SIMULTANEOUS BILATERAL PULMONARY RESECTION

R. P. HEWITSON, F.R.C.S. (ENG. and EDIN.)
Thoracic Surgeon, Groote Schuur Hospital, and Brooklyn Chest Hospital, Cape Town

In the surgical treatment of any condition it is more satisfactory to achieve the desired result in one procedure rather than two, provided that the operative risk, both in mortality and morbidity, makes this justifiable. With developments in medical practice, various operations, which formerly were performed in two stages, are now completed in one. For the patient this is preferable, both psychologically and economically. It saves theatre time and other hospital time. Thus, the possibility of operating simultaneously on both lungs has been raised when the disease process demands bilateral surgical action.

The practicability of an operation of this nature was demonstrated in 1952 by Overholt,[1] and by 1956 he was able to report on 10 cases.[2] Lewis *et al.*[3] mention that in 1882 Block attempted a bilateral lung resection, but it was not successful. In this report they cite 16 cases of their own, and a year later Björk[4] reported on 4 patients on whom he had combined bilateral resection with a unilateral osteoplastic thoracoplasty at one sitting. The only other report noted of simultaneous bilateral resection was published by Baronofsky *et al.*[5] in 1957; the resection was carried out in dealing with spontaneous pneumothoraces. Since 1956 isolated reports have appeared from other countries in languages other than English, e.g. from Holland,[7] France,[8] Brazil,[9] and Russia.[10]

A comparable procedure is a resection of part of the remaining lung after total pneumonectomy, which has been shown to be a reasonable operation in certain circumstances.[6]

In the reported cases there have been 3 indications for surgery, i.e. bronchiectasis, tuberculosis, and spontaneous pneumothorax. The fact that Overholt[2] could only report on 10 cases after 4 years indicates how uncommonly the opportunity arises. Most of his cases were treated for bronchiectasis.

Lewis *et al.*[3] were stimulated to attempt simultaneous surgery by the number of bilateral cases of pulmonary tuberculosis presenting from a large mental institution. After unilateral thoracotomy and resection it takes some 4 - 8 weeks before lung function begins to approximate to its final figures, and maximal improvement needs 4 - 6 months according to Pecora.[13] Consequently, it has been customary to wait a few months before the second operation is performed in a staged bilateral resection. This staging presents considerably increased difficulties in insane patients, so that Lewis *et al.*[3] tried operating on the two sides simultaneously and found that it was tolerated very well.

Shumway *et al.*[11] have suggested that simultaneous bilateral resection actually results in better function of the remaining lung tissue than if the operations are staged, because of greater stimulation to use the lungs. This seems doubtful even in theory, since there is a considerable temporary load placed on the non-operated lung during unilateral surgery. Pecora[12] disputes this suggestion and has tried to produce some factual evidence. However, his figures include only one case of simultaneous resection, and the vital capacity was the only function test used for comparison. He maintains that there is no functional benefit from the simultaneous procedure and that the final ventilatory deficit appears to be the sum of each resection, whether simultaneous or staged.

An argument can be made for staging the resections in patients with poor pulmonary function, so that the first side can recover as much as possible before the function of the opposite side is temporarily reduced in a similar way. Against this must be weighed the advantage of removing all the disease at one sitting, so that the risks of postoperative bronchial spread of infection or a tuberculous flare-up are reduced to a minimum.

Usually cases have been accepted for simultaneous surgery only when small amounts of lung tissue need removal, but Björk,[4] for instance, has shown that much more can be removed at one sitting than would previously have been thought possible. A great deal depends on the methods and facilities available for postoperative respiratory assistance. Thus Björk[4] has removed in one patient the right upper lobe, the whole left upper lobe, and the apical segment of the left lower lobe; combining this with an osteoplastic thoracoplasty on the left. The degree of destruction of the removed lung tissue and the function of the remaining part are important factors.

Even in tuberculosis the indications for bilateral resection are not common. Bilateral disease so often means widespread involvement with correspondingly reduced pulmonary function. The largest reported series is probably that of Curtis *et al.*,[14] who had 87 patients for bilateral surgery out of a total of 450 patients for resection. The majority were segmental resections with an average loss of function after the two operations of about 14% of the pre-operative figure. Where lobectomy was the procedure on both sides (7 cases), the loss was about 27% of the pre-operative figure. (Tests for vital capacity and maximum breathing capacity were used.) Cooley *et al.*[15] had 12 out of 189 patients for resection, and they stress that assessment must be careful since 3 of their 12 patients fell into the 'failure' category. These were all staged resections.

Of the cases of simultaneous resection reported in the English literature, there has been no mortality.

Selection of Cases

The less lung tissue needing resection and the better the function of the remaining lung tissue, the better is the case suited to simultaneous bilateral surgery. The indication for removing a particular portion of lung should be the same as when contemplating unilateral surgery or staged bilateral surgery. However, smaller lesions are, generally speaking, more suited to a simultaneous approach than larger ones. Extensive fibrosis or emphysema are factors against bilateral surgery, though, as mentioned above, Björk[4] has had success with the removal of up to 9 pulmonary segments. The removal of whole lobes rather than segmental resection has the advantage that the postoperative air leak may be minimal, but, with adequate care this factor can be overcome and should not influence the decision.

The patient's general condition should be as good as possible. This may entail much pre-operative care, with antibiotics, diet, and physiotherapy. Tuberculous patients should preferably be ambulant.

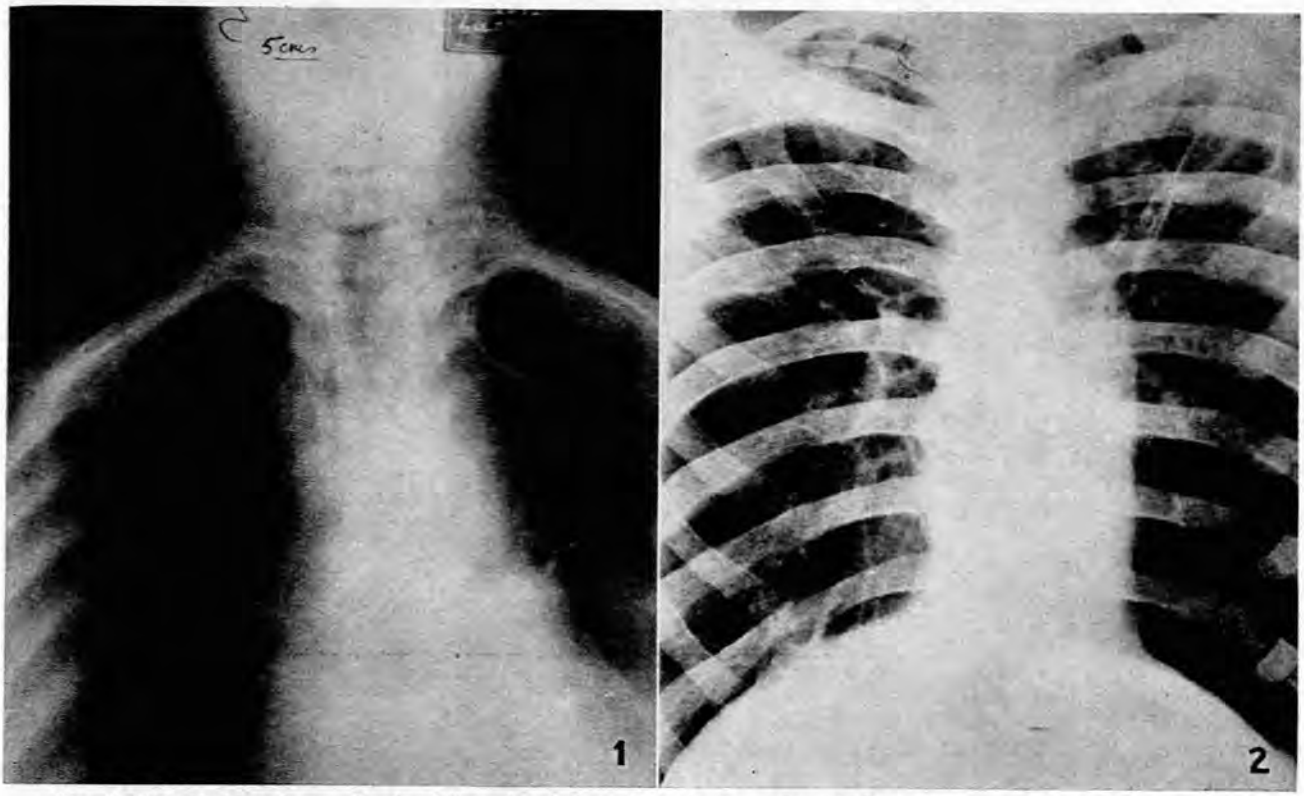

Fig. 1. Tomogram at 5 cm. showing bilateral apical cystic cavitation. *Fig. 2.* Postero-anterior chest X-ray showing tuberculous cavitation in both upper lobes and emphysema of the left lower lobe.

The patient should be young, if possible. However, Lewis *et al.*,[3] who make this point, nevertheless found that the average age of their 16 patients was 44 years, with a range of 25 - 56 years. Thus age alone is no absolute criterion, but is a partial guide to the state of the rest of the cardio-pulmonary system.

Mental patients apparently afford a special indication for simultaneous resection in tuberculotics, since nursing is easier and it is better in a mental institution if all the disease can be eradicated at an early date to prevent spread of infection. Mentally disordered patients often cannot be trusted in dealing with sputum or in other normal precautions.

Pulmonary-function tests play some part in assessment as in unilateral cases, but they have their limitations. Low figures do not necessarily exclude surgery.

In bronchiectasis the decision is often very difficult, since it is precisely in the bilateral case where there may be difficulty in being completely sure of the limits of the disease and where one is hesitant to recommend even staged resection. Bilateral bronchiectasis is so commonly a disease which starts insidiously in youth without much associated atelectasis, that one is reluctant to remove large areas of functioning lung tissue. Again, sometimes there is sufficient improvement after unilateral resection in these patients to decide against operating on the second side. These various factors make one particularly cautious in cases of bronchiectasis. One other point which may influence the decision slightly is that there is usually some bronchitis in the non-dilated bronchi of these patients, and this can make the postoperative course more difficult than, for example, in well-drained upper-lobe tuberculosis where there may be little sputum.

Operative Considerations

The pre-operative care is the same as for unilateral surgery, but must be attended to meticulously. Thus, the amount of sputum must be at a minimum, tuberculosis control by chemotherapy must be at its maximum, and the general health should be as good as possible.

There are 2 possible operative approaches: from the front or from the back. Overholt[1] has pioneered the prone position for pulmonary surgery and he advocated this for simultaneous bilateral resections also. Others, such as Björk[4] follow this method and he makes 2 points about it: the surgeon can be content with dealing with only one side if factors arise to dictate this, without opening the opposite side of the chest at all; and it is by far the easier position if a thoracoplasty is needed at the same time.

The supine position is used by Lewis *et al.*[3]; they split the sternum, but this is not always necessary. The 2 sides may be approached from the front through separate incisions. The table may be tilted from side to side to assist, if necessary. If the sternum is split, there is the danger of exposing the mediastinum to the infection, either tuberculous or pyogenic, for which the operation is being done. It is noteworthy that in their 16 reported cases, there were 3 with sternal separation as a major complication. This occurred in mental patients. Lewis and his co-workers[3] suggest that mentally disordered patients with reduced regard for pain, may well throw an additional strain on the sternal wound during convalescence.

In the cases reported below, the prone position was used and found to be satisfactory. There was no difficulty in positioning the patient on sandbags in the absence of an 'Overholt' table, so that both upper arms were dependent to draw the scapulae forward. It was not necessary to move the patient between the two operative sides. The usual curved periscapular incision was used, and the two incisions did not meet medially. Björk[4] used an inverted Y incision, and some sloughing occurred in one case where the angle was too acute. An intercostal approach is usually adequate without rib resection.

A double-lumen intratracheal tube for separate inflation of each lung, such as a Carlen's tube, is useful, but not essential. It was only used in one of the cases reported here.

The method of resection is the same as is usually followed, but special care should be taken to reduce the air leak from raw lung surface to a minimum. At the close, the drainage tubes must be well placed to deal with both apical air and basal drainage; at least 2 tubes on each side are essential.

The postoperative care is a vital part of the treatment; it consists mainly of a meticulous adoption of the usual methods for a unilateral case. The need for sedation is no more than usual and must allow full cooperation in coughing and physiotherapy. Blood replacement must be adequate. The drainage tubes must be kept open so that the pleural spaces are obliterated as soon as possible. Suction on the underwater sealed drainage bottles is often necessary to ensure this and also to avoid excessive paradoxical movement.

Any indication of respiratory inadequacy must be dealt with promptly. Poor coughing out of secretions, poor respiratory movements, and dyspnoea caused by lack of lung tissue, point towards early tracheotomy, which in some cases may be advisable on the operating table. Tracheotomy reduces the respiratory dead space, thus reducing the amount of movement needed, and it allows free suction of secretions at all times. If this alone is insufficient, positive-pressure assistance may be needed. Nevertheless, such patients are not necessarily respiratory cripples later, once the remaining lung has adjusted itself

CASE REPORTS

Case 1

F.E., a Coloured female aged 19 years, had been treated for some 9 months for bilateral upper-zone tuberculosis. She was left with 'cystic' cavitation at both apices (Fig. 1), and bronchography showed that the bronchial damage involved the whole right upper lobe and the apico-posterior segment of the left upper lobe.

At operation, the right side was resected first. The lobe was firmly adherent and there was virtually no lesser fissure, so that a segmental type of strip was needed. The raw surface was not oversewn and there was little air leak. On the left side the segment stripped off readily, but the raw surface was oversewn—the edges fell together readily.

Two tubes were left in each pleural space, and it was possible to remove them all by the 4th day, after which the patient was ambulant. No particular postoperative treatment was needed in this case.

The pre-operative function tests for this patient showed a forced expiratory volume of 1,500 c.c. in 1 second and 2,000 c.c. in 3 seconds.

Case 2

M.L., a Coloured female aged 16 years, was similar in many ways to the previous patient. The same type of pathology was present, but was confined on the right to the posterior and apical segments, and on the left to the apico-posterior segment. The left side was resected first and it was not necessary to oversew the raw lung surface on either side. All four drainage tubes were removed by the 4th day, and there was no postoperative difficulty.

The function figures were as follows: pre-operatively, 1,400 c.c. in 1 second and 1,800 c.c. in 3 seconds; 6 months postoperatively, 1,300 c.c. in 1 second and 1,600 c.c. in 3 seconds. Thus the functional loss was in the region of 10%.

Case 3

S.S., a Coloured male aged 25 years, had been under treatment for 2 years for pulmonary tuberculosis, but his sputum was still persistently positive with organisms that were resistant to the ordinary drugs. He had not responded to cycloserine. The X-ray film showed cavitation in both upper lobes with much emphysema at the left base (Fig. 2). His forced expiratory volume for 1 second was 1,000 c.c. Pyrazinamide was given for 3 weeks before and 4 weeks after operation.

The right upper lobe was removed with a difficult strip along a fused lesser fissure and a partly extrapleural dissection. On the left the whole upper lobe had to be resected since the lingula was diseased. In view of the emphysema of the lower lobe, an osteoplastic thoracoplasty of the Björk type was performed, from the 2nd to the 6th ribs. Finally, because of the poor pulmonary function, a tracheotomy was done on the table.

The postoperative course was fairly smooth and the tracheotomy tube was removed on the 3rd day. However, on the following day there was some gastric distension and the patient became very dyspnoeic; vigorous treatment was needed to relieve this. Sedation and bronchodilator drugs were required for some time after this episode, and he had 2 further minor attacks of a similar nature. The other retarding factor was a persistent small leak from the raw lung surface on the right for which the apical drainage tube had to be kept in place for some 3 weeks. Soon after this he was able to get up and he rapidly recovered his mobility.

Four months after operation he could produce 700 c.c. in 1 second and 900 c.c. in 4 seconds. In spite of these poor figures he was ambulant, with a negative sputum.

Case 4

M.S., a Coloured female aged 15 years, had been treated for some 18 months for tuberculosis and was left with bilaterally destroyed upper lobes, the left having a small cavity. The sputum was negative at this stage. Both upper lobes were well shrunken so that, although the forced expiratory volume for 1 second was only 1,200 c.c., it was decided to remove both upper lobes at the same operation.

No space-reducing procedure was needed and tracheotomy was not done. Recovery was entirely uneventful.

Case 5

E.L., a Coloured male aged 24 years, was assessed in 1958 for a chronic productive cough and the bronchogram revealed bronchiectasis of both bases, concentrated mainly in the right middle lobe, the left lower lobe, and the lingular segment of the left upper lobe. Physiotherapy was advised and he was referred to the ENT department where radical maxillary antrostomies were performed. He was followed-up as an outpatient, but the constant purulent sputum was a real trial to him. Check bronchography, 2 years after the first, showed much more atelectasis of the left lower lobe, and although the basal bronchi on the right were not perfectly normal, it was decided to resect the right middle lobe and the lingular segment with the left lower lobe.

At operation no clear lesser fissure was found on the right and there was a fair amount of postoperative air leak from this strip. On the left the segmental strip was reasonably easy and the raw surface was not oversewn.

On the day after operation there was a fair amount of secretion which he could not cough out, and tracheotomy was performed. The tube had to be kept in until the 10th day because of his inability to raise the mucoid sputum even though it was thin. The air leaks continued for longer than one would normally expect in a unilateral case. On the right the tubes were removed by the 8th day, and on the left a basal tube was kept in for 6 weeks.

This was not an ideal case since the operation has unfortunately not cleared all his bronchiectasis. A great deal of the difficulty was probably due to the associated bronchitis with its secretions, in contrast with the tuberculous cases which were mainly dry.

SUMMARY

The possibility of performing resection on both lungs at the same operation is discussed, and the need for and advisability of a procedure of this nature are mentioned, with a brief review of the literature.

It is pointed out that there are few indications for performing simultaneous bilateral resection, the main two being tuberculosis and bronchiectasis.

The operative approach and the particular postoperative needs are discussed.

Finally, 5 cases are reported (without mortality) to illustrate the method. Four of these patients suffered from tuberculosis and one from bronchiectasis.

Thanks are due to the nursing and medical staff who have been essential to the teamwork which is necessary for such operations; also to the Superintendents of the Brooklyn Chest and Groote Schuur Hospitals for permission to publish; and to Mr. B. Todt for the radiological reproductions.

REFERENCES

1. Overholt, R. H. (1952): Bull. New Engl. Med. Cent., **14**, 1.
2. *Idem* (1956): *Op. cit.*[5]
3. Lewis, F. J. *et al.* (1956): J. Thorac. Surg., **31**, 93.
4. Björk, V. O. (1957): *Ibid.*, **33**, 617.
5. Baronofsky, I. D. *et al.* (1957): *Ibid.*, **34**, 310.
6. Björk, V. O. (1960): *Ibid.*, **39**, 179.
7. Hingst, S. S. (1958): Ned. T. Geneesk., **102**, 598.
8. Daumet, P. and Olivier, R. (1956): Presse méd., **64**, 30.
9. Guertzenstein, E. (1956): Arch. bras. Med. nav., **17**, 5005.
10. Dedkov, I. P. (1959): Probl. Tuberk., **37**, 37.
11. Shumway, N. E. *et al.* (1954): J. Thorac. Surg., **28**, 90.
12. Pecora, D. V. (1959): Surg. Gynec. Obstet., **109**, 89.
13. *Idem* (1956): *Ibid.*, **103**, 455.
14. Curtis, J. K. *et al.* (1959): J. Thorac. Surg., **37**, 598.
15. Cooley, J. C., Moser, F. H. and Hedberg, G. A. (1957): *Ibid.*, **33**, 383.