Surgery in bronchial carcinoids: experience with 83 patients

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Abstract

Objective: With the changing clinical presentation and histopathological pattern, carcinoids are now considered as a distinct and well-defined group in the neuroendocrine tumour scale. Surgery, especially parenchyma-sparing operations, are the treatment of choice for carcinoids. Methods: Over a 25-year period, 83 patients with typical carcinoid tumour underwent thoracotomy on in our institution. The records of the patients were reviewed and the results were evaluated. Results: The diagnosis was made with radiological methods and bronchoscopy. Cough and recurrent pneumonia were the most common symptoms. A variety of surgical procedures were performed. Thirty of the 83 patients underwent tissue-saving operations. Twenty patients underwent bronchotomy excision, eight were managed with sleeve or partial sleeve resective procedures, and two underwent segmentectomy. Conclusions: Conservative surgery is the treatment of choice of carcinoids, which were histologically typical and anatomically endobronchial. Especially for polypoid type carcinoids and for selected cases with sessile type, bronchotomy with simple excision and sleeve resections is a simple and effective method. As these types of operations produce a better functional result, they should be encouraged in these patients.

Keywords: Bronchial carcinoid; Sleeve resection; Bronchotomy; Simple excision

1. Introduction

Typical bronchial carcinoids are very low-grade neoplasms of the bronchopulmonary system and represents approximately 1–2% of all lung neoplasms [1–3]. As they usually arise from the Kulchitsky cells normally found between the basal parts of lining ducts and glands of the tracheobronchial columnar epithelium, 90% locate in the central bronchi of the lung. Only 10% are in peripheral locations [4]. Surgery is the treatment of choice in typical carcinoids. The surgical approach over the last three decades has been changing. Now tissue-saving operations such as bronchoplastic procedures are accepted with good long-term results [1–3,5].

Here we review our experience with 83 patients and evaluate our surgical results.

2. Material and methods

From 1974 to 2000, 83 consecutive patients underwent thoracotomy for typical carcinoid tumour. During the same period, nine patients underwent thoracotomy for atypical carcinoids. These are excluded from this study. The records of the patients were reviewed for preoperative symptoms, diagnostic procedures, surgical procedures performed and postoperative complications. Follow-up information for patients was obtained from direct patient contact.

3. Results

The group consisted of 45 male and 38 female patients with ages ranging from 18 to 68 years. The median age of patients at the time of operation was 34 years. Of our 83 patients, 81 had a central tumour located from the main bronchus to the segmental bronchi. Two had a peripheral tumour. These two peripheral tumours presented as asymptomatic coin lesions and were diagnosed after thoracotomy. The presenting symptoms are listed in Table 1. The commonest symptoms were cough and recurrent pulmonary infection occurred in 75.9 and 69.8% of patients. Twelve of the patients were referred with asthma-like symptoms and 11 of them were asymptomatic. Carcinoid syndrome was not observed in any of the patients.

The diagnostic work-up was made with radiological methods such as plain chest roentgenography, computed tomography (CT) scan and bronchoscopy. Plain chest radiographs showed a variety of findings like, non-specific density, lobar consolidation or normal findings. CT scan
was successful in predicting the location, extent of tumours
and also helpful in assessing the lymph node status. Also in
most of our cases tomography showed the endobronchial
lesion (Fig. 1).

Rigid or flexible bronchoscopies were performed in all of
the patients preoperatively. Biopsies were taken in 34 of
these patients and diagnosed as carcinoid with histopatho-
logical examination and for the rest, a morphological
appearance that was hypervascularized or pink-purple in
colour led us to consider typical carcinoids. Biopsy was
not taken in these patients because of the risk of bleeding.

The site of the lesion was determined with radiologic and
bronchoscopic findings. Fifty of the tumours were on the
right side and 33 were on the left. A variety of surgical
procedures were performed (Table 2). Double lumen endo-
bronchial tube was used for entubation in the most of the
patients.

Posterolateral thoracotomy was performed in all of the
patients. Fifty-three underwent aggressive procedures. For
81 patients that had centrally located carcinoids, 29 tissue-
saving operations were performed. Twenty underwent
bronchotomy excision wherein all had tumours with a de-
finite stalk, eight were managed with sleeve or partial sleeve
resective procedures and one was managed with segment-
tectomy. A decision on whether to choose aggressive
surgery or conservative surgery was made with broncho-
sopic presentation and CT scanning as well as intraopera-
tive findings such as state of the lung parenchyma and
lymph node status. Bronchotomy and simple excision or
sleeve resections were performed if there was no parench-
ymal change or lymphatic involvement proven by frozen
section. Lymph node dissection was performed for all of
the patients but node involvement was seen in only three.

Forty-five postoperative complications occurred in 18
patients (21.6%). Atelectasis and secretion retention that
required bronchoscopy occurred in 14 patients. Pleural
space problems and delayed air leakage was observed in

Table 1

<table>
<thead>
<tr>
<th>Symptoms and signs</th>
<th>No. of patients</th>
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<tr>
<td>Cough</td>
<td>63</td>
</tr>
<tr>
<td>Recurrent infection</td>
<td>58</td>
</tr>
<tr>
<td>Haemoptysis</td>
<td>31</td>
</tr>
<tr>
<td>Dyspnea</td>
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</tr>
<tr>
<td>Chest pain</td>
<td>17</td>
</tr>
<tr>
<td>Wheeze</td>
<td>10</td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>11</td>
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Table 2

<table>
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<tr>
<th>Operation</th>
<th>Left</th>
<th>Right</th>
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</thead>
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<tr>
<td>Wide resections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumonectomy</td>
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<td>6</td>
</tr>
<tr>
<td>Bilobectomy inferior</td>
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<td>9</td>
</tr>
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<td>–</td>
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<tr>
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<td>12</td>
</tr>
<tr>
<td>Median lobectomy</td>
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<td>4</td>
</tr>
<tr>
<td>Tissue-saving resections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segmentectomy</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>Sleeve resection</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Bronchotomy</td>
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<td></td>
</tr>
<tr>
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<td>5</td>
</tr>
<tr>
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<td>–</td>
<td>5</td>
</tr>
<tr>
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<td>3</td>
</tr>
<tr>
<td>Upper lobe bronchus</td>
<td>1</td>
<td>–</td>
</tr>
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</table>

Fig. 1. Typical carcinoid on the posterior segment of the right upper lobe in a 23-year-old woman. (a) CT scan of the patient. (b,c) Operation area and specimen after segmentectomy.
13 patients, empyema healed by drainage developed in three. Haemorrhage, more than 300 cc/day, occurred in nine patients. Wound infection occurred in six patients. Bronchopleural fistula was observed in one of the 20 patients who underwent bronchotomy excision. The patient was healed 2 months later with adequate thoracic drainage.

All patients were subjected to a follow-up of 2–12 years. Check bronchoscopies were performed according to a protocol on the tenth day, third, sixth and 12th months. Bronchoscopic examination was performed also for the patients who had complaints after 12 months. We have not seen any recurrence on the anastomosis line after surgery. Granulation tissues in the anastomosis line of the retaining bronchus were observed in two patients on whom non-absorbable sutures were used in bronchotomy closure in the sixth post-operative month. Eight bronchoplasty patients are still in our follow-up and no recurrence in the anastomosis line has been found. Two of our 83 patients died in the second year and the fourth year postoperatively due to non-operative reasons; one due to non-malignant disease and one due to an accident.

4. Discussion

Since the first description of bronchial adenoma by Muller in 1882 [2,4], pathologic and clinical concepts have changed considerably. Now bronchial carcinoids are considered as a distinct and well-defined group in the neuroendocrine tumour scale [1]. In this scale, typical carcinoids represent the best-differentiated form and small cell carcinoma is the least undifferentiated form. There is no apparent correlation between the formation of carcinoids and family history, age, tobacco use and environmental exposure. The average age for it to be discovered is the fourth decade [5,7]. In our study group, the median age of patients at presentation was 34 years.

Patients with typical carcinoids show variable symptoms. All are related to bronchial irritation and obstruction which depends on the central or peripheral location of the tumour. The most frequent symptoms are persistent irritative or productive cough, haemoptysis and recurrent infections [4]. We have seen pulmonary infections in 69.8%, cough in 75.9%, and haemoptysis in 37.3% of our patients.

Posteroanterior chest graphs and computed tomography scanning are the most useful techniques in the diagnosis of carcinoids. Pulmonary appearance can be normal or infiltrations can be seen in chest X-ray. CT scan is necessary in evaluating the lesion, especially for the extension of the lesion and for prediction of lymph node metastasis [1,2,5]. In most of our patients tomography showed the endobronchial lesion. We thus recommend preoperative CT scanning for all patients routinely. However, surgeons should remember while realizing that enlarged lymph nodes can be deceptive, chronic recurrent infections might be the cause of lymph node enlargement.

In the diagnostic work-up, the major method is rigid or flexible bronchoscopy [1,2,4–6]. Finding a partial or a complete obstruction of a bronchus explains some of the asthma-like symptoms. Also, distinguishing a benign tumour from a malignant tumour can only be achieved by bronchoscopic biopsy. Their lobulated pink-purple appearance is usually typical and they are highly vascularized, so taking a biopsy may cause major bleeding. Direct bronchoscopic examination is currently used in our centre. We took biopsies in only 34 of our cases and for the remainder, diagnosis was made with morphologic appearance. We have not been faced with any major bleeding during biopsies. Only a small amount of bleeding that resolved spontaneously occurred in some patients. In our opinion rigid bronchoscopy is a more safe and effective method than fiberoptic bronchoscopy, and experienced hands can get good results from biopsy. With rigid bronchoscopy, it is easy to obtain a huge specimen and it is easy and safe to control excessive bleeding. The use of the bronchoscope and CT scan help us to obtain information about resectability. If the lesion permits the bronchoscope to pass behind it and if the bronchoscope shows no destructive changes, and if the CT scan verifies this, conservative resections are performed.

In the last three decades, with differentiation of bronchial carcinoid tumour from other endobronchial tumours, more conservative resections such as bronchoplastic procedures have become accepted [1,2,4–7]. These include sleeve resections, wedge resections, ‘partial sleeve’ of bronchus, and bronchotomy with simple excision [2,8].

The first sleeve resection was performed by Sir Price Thomas in 1947 to remove a bronchial carcinoid tumour of the right main bronchus [1,6]. Since then sleeve resections with or without lobectomy rather than pneumonectomy have been considered as the operation of choice for central carcinoids (Fig. 2). Some authors have discussed wedge bronchoplasty and believe that this is an easy, fast and safe procedure [8]. We believe that, although it is easy and fast procedure, it is not safe. As will be discussed later, wedge bronchoplasty with large margins can cause kinking in the bronchial system, which is one of the major reasons causing complications such as atelectasis, stenosis and dehiscence. In our opinion, with wedge bronchoplasty enough material with disease-free margins cannot be taken without causing a kink.

Parenchyma-sparing surgery has to be the goal for the treatment. However, in our study group we have seen that most of our resected carcinoid tumours required anatomic lobectomy. The reason for this is that patients applied to our centre after having inappropriate treatments and losing time.

Central carcinoid tumours can be sessile or polypoid type with a definite stalk. Polypoid-type carcinoids (cherry type), in contrast to sessile carcinoids, do not invade the bronchial wall and have a better prognosis [2]. For polypoid-type carcinoids we performed bronchotomy and simple excision. For central sessile tumours we performed sleeve resections.
For bronchotomy with simple excision, the surgical approach can be summarized as follows. First the attached bronchus was dissected partially. In this way the exact localization of the lesion can be seen. Bronchotomy was usually made from the posterior side of the bronchus. Following the deflation of the non-dependent lung, transverse bronchotomy was performed just above the level of the tumour, and the tumour mass was removed with a small part of the bronchial wall, if the stalk of the tumour was on the bronchotomy side. If it was located on the opposite side, it was resected with a small part of the mucosa and minimal cauterization was performed in that part of the bronchial wall. After achieving good results with bronchotomy, we performed sleeve resections; this method can be summarized as removal of bronchus circumferentially or segmentally without a standard lobectomy.

Fig. 2. Typical carcinoid on the left main bronchus in a 28-year-old woman. Bronchoscopic evaluation shows the lesion obliterating the inferior lobe orifice. Partial sleeve resection was applied to the patient.

According to our experience; we have observed that during some of our operations, i.e. wedge bronchoplasty with or without lobectomy, the lung parenchyma behind the resected bronchus was inflated but the deflation was not seen. So a control bronchoscopy with a 3.1-mm fiberoptic bronroscope was done through an entubation tube. It was seen that there was a kinking in the remaining bronchus that resulted in a kind of valve, which allowed air to go in but not to go out. Even aspiration of secretions were not achieved by bronchoscopy. The resection was then converted to a standard sleeve resection. We believe that as a rule, if the length of the bottom part of the piece which is to be resected is more than the dimension of the bronchus, wedge bronchoplasty should not be done.

Before performing a bronchoplastic procedure the feasibility of performance must be assessed. The extent and size
of the lesion has to be determined with bronchoscopy and CT scanning. Irreversible parenchyma change is an absolute contraindication for bronchoplastic procedures. Also, during the operation lymph node status, bronchial wall involvement and divided edges have to be evaluated with frozen-section examination. In general, the finding of extensive nodal and bronchial wall involvement should be considered as a contraindication for bronchoplasty.

Bronchotomy with simple excision was made for 20 of our patients. Although the centrally located lesions had earlier mediastinal lymph node metastases, we have not seen any lymph node involvement in polypoid-type carcinoids. Bronchoscopic excision and laser treatment is under discussion and not recommended [7]. In selected cases bronchotomy and sleeve resections should be preferred. In our centre, we usually try to apply conservative methods to the patients but we frequently perform more aggressive procedures as most of our cases previously had inappropriate treatments by other centres as well as lost time. Because of the risk of malign degeneration and post-obstructive parenchyma destruction, it is very important to evaluate the patients in the very early period. For every patient who has recurrent infections or chronic cough, or a suspicion of asthma, bronchoscopy should be carried out. Bronchial carcinoids have a better prognosis after surgical resection even in lymph node metastasis than other bronchogenic neoplasms [5]. In our study the survival rate for a 5-year period was 97%.

In conclusion, conservative surgery is the treatment of choice of typical carcinoids. Early diagnosis is important. Especially for polypoid type carcinoids and for selected cases with sessile type, bronchotomy with simple excision and sleeve resections are simple and effective methods. These methods have low morbidity and have good long-term results. Prognosis is excellent even in the lymphatic spread. We have seen that bronchoplastic procedures produce a better functional result with low operative morbidity and mortality, and have long-term tumour-free survival. Therefore conservative procedures should be encouraged in these patients.

References