EXPERIENCES IN RESECTION FOR PULMONARY TUBERCULOSIS IN THE SOUTH AFRICAN NON-EUROPEAN

A REVIEW OF 203 CONSECUTIVE CASES

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Although the literature abounds with reports on resection for pulmonary tuberculosis, a series on South African non-Europeans has not been described.

This is a review of the cases resected during the period January 1949 to June 1953, with a follow-up of 1—5 years. There were 90 Bantus, 77 Asiatics and 36 Coloured patients; of these 113 were males and 90 females.

The 5-year period has been one of changing concepts and the analysis will indicate this.

Prospective surgical cases, after full investigation, are presented at a weekly meeting of the hospital staff and visiting surgeons. The discussions are led by the medical superintendent. In the cases accepted for operation the resection to be performed is also decided on. If, as occasionally happens, unsuspected lesions are found at thoracotomy, the surgeon uses his discretion as to the type of operation necessary.

Indications. The indications for extirpative operations have followed the general trend as found in the literature.[1–5] Whereas resections were performed in 1949 and 1950 for gross disease only, cases with less extensive lesions were submitted to surgery in 1951, 1952 and 1953 in the form of segmental resections (Table I). Taking

TABLE I

Year	*Pneumonectomies*	*Lobectomies*	*Lobectomies and Segmental Resections*	*Segmental Resections*
1949	4	3	1	*Nil*
1950	13	17	1	*Nil*
1951	12	18	3	4
1952	19	39	9	16
1953, to June ..	11	14	4	15
Total ..	59	91	18	35

into account only the most prominent indication for operation in each case, the following totals illustrate the frequency of the different indications. Ninety-four operations were performed for cavitatory tuberculosis, 43 for tuberculous bronchiectasis, 36 for destroyed lobes or lungs, 28 for minimal lesions and 4 for failed thoracoplasties.

Investigations. Before cases are assessed for surgery, the following investigations are carried out:

1. A full clinical examination and revaluation of the patient. This includes a re-check on all the laboratory investigations.
2. Bilateral bronchography.
3. Bilateral tomography.
4. A recent bronchoscopic examination.

The E.N.T. consultant and the dentist then have to pass the patient as fit for major surgery. A clinical evaluation of the respiratory function of the patient, and an electrocardiographic examination, are performed shortly before the operation.

Pre-operative Treatment

All the cases in this review have received anti-tuberculous drugs, but the dosage, the type of antibiotic and the period of pre-operative administration have varied considerably. Thus in 1949 antibiotic treatment consisted of 1 g. of streptomycin daily, and 12 g. of PAS per day for a relatively short period before and after the operation. Then, during 1950 and up to June 1951, there was no fixed scheme of antibiotic treatment. Every new admission was individually assessed as to the antibiotic therapy required. So some patients had streptomycin daily for 42 days, while others had streptomycin and PAS daily in short courses; but 10 days before the operation all cases started with daily streptomycin and PAS and completed a period of 42 days of continuous antibiotic treatment. By June 1951 the regime became standardized and 1 g. of streptomycin was administered every 3rd day, with daily PAS, and continued for an extended period. When isoniazid was introduced during 1952 it was used to cover the period of the operation, but by May 1953 most cases had received isoniazid for several months, combined with streptomycin and PAS given for periods varying from 6 to 24 months as pre-operative treatment.

Phrenic crush and pneumoperitoneum were methods of treatment employed before 1951. Since then they have been abandoned.

As far as the general condition of the patient is concerned, we try to rectify any abnormality and eliminate all concomitant infections and parasites. Pre-operative and post-operative physiotherapy is carried out with attention to posture and controlled respiration by the hospital physiotherapist. The routine use of penicillin and 'broad-spectrum' antibiotics has been stopped and they are only administered when indicated and according to sensitivity tests.

The Operation

The resections are carried out in the face-down position by the generally accepted ligation technique.

All blood lost during and after the operation is replaced by blood transfusion. For this purpose we prefer a cut down on a forearm vein, rather than the ankle, because it has been our experience that the rate of flow is better in this position and that post-operative thrombosis of the vein is less frequent. This arrangement is also more convenient for the anaesthetist. The loss of blood is estimated by weighing the swabs, after the

method described by Cole and Longhead.[6] To this is added the amount in the suction bottle.

For anaesthesia the closed-circuit CO_2-absorption method is employed. Relaxants are used. At present pentothal and scoline are used for induction, followed by laudolissin or flaxedil, pethidine, and gas and oxygen.

Post-operative Treatment

Two water-sealed drainage tubes are always inserted for lobectomies and segmental resections. After extrapleural pneumonectomies where excessive oozing may be anticipated a tube is inserted as well. In these pneumonectomy cases we clamp the tube and release it at regular intervals for a short while. Suction is used for all segmental resections, so as to keep a continuous negative pressure in the chest and remove all accumulated air.

The patient is nursed in the resuscitation room of the theatre until he is conscious and has a stable blood-pressure.

In cases of post-operative shock levophed, methedrine and eucortone have been used with benefit, although adequate replacement of blood remains the basis of treatment of shock.

After lobectomies and segmental resections 10 c.c. of a 10% solution of sodium iodide is given intravenously daily or even twice daily for about a week, to decrease the viscosity of the sputum, as described by Baker *et al.*[7] With this form of treatment the number of cases of post-operative ateletasis decreased and those that occured seldom required bronchoscopy. The present antibiotic regime following resection is as follows: Daily 400 mg. of isoniazid, 8—12 g. of PAS, and 2 g. of streptomycin for 14 days. Then 1 g. of streptomycin daily is administered for a fortnight more. Finally we carry on with 1 g. of streptomycin every 3rd day.

The patients included in this review were, if no complications occurred, kept in hospital for 4—6 months after the operation. During the last 2 months of their stay in hospital they attended the rehabilitation centre run by the South African Red Cross, where they were taught different crafts. Thus a graduated return to normal activity was obtained.

Today patients are discharged earlier, but receive active treatment for a much longer period than before at clinics.

ANALYSIS OF RESULTS

Surgical statistics will vary directly with the type of risk the medical and surgical staffs, working as a team, are willing to accept for surgery. Usually surgery is an elective procedure, but we have operated on cases as a last resort and as a life-saving measure, and the general tendency has always been to apply surgery to destroyed lungs and persistently positive cases. Table II is aimed at giving a concise reflection of the results obtained.

Deaths

The deaths are subdivided into 2 groups: (*a*) those that occurred within the first 60 days following a resection and (*b*) those that happened later. Deaths that were not related to the operation or to tuberculosis have nevertheless been included.

There were 22 deaths in all. Fourteen occured early and 8 were late deaths.

The Early Post-operative Deaths

1. (1949) Coloured female. Left pneumonectomy for failed thoracoplasty. Died of bronchopneumonia 4 days after the operation.
2. (1950) Indian male. Left upper lobectomy following a left 7-rib thoracoplasty. Died of congestive cardiac failure 20 days after resection.
3. (1950) Indian male. Left extrapleural pneumonectomy for a destroyed lung. Died of peripheral circulatory failure 5 hours after the operation.
4. (1950) Native male. Right upper lobectomy for cavitatory tuberculosis. A tension pneumothorax subsequent to a burst bronchus caused his sudden death on the 4th day after the operation.
5. (1950) Indian male. Right extrapleural pneumonectomy for a destroyed lung. Died on the 4th post-operative day of strangulation of part of the liver through a tear in the diaphragm.
6. (1950) Native male. Left upper lobectomy for cavitatory tuberculosis. Succumbed to acute pulmonary oedema and atelectasis of the left lower lobe on the day after operation.
7. (1950) Native male. Right upper lobectomy and resection of apical segment of right lower lobe for cavitatory tuberculosis. Died of amoebic dysentery 10 days following the operation.
8. (1950) Coloured male. Left upper lobectomy and concomitant 5-rib thoracoplasty for haemoptyses from a destroyed lobe. Fatal pulmonary embolus on the 10th post-operative day.
9. (1951) Indian male. Left extrapleural pneumonectomy combined with a 6-rib thoracoplasty for a destroyed lung. Died of surgical shock the night of the operation.
10. (1951) Native female child. Left lower lobectomy for tuberculosis bronchiectasis. Sudden cardiac arrest during operation.
11. (1951) Native female. Left upper lobectomy for cavitatory tuberculosis. Died 12 hours after the operation of massive pulmonary oedema and acute cardiac failure.
12. (1952) Adolescent Native female. Left extrapleural pneumonectomy for a destroyed lung. A very difficult resection with sudden cardiac arrest.
13. (1952) Native male. Left extrapleural pneumonectomy for a destroyed lung associated with a tuberculous empyema. Died of haemorrhage and shock 4 hours after the operation.
14. (1952) Native female. Left upper lobectomy for a destroyed lobe. Sudden cardiac arrest during the operation.

The Late Post-operative Deaths

1. (1950) Indian male. Right upper lobectomy for a destroyed lobe. Thoracoplasty for a complicating broncho-pleural fistula

TABLE II

Year	*Total*	*Quiescent*	*Active*	*Unknown*	*Deaths before 60 days*	*Deaths after 60 days*	*Operative Mortality*	*Total Mortality*
1949	8	4	1	2	1	*Nil*	12·5%	12·5%
1950	31	16	1	2	7	5	22·6%	39 %
1951	37	28	2	3	3	1	8·1%	10 %
1952	83	72	1	6	3	1	3·7%	4·7%
1953, to June	44	41	*Nil*	2	*Nil*	1	*Nil*	2·2%
Total	203	161	5	15	14	8	7 %	11 %

and empyema. Died 8 months after the resection of a persistent fistula and empyema.

2. (1950) Indian male. Left upper lobectomy and decortication of lower lobe for cavitatory tuberculosis. Thoracoplasty for bronchopleural fistula and empyema. Died of an intrathoracic haemorrhage 2 years after the original operation.

3. (1950) Native male. Right upper lobectomy for cavitatory tuberculosis. Death due to constrictive pericarditis 5 months after the operation.

4. (1950) Coloured female. Left pneumonectomy for a destroyed lung. Died 3 years later of a non-specific pneumonia. No evidence of active tuberculosis found.

5. (1950) Native female. Left extrapleural pneumonectomy with a simultaneous rib-thoracoplasty. Died of a reactivation of the disease in the remaining lung 3 years later. Unfortunately this patient did not return for further treatment after the recrudescence of the tuberculosis.

6. (1951) Coloured male. Right pneumonectomy for cavitatory tuberculosis. Broncho-pleural fistula and empyema followed. Death due to sudden intrathoracic bleeding 4 months after.

7. (1952) Native male. Right pneumonectomy for cavitatory tuberculosis. An empyema followed but this was healed by a thoracoplasty. Died of paralytic ileus 4 months after the operation.

8. (1953) Native female. Left extrapleural pneumonectomy for a destroyed lung. A broncho-pleural fistula and empyema followed. Died of broncho-pneumonia 6 days after the thoracoplasty which, 6 months after the original operation, was performed to close the space.

Complications

The complications that occurred after the various forms of resection are shown in Table III. There were 18 broncho-pleural fistulas with empyema. Although

TABLE III

Complications	*Pneumonectomy*	*Lobectomy*	*Lobectomy and Segmental Resection*	*Segmental Resection*
Broncho-pleural fistula and empyema	5	11	1	1
Empyema	6	1	*Nil*	1
Spreads	4	7	*Nil*	*Nil*
Bronchial-stump infections	2	2	*Nil*	*Nil*
Blindness in one eye	1	*Nil*	*Nil*	*Nil*
Paralysis of vocal cord	*Nil*	1	*Nil*	*Nil*

this is a very formidable complication only 4 of these patients died. Two patients have small persistent sinus tracks, even after extensive thoracoplasty. They are however 'negative' and able to work.

Seven of the 8 cases of empyema are quiescent and working after extensive thoracoplasty operations to obliterate the space. The 8th patient is still receiving active antibiotic treatment.

There were 11 cases of post-operative reactivation or spread of the disease. One patient did not return for treatment and died at home. Five became quiescent after further prolonged antibiotic treatment and have been discharged. Two cases are still showing signs of resolution of the disease with general improvement, and 3 are not responding to treatment, probably because the organism is by now insensitive to the known antibiotics. The 4 bronchial-stump infections mentioned in the table cleared up on further antibiotic treatment and are asymptomatic.

We have not enumerated the cases of immediate post-operative atelectasis because this condition is as a rule transient and responds to intravenous sodium iodide or bronchoscopic aspiration. There is, however, one case with a permanently collapsed left lower lobe after a left upper lobectomy combined with a limited thoracoplasty, performed as one operation. This patient, however, has remained 'negative' and asymptomatic and has refused further surgery. He attends clinic regularly.

One patient, who had a pneumonectomy, was found to have a total ophthalmoplegia and blindness of the right eye on recovering consciousness. The eye muscles recovered completely about 3 days after the operation, but the blindness has been permanent.

Follow-up

Many ex-patients attend clinics regularly, but the follow-up of the remainder has been difficult. This is due to their wide dispersal, the great distance of some from a clinic, frequent change of abode, and low standard of education. Some have returned to kraals with little contact with the outside world. Nevertheless, of the 181 patients presumed living we have been able to trace 166. Of these, 129 have received repeated and recent follow-up examinations at the Durban Chest Clinic and found to be fit and well with no evidence of disease. There were 25 patients who were unable to report locally for final examinations, but we have had medical reports about them from their local doctors. About 12 patients we have had no recent medical reports, but they have reported themselves as feeling fit and are working.

Five cases out of the 166 traced have active disease. Four are still receiving treatment in hospital and one is working, while being treated at the Durban Chest Clinic.

Ten patients can be classified as respiratory cripples and and are in sheltered employment. Of these, 6 had pneumonectomies.

COMMENT

It has been indicated how the types of resection varied year by year. There has been an impressive improvement in results. Whereas the operative mortality for the whole series is 7%, that for the first 2 years under review was 20.5% and for the next 2½ years only 3.7%. In our view this is due to:

1. The improved condition of the patient pre-operatively.
2. The introduction, and more discriminate use, of antibiotics to combat tuberculosis.
3. The wide range of 'broad-spectrum' antibiotics now available and their judicious use according to sensitivity tests.
4. The improvement, with experience, of the surgical team.
5. The more accurate estimation of the loss of blood at operation.
6. The prolonging of the patients' stay in the anaesthetic recovery room.
7. The relative increase in segmental resections.

Except for a short period after the introduction of isoniazid, no drugs have been withheld for the specific

purpose of saving them to tide the patient over the operation.

Our approach to thoracoplasty as a procedure either before or after a resection has been conditioned by the fact that the non-European patient does not readily consent to this operation. He is averse to thoracoplasty because he feels that it will greatly reduce his chances of subsequent employment.

In cases of extreme mediastinal displacement we do however insist on a thoracoplasty before resecting. After resections thoracoplasties are considered in cases of marked mediastinal shift, in complications (bronchopleural fistula and empyema), and to obliterate dead-space after lobectomy or segmental resection.

We have noted with interest the findings of John Friend [8] and Kergin and Coulthard,[9] that over-expansion is not necessarily deleterious to pulmonary function, or to quiescent foci in the remaining lung-tissue.

Our investigations have shown that the duration of the disease has had no significant bearing on the end results.

In the present state of our knowledge, patients are advised to continue with at least 2 antibiotics for a more or less indefinite period under the control of a tuberculosis clinic.

Since the period under review there has been a tendency to revert to a more conservative approach to resection and as a result the number of segmental resections has decreased considerably. The majority of cases operated on at present are those that are left with gross destruction of lung tissue after they have had the full benefit of anti-tuberculous drugs.

SUMMARY

A review of 203 cases of resection for pulmonary tuberculosis in the South African non-European (Bantu, Indian and Coloured), is presented. The operations performed were as follows:

1. Pneumonectomies—59 cases with 6 early and 5 late deaths.

2. Lobectomies—91 cases with 7 early and 3 late deaths.

3. Combined lobectomy and segmental resection—18 cases with 1 early death.

4. Segmental resections—35 cases with no deaths.

The pre-operative preparation, the post-operative care and the complications have been outlined.

A follow-up of 166 of these cases over a period of 1—5 years is recorded.

We wish to thank the Medical Superintendent (Dr. B. A. Dormer) and Dr. P. Smit for encouragement and helpful advice.

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