Endobronchial Radiation Therapy for Obstructing Malignancies: Ten Years’ Experience with Iridium-192 High-Dose Radiation Brachytherapy Afterloading Technique in 365 Patients

H.-N. Macha, B. Wahlers,1 C. Reichle, and D. von Zwehl

Departments of Chest Diseases and 1Radiotherapy, Lungenklinik, Hemer, Germany

Abstract. From 1983 to 1993, 365 patients with obstructing endobronchial malignancies were treated by endobronchial high-dose radiation (HDR) iridium-192 afterloading. In 346 patients, the objective was palliation, and in 19, the objective was curative. A dose of 5 Gy at 10 mm from the source axis was administered on three (palliation) and four (cure) occasions, at intervals of 14 days. The majority of patients were treated after exhaustion of external beam radiation therapy (EBRT), often in conjunction with other interventional bronchologic modalities such as endobronchial laser resection. Of the patients, 65% had a squamous cell carcinoma. Endobronchial HDR brachytherapy results in few acute complications and can be performed with no major discomfort on an outpatient basis. In approximately 66% of patients, a palliative effect is achieved, even after the exhaustion of conventional treatment. Life may be prolonged for a few months, but the enhancement of survival is difficult to assess for several reasons. Mean survival is 9 months for limited disease and 5 months for extensive disease. Endobronchial HDR brachytherapy influences the pattern of failure: a 21% rate of fatal hemorrhages is probably the result of the selection of patients for this treatment rather than a treatment-related complication. There is sufficient evidence to suggest the rational use of HDR brachytherapy in combination with EBRT to effect a cure, or even on its own when tumor growth is strictly limited. However, the standardization of radiotherapy and endoscopic indications is an urgent priority. Prospective, controlled, and cooperative studies are man-
datory. Endobronchial iridium-192 HDR brachytherapy complements endobronchial laser resection and is currently an established technique in the treatment of advanced malignant airway obstructions.

Key words: Endobronchial iridium-192 high-dose radiation brachytherapy—Palliation—Cure—Bronchial carcinoma.

The Therapeutic Approach of Endobronchial High-dose Radiation Brachytherapy

The discovery of an obstructing tumor in a major airway presents a challenge for the endoscopist. For the patient, a rapid reopening of the obstructed airway is an urgent need, because usually he or she suffers from severe dyspnea, atelectasis, or atelectatic pneumonia. In this case, this primary palliative goal can be achieved by removing the tumor bulk by forceps biopsy and rigid bronchoscopy, with the patient under general anesthesia [5, 9]. However, this method has proved to be dangerous because of the risk of severe bleeding, and although the complementary use of electrocautery reduces this risk, the resultant coagulation of the tissue is not completely free from hemorrhage [6]. Cryosurgery, which induces a well-defined necrotic coagulation, is far more successful in preventing subsequent bleeding [16]. In addition, by inducing posttherapeutic hyperemia, it facilitates the therapeutic administration of cytotoxic agents to combat subsequent tumor relapse [8]. Unlike endobronchial laser resection, cryosurgery is not suitable for emergencies because of its slow onset of action. Nevertheless, during the past 10 years, in spite of its advantages, cryosurgery has not achieved the popularity of use currently enjoyed by endobronchial laser resection. The latter technique is well established in interventional bronchology [2, 5, 7, 24].

The use of the neodymium:yttrium-aluminum-garnet (Nd:YAG) laser produces tumor shrinkage by inducing a precisely defined necrotic coagulation. The necrotic tissue can then be easily removed by forceps biopsy, effecting rapid patency of an occluded bronchus.

To achieve palliation, complete reopening of the bronchus and resection of tumor tissue flush with the bronchial mucosa are not essential: because airway resistance obeys the fourth power of the bronchial lumen diameter, even minor changes in airway diameter induce dramatic improvements in pulmonary function [13]. However, the laser technique has proved to be only palliative because the cryptic parts of the tumor (intramural and in the surrounding bronchus) are not accessible to the laser. Even after successful recanalization with the Nd:YAG laser, a local recurrence of bronchial obstruction can be expected within weeks. Clearly, under these circumstances, an additional technique should be included in an attempt to prevent tumor recurrence, or perhaps more realistically, to avoid reocclusion of the bronchial lumen: radiation therapy.

Initially, external beam radiation therapy (EBRT) offers major benefits. It is a highly efficient palliative tool, especially in the case of superior vena cava