THE CHANGING TRENDS IN THE SURGICAL MANAGEMENT OF PULMONARY TUBERCULOSIS*

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INTRODUCTION AND HISTORICAL BACKGROUND

From earliest times, it was recognised that bed rest and fresh air has a salutary effect on Pulmonary Tuberculosis. In the mid-nineteenth century this took the form of the Sanatorium which was established in Germany by Brehmer. The Advent of anti-tuberculous drugs marked a very important point in the history of management of pulmonary tuberculosis. With effective chemotherapy and aid of surgery the sanatoria closed their doors in 1954 in many countries.

THE SURGERY OF PULMONARY TUBERCULOSIS

Surgery as an aid to the management of Pulmonary tuberculosis is a comparatively late development. From the historical point of view they are direct drainage, artificial pneumothorax, closed intrapleural pneumonolysis, induced diaphragmatic paralysis, thoracoplasty and pulmonary resection.

The direct drainage of tuberculous cavities was urged as early as 1696, but this procedure was rather uncommonly used. Pneumothorax was recommended as early as 1833, but never became generally accepted owing to the presence of adhesions between the lung and the chest wall preventing collapse of the lung. It was not until Jacobaeus in 1913 divided adhesions with a cautery passed through a cannula in the chest wall with intrapleural pneumonolysis which may be accepted and by 1940 this was used extensively in the management of pulmonary tuberculosis. Complications began to manifest themselves and by 1955 this was largely given up.

Induced diaphragmatic paralysis was introduced in 1911 became widely accepted in 1922. From 1960 onwards this was largely given up.

Collapse operation as a means to close tuberculous cavities was first described in 1879. But it was not until in 1907 that this operation was done in earnest. The mortality was high, but of these that survived the result was satisfactory. In 1937 Carl Semb came forward with the idea of Extrafascial Apicolysis and advised that the operation should be limited to the upper chest where the lesions were mainly located. This is the operation which is mainly practised to-day where the extent of the operation is tailored to the extent of the lesion.

Pulmonary resection for tuberculous of the lungs was first done in 1833. From then on isolated attempts were made until in 1935 Freedlander did the first successful lobectomy. This success came only nine years before the advent of chemotherapy. In 1936 Lindskog did the first pneumonectomy. It was only after effective chemotherapy was established that Chamberlain in 1953 did the first segmental resection.

THE RESULTS OF SURGICAL INTERVENTION

Thoracoplasty

After the foundations of modern thoracoplasty were firmly laid in 1937 by Carl Semb in Sweden and Alexander in North America, this from of treatment gradually gained acceptance.

Even at this time, when the blood transfusion was not available, the operation gave an acceptable mortality of between 6·0% and 11·0%. The cavity closure rate was over 83%. Of the survivors over 93% had cavity closure. This is truly remarkable when it is realised that the patients were subjected to surgery when the conservative regime had failed to control the disease process.

The advent of chemotherapy only served to make a good operation even better as shown by the marked fall in the mortality figures. The patients during this period were in a much better physical condition when they were submitted to surgery. The cavity closure obtained were much the same as before chemotherapy indicating that it depended on the physical factors present

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TABLE I

RESULTS OF THORACOPLASTY

	Number	Mortality	Cavity Closure	Active D.
Pre-Chemotherapy Era				
Alexander, J. (1937)	119	10.9%	83.1% (93.4% of survivors)	
Carl Semb (1937)		6.0%	87.3% (93% of survivors)	
Post-Chemotherapy Era				
Sellors, T.H. (1957)	231	1.3%	82%	3.0%
Striedler (1957)	99	2.0%		
Semb (1962)	451		92%	8.0%
Francis and Curwen (1964)	2319	4.6%	87%	4.7%

alone to determine whether the cavity would close with the operative procedure.

This indicated the inherent safety of the procedure in the management of the patient irrespective of whether the sputum was positive or negative, or whether the organisms were resistant or sensitive to the drugs exhibited at the time of surgery.

PULMONARY RESECTION

Before the advent of chemotherapy with anti-tuberculous drugs, the mortality resulting from the resection of the lung was between 25% to 33%. Over half of the patients submitted to surgery had some morbidity. Thus only the more resolute of the practicing surgeons undertook these operations. Even then the numbers were small.

The advent of anti-tuberculous chemotherapy completely changed the picture. The mortality following these operations fell dramatically to about 1·0% in most reported series. The morbidity also fell drastically. Satisfactory results in the region of 90% of the cases resected were obtained in most centres. Thus Specific Anti-tuberculous Chemotherapy contributed significantly to the acceptability of pulmonary resection in the management of pulmonary tuberculosis.

THORACOPLASTY AND PULMONARY RESECTION

In 1962 Carl Semb wrote that "Specific treatment widened the scope of operative treatment by improving the general condition of the patients and by reducing post-operative complications".

Thoracoplasty was already firmly established by the time that specific chemotherapy appeared on the scene. The effect of the anti-tuberculous drugs was to improve the pre-operative condition of the patients and hence further improve the results of the operation.

In his series of 2,316 patients that were reported by Carl Semb in 1962, before the introduction of specific chemotherapy, only thoracoplasty was used in the Vardaasen Sanatorium. When chemotherapy became available, the number of operations practically doubled in the course of 6 years. Most of the patients had thoracoplasty but some resections were also done. In 1949, 40% of all patients in this sanatorium had undergone surgical treatment. By 1957 the number of cases submitted surgery had fallen drastically until in 1958 it constituted only 8·0% of the cases under treatment in the Sanatorium.

At a conference held at the King Edward VII Sanatorium, Midhurst in 1962 on the "Treatment of Pulmonary Tuberculosis", Horne reported on the surgical operations that were done for pulmonary tuberculosis from South-East Scotland. It is interesting that with chemotherapy both pulmonary resection and thoracoplasty were used more as the general condition improved with the pre-operative chemotherapy. The peak years in the series were between 1952

TABLE II

RESECTION FOR PULMONARY TUBERCULOSIS

Pre-Chemotherapy Era

	Year	Cases	Morbidity	Mortality
Janes, R.	1945	31		25.8%
Overholt	1946	200	41.0%	25.0%
Sweet, R.H.	1946	63	57.0%	33.0%
Bailey, C.P.	1947	80	70.0%	27.5%
Jones, J.	1947	27	37.0%	29.0%

Post-Chemotherapy Era

	Year	Cases	Mortality	Sput. Neg.	Morbidity
Hui, K.L.	1962	395	1.0%	97.0%	13.4%
Chamberlain	1953	300	1.0%	93.7%	
Steele, V.A.	1955	1554	1.0%		
Brewer & Bai	1958	330	0.9%	98.0%	
Trapp, et al.	1963	682	1.9%		
Teare, H.D.	1962	694	0.3%	96.7%	
Bergh et. al	1963	403	1.5%		
Francis et al.	1964	1186	4.3%	83.0%	19.0%
Singapore	1967	120	5.0%	82.0%	38.8%

and 1957. The number of patients submitted to resection were about 80% more that to thoracoplasty.

In a national survey of 8,232 patients operated on from April, 1953 to March 1954 and followed up for 5 years, Francis and Curwen of the British Tuberculosis Association reported in 1964 that, for uni-cavitated disease confined to the upper lobe, 1,186 patients had pulmonary resections with a mortality rate of 4·6% and satisfactory results were obtained in 82·5% of the patients. During this period, 2,319 patients had thoracoplasty with a mortality rate of 4·6% and satisfactory results were obtained in 78·2% of them. Hence, even in Britain itself about twice as many patients had thoracoplasty for uni-cavitated lesions when compared with pulmonary resection. The mortality and post-operative results are comparable with each other.

Thus it would appear that, apart from a very small group of patients where the indication for one operation or the other is clear cut, the majority of the patients would get reasonable results with either a thoracoplasty or a pulmonary resection. The choice of the operation depended to some extent on the preference or skill of the surgeon and the presence of resistant organisms.

Following their study of 8,232 patients over a period of 5 years, Francis and Curwen concluded that "There has been little to choose between the results of Collapse Operation and Resection where the type of disease might have permitted a choice".

One can see that there was a phase when patients were submitted freely to surgical treatment because the results were acceptably good. But soon, the results of long term specific chemotherapy proved to be just as good. And the patients were not exposed to the hazards of an operative mortality and morbidity.

In those patients where the sputum is still positive and particularly if it is also resistant to the chemotherapeutic agents available, the operation of thoracoplasty with its inherent advantages of not traversing diseased tissue is to be preferred.

THE SURGERY OF PULMONARY TUBERCULOSIS IN SINGAPORE

From the data available since 1956, it can be noted that the number of cases under assessment and treatment in Singapore remain remarkably constant between 4,000 and 5,000 each year. In 1958, 1959 and 1961, the numbers exceeded

6,000. The numbers submitted to surgery were relatively small-varying from 3·2% in 1957 when the most surgery was done to 0·6% in 1966 ten years later. The average hovered around 1·0%.

When considering the resections and the thoracoplasties, it will be noted that the rise and fall in the number of cases each year roughly parallel, although the number of resections tend to be twice as much as those of thoracoplasty.

In the presence of effective chemotherapy, as it has been noted, this is a matter of preference.

THE CURRENT TRENDS

From the present day practice and a survey of the literature, there is no doubt that the trend is away from surgical therapy. The factors responsible for this drift away from surgery are:

1. Long term chemotherapy has proved beyond doubt that it can achieve very satisfactory conversion of the sputum and prolonged quiescence of the disease amounting to a cure in many patients.
2. The results of long term chemotherapy rival if not better the results of surgery without incurring an operative mortality and morbidity which must attend an operative procedure no matter how small.
3. The "healing" of tuberculous foci in the lungs causes areas of scarring with compensatory emphysema in adjacent areas of the lungs with consequent loss of functioning alveolar surface and pulmonary vascular bed. Thus the patient can ill afford any further loss of lung tissue through resection.
4. It has been increasingly realised that the distortion caused by extensive collapse operations results in secondary haemodynamic changes in the pulmonary vascular bed with the development of Chronic Pulmonary Heart disease in later years.
5. Strehler and Mildvan (1960), in a scientific study directed to evaluating the physiological reserves of the cardiac, respiratory and renal systems in the process of aging, found that, over the age of 30 years, these reserves appear to drop at a rate of between 0·9% to 1·4% per year of life. There is, of course, quite considerable individual variation. These factors have to be weighed carefully, especially in a patient who has had extensive bilateral tuberculosis and would also have extensive scarring following the healing of the tuberculous process.
6. In the presence of tuberculous organisms resistant to all available drugs and where it is felt that a surgical procedure might just tilt the scales in the favour of the patient, then the operation of thoracoplasty would have more to offer as it would afford rest to the portion of the lung without releasing organisms into raw traumatised tissues.

TABLE III

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	New Cases			Surg. Cases Resect.			
Year	T-cases	A-cases	Total	Resect.	'plasty	'plasty	Total
1956	1946	2374	4320				
1957	2405	2816	5221	119	44	5	168 (3.2%)
1958	2790	3434	6224	83	33	—	116 (1.9%)
1959	2685	3946	6631	74	16	—	90 (1.4%)
1960	2863	2703	5366	76	39	2	117 (2.2%)
1961	3613	2914	6527	62	18	—	80 (1.2%)
1962	3231	2597	5828	51	22	1	74 (1.3%)
1963	3006	2127	5133	37	4	3	44 (0.9%)
1964	2665	2004	4669	48	—	6	54 (1.2%)
1965	2894	2277	5171	58	5	14	77 (1.5%)
1966	2429	2571	5000	9	2	1	12 (0.6%)

CONCLUSION

In discussing the future of the management of Pulmonary Tuberculosis, following the survey of 8,232 patients who have undergone major surgery between April 1953 to March, 1954, Francis and Curwen concluded in 1964 that

> "For the future we must hope that by further research and zealous management of chemotherapy, surgical treatment for pulmonary tuberculosis will eventually pass into limbo along with artificial pneumothorax, phrenic crush and pneumoperitoneum."

For the moment, however, there are some patients for whom surgical treatment may still remain a painful necessity.

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