentgenography of the Pulmonary Apex, Kojima, Komao; Yao, Takeshi; Sekura, Takashi and Fukuda, Masao; Rep. Med. Res. Probl. Jap. Anti-Tbc. Ass., 3: 3: 362*).

Surgical Treatment of Constrictive Pericarditis.—The authors report their experiences in 70 cases of constrictive pericarditis by pericardiectomy. Fifty per cent of the cases were proved to be tuberculous pericarditis. In the early post-operative period, 57.1% of the cases were markedly improved, 25.7% of the cases were improved, giving a total early improvement rate of 82.8%. There were 10 early deaths, or an early mortality rate of 14.3%. Of the 39 cases followed up for periods ranging from six months to six years, 66.6% were cured and 12.8 per cent improved, making a total improvement rate of 79.4%. There were six late deaths, or a late post-operative mortality rate of 15.4%.

An analysis of fatal and unimproved cases showed that most of these were chronic cases in which there were either marked impairments in cardiac and hepatic functions, or technical shortcomings in operation. Improvements in timing the operation, in the preparation of patients for operation, and in the operative technique will give better results in the surgical treatment of constrictive pericarditis.

Pericardiectomy should be done as early as possible after the diagnosis of constrictive pericarditis has been established. However, during the early stage of tuberculous pericarditis, when compensatory action of the body is not yet established and the chief disturbance of cardiac function is due to pericardial effusion, treatment should consist of conservative measures and close observation for changes in the disease process. Operation is done when pericardial constriction develops.

The resection of pericardium should be adequate, including the pericardium over the anterior aspects and the lateral borders of both ventricles. It is not absolutely necessary to resect the pericardium over the auricles.

The choice of incision for pericardiectomy is based upon the position of the heart and the pericardium, the specific needs of the operation, and the general condition of the patient. The advantages and disadvantages of the median sternotomy incision and the left parasternal incision have been discussed by the authors.

A well planned regime of anti-tuberculosis drug therapy during the pre-and post-operative periods is considered necessary by the authors. In cases where tuberculous infection is grossly active, a longer period of postoperative drug therapy should be instituted.

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The treatment of constrictive pericarditis by pericardiectomy is a complicated problem that requires the full co-operation of the physician, surgeon, anaesthetist and the nursing personnel.

(Surgical Treatment of Constrictive Pericarditis, Wu Ying-K'ai; Chand T'ieti-Hnei; Huang Kuo-Chun; Howe Yu-Lin and Hu Ming-Tao; Chinese M. J. : 73 : 2 : 122).

Renal Tuberculosis.—The authors have presented an analysis of 511 clinical cases of renal tuberculosis which is still a common disease in China. Statistics from three hospitals in Peking show that 16.3% of the genitourinary patients were cases of renal tuberculosis. Among the C.U.M.C. Hospital cases included in the series, 64% of the nephrectomies were performed for renal tuberculosis.

The ratio between male and female patients was 2.2 : 1, and in 79.6% of patients, the disease occurred between 16 and 40 years of age.

The important clinical symptoms were frequency of urination (82.3%), hematuria (72.4%), and both (66.9%). Only 12.1 % of the cases were free from these symptoms.

In the authors' series, 73.1% of the cases had tubercle bacilluria

The important points to be noted in the clinical diagnosis are bladder symptoms and sign of male genital tuberculosis in the male was as high as 58.5%. Symptoms of renal tuberculosis are usually referred not to the kidney but to the bladder and the positive clinical signs are found in the genital tract rather than in the urinary system.

The use of cystoscopy, retrograde or excretory pyelography should be based on actual conditions at the time, as each method has its own value in establishing diagnosis.

It is worthwhile to try to treat early renal tuberculosis with streptomycin alone, but the patient must be kept under close observation and checked up by pyelographic studies to evaluate the therapeutic results. Streptomycin is an excellent adjuvant to operative treatment and should be widely employed, according to the authors.

The incidence of unilateral renal tuberculosis with CONTRALATERAL hydronephrosis was 11%. This condition should not be mistaken for bilateral renal tuberculosis, and energetic treatment should be instituted.

The operative mortality in the 383 nephrectomies of the authors' series was 0.8%, post-operative sinus formation was found in 9.7%. After the use of streptomycin since 1949, there has been no operative mortality. Postoperative sinus formation was reduced to 3 per cent (6-cases including 2 cases of preoperative sinus).

When there is no stricture at the lower end of the ureter, it is necessary to excise the whole length of the ureter, according to the authors. The perirenal fat should be excised as completely as possible. No drain is indicated routinely, and, if used, it should not be left for more than 48 hours.

—(*Renal Tuberculosis : An analysis of 511 cases ; Wu Teh-Ch'eng ; Sun Chaang-T'i ; Wu Chieh-P'ing and Meng Kwang-Tung; Chinese M. J., 73 : 5 : 379.*)