Surgical intervention for pulmonary tuberculosis: analysis of indications and perioperative data relating to diagnostic and therapeutic resections

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Abstract

Objective: To analyze the data on patients operated on for pulmonary tuberculosis (TB) with (Group I) or without (Group II) a correct TB diagnosis and preoperative anti-TB treatment.

Methods: Between 1980 and 1997, 144 resections for TB (Groups I + II) were performed. The 80 patients in Group I underwent therapeutic resections: 32 cases involved recurrent cavities or tuberculomas, three involved post-TB bronchiectasis, 13 involved progression of cavities or tuberculomas, and 32 involved persistent tuberculomas after 6 months of anti-TB therapy. The 64 patients in Group II were operated on for a suspicion of malignancy in 49 cases, for cavitary lesions with haemophthysis in six cases, for multiple lesions in seven cases, and for recurrent hydrothorax in two cases. Results: Groups I and II included 0 and five pneumonectomies, 32 and 29 lobectomies, 48 and 20 wedge resections, 0 and nine videothoracoscopic biopsies, and 0 and one hilar lymphadenectomy, respectively. In Groups I and II, the mean duration of postoperative hospitalization was 13.2 and 10.4 days, and the frequency of postoperative pneumothorax was 11.25 and 4.6%, respectively. The incidence of bronchopleural fistula was 1.25 and 0%, the mortality was 0 and 3.1%, and the morbidity was 53.7 and 35.9% in Groups I and II, respectively. Two patients with active disease died in Group II. Pathology demonstrated that the frequency of acid-fast bacilli in Groups I and II was 40 and 25%, respectively.

Conclusions: Patients without a correct preoperative TB diagnosis underwent more extensive parenchyma resection. Postoperative complications increased when acid-fast bacilli were present. The lack of preoperative anti-TB treatment did not involve a higher risk of minor complications, but death occurred only in this group. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Pulmonary tuberculosis; Preoperative antituberculotic treatment; Diagnostic resection; Endobronchial tuberculosis

1. Introduction

It has recently been reported [1,2] that the incidence of pulmonary tuberculosis (TB) is currently increasing, and within this increase there has been a particularly marked rise in the number of multi-drug-resistant (MDR) cases. An annual rate of increase of even 5–6% has been mentioned [3]. The risk of development of drug-resistant TB is enhanced among individuals who have earlier participated in anti-TB treatment, among those infected with HIV, and among i.v. drug abusers [1]. Accordingly, it is necessary to reckon with an increase in the number of surgical interventions required in connection with pulmonary TB. Such interventions have undergone a considerable transformation in character in recent decades. During the 1960s and the early 1970s, a significant proportion (17.7%) of the interventions involved ‘collapse therapy’ [4], but this procedure has now virtually disappeared from the surgical spectrum. Resections were performed in only 66% of the cases in that earlier period, but by the 1980s and 1990s they were applied in 92% of the interventions [5]. In the second half of the 1990s, diagnostic surgery for the confirmation of TB became standard practice [6].

It is recommended in the literature [3,5,7] that a surgical intervention required because of a known TB process should be preceded by anti-TB treatment for a period of some months. In this way, the positivity of the sputum, and hence the number of postoperative complications, may be reduced. It is clear that the presence of TB is at most only assumed prior to interventions carried out for diagnostic
purposes. In such cases, therefore, there can be no preoperative anti-TB treatment, and accordingly no accompanying preventive effect.

In the present work, we have studied how the postoperative complications are influenced by the provision or not of presurgical anti-TB treatment.

2. Patients and methods

This retrospective study involved the processing of the perioperative data on 144 patients (32 females, 112 males) with an average age of 40.2 years (range 19–68 years) who underwent thoracic surgery for pulmonary or pleural TB between 1980 and 1997.

The patients were divided into two groups, depending on whether the surgical intervention was preceded or not by anti-TB treatment: those in whom the TB had been diagnosed preoperatively were placed in Group I (therapeutic resection), while those in whom there had been no preoperative anti-TB treatment and the TB was confirmed histologically on material obtained during surgery, were placed in Group II (diagnostic resection).

2.1. Group I

In Group I, the therapeutic resection group, there were 80 patients (16 females, 64 males), with an average age of 47.3 years (range 19–68 years). The average duration of TB among the 80 patients was 5.4 years (range 2–360 months). The pulmonary lesions were followed and confirmed by direct staining and culturing of the sputum, and by chest X-ray and computer tomographic (CT) examinations. The preoperative tests revealed a positive sputum culture in nine cases (11.3%) and a positive direct stain (sputum positive for acid-fast bacilli on the direct smear) in 11 cases (13.8%). Following combined anti-TB treatment based on rifampin and isoniazid for a period ranging between 2 and 18 months, the indication for surgery was the progression of the radiological picture in 32 cases (40.0%), the stationery condition of the radiological picture in 13 cases (16.3%), the stationery condition of the radiological picture in 32 cases (40.0%), and recurrence after 3–30 years of an earlier healed TB process in 35 cases (43.7%). The radiological lesion involved a tuberculosis in 49 cases, a caverna in 28 cases, and post-TB bronchiectasis in three cases.

2.2. Group II

Group II, the diagnostic resection group, comprised 64 patients (16 females, 48 males) with an average age of 45.5 years (range 32–67 years). TB did not feature in the case-histories of these patients, nor in their immediate environments, the suspicion of TB had not arisen, and TB had not been confirmed by pulmonological examinations (skin tests, Mantoux test, and direct staining and culturing of the sputum). These patients had not participated in preoperative anti-TB treatment. The lesion was demonstrated and followed up by means of chest X-rays, CT and bronchoscopy, and additionally, if the suspicion of a tumor arose, by means of thin-needle biopsy or bronchial brush cytology. The instrumental examinations led to the following surgical indications: 49 presumed malignancies, six cases involving a caverna with haemopthysis, seven multiple nodular lesions, and two cases of recurrent hydrothorax.

Following isolated intubation, surgery was carried out via a posterolateral or axillary thoracotomy, or (in nine cases) according to the rules of videothoracoscopy (VATS). The types of operation performed are presented in Table 1. When the lesion was located on the surface of the lung, wedge resection was performed. If the intraoperative cytology or frozen-section revealed malignancy, lobectomy was carried out. When the lesion was situated deep in the parenchyma, lobectomy was performed.

In the determination of the morbidity, consideration was given to a bronchopleural fistula (BPF), postoperative pneumothorax (PTX), chest fluid and any disturbance of wound healing. BPF was confirmed by bronchoscopic examination. PTX and the accumulation of fluid in the chest were included among the complications if PTX or fluid could be seen on the control X-ray after removal of the drains inserted during surgery. Every reopened wound was classified among the complications.

3. Results

Two patients died in the postoperative period, 5 and 10 days, respectively, after the surgical intervention. One of these patients, in whom miliary TB had been confirmed by VATS biopsy, died from rapidly progressing pneumonia. In the preoperative period, she was given high-dose steroid by the pulmonologist to treat the suspected pulmonary fibrosis. The other patient died from a massive hemorrhage after lobectomy performed because of a destroyed lung. Both of these patients were from Group II. Their TB processes had not been recognized, and they had not received anti-TB pretreatment. Thus, the postoperative mortality in Groups I + II was 1.4%, while in Group II alone (the diagnostic resection group) it was 3.1%.

The morbidity and mortality data are listed in Table 2. Table 2 reveals that the overall morbidity among the TB patients was 45.8%.

The BPF listed among the surgical complications devel-

<table>
<thead>
<tr>
<th>Types of operation performed for TB</th>
<th>Group I (n = 80)</th>
<th>Group II (n = 64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonectomy</td>
<td>0</td>
<td>5 (7.8%)</td>
</tr>
<tr>
<td>Lobectomy</td>
<td>52 (40%)</td>
<td>29 (45.3%)</td>
</tr>
<tr>
<td>Wedge resection</td>
<td>48 (60%)</td>
<td>20 (31.3%)</td>
</tr>
<tr>
<td>VATS biopsy</td>
<td>0</td>
<td>9 (14.0%)</td>
</tr>
<tr>
<td>Hilar lymphadenectomy</td>
<td>0</td>
<td>1 (1.6%)</td>
</tr>
</tbody>
</table>

a VATS, video-assisted thoracic surgery.
operated on postoperative day 24 following a left upper lobectomy in a patient in Group I. In response to drainage, the partial PTX was eliminated and the BPF closed. Thus, BPF occurred in 0.69% of the overall TB patients (Groups I, II).

In the group of diagnostic resections, the indication for pneumonectomy was cytologically confirmed epithelial cancer in 1 case, and the suspicion of a tumor in four cases. For all five patients, direct staining and culturing of the sputum were negative as concerns TB, and the case-histories had not given rise to the suspicion of a specific process. Accordingly, the suspicion of a tumor, as a surgical indication, was established on the basis of the chest CT, bronchoscopy and the cytological finding. Bronchoscopy indicated an endobronchially extending bronchial constriction and an uneven mucosal surface caused by a tumor in a bronchial orifice; in two cases this was in the left, while in three cases it was in the right upper lobe. At the site corresponding to this, the CT picture showed a ‘central tumor’. In the course of surgery, a lymph node conglomeration was found that infiltrated the pulmonary artery and the main bronchus in the hilus of the upper lobe; technically, this could be removed only at a pneumonectomy level. In all cases, the intraoperative cytology revealed TB, and the final histological finding confirmed fibrocaceous endobronchial TB, but not malignancy. Acid-fast bacteria were demonstrated in one case. Neither BPF nor empyema was observed after the five pneumonectomies.

The clinical and instrumental examination pictures of the mediastinal lymphadenectomy case in the diagnostic group (Group II) fully agreed with the findings on the five patients pneumonectomized because of endobronchial TB. Intraoperatively, however, it was observed that the lymph node conglomeration designated as the central tumor did not infiltrate its environment; thus, separation was possible from the main bronchus and the pulmonary artery, and lung resection was not necessary. In this case too, the histology confirmed fibrocaceous TB. In response to anti-TB treatment, the endobronchial picture improved without a significant constriction.

There were nine cured cases (11.3%) involving postoperative partial PTX or an encapsulated air accumulation after resection among the 80 cases in the pretreated group (Group I), and three such cases (4.6%) among the 64 patients in the diagnostic group (Group II). The cavity did not cause clinical symptoms, but chronic postoperative drainage was needed in all patients in consequence of the continuous air suction. The average duration of postoperative drainage was 6 days (range 3–40 days) in Group I, and 4.2 days (range 3–24 days) in Group II. 13.2 days (range 8–42 days) of postoperative nursing was required in Group I, and 10.4 days (range 6–26 days) in Group II.

Fluid accumulated in the chest in 63 patients (43.5%) after removal of the tubes. Similarly as for the incidence of PTX, the accumulation of fluid was more frequent in Group I (41 cases: 51.3%) than in Group II (22 patients: 35%).

Histologic examination revealed acid-fast bacteria in 32 patients (40.0%) in Group I, in 16 patients (25.0%) in Group II, and in 48 patients (33.3%) in Groups I + II. Complications were observed in 11 (22.9%) of the acid-fast positive cases.

As concerns the overall TB cases (Groups I + II), 34% of the interventions (i.e. in 49 patients) were performed because of the suspicion of a malignant process. The final histology indicated malignancy in nine cases (overall 6.25%).

Prior to the operation, aspergilloma was assumed in 12 patients; in fact, aspergilloma was confirmed by histological examination in 15 cases (10.4%). A cure with complications resulted in 12 of them.

### 4. Discussion

The indications for surgical interventions to treat TB have recently changed. From the 1960s, when collapse therapy was applied to treat TB, up to the present day, the surgical indications have varied as follows [4,6,16-18]:

1. **TB complications** (haemophthysis, empyema, bronchiec-tasis, cavity formation associated with aspergilloma, adenopathy with fistula, and endobronchial TB).
2. **Cases displaying an inappropriate healing response to medication,** in which the clinical and radiological pictures remain unchanged or indicate progression (cavity, tuberculoma).
3. **AFB positivity of the sputum after a 3-month treatment period,** with a circumscribed radiomorphological lesion.
4. **The suspicion of a malignant tumor.**

The range of indications for the interventions we performed fits in with the ranges mentioned in the literature. However, we did not carry out surgery for MDR TB, though the numbers of such interventions must be expected to rise in the future. The survey by Frieden et al. [1] indicated that 33% of the patients in New York City exhibited resistance to one or more anti-TB drugs. Whereas 98–99% of TB patients who had not participated in previous anti-TB therapy are

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### Table 2

**Morbidity and mortality after surgery for TB**

<table>
<thead>
<tr>
<th></th>
<th>Group I (n = 80)</th>
<th>Group II (n = 64)</th>
<th>Groups I + II (n = 144)</th>
</tr>
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<tbody>
<tr>
<td>BPF*</td>
<td>1 (1.25%)</td>
<td>0</td>
<td>1 (0.69%)</td>
</tr>
<tr>
<td>Fluid</td>
<td>32 (40%)</td>
<td>19 (29.7%)</td>
<td>51 (35.4%)</td>
</tr>
<tr>
<td>PTX</td>
<td>9 (11.2%)</td>
<td>3 (4.6%)</td>
<td>12 (8.3%)</td>
</tr>
<tr>
<td>Wound infection</td>
<td>1 (1.35%)</td>
<td>1 (1.56%)</td>
<td>2 (1.39%)</td>
</tr>
<tr>
<td>Morbidity</td>
<td>43 (53.7%)</td>
<td>23 (35.9%)</td>
<td>66 (45.8%)</td>
</tr>
<tr>
<td>Mortality</td>
<td>0</td>
<td>2 (3.1%)</td>
<td>2 (1.39%)</td>
</tr>
</tbody>
</table>

* BPF: broncho-pleural fistula; PTX: Pneumothorax.
cured in response to appropriate anti-TB treatment, if the disease is caused by drug-sensitive \textit{M. tuberculosis} [8], Goble et al. [2] found that only 65\% of 171 drug-resistant TB patients responded to medication and became sputum-negative. In nine patients among the remaining 35\%, a surgical intervention was performed, as a result of which seven of the nine became sputum-negative, while two were unchanged. The surgical indication in drug-resistant TB patients is likewise emphasized by Neptune et al. [4]. Pomerantz et al. [3] recommend the early resection of indolent lesions caused by non-tuberculous mycobacteria. MDR TB was the most frequent indication for surgery in the material of Treasure et al. [7].

In this almost 20-year period, we carried out a large number of operations for diagnostic purposes, because of undiagnosed TB, in 64 of the 144 patients (44.4\%). This proportion seems to be too excessive today, but in our Clinic in the early 1980s the diagnosis was not so accurate, which resulted in this high number of patients in the diagnostic group. In the study by Mouroux et al. [6] between 1987 and 1993, the diagnostic procedure rate was 42.4\%. In 36\% of these 25 patients, the TB was suspected, but it could not be diagnosed via the sputum sample, bronchial washing or transbronchial biopsy. In our Group II, the most common indication, in 49 of 64 patients, was a presumed malignancy. For the overall TB patients (Groups I + II), the frequency of a presumed malignancy as the surgical indication was 34\%. The final histologic result, however, confirmed such a malignancy in only 6.25\% of the cases. A presumed malignancy featured as an indication for surgery in 24.2\% of the cases of Rizzi et al. [5], and the histollogical processing confirmed carcinoma in addition to TB in 26.1\% of the cases. The considerable difference between the presumed and confirmed levels of malignancy in our material (34 vs. 6.25\%) is not in accordance with the literature data [3–7,9,10]. The cause of this is to be sought in the uncertainty in the diagnostic steps [15,19,21]. Preoperative transthoracal biopsy (which was not a routine procedure at the beginning of the mentioned period, and which was performed only in some cases of the learning curve) or bronchial brush cytology did not confirm TB in any of the 49 cases, and indicated a malignancy in only one case. As demonstrated by Wilcox [20], the accuracy of the preoperative diagnosis of TB can be improved by the use of a fibreoptic bronchoscope. In 56 sputum-negative cases, the bronchial brushing for smear and culture was positive in 67.5\%, and in 18 cases the transbronchial biopsy yielded a TB diagnosis in 50\%. To date, we have not used this technique.

The question of the justification of pneumonectomy for palliative purposes or in cases that involve a benign process remains a matter of debate at present.

In our material, pneumonectomy was carried out on 5 patients because of endobronchial TB. Technically, the conglomerate designated as a central tumor in the course of the preoperative examinations could only be removed at the pneumonectomy level in consequence of the infiltration of the pulmonary artery and the main bronchus. Even for intraoperative freezing examination, we were unable to take a representative sample: we could not remove a lymph node in its entirety, and we could therefore not exclude malignancy with certainty. Keagy et al. [11] similarly recommended an excisional biopsy in cases with an uncertain diagnosis, to attain a histological verification of the process; their material included nine pneumonectomies among 102 major resections (lobectomies and pneumonectomies) performed for diagnostic purposes. As a conclusion, however, they propose pneumonectomy for diagnostic purposes only with reservations. The difficulties inherent in the preoperative diagnosis are illustrated by the endobronchial cases of Watanabe et al. [12], where TB was successfully demonstrated in only four of 14 patients during the preoperative examinations. It was further mentioned that, in spite of anti-TB treatment, stenosis developed at the site of the endobronchial specific inflammation in nine of the 14 patients, on average 5.7 years after the first observation, as a result of which a surgical solution sometimes became necessary.

When an accurate preoperative diagnosis was not available (Group II), a resection accompanied by a large loss of parenchyma (29 lobectomies and five pneumonectomies) was carried out more frequently than when the TB process was known. The lobectomy rates, 40 and 45.3\% in Groups I and II, respectively, were not seriously different, but the pneumonectomies performed for endobronchial TB yielded a significant parenchyma reduction. Although this did not lead to an enhanced morbidity in Group II, where the rate (35.9\%) was in fact lower than that in Group I (53.7\%), we nevertheless recommend parenchyma-sparing resections in TB cases, with regard to the possibility of carrying out further resections which may become necessary at a later date. In the article by Neptune et al. [4], the lobectomy rate was 41.6\%, and the pneumonectomy rate 5.4\%.

The most common surgical indications tend to differ in the various literature publications. In our material, we performed surgery most often because of caverna and tuberculoma as radiomorphological lesions: in 132 (91.6\%) of the 144 patients. This differs from the data of Reed et al. [9], who performed such surgery for haemophthysis in 58\% of their patients. In the report by Treasure et al. [7], the most frequent surgical indication was MDR TB with a localized lesion. Resection for haemophthysis was carried out in six of our patients (4.2\%), where the morphological picture was caverna. Because of the bleeding, these patients did not receive preoperative anti-TB treatment for a long time.

With the factors we considered characteristic of morbidity, the morbidity after lung resections in our TB patients was 45.8\%; 53.7\% in Group I and 35.9\% in Group II. In the material of Rizzi et al. [5], the average morbidity was 29.1\%, but in the sputum-positive cases it was 30\%. Reeds et al. [9] reported a morbidity of 46\%, while the value found by Pomerantz et al. [3] in MDR and atypical
TB cases was 45%. As morbidity risk factors, Pomerantz et al. mention an AFB-positive sputum, previous irradiation, previous lung surgery and polynomic infection. The literature recommends anti-TB therapy for a period of months for the preoperative treatment of active TB [3,5,7], in order to diminish the positivity of the sputum and hence the risk of complications. In cases involving a known TB process, we too adhere to this principle. Paradoxically, however, the morbidity (53.7%) among the patients who participated in preoperative anti-TB treatment in our material (Group I) was higher than that among the cases who were not treated preoperatively (Group II), where it was only 35.9%. In the study by Rea et al. [25], the morbidity, after small cell lung cancer resection with neoadjuvant chemotherapy, was 13.4%, which is lower than that was in our TB cases. The postoperative hospitalization was also longer for Group I (13.2 days) than for Group II (10.4 days). The cause of this was the prolonged postoperative drainage time of 6.0 and 4.2 days in Groups I and II, respectively. The longer period of drainage accompanying the continuous air suction and the fluid evacuation may have been caused by the scarring that developed as a consequence of the TB. In the study by Jalal et al. [23] from Bristol, in bronchoplasty cases the median hospital stay was 13 days (mean 16, range 6–35 days), i.e. almost the same as in our TB cases.

BPF was not observed after pneumonectomies performed without preoperative anti-TB treatment. The one case of BPF occurred in Group I, after lobectomy (1.25%). The frequency of BPF after pneumonectomy in the material of Rizzi et al. [5], was 1.9%, while Reed et al. [10], gave a value of 23% in a paper reporting on pneumonectomy necessitated by inflammatory diseases. The BPF in cancer cases in the study by Ashamura et al. [22] was 2.1%. The mortality among our overall TB patients was (1.39%), 0% in Group I and 3.1% in Group II. The analogous literature values in TB cases vary between 2.4% and 14.2% [3,5,10,13,14]. In bronchoplasty cases for malignant and benign diseases, Jalal et al. [23] found a 0% mortality, while in the study by Pitz et al. [24] with resections for T3 cancer cases, the mortality was 8.3%. We must stress, however, that we experienced mortality only in Group II, i.e. among those patients who did not receive preoperative anti-TB treatment.

In the practice of Neptune et al. [4], collapse therapy was needed in 17.7%, while Rizzi et al. [5] performed thoracoplasty in 2.8% and muscle transposition in 5.1% concomitant with resections. In our practice, we did not perform thoracoplasty for TB cases. In postoperative pleural space problem, prolonged pleural drainage was carried out, and at the end of the suction therapy a thick pleura callus developed.

Fourteen percent of our diagnostic interventions were performed by means of videothoracoscopy. We regard this procedure as suitable for the sampling of lesions located at visible sites on the pleura or in the parenchyma. It must be mentioned, however, that one of our fatalities occurred after a VATS lung biopsy.

5. Conclusions

In lung resections for pulmonary TB performed without preoperative anti-TB treatment, the mortality was in the same ranges as mentioned in the literature for patient operated on following preoperative anti-TB treatment or with cancer disease. In TB cases the morbidity rate was higher than in cancer cases. A higher number of complications was noted among TB patients who had been pretreated for months and among recurrent TB patients, than among patients without preoperative anti-TB treatment. Nevertheless, postoperative mortality was observed only among patients who were operated on without receiving preoperative anti-TB treatment. In spite of this, the justification of diagnostic resections for TB, VATS biopsies and mediastinal lymph node dissection is undisputed. In resections performed for diagnostic purposes, an essentially larger quantity of lung parenchyma was removed, which may prove to be an obstacle to the practicability of later lung resections.

References

problems with white cells? 


Appendix A. Conference discussion

Dr J. Thorpe (Leeds, UK): To what do you account the morbidity in the pretreated group? Do you think the medication, in other words, had something to do with the increased morbidity?

Dr Forák: We think that this higher morbidity was because of the tuberculous fibrosis in the lung. The lung after the resection couldn’t fill the thorax, so we had space and fluid and permanent leak. We thought it was because of the fibrosis and not because of the anti-TB treatment.

Dr Thorpe: You didn’t see any hematological effect, like leukopenia or problems with white cells?

Dr Forák: We chose only this point of view. We know that in the literature there are, for example, the fever, white counts. We measured the white blood cell count, but it was not different from the normal population in our study.

Dr A. Tcherveniakov (Sofia, Bulgaria): Practically in most published data the complications after surgery for tuberculosis is higher than surgery in the lung tumors, for example, and this is the reason that I want to ask you two questions. What are the indications for wedge resection in those cases with tuberculosis and what is the treatment of the patients with bronchial fistula after your operation?

Dr Forák: For the second question, the bronchopleural fistula occurred not in the pneumonectomy group but in the lobectomy group, and after that, the space and the fistula was closed by drainage and suction therapy. More wedge resection was in the diagnosed groups. So if we found it on the surface and it was possible to remove it with safety, we did it. It was simple. The indication was mainly the tuberculoma.

Dr M. Perelman (Moscow, Russia): My question is about your opinion about preoperative and postoperative chemotherapy in cases of diagnosed tuberculoma. If you have a patient with diagnosed tuberculoma, is the chemotherapy necessary before the operation or not?

Dr Forák: We think yes, for 3 months, median, but in our group the preoperative anti-TB treatment ranges in wide intervals because lots of patients came from another country and we couldn’t influence the standard procedure in Romania and Yugoslavia, for example. In Hungary this preoperative treatment is for 3 months, and after the resection, half a year, combined therapy.

Dr Perelman: How long after resection is it?

Dr Forák: Half a year, 6 months.

Dr Perelman: Yes, I agree with you.

Dr V. Sa Vieira (Lisbon, Portugal): In Portugal we have the same results as you. We have more complications in the TB surgery than in the lung cancer surgery. But you have not mentioned one very important thing. In the case of tuberculosis surgery, in patients with no pulmonary TB or clinically cured, we found that between 40% and 45% of the patients had active lesions, histologically observed. So it is very important to study the histology and to study the histology of these patients, and we find, like I told you, that between 40% and 45% of the results are positive, with active lesions in lymph nodes or in the lung resections. Another question now is, you have 5 patients with bronchial TB, and you performed probably, and I don’t know if I heard well, pneumonectomy.

Dr Forák: Pneumonectomy.

Dr Sa Vieira: Also the risk is very high, but what kind of procedures did you use near the bronchus? Have you done any protection near the bronchus in these 5 patients?

Dr Forák: Yes. These cases came to our clinic as a tumor. The preoperative CT and the preoperative bronchoscopy revealed tumor, and in two cases, the cytology detected and confirmed metastasis. We opened the chest and we found a lymph node conglomerate attached, infiltrated to the main bronchus and the main artery. So in that case, after the preoperative histology, there was no other possibility to remove the lymph node for a sampling only with the lung. So the intraoperative cytology – the pathologist was in the room – revealed that it was a tumor. It was a desperate situation, and we could manage the problem in this way, and we covered the stump with the pleura. And I mentioned the sixth case. It was a lymphadenectomy, the same situation with the same instrumental results, but we could remove the lymph nodes only. There was no infiltration to the surrounding tissue, and at that time the postoperative TB therapy cured the endobronchial TB.

Dr D. Blyth (Natal, South Africa): I think as a general remark, it’s a bit unfair to compare the results of tuberculosis surgery with surgery for bronchial carcinoma. They are totally different. I think if one is going to compare, it should be with other forms of inflammatory lung disease. I know it’s well described that one would expect more complications in tuberculosis surgery.

We also are going through a point, just as you mentioned, Mr. Chairman, where we are finding histologically active tuberculosis despite in many instances 6 months of anti-TB therapy, and these patients appear to behave very well and not complicate as you would expect. In our experience with pneumonectomies through empyema these patients complicate less than the non-tuberculous cases. We are now doing emergency surgery for massive hemoptysis in patients with both TB and HIV infection, where initial results look good, but it will be of interest to see what happens in the longer term.