REVIEW

A Review of Pulmonary Tuberculosis in Korea and at Severance Hospital*

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In many countries of the world today, pulmonary tuberculosis has dwindled statistically to a place of relative insignificance, and scores of huge tuberculosis sanatoria are being closed down permanently for lack of patients to treat. For South Korea, however, tuberculosis is today just as ravaging a scourge as the Great White Plague once was in Europe.

Incidence

Of over 25,000,000 persons living in South Korea, one-half of whom are under 19 years of age, the Korean National Tuberculosis Association estimates that 17,000,000, or 70%, are or have been infected with pulmonary tuberculosis. The pertinent morbidity and mortality statistics for 1961 are as shown: in Table 1.

Socio-Economic Drain

From a socio-economic standpoint, the loss to the Korean nation from pulmonary tuberculosis is illustrated in the following statistics:

	Korean Hwan	U.S. Dollars
1. Estimated loss of earning power by death due to tuberculosis	85,000,000,000	$65,400,000

Calculation: 85,000×40,000×(60−35)
(a) (b) (c) (d)

(a) National average annual income in hwan per capita=₩ 85,000 ($64.50)
(b) Number of tuberculosis deaths per year=40,000
(c) National average life expectancy in years=60
(d) Average age at death due to tuberculosis=35

2. Estimated loss of earning by giving up work (for moderately and far-advanced cases)	₩ 42,500,000,000	$32,700,000

Calculation: 85,000×500,000
(a) (b)

(a) National average annual income in hwan per capita=₩ 85,000 ($64.50)
(b) Estimated number of patients with moderately or

Table 1. Morbidity and Mortality from Tuberculosis in Korea 1961

	Korean National Tuberculosis Associaton Statistic		Ministry of Health & Social Affairs, Korean Government Statistics	
	Number of Patients	% of Population	Number of Patients	% of Population
1. Active pulmonary tuberculosis cases	800,000	3.2% or 1 in 30	1,000,000	4.0%
(a) Minimal or Mod.-Advanced	500,000			
(b) Far-Advanced	300,000			
(c) Number of new cases each year	120,000			
	Number Annually	Rate per 100,000 population	Number Annually	Rate per 1000,000 pop.
2. Deaths due to Pulmonary Tuberculosis	40,000	160	50,000	200

(About 5 deaths per hour)

*Thankful acknowledgement is made to Dr. Hyo-Keun Lee for valuable assistance in collecting statistics in Korea.

far-advanced Tb=500,000

(Note: It is true that a sizeable proportion of these patients continue working; but this is offset by the fact that tuberculosis attacks those most who are in the most productive age in life).

3. Rough estimate of cost of treatment:

₩ 15,600,000,000 $12,000,000

Calculation:

60,000×35,000+1,200,000×5,000+7,500,000
(a) (b) (c) (d) (e)

(a) Estimated average annual medical expenses per tuberculous ambulatory patient=₩ 60,000 ($46)

(b) Number of ambulatory patients treated in regular Tb clinics=35,000

(c) Average cost per Tb hospital bed per year (medical and surgical)=₩1,200,000 ($923)

(d) Number of hospital beds for Tb care=5,000

(e) Rough guess at expenses incurred in private clinics, drug stores, herb shops, etc., by patients for treating pulmonary Tb=₩7,500,000,000 ($5,770,000)

Total annual loss due to pulmonary tuberculosis (adding 1, 2 and 3 above)=₩ 143,100,000,000 ($110,100,000)

(Figures for extra-pulmonary tuberculosis are not included)

4. The number of close relatives of tuberculosis patients who are directly affected by this illness in their family total about 4,000,000 people.

5. To carry out adequate preventive measures and so bring the morbidity and mortality rates of tuberculosis down to those of more advanced countries, the Korean National Tuberculosis Association has estimated that 14,000,000,000 Hwan ($10,770,000) would be needed yearly. But the total money available for this purpose, both government and private, totals only 1,313,000,0000 Hwan($1,010,000), which is less than one-tenth of the amount needed.

Traditional Control Measures

Tuberculosis has existed in Korea from antiquity. In the past, efforts to cope with this vast problem in Korea have been, in the light of modern medical knowledge, both ineffective and ludicrous. In "Han Yak"——the ancient, traditional Chinese system of herb medicine still practiced in Korea——tuberculosis is designated by several names, all characterizing it as chronic, communicable and incurable. For centuries, "Han Yak" has prescribed for tuberculosis such remedies as ingesting eels and children's urine. General measures were aimed at "increasing the blood, strengthening the stomach and cleaning the lungs." A popular remedy still prevalent today among many is the ingestion of raw snake, and in this connection, one of us (P. W. Hong) recently performed a lobectomy for pulmonary tuberculosis in which an unusual variety of tape worm was coiled within the adjacent healthy lung, a variety requiring a reptile as intermediary host; the patient afterwards admitted, somewhat sheepishly, that he had tried to cure his disease by eating raw snake. Singing out lustily into the still, pre-dawn night is still occasionally heard, as someone with pulmonary tuberculosis endeavors to "strengthen his lungs". Fortunately, "Han Yak", though its practice still flourishes throughout Korea, 1961, is losing ground to modern medicine, and in November, its one college in Korea was closed permanently by the Military Government.

Modern Efforts at Control

The first tuberculosis sanatorium in Korea was established in 1931 at Haeju, in North Korea, by Drs. Rosetta and Sherwood Hall, American Methodist missionaries. In addition to treating tuberculosis patients, Dr. Hall conducted public health education for the general public. Thereafter, the Japanese opened several small sanatoria, but these treated Japanese patients only, until after World War II.

Following World War II, the National Tuberculosis Sanatorium in Masan was opened June 1, 1946, with a capacity of 144 beds, in buildings originally used for a Japanese Army Hospital. Since then, major government and military hospitals have maintained certain beds specifically for tuberculosis patients. In 1960, the large, modern National Tuberculosis Sanatorium in Kongju was opened for public use, with a total bed capacity of about 400 and with plans to offer surgery, beginning in 1962, to about 100 patients each year.

But in spite of the bravest efforts of a newly-established nation to cope with the burden of its number-one health problem, tuberculosis, Korea still can count only 5,000 beds for tuberculosis care, which is only one bed for the over 100 patients needing that bed. This continuing disparity was not the

result of indifference to the large-scale ravages of this disease, but the result of national poverty, compounded by a cruel, wasting war that drove 10 million people from their homes, inflicted a million civilian casualties in addition to heavy military casualties and destroyed half a million homes and most of Korea's industry. Where the Government is obliged to obtain half of its budget income from American loans and then to maintain the sixth largest army in the world, and where the average per capita income is only $64.50 per year, the chances of providing adequate hospitalization for tuberculosis, either governmental or private, are exceedingly remote.

Obviously, some approach other than building sanatoria was necessary to combat tuberculosis in Korea. But what? and how? In 1952, the World Health Organization was given $100,000 to combat the tuberculosis problem in Korea, and a careful survey was made. But surveys do not cure patients, and this survey only revealed the problem to be more dismal than had been realized. There being no hopeful direction to move in, a psychological road-block barred all persons interested in the problem from making any major move, it seemed, and the national budget appropriation for tuberculosis dwindled almost to nothing, due to a prevailing sense of futility. This was immediately following the Korean War.

Korea Church World Service Tuberculosis Control Project

In January of 1954, Dr. Ernest B. Struthers, a veteran Canadian medical missionary from China, opened a small pilot project at Severance Hospital in Seoul for treating pulmonary tuberculosis on an ambulatory and home-visiting basis. One of us (K. M. Scott) was on the original advisory committee for this pilot program. Admittedly, conditions for effective treatment of the disease could not be ideal, and many persons laughed off such a venture as being too unsophisticated. But initial results were encouraging, over-all sputum conversion rates during the first six months of therapy seemed to exceed 60 %, and, what seemed more important, a ray of optimism broke the psychological barrier of defeatism

Grants-in-aid from the United Nations Korean Reconstruction Agency and others, and sponsorship by Korea Church World Service (a major international, interdenominational Protestant relief agency), permitted this humble pilot project to expand. In Seoul, sister tuberculosis clinics were established by Dr. Struthers in the Red Cross Hospital (late 1954), the Dong Boo City Hospital (1955), the Chung Boo City Hospital (1956), the Yong Dong Po City Hospital (1957) and the Ewha University Hospital (1960), all under KCWS sponsorship. Outside of Seoul, with the help of the Australian radiologist Dr. John N. Burgess, similar clinics were opened in Andong, Chungju, Inchon, Iri, Kwangju, Mokpo, Sapkyo, Taegu, Wonju and Yongin. The direction, training and statistical evaluation for this project continued to come from the original clinic, the Severance Hospital Chest Clinic. Anti-tuberculosis drug supplies and X-ray film were provided by KCWS and the Korean Government to permit uninterrupted free care for the predominantly poor and destitute, clinic patients.

By 1960, these 16 KCWS clinics were treating over 10,000 patients anually, over one-third of whom had been freshly discovered in these clinics. About 88% of patients with early disease, and even 60% of those with advanced disease, were becoming non-infectious in 6 months. One is impressed with the observation that, in general, these patients now understand the seriousness of their disease and are cooperating closely in reporting regularly to their respective clinics for sputum and X-ray control studies, for their supplies of drug and for further instruction and encouragement.

By 1960, also, trained nurses and social workers from the KCWS tuberculosis clinics were making over 10,000 systematic home visits yearly. These provide excellent opportunity for public health instruction, for connselling in tuberculosis hygiene, and furnish the realistic contact needed with patients and their families, revealing their individual, practical problems and meeting them individually, thus preserving the whole program from working in the

dark or from operating out of an "ivory tower". In most places, home-visiting nurses have been well received, and their advice, in general, has been closely followed. Only occasionally is there opposition to home visiting, and this exists only when patients fear that others may learn that they have tuberculosis, since landlords, and even relatives, have been known to turn such patients out on the street.

Ambulatory treatment of tuberculosis in Korea has its appalling problems, which are basically economic ones, and systematic home visits have shed valuable light on the degree and ramifications of poverty and overcrowding as they affect tuberculosis. Poverty causes malnutrition and overcrowding. Overcrowding perpetuates infection by continuous intimate contact. Poverty and overcrowding fan the flames of tuberculous infection, especially, and tuberculous infection fans the flames of poverty and overcrowding. Figure 1 illustrates one finding of the KCWS

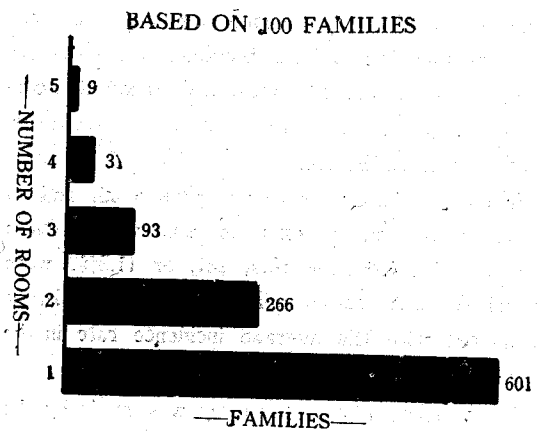

Fig. 1. Number of Rooms per Family

home-visiting program, namely that 60% of the patients live in homes having only one room, 26% in homes having two rooms. Half of these rooms are 8 feet×10 feet or smaller. Even here, though, the visiting nurse can have a single-room home arranged in such a way as to reduce materially the exposure of others in the family to the patient's infection.

Very often, prescribing and even donating adequate medication is meaningless unless somehow the grinding poverty of certain patients is ameliorated. Brought to light by the home-visiting nurses and social workers, these patients are given relief food (usually 15 pounds every two weeks), vitamins, warm clothing. During freezing weather, coal briquettes are often given for fuel. Occasionally, a small shelter has been constructed against an overhanging bank for the patient. Often, all that is needed is bus fare. These details are all part of the modest program of the KCWS Tuberculosis Control clinics, which must be realistic if they are to be effective. Well over 100,000 pounds of food (87,700 pounds from the Severance Hospital Chest Clinic alone in 1960) is issued yearly to KCWS Clinic patients.

The wonder of it all is that, in spite of obvious serious obstacles, ambulatory home treatment has been successful and, with the help of partial drug and film subsidies from the Korean Government, has in our hands cost only a little over $10 a year per patient (as compared with an average $60 in other countries). Thus in 1961, on a very small budget, 15 KCWS Tuberculosis Control clinics discovered and treated 6,696 new cases of tuberculosis (1,193 in the Severance Clinic).

Clinic Routine

In the KCWS clinics, patients are seen by appointment at weekly or bi-weekly intervals and by the same physician. The clinic routine, as first established in the Severance Hospital Chest Clinic, is outlined as follows:

A. Clinic visits:

(1) every week for patients nearby.
(2) every 2 weeks for those farther away.
(3) every 3 weeks for those from out of town.
Home visits: initially, then once a year (average).

B. X-ray:

(1) initially, and repeat in 2 months,
(2) then every 3 months while on treatment.
(3) special studies as indicated.
(4) Follow-up after treatment completed: at 3 months, 6 months, and 1 year.

C. Sputum examination:

(1) every 2 months.
(2) If negative on direct smear, then concentration. (Concentration tests are routine in the

Severance Clinic)

(3) If concentration is negative 3 times, then culture.

D. Drugs:

(1) INH for most cases—based on adult dose of 300mg/day.

(2) PAS—use varies from clinic to clinic.

(3) Streptomycin 1 gm twice weekly—reserved for complications, poor response to other agents and in conjunction with surgery.

(4) Pyrazinamide, Cycloserine, etc., generally limited to resistant cases requiring surgery.

E. Conferences:

Each patient is reviewed by the entire staff in the clinic initially and at least every 3 months. Possible candidates for surgery and problem cases (includes those from outlying clinics) are reviewed by the Severance Clinic Chest Surgical Conference held weekly by the combined clinic staff and thoracic surgery staff of Severance Hospital (See later section on surgical treatment of tuberculosis).

Special Research Projects

These are being conducted by Dr. Hyo Keun Lee, Dr. Sung Ok Park, and others of the medical staff in the Severance Chest Clinic. Though unpretentious, these are proving to be practical and very helpful.

A. Chemoprophylaxis. A controlled study currently on children below 5 years of age who live in tuberculous households and give a positive tuberculin test. A preliminary report strongly indicates that INH used prophylactically is exceedingly effective in usual doses in suppressing clincal tuberculosis.

B. INH metabolism. Recent studies on INH inactivation in 248 Severance Chest Clinic patients indicate that 69% of patients are rapid INH inactivators, 16% are intermediate, and 15% are slow inactivators (The significance of this finding awaits further studies).

C. Random determinations of **PAS in the urine,** to determine the extent of cooperation of clinic patients receiving PAS, have revealed that only 8 % of Severance Clinic patients have failed to cooperate faithfully in ingesting prescribed doses of PAS, and these few have been largely from among the very ignorant or those with minimal disease.

Contact Surveys

An epidemiological survey conducted by the National Tuberculosis Center in 1957 on the families of 100 tuberculous out-patients reported that 88.4% of children under10 years of age living in the same house with active pulmonary tuberculosis patients showed a positive tuberculin reaction; and 36.8% of children under 10 years of age living in the same house with active pulmonary tuberculosis patients showed radiological evidence of active pulmonary tuberculosis.

This report and other pertinent observations pointed to the necessity of having good contact surveys. And so in 1959, a concerted effort was made in the KCWS clinics in Seoul to examine roentgenographically every family household contact of 900 index clinic patients under treatment. As a result, 3,002 contacts, or 85.1% of the total number of contacts, were examined (The Severance Chest Clinic reached 90.2% of all its patient-contacts). Of these 3,002 contacts, 357 (11.9%) were found to have active tuberculosis unknown before.

In 1960, a similar survey was performed, and of 2,482 family members examined who were in close contact with clinic patients, 281, or 11.3%, were found to have active pulmonary tuberculosis, as compared with the average incidence rate in the general popupulation of 3.4%.

An even larger contact survey was made by the KCWS clinics in Seoul in 1961. Of 4,336 household contacts examined, 598, or 13.8%, were found to have active tuberculosis.

Of greater significance than the finding of a high incidence of infection among contacts is the fact that the majority of the new patients found by contact survey have only primary or minimal tuberculosis, a stage which usually responds readily to chemotherapy within 6 months. This proportion is in sharp contrast to that seen in the index cases (the "usual" clinic cases). Figures 2 and 3 show this contrast well in graph form; these figures are based on the contact survey of 1961.

The practical lessons to be learned from these surveys are obvious and important:

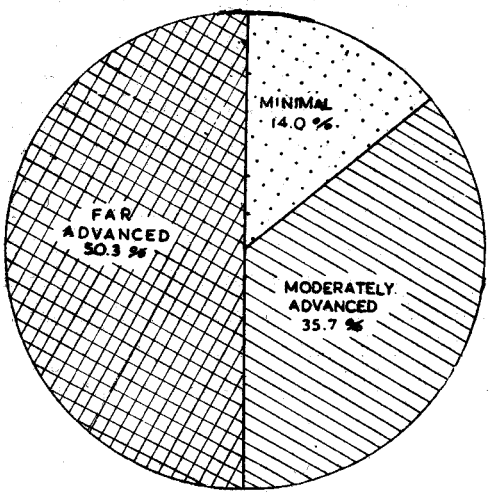

Fig. 2. O.P.D. Index cases, 1961

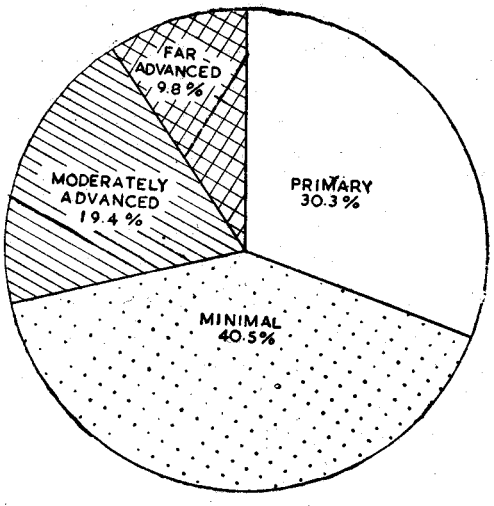

Fig. 3. Contact cases, 1961

(1) The most fruitful and the most economical means of discovering new cases of tuberculosis in Korea is, we believe, by contact survey, which can be effective, we also believe, only where a dedicated, able staff have won the confidence of the the patients.

(2) The new patients discovered by careful contact surveys are predominantly early or minimal cases, the kind controlled most quickly and most easily in any out-patient program.

(3) Therefore, for practical usefulness and economy, and for greater effectiveness in the therapeutic control of the disease, major emphasis should be placed on contact surveys for discovering new cases, at least for the present in Korea, under her existing economic limitations.

SURGICAL TREATMENT OF PULMONARY TUBERCULOSIS AT SEVERANCE HOSPIAL

No program for the control of pulmonary tuberculosis could be complete without providing the opportunities of surgery for those patients for whom surgery is imperative. Such opportunities have for a number of years been available at Severance Hospital, where surgery for tuberculosis is emphasized. The remaining pages of this review article will be devoted to a summary of the authors' experiences at Severance Hospital in major surgery for pulmonary tuberculosis, viz. in pulmonary resection and thoracoplasty.

By way of introduction, it should be remembered that Severance Hospital is not an endowed institution, nor does it receive government subsidy. In view of the economic situation of tuberculosis patients in Korea, who, in general, are economically non-productive, having already been bled-white financially, in most cases, by the time they reach surgery, it becomes obvious why this service must depend upon outside sources for monetary support to subsidize the surgical care of the many who can afford to pay little or nothing toward their hospitalization. Particularly does this need become appare t as the thoracic surgery service enters, in 1962, into its fine new facilities in the Eighth U.S. Army Memorial Chest Hospital unit of Severance Hospital, which consists of 100 beds donated primarily for the treatment of tuberculosis.

During a period of five years and three months, from January, 1956, to March, 1961, a total of 225 patients were operated on for pulmonary tuberculosis. Of these, 145 cases received resection; 80 cases had thoracoplasty.

Selection of Cases: A weekly conference was held jointly by surgeons, chest physicians and radiologists, and all surgical candidates were presented,

the X-ray films and history of past chemotherapy carefully reviewed and the type of surgery decided, if any was indicated. In many cases, further medical treatment or further studies such as laminography or drug resistance studies were decided upon. Approximately 1300 cases were thus recommended for surgery at this conference, and it is unfortunate that only 225 patients were able to come to surgery, the majority of the remainder not receiving operation simply because of their very limited financial resources. Some, of course, refused surgery out of fear.

Sex and Age: 163 cases (75.1%) were males, and 54 cases (24.9%) were females. The age distribution shows that the majority of the cases (117 patients out of 213 at the end of 1960) were in their third and fourth decades of life, the youngest being 5 months old and the oldest 52 years of age(Table 2).

Table 2. Age of patients (end of 1960)

Age in yrs.	No. of Cases
0—10	1
11—20	16
21—30	102
31—40	75
41—	19
Total	213

The Ratio of Resection and Thoracoplasty: The total mumber of surgical cases increased every year, and the number of resections has gradually increased compared to the number of thoracoplasties in recent years. For instance, in 1960, resection was performed in over 70% of all cases, while in 1957, both types of surgery were practically equal in number. This may illustrate the fact that medical treatment has improved during the past 5 to 6 years, and a smaller number of far-advanced cases are referred for surgery, and also the fact that the patients, as well as the physicians, are increasingly aware of the merits of surgical treatment in well-selected cases.

Operative Mortality: Over-all operative mortality was 2.6%. Out of 80 cases of thoracoplasty, two died during the immediate postoperative period, with a mortality rate of 2.5%. Among the 145 cases of resection, four died, with mortality of 2.6%, this comparing favorably with the operative mortality of 6.5% reported by Lee (1955).

One patient died of uncontrollable bleeding from the entire operative field from an abnormal bleeding tendency. Another patient, a 33-year-old male who had a left 7-rib thoracoplasty in another hospital several years previously, died after a 2nd-stage 7-rib thoracoplasty in our hospital. He tolerated the 1st-stage thoracoplasty without difficulty, and at the time of the 2nd stage, blood replacement was not adquate, and probably cerebral anoxia during the procedure was the cause of death, for he died several hours after surgery, without ever regaining consciousness.

Among the resection cases, two pneumonectomy cases died of uncontrollable bleeding from the raw area of the chest wall following extensive extrapleural dissection. Another 32-year-old male had a right pneumonectomy which was complicated by empyema, and this was treated with open drainage. There was bleeding from the tube several days after surgery. This was treated with blood replacement. This patient died during the third episode of excessive bleeding before surgical hemostasis could be attempted. The source of hemorrhage was never determined. One patient died following lobectomy and cause of death was liver failure(Tables 3 and 4).

Table 3. Operative mortality

	No. of cases	No. of death
Thoracoplasty	80	2—(2.5%)
Resection	145	4—(2.6%)
Total	225	6—(2.6%)

Table 4. Operative mortality in resection cases

	No. of cases	No. of death
Pneumonectomy	25	3—12.0%
Lobectomy	107	1— 0.9%
Segmental resection	13	0
Total	145	4— 2.6%

The operative mortality of 12% following pneumonectomy is too high and should be reduced by a more refined surgical technique and a more careful

selection of cases. Uncontrollable oozing from the raw chest wall following extra-pleural dissection has been found to be a major problem.

The operative mortality of 0.9% following lobectomy is considered to be within acceptable limits.

Resections and Complications: Of 145 resection cases, pneumonectony was done in 25, lobectomy, bilobectomy or lobectomy plus segmental resection in 107, and segmental resection in 13 cases. Excluding pneumonectomy cases, 120 cases underwent resection, the upper lobe, or a portion of the upper lobe, alone or together with other portions of the lung, was removed in 106 cases (88%). Obviously the upper lobe is the most frequently involved portion in tuberculosis (Table 5).

Table 5. Resections

Pneumonectomy	25(17.2%)
Lobectomy	107(73.8%)
Segmental resection	13 (9.0%)

The most serious complication of resection was bronchopleural fistula, and this occurred in three cases. Empyema without bronchopleural fistula occurred in four cases. These complications were well managed by open drainage, except in one pneumonectomy case who had to have a thoracoplasty subsequently. Wound infection occurred in 5 cases, all of them by coagulase-positive staphylococci. A serious atelectasis was seen in one case. Post-operative bleeding occurred in 5 cases, 2 of whom had to be reopened for hemostasis(Table 6).

Table 6. Complications in resected cases

	Pneumo-nectomy	Lobec-tomy	Segmental resection	Total
Broncho-pleural fistula	1	1	1	3
Empyema	1	2	1	4
Atelectasis		1		1
Postoperative bleeding		4		4
Wound infection		4	1	5
Total	2	12	3	17

Long Term Results: Of the 225 surgical cases, 115 patients were followed for a period ranging from 5 years to 6 months. The others were either returned to the care of the physician who referred them to us or were lost from the follow—up. Those who showed negative sputum for over 6 months continuously and showed no x-ray evidence of spread of the lesion were considered to have been converted to inactivity. The others who had positive sputum postoperatively or x-ray evidence of spread of the disease or both were regarded as failure cases with active disease.

Of the 115 follow-up cases, regardless of the type of surgery employed, 85.2% had good results, while 13.9% were failure cases. There was one death from tuberculosis (0.9%) (Table 7).

Table 7. Follow-up results (6 months~5 years)

Cured or inactive	98(85.2%)
Active or failure	16(13.9%)
Dead	1 (0.9%)
	115(100.0%)

The relation between age and the long term results shows that the best result was obtained among patients over 41 years of age with 100% good results, then those between 11-20 years of age showing 90.9% good results. The 21-30 and 31-40 year old groups had similar figures of good results, 82.5% and 84.9 %, respectively. However, there are only 8 patients over 41 years of age in this series, and it may not be a large enough number to draw any statistical conclusion. It should be noted that thoracoplasty was seldom performed on young patients under 20 years of age (Table 8).

Table 8. Age and results

	11-20yrs. (%)	21-30yrs. (%)	31-40yrs. (%)	41yrs. & over(%)	Total
Cured or inactive	10 (90.9)	52 (82.5)	28 (84.9)	8 (100.0)	98
Active or failure	1 (9.1)	11 (17.5)	4 (12.1)	0	16
Dead	0	0	1 (3.0)		1
Total	11	63	33	8	115

Those who had a negative sputum preoperatively had good results in 92.0%, while 84.9% of those who had a positive sputum preoperatively had good results (Table 9).

Table 9. Preoperative sputum status and results

	Preoperative sputum	
	Positive	Negative
Cured or inactive	73 (84.9%)	23 (92.0%)
Active or failure	12 (13.9%)	2 (8.0%)
Dead	1 (1.2%)	0
	86 (100.0%)	25 (100.0%)

The relation between the extent of the disease and the results of operation shows that the farther the disease had advanced before surgery, the poorer the result was. Hence, 16.4% of those who had far-advanced disease were failure cases, whereas 10.3% of those who had moderately-advanced disease were failures. All three patients who had minimum disease had good results (Table 10).

Table 10. Status of the disease and results

	Far advanced (%)	Mod. advanced (%)	Minimal (%)	Total
Cured or inactive	60 (82.2%)	35 (89.7%)	3 (100%)	98
Active or failure	12 (16.4%)	4 (10.3%)	0	16
Dead	1 (1.4%)	0	0	1
	73 (100.0%)	39 (100.0%)	3 (100.0%)	115

The relation between the duration of the disease and the results of surgery is not strikingly significant. Some had the disease less than one year, and others had it for over 5 years. The long-term results do not seem to be affected by this factor. It is a common belief that those who had longstanding chemotherapy are resistant to the major drugs, and this constitutes one hazard in surgical treatment. Our observation does not support this view entirely, though many patients who had prolonged treatment with the three major drugs had complementary secondary drugs such as pyrazinamide, cycloserine and viomycin before and after surgery, especially with resections (Table 11).

A comparison of the results between resection and thoracoplasty cases shows that, of the 77 resection cases, 87% had good results, 11.7% were failures and 1 patient died of tuberculosis. Of the 38 thoracoplasty cases, 81.4% had good results, and 18.4% were failures. There were no deaths among the thoracoplasty group. As pointed out in a previous communication, (Hong et al., 1960) the results of the two groups are not remarkably different (87% vs. 81.6%), despite the fact that those who were subjected to thoracoplasty had, in general, far more advanced, wide-spread disease as compared with those who had resection. It should be emphasized that thoracoplasty still has an important place in this country, where many tuberculous patients receive inadquate medical treatment, and when they come to surgery the disease is often too far advanced for resection. Some come to surgery as the last resort (Table 12).

The results among the resection cases are as follows: All 11 cases who under-went pneumonectomy had good results. It is true that these cases had a most careful study and and a longer observation before deciding to remove the entire lung on one side, but once they survived the operation, all enjoyed good results.

Of 60 patients who received lobectomy, bilobec-

Table 11. Duration of disease and results

When duration of disease is less than	1 yr. (%)	2 yrs. (%)	3 yrs. (%)	4 yrs. (%)	5 yrs. (%)	over 6 yrs. (%)
Cured or inactive	8 (88.9%)	24 (80.0%)	19 (90.5%)	16 (88.9%)	16 (84.2%)	13 (92.9%)
Active or failure	1 (11.1%)	5 (16.7%)	2 (9.5%)	2 (11.1%)	3 (15.8%)	1 (7.1%)
Dead	0	1 (3.3%)	0	0	0	0
Total	9 (100.0%)	30 (100.0%)	21 (100.0%)	18 (100.0%)	19 (100.0%)	14 (100.0%)

tomy, or lobectomy plus segmental resection, 85% had good results, while 13.3% were failures. There was one death among this group. Among 6 patients who underwent segmental resection, 83.3% had good results, and 16.7% had reactivation. In the failure cases following lobectomy, two patients are included who had been known to have bilateral cavitary lesion, and only one side was operated on, the lesion on the contralateral side remaining still active (Table 13).

Table 12. Procedures and results

	Resection (%)	Thoracoplasty (%)
Cured or inactive	67 (87.0%)	31 (81.6%)
Active or failure	9 (11.7%)	7 (18.4%)
Dead	1 (1.3%)	0
Total	77 (100.0%)	38 (100.0%)

Table 13. Resections and results

	Pneumonectomy	Lobectomy	Segmental resection
Cured or inactive	11 (100.0%)	51 (85.0%)	5 (82.7%)
Active or failure	0	8 (13.3%)	1 (17.3%)
Dead	0	1 (1.7%)	0
	11 (100.0%)	60 (100.0%)	6 (100.0%)

To improve the long-term results of resection, it is important to recognize the possibility of surgery during the earliest-possible phase of the disease, and to select the candidate with utmost care. It has been our impression that post-operative care and chemotherapy play a significant role, since tuberculosis is a systemic disease, and in many instances not all the lesion is eradicated by surgery. This fact should be carefully explained to patients so that they may fully undergo the necessary post-operative treatment for an adequate period of time.

SUMMARY: During the period of 5 years and 3 months from January, 1956, to March, 1961, 225 patient received surgery for pulmonary tuberculosis at Severance Hospital; of which 145 cases had resection and 80 had thoracoplasty.

The over-all operative mortality was 2.6%; 2.5% for thoracoplasty and 2.6% for resection. The highest operative mortality was 12% among the pneumonectomy cases.

The complications following resection were bronchopleural fistula in 3 cases, empyema in 4 cases, wound infection in 5 cases.

Of the total of 225 cases, 115 cases were followed in our hospital for 6 months or over. Of these, 85.2% had good results, 13.9% were failures and 0.9% (1 patient) died of tuberculosis.

In 87% of the resection cases and 81.6% of the thoracoplasty cases, the disease became inactive.

Although it is true that resection is a more desirable procedure for pulmonary tuberculosis, there are still many cases who have to be subjected to thoracoplasty because of the nature and extent of their disease, and, for these patients, thoracoplasty was found to be a safer procedure and the results from it have been gratifying.

It is encouraging to see that, as years go by more and more patients have been undergoing surgery for pulmonary tuberculosis in our institution, and the number of resections has been steadily increasing as compared to the number of thoracoplasty cases.

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