Lung Cancer: A Bronchoscopic Approach

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The unfavourable epidemiological data of lung cancer has not been changed during the past ten years. The only possibility to cure this malignancy is surgical resection. The five year survival rate after surgery is highly dependent on early discovery of the tumor. Today, bronchoscopy plays a central role in the diagnosis, staging and therapy of lung cancer. The main indications of diagnostic bronchoscopy are the identification of the tumor and the determination of its extent. The aim of therapeutic bronchoscopy – laser photocoagulation, high dose rate afterloading irradiation and stent implantation – is to provide an acceptable quality of life and to manage symptoms such as bleeding, cough and dyspnea. (Pathology Oncology Research Vol 2, No1–2, 11–15, 1996)

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Bronchogenic carcinoma is still one of the major health problems in developed western countries. In 1990, 175,400 new cases were discovered in the European Union.25 In Hungary the number of the new cases increases continuously: the incidence was 5,700 patients in 1994 (Fig. 1).26

The most effective method of managing this tumor is surgical resection. Unfortunately, only 20-30% of patients are suitable for surgery at the time of diagnosis. The most frequent causes of inoperability are either the advanced stage of the tumor and/or the histological type, or the poor general condition of the patient. Despite surgical intervention, the overall survival rate is 8-15% at five years. The survival rate could approach 70% with intervention at the early localized stage. However, only 24% of new cases belong to this "favourable" oncological stage. These figures have not changed over the past decade.27

The diagnosis of lung cancer must be based on cytopathological data. Without exact pathomorphological diagnosis neither chemotheraphy, nor irradiation should be performed (the only exception is the vena cava superior syndrome). The possibility of surgical interventions (resectability, radicality) can also be influenced by histological type of the tumor.

Recently, we celebrated the 100th anniversary of the discovery of the bronchoscope. Endoscopic examination of the bronchial system has continuously improved during the past hundred years. An important cornerstone was the introduction of the flexible bronchoscope in 1964, which contributed to the widespread use of airway endoscopy, mainly among pulmonologists. Currently, more than 90% of bronchoscopies are performed with flexible endoscopes.28,29 However, in certain cases (mainly laser photoacoagulation and prevention of certain life threatening complications) the use of a rigid bronchoscope is indis-

![Incidence of lung cancer in Hungary](image)

*Figure 1. Incidence of lung cancer in Hungary.*

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pensable in a bronchosopic unit. Today, bronchoscopic examinations are fundamental to the diagnosis, staging and therapy of lung cancer.  

**Bronchoscopic diagnosis of lung cancer**

**Bronchoscopically visible tumors**

If the tumor can be well visualized in the bronchial system, (Figs.2,3,4) the overlying mucous, blood or necrotic material should be removed from the surface before performing the biopsy. A maximum diagnostic yield can be achieved with three or four forceps biopsies; however a combination of different sorts of biopsies can increase also the accuracy of bronchoscopic procedures. The combined method, application of brush-, forceps- and trans-bronchial fine needle techniques and bronchoalveolar lavage, increase the diagnostic yield over 90%.  

**Peripheral tumor – invisible with bronchoscope**

Solitary pulmonary nodules or peripheral coin lesions are defined as circumscribed lesions completely surrounded by normal lung tissue. Diagnostic yields are affected by the size and location of lesions, probability of malignancy, as well as the sampling techniques. The brush biopsy, bronchoalveolar lavage and bronchoscopic lung biopsy are the most effective techniques to achieve a diagnosis. The combination of these techniques can also improve the efficacy of the intervention.  

Reviewing the data concerning the diagnostic yield of peripheral nodules, bronchoscopy has a significant role only in those cases where the diameter of the lesion is over 2 cm. It is recommended that five forceps biopsies be taken in patients with peripheral lesions to reach optimal diagnostic accuracy.  

Bronchoscopy for peripheral lung lesions is generally performed under biplane (or "C" arm) fluoroscopic guidance (Fig.5). The CT scan also contributes to increased diagnostic efficacy of bronchoscopy by showing the relation of the bronchus to the lesion. Diagnostic accuracy is significantly higher in those cases where the bronchus leads directly into the nodule (positive bronchus sign).

**Staging lung cancer with bronchoscope**

The aim of the staging procedure is to determine operability of the lung tumor. This procedure comprises establishment of the resection line for the surgeon (definitely non-tumorous bronchial structure proximally from the primary lesion and its distance from the proximal carina). There are certain methods concerning biopsies from macroscopically normal bronchial mucosa in the "planned" resection line, but these techniques are not generally accepted because of their inconsistent results.

The other reason for preoperative staging bronchoscopy is to map the hilus and mediastinum to disclose metastatic lymph nodes which can modify and/or preclude the operation. The bronchoscopist can detect airway compression by lymph nodes (or by the tumor itself) without the need to perform a biopsy under direct visual control.
Table 1. Therapeutic bronchological interventions in lung cancer

<table>
<thead>
<tr>
<th>Indication</th>
<th>Laser</th>
<th>Afterloading</th>
<th>Stent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localization</td>
<td>intrabronchial processes</td>
<td>extra- and intrabronchial tumors</td>
<td>extra- and intrabronchial tumors</td>
</tr>
<tr>
<td>Brochoscope</td>
<td>rigid and/or flexible</td>
<td>flexible</td>
<td>rigid and/or flexible</td>
</tr>
<tr>
<td>Anaesthesia</td>
<td>local or general</td>
<td>local</td>
<td>local or general</td>
</tr>
<tr>
<td>Effect</td>
<td>immediate</td>
<td>late</td>
<td>immediate</td>
</tr>
<tr>
<td>Complication</td>
<td>bleeding, perforation, fire</td>
<td>bleeding, perforation, irradiation, bronchitis</td>
<td>displacement, obstruction by secretion</td>
</tr>
</tbody>
</table>

Bronchial needle biopsy developed for rigid bronchoscopes is applied for flexible bronchoscopes as well, with considerable diagnostic accuracy. Endobronchial sonography is a newly developed technique for mapping extrabronchial tumors and enlarged lymph nodes located near the airways. This structure is echo-poor and can be distinguished from the echo-rich bronchial wall. The pulmonary vessels can also be separated from tumor tissue designated for biopsy. Another new diagnostic technique is differential laser application with and without photosensitising compound to distinguish normal bronchial epithelium from lesions like metaplasia or dysplasia. The main advantage of this method is the capability to mark that pathological region which would otherwise be invisible with conventional bronchoscope.

Therapeutic bronchoscopy in lung cancer

Endoluminal obstruction or compression of the central airways commonly cause dyspnea, cough, hemoptysis, obstructive pneumonia and respiratory failure. The most frequent cause is lung cancer discovered generally in an inoperable, advanced stage. Therapeutic possibilities depend on the nature of the disease, extent of the malignancy and prognosis. In these cases, the use of the airways can be maintained by mechanical dilatation, laser photocoagulation, stent implantation, local or external beam radiation, intubation, tracheotomy with cannula, electro-cryotherapy, etc. These techniques can be combined one with another. It should be understood that all these procedures can be applied only with the expectation of palliation and, importantly, improving the quality of life, not prolonging it.

Endobronchial laser therapy

In endobronchial therapy, most commonly the Nd-YAG laser is applied through a rigid bronchoscope under general anaesthesia (Fig.6). The mechanical removal of the coagulated-carbonized tumor tissue follows. The indications and complications of the laser photocoagulation are shown on Table 1.

Endobronchial irradiation

Endobronchial irradiation (brachytherapy, afterloading therapy) can be applied in case of intrabronchial obstruction, as well as in extrinsic compression. The radioactive

Figure 5. Fluorescopy guided biopsy from a bronchoscopically undetectable tumor.

Figure 6. Nd-YAG photocoagulation of a squamous cell carcinoma in the right main bronchus.
source (generally $^{192}$Ir) afterloading into a catheter is placed intrabronchially adjacent to the tumor by bronchoscope. The procedure is generally combined with external beam irradiation. Reduction of tumor size and improvement of symptoms can be observed in 60-90% of cases.\textsuperscript{4,12,13,16,20,25,35,40,41}

Endobronchial prosthesis (stent) implantation

After opening the airway by laser, or any other method, reobstruction can occur because of rapidly proliferating tumor tissue. Several types of tracheobronchial stents have been developed to splint open the airway segment (Fig. 7). The Montgomery silicone T stents require tracheostomy, although straight silicone stents may be placed endoscopically and these and different metal-reinforced silicone stents can be tailored to fit most anatomical situations. Nowadays, a variety of stents can be inserted without a bronchoscope (Strecker, Palmaz, Wall) under fluoroscopic control. These endoprostheses are much more preferable for the patient because of the possibility of avoiding a tracheostomy.\textsuperscript{3,9,10,14,15,35,39}

Finally, it should be emphasized again, that most patients with inoperable lung cancer can be offered only palliation. The above discussed methods (main characteristics are described on Table 1) can contribute to the improvement of the major symptoms (breathlessness, hemoptysis, refractory cough) without prolonging life span.

References


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