Endobronchial Brachytherapy

Medical Policy

<table>
<thead>
<tr>
<th>Section</th>
<th>Original Policy Date</th>
<th>Last Review Status/Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy</td>
<td>12/2013</td>
<td>Reviewed with literature search/12/2013</td>
</tr>
</tbody>
</table>

Issue
12/2013

Disclaimer

Our medical policies are designed for informational purposes only and are not an authorization, or an explanation of benefits, or a contract. Receipt of benefits is subject to satisfaction of all terms and conditions of the coverage. Medical technology is constantly changing, and we reserve the right to review and update our policies periodically.

Description

Endobronchial brachytherapy describes the delivery of radiation therapy directly to endobronchial lesions, using either permanent interstitial implantation of radioactive seeds or a temporary afterloading implant. The technique permits targeted radiation while minimizing exposure to surrounding radiosensitive structures, such as normal lung, heart, and spinal cord.

Endobronchial brachytherapy has been most investigated as a palliative treatment of obstructing primary or metastatic tumors, particularly in non-small cell lung cancer. There is also experience using endobronchial brachytherapy as a tool in curative treatment for some primary bronchial and tracheal tumors. Two to four fractions delivered weekly is a typical schedule. The most serious complications described for endobronchial brachytherapy are massive hemoptysis, formation of tracheoesophageal fistulas, bronchospasm, bronchial stenosis and radiation bronchitis (1).

In the outpatient setting, the patient receives local anesthesia and monitored sedation. A flexible bronchoscope is passed transnasally; a separate port on the bronchoscope allows passage of the afterloading catheter to the target lesion. Once the catheter is placed, the radioisotope can be administered by the high-dose radiotherapy afterloading machine. Patients with potential airway compromise due to bleeding may require treatment with a rigid bronchoscope, which requires general anesthesia and frequently an overnight stay.

Endobronchial brachytherapy represents one approach to the local treatment of endobronchial lesions. Other technologies include electrocoagulation, cryosurgery, laser resection, endosurgery and endobronchial stent placement. In some instances, the therapies may be used together, such as using laser therapy for initial debulking followed by brachytherapy.

Policy
Endobronchial brachytherapy may be considered **medically necessary** in the following clinical situations:

- In patients with primary endobronchial tumors who are not otherwise candidates for surgical resection or external beam radiation therapy due to co-morbidities or location of the tumor
- As a palliative therapy for airway obstruction or severe hemoptysis in patients with primary, metastatic, or recurrent endobronchial tumors

Other applications of endobronchial brachytherapy are **investigational** including, but not limited to, its use as a radiation “boost” to curative external-beam radiotherapy, as treatment for asymptomatic recurrences of non-small-cell lung cancer, or in the treatment of hyperplastic granulation tissue.

---

**Policy Guidelines**

Endobronchial brachytherapy is a multistep procedure requiring a series of radiation oncology CPT codes for radiation treatment planning, radiation physics, treatment delivery, and clinical treatment management. CPT codes 77761-77787 describe various types of radiation source application; these codes are used to describe the brachytherapy delivery. In contrast to other types of radiation therapy, endobronchial brachytherapy requires the services of a radiation oncologist and a pulmonologist or other physician to perform the bronchoscopy and insert the catheter. In 1999, a new CPT code was introduced that specifically identified the catheter placement:

31643: Bronchoscopy (rigid or flexible); with placement of catheter(s) for intracavitary radioelement application.

Previously, the bronchoscopy component of endobronchial brachytherapy was probably coded with CPT code 31641 (bronchoscopy with destruction of tumor) or by using CPT codes 77761-77763 with a modifier –62 to indicate the participation of a surgeon/pulmonologist in addition to the radiation oncologist.

---

**Rationale**

This policy was created in 1999 and updated with searches of MEDLINE through December 2011. Following is a summary of the key literature to date:

Endobronchial brachytherapy is used as both palliative treatment and curative treatment; either alone or in combination with other modalities such as surgery, external beam radiation or other endoscopic interventions.

**1. Endobronchial brachytherapy as palliative treatment**

Many patients with NSCLC are initially treated with external-beam radiation therapy but
ultimately experience local recurrence. Unfortunately, many are not candidates for further external-beam radiation therapy due to the limited tolerance of normal tissue. If symptoms persist following external-beam radiation, endobronchial brachytherapy is well accepted as a short-term palliation for such symptoms as hemoptysis, cough, dyspnea, and resolution of obstructive atelectasis or pneumonitis. A European prospective study reported on 270 patients who had previously received radiation therapy and subsequently were given high-dose brachytherapy resulting in a total response rate of 80% for symptoms of dyspnea, cough, hemoptysis and postobstructive pneumonia with a median duration of palliation of 5 months with a range of 2 to 14 months. (2) In a summary of studies of palliative endobronchial brachytherapy between 1985 and 1994, Villanueva and colleagues reported effective palliation in 60–100% of patients. (3) The median survival of these patients is typically less than 9 months.

A 2008 Cochrane review of palliative endobronchial brachytherapy for NSCLC (1) analyzed 13 randomized, controlled trials (RCTs) but could not combine them into a meta-analysis because of heterogeneity in the doses of radiotherapy delivered, patient characteristics, and outcomes measured. The authors concluded that external-beam radiation therapy alone is still more effective for palliation of symptoms than endobronchial brachytherapy alone. Their findings did not provide conclusive evidence that endobronchial brachytherapy plus external-beam radiation therapy improved symptom relief over external-beam radiation alone, nor did it improve complication rates or extend survival. In summary, the authors were not able to provide conclusive evidence to recommend endobronchial brachytherapy as an add-on to first-line external beam radiation therapy, chemotherapy, or Nd-YAG laser palliative treatment. For patients previously treated by external-beam radiation who are still symptomatic, endobronchial brachytherapy may be considered an option.

In agreement with the Cochrane review, a 2006 prospective randomized trial from India with just 45 patients suggested that endobronchial brachytherapy alone and endobronchial brachytherapy with external radiation had similar efficacy and safety profiles in the palliative management of NSCLC. (4)

Also in agreement with the Cochrane review, Ung and colleagues conducted a 2006 systematic review of endobronchial brachytherapy in the palliative treatment of NSCLC with 29 studies and 6 randomized trials. (5) The authors concluded that external-beam radiation therapy alone is more effective than endobronchial brachytherapy alone for symptom palliation in previously untreated patients. In contrast to the Cochrane review though, the Ung et al. review concluded that endobronchial brachytherapy with external beam radiation seems to provide better symptom relief than external beam radiation alone, yet their final recommendation is to only use endobronchial brachytherapy with symptomatic recurrent endobronchial obstruction following external-beam radiation.

Most studies evaluate the use of endobronchial brachytherapy in lung cancer, but a 2007 French study reported on the use of endobronchial brachytherapy in a small number of patients with endobronchial metastases secondary to colorectal carcinomas. (6) All patients had primary resection of the colorectal carcinoma; then 7 received intrabronchial therapies including brachytherapy and 7 did not. Patients receiving intrabronchial therapies had a median survival of 55.7 months versus 12.7 months for the controls. It is difficult to draw conclusions from this small study; larger trials are still needed.

Ozkok et al. published a case series from Turkey on the use of high-dose-rate endobronchial brachytherapy for palliation of symptoms for 158 patients in 3 patient groups. (7) Group A
consisted of 43 patients with stage IIIA and IIIB NSCLC who received endobronchial brachytherapy in combination with external-beam radiation; Group B consisted of 74 previously untreated patients with incurable, locally advanced lung cancer; and Group C consisted of 41 patients with symptomatic endobronchial recurrences and who had previously been irradiated with full doses of radiation therapy. Participants in Group A were from a previously reported prospective trial (8); data from these participants were reanalyzed for palliation of symptoms in the current report. Not all patients received the intended number of fractions due to patient refusal or deterioration in performance status. A few patients required more than the prescribed doses due to repetitive obstructive symptoms. Response rates for cough, dyspnea, and hemoptysis were measured by the Speiser symptom index scoring system. The response rates in Group A were 58% for cough (30% CR [complete response]), 77% for dyspnea (76% CR), and 100% for hemoptysis (92% CR). Groups B and C had response rates of 57% and 55% for cough and 90% and 78% for dyspnea, respectively. Eighteen patients (11%) died of hemoptysis, with a median time to event of 7 months. Significant prognostic factors for fatal hemoptysis were use of brachytherapy intended as a treatment (as opposed to strictly palliation, p<0.001), total radiobiological equivalent dose (p<0.001), and the number of high-dose-rate endobronchial brachytherapy fractions (p<0.001). The authors conclude that high-dose-rate endobronchial brachytherapy is effective for the palliation of symptoms related to inoperable lung cancer, either alone or in combination with external-beam radiation. They caution that optimal dose, fractionation, and combination schedule with external-beam radiation are yet to be determined. Further, they state that any benefit must be weighed against potentially serious treatment-related morbidity or mortality. Without a comparison group, it is not possible to draw conclusions from this case series.

While endobronchial brachytherapy is often used to palliate hemoptysis, historically, concern has existed of an observed association between treatment with endobronchial brachytherapy and fatal hemoptysis. The largest study was a retrospective review of 938 patients treated with external irradiation and/or endobronchial brachytherapy for inoperable NSCLC. (9) In this study, 101 (10.8%) patients died from massive hemoptysis; 78 (77%) of those had clinical or radiologic evidence of tumor progression, while 23 did not. On multivariate analysis, intrabronchial tumor extension in the main bronchus, hemoptysis prior to radiotherapy, and tumor location in the upper bronchus were independently associated with the incidence of massive hemoptysis. A dose-response relationship between the fraction dose and massive hemoptysis was also found; and in all subsets, higher incidence of massive hemoptysis was seen after fraction dose of 15 Gy. These data were largely consistent with the data published by Hennequin et al. who reported that hemoptysis is most likely due to disease progression, with brachytherapy facilitating the bleeding, rather than a direct complication of the brachytherapy itself. (10) They noted that when tumors are located in the upper lobes, brachytherapy may be causal. Tumor location was cited as the most important factor in predicting pulmonary hemoptysis in a case series reported by Bedwinek et al. in which 32% of patients died of massive hemoptysis following brachytherapy. (11)

Dagnault and colleagues reported a retrospective review of 81 patients who were treated with brachytherapy in the palliation of symptoms due to endobronchial primary lung tumors or metastases. (12) Between 2002 and 2007, 81 patients who were not candidates for surgery or external radiation because of poor respiratory function, medical comorbidities, or previous treatment with thoracic radiation or surgery, were treated at a single institution. Mean patient age was 66 years (range: 39-87 years). Prior treatment consisted of surgical resection of the primary tumor in 58% of patients, chemotherapy in 41%, and lung radiotherapy in 44%. After endobronchial brachytherapy, patients were followed until death or loss to follow-up. Patient
characteristics included 59 (73%) with a lung primary and the remainder with metastatic disease including primary colorectal cancer (13%), kidney, gynecologic, and head and neck (each 4%), and other (2%). Presenting symptoms included dyspnea (66%), cough (47%), hemoptysis (28%), and no symptoms (6%). After brachytherapy, major symptomatic improvement was seen in most patients. Eighty-five percent of patients had an improvement in dyspnea during or shortly after the end of treatment, hemoptysis stopped in all 23 patients, and 77% had an improvement of their cough, whereas 18% remained stable. At 6 weeks’ follow-up, 72% of tumors were evaluable for bronchoscopic response. A visible bronchoscopic response was evident in 77 patients and for 42 of 81 patients, the tumor shrank significantly during treatment. Median survival was 14.7 months and local progression-free survival (PFS) at 12 months was 77% and at 24 months, 64%. For comparison, the authors state that the survival for most patients with inoperable endobronchial tumors or metastasis is less than 6 months. The complication rate was low, with all complications resolved.

Guarnaschelli and Jose reviewed the treatment outcomes of 52 patients with recurrent endobronchial tumors who underwent palliative high-dose-rate endobronchial brachytherapy between 1995 and 2005 at one institution. (13) Objective response was assessed by bronchoscopy and chest CT (computed tomography) and subjective clinical response by patient reports. All patients had histologically proven bronchogenic carcinoma, recurrent or persistent symptoms (hemoptysis, cough, dyspnea, or post-obstructive pneumonia), previous definitive external-beam radiotherapy, and evidence of an endobronchial obstructive component based on bronchoscopy. Patient age ranged from 41-83 years (mean: 63 years) and 37% of the patients were female. Tumor histology was non-small cell in 77% of patients, small cell in 13%, adenoid cystic in 2%, and metastatic in 2%. Patient symptoms prior to brachytherapy included dyspnea upon exertion (79%), cough (89%), hemoptysis (62%), wheezing (52%), dysphagia (8%), chest pain (15%), and shortness of breath (83%). Symptomatic improvement was defined as significant if there was improvement in 2 or more symptoms and mild if only 1 symptom improved. Forty-eight patients (92%) showed symptomatic improvement, with 60% (n=31) showing significant improvement and 35% (n=18) showing mild improvement. One patient had worsening hemoptysis and 2 patients (4%) failed to return for assessment. The median time to symptomatic relapse following the first fraction of brachytherapy was 6 months (range: 1 to more than 6 months). Complete or partial tumor regression was demonstrated in 44 patients (85%) on repeat bronchoscopy. Median follow-up was 31 months, and median overall actuarial survival for the entire cohort from the time of the first brachytherapy session was 7 months (range: 0-55 months). Fifty patients (96%) tolerated the treatment without acute, treatment-related complications. Significant treatment-related complications (grade 3 or 4) were reported as possibly occurring in 2 patients (4%): one patient developed a pneumothorax 6 weeks after treatment and one patient died from hemoptysis 48 hours after brachytherapy; however, it was unknown if the hemoptysis was directly related to the brachytherapy or erosion of the tumor into a blood vessel.

2. Endobronchial brachytherapy as primary treatment

Candidates for primary treatment have principally included patients with early-stage endobronchial tumors who are not candidates for surgical resection or external-beam radiation due to comorbidities or the location of the tumor. Results have predominantly been reported in case series for which complete response (CR) rates in the range of 50–80% have been noted. (14-16)
There have also been early investigations for the use of brachytherapy to deliver a focused radiation boost to patients undergoing curative external-beam radiation therapy. External-beam radiation therapy is typically the primary treatment for the majority of patients with NSCLC due to the fact that patients usually present with surgically unresectable disease and that NSCLC is unresponsive to chemotherapy. Aumont-le Guilcher and colleagues reported the outcomes of 226 patients with primary non-small cell carcinoma (endobronchial only) who underwent high-dose-rate brachytherapy because of contraindications to surgery and external-beam radiation therapy. (17) The patients were 223 men and 3 women from 9 institutions, mean age 62.2 years (range: 40-84 years). Tumor histology was squamous cell in 96%, adenocarcinoma in 2%, and other in 2%. Response to high-dose-rate brachytherapy at 2 to 3 months was classified as complete histologic response (disappearance of the lesion bronchoscopically and negative biopsy), complete macroscopic response (disappearance of the lesion but no biopsy), partial response (greater than 50% decrease in endobronchial tumor volume), or progression (increase in endobronchial tumor volume or tumor visible on computed tomography [CT] scan). At 3 months, a complete local response was observed in 213 patients (94%), and in the 137 patients with biopsies, 126 (91.3%) had a CR. Seven patients had tumor progression, 5 had a partial response, and 1 had stable disease. Overall survival was 57% at 2 years and 29% at 5 years. Median survival was 28.6 months. Cancer-specific survival was 81% at 2 years and 56% at 5 years. Complications led to treatment interruption in 4.5% of patients. The rate of fatal complications was 6% and consisted mostly of fatal hemoptysis.

3. Endobronchial brachytherapy in the treatment of hyperplastic granulation tissue

Endobronchial brachytherapy has also been investigated to treat hyperplastic granulation tissue causing recurrent airway stenosis complicating lung transplantation or stent placement. A 2008 case series reported on the use of endobronchial brachytherapy in 8 patients following excision of obstructive granulation tissue; 6 had a good or excellent subjective early response for the first 6 months. (18) A 2006 case series used endobronchial brachytherapy in 5 patients with benign granulation tissue following lung transplantation that was refractory to multiple other bronchoscopic interventions. After a median follow-up of 12 months, 3 of the 5 patients had marked symptom improvement. (19) While these case series offer positive outcomes, larger trials with adequate follow-up are needed to fully evaluate the potential role of endobronchial brachytherapy in the treatment of granulation tissue.

Rahman and colleagues reported the long-term follow-up of 115 patients who underwent various flexible bronchoscopic therapeutic modalities for the management of benign tracheal stenosis between 2001 and 2009. (20) High-dose-rate endobronchial brachytherapy was used in cases of refractory stent-related granulation tissue formation, defined as a patient requiring 3 or more interventions within 6 months due to recurrent granulation tissue formation. A stent was placed in 33 patients for restoration of airway patency, 28 of whom also underwent brachytherapy. All patients presented with signs and symptoms of upper airway obstruction, including shortness of breath, stridor, cough, dyspnea, and wheezing. All of the patients who underwent brachytherapy experienced a reduction in therapeutic bronchoscopic procedures after brachytherapy compared with the pretreatment period, although no further detail of the duration of the response or other patient outcomes were reported for this subset of patients who received brachytherapy. There were no treatment-related complications. While results from this case series are positive, the small numbers of patients and concerns about outcome reporting limit the conclusions that can be reached from this study.

National Cancer Institute Clinical Trials Database (PDQ®)
As of December 2011, no Phase III trials are identified that address the use of endobronchial brachytherapy for NSCLC or metastases.

Summary

Many patients with non-small-cell lung cancer are initially treated with external-beam radiation therapy but ultimately experience local recurrence; many are not candidates for further external-beam radiation therapy due to the limited tolerance of normal tissue. If symptoms persist following external-beam radiation, endobronchial brachytherapy is well-accepted as a short-term palliation for such symptoms as hemoptysis, cough, dyspnea, and resolution of obstructive atelectasis or pneumonitis.

Candidates for primary treatment have principally included patients with early-stage endobronchial tumors who are not candidates for surgical resection or external-beam radiation due to comorbidities or the location of the tumor. Results have predominantly been reported in case series for which complete response rates in the range of 50–80% have been noted.

Endobronchial brachytherapy has also been investigated to treat hyperplastic granulation tissue causing recurrent airway stenosis complicating lung transplantation or stent placement. Case series offer positive outcomes, however, larger trials with adequate follow-up are needed to fully evaluate the potential role of endobronchial brachytherapy in the treatment of granulation tissue.

Practice Guidelines and Position Statements

National Comprehensive Cancer Network (NCCN) Guidelines

NCCN guidelines recommend endobronchial brachytherapy for locoregional recurrence of non-small cell carcinoma with endobronchial obstruction or severe hemoptysis (category 2A). (21)

The American College of Radiology (ACR) published ACR Appropriateness Criteria on nonsurgical treatment for NSCLC. These criteria were agreed upon by an expert panel. The panel considers endobronchial brachytherapy a palliative treatment, “providing relief for patients with endobronchial lesions causing obstruction or hemoptysis.” (22)

References:


5. Ung YC, Yu E, Falkson C et al; Lung Cancer Disease Site Group of Cancer Care Ontario's Program in Evidence-Based Care. The role of high-dose-rate brachytherapy in...


<table>
<thead>
<tr>
<th>Codes</th>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPT</td>
<td>31643</td>
<td>Bronchoscopy; with placement of catheter(s) for intracavitary radioelement application</td>
</tr>
<tr>
<td></td>
<td>77326, 77327, 77328</td>
<td>Brachytherapy isodose calculation; code range</td>
</tr>
<tr>
<td></td>
<td>77761, 77762, 77763</td>
<td>Intracavitary radioelement application; code range</td>
</tr>
<tr>
<td></td>
<td>7785, 77786, 77787</td>
<td>Remote afterloading high dose rate radionuclide source</td>
</tr>
<tr>
<td></td>
<td>77790</td>
<td>Supervision, handling, loading of radio elements</td>
</tr>
<tr>
<td>ICD-9 Procedure</td>
<td>92.27</td>
<td>Implantation or insertion of radioactive element</td>
</tr>
<tr>
<td>ICD-9 Diagnosis</td>
<td>162.2 – 162.9</td>
<td>Primary neoplasm of bronchus, code range</td>
</tr>
<tr>
<td></td>
<td>197.0</td>
<td>Secondary malignant neoplasm of lung (bronchus)</td>
</tr>
<tr>
<td></td>
<td>231.2</td>
<td>Carcinoma in situ of bronchus and lung</td>
</tr>
<tr>
<td>HCPCS</td>
<td>No code</td>
<td></td>
</tr>
<tr>
<td>ICD-10-CM (effective 10/1/13)</td>
<td>C34.00-C34.92</td>
<td>Malignant neoplasm of bronchus lung, code range</td>
</tr>
<tr>
<td></td>
<td>C78.00-C78.02</td>
<td>Secondary malignant neoplasm of lung, code range</td>
</tr>
<tr>
<td></td>
<td>D02.20-D02.22</td>
<td>Carcinoma in situ of bronchus and lung, code range</td>
</tr>
<tr>
<td>ICD-10-PCS (effective 10/1/13)</td>
<td></td>
<td>ICD-10-PCS codes are only used for inpatient services. There is no specific ICD-10-PCS code for this procedure.</td>
</tr>
<tr>
<td></td>
<td>0BH001Z, 0BH031Z, 0BH041Z, 0BH071Z, 0BH081Z</td>
<td>Surgical, respiratory system, insertion, tracheobronchial tree, radioactive element, code by approach (open, percutaneous,</td>
</tr>
<tr>
<td>Type of Service</td>
<td>Radiation Therapy</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>Place of Service</td>
<td>Inpatient</td>
<td></td>
</tr>
</tbody>
</table>

**Index**

Brachytherapy, Endobronchial
Endobronchial Brachytherapy
Lung Cancer, Brachytherapy