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Photodynamic Therapy for Refractory Chest Wall Disease from Breast Carcinoma

ABSTRACT & COMMENTARY

Synopsis: *The activity of photodynamic therapy in the treatment of recurrent chest wall disease in patients with adenocarcinoma of the breast has been well documented.[1] However, there is reluctance to use this modality in patients who have been extensively treated with surgery, chemotherapy, and full-dose radiation for fear of inducing nonhealing ulcers and necrosis. Subsequent studies have suggested that a lower dose of PDT can achieve control of chest wall disease with less toxicity. This study reports PDT treatment of 102 chest wall sites in 9 patients with lesions ranging in size from .57 to 9 cm. Systemic therapy continued without modification during PDT. Complete response was noted in 89% of the lesions, reduction without regrowth occurred in 8%, and there was no response in 3% of the lesions. All lesions except 1 healed within 3 months and all of the lesions healed without additional scarring. This study suggests that lower doses of PDT can effectively control chest wall disease, even if it has been highly refractory to prior treatments. Repeat applications, if necessary, can be done without additional toxicity.*

Source: Allison R, et al. *Cancer.* 2001;91:1-8.

Despite major advances in the treatment of breast cancer, the development of persistent and progressive chest wall disease despite optimal surgery, maximum doses of radiation, and chemo-hormonal therapy is still not an uncommon occurrence. Photodynamic therapy (PDT) has been recognized for many years as a potential treatment for cutaneous malignancies and can result in an excellent clinical and cosmetic response. However, it appears that high doses of the photosensitizer and/or too high a light dose do not improve response rates and can increase morbidity, manifested as treatment related pain, fibrosis, scarring, hyperpigmentation and, at times, local necrosis.

In this study the photosensitizer Photofrin was administered in a dose of 0.8 mg/kg followed by laser therapy approximately 48 hours later using a KTP:YAG laser using a 630 nm wavelength with dose ranges from 135-170 Joules/cm^2 (mean, 150 J/cm^2). Nine patients

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with persistent and progressive chest wall disease despite standard surgery, radiation, and chemotherapy with or without Tamoxifen were treated. A total of 102 lesions were treated with a range of 4-26 lesions per patient. At 6 months of follow-up all patients were still alive. At that time, 89% of tumors had been eliminated completely. A 50% or greater reduction occurred in 8% and no response occurred in 3%. Only 1 treated lesion grew through therapy. At the 6-month follow-up period no fibrosis was noted in any treatment regions, and no treatment region was painful. None of the 9 patients needed pain medication for chest wall discomfort. Two patients underwent a second course of treatment after the 6-month evaluation. Similar results were noted with no increased morbidity.

COMMENT BY MICHAEL J. HAWKINS, MD

None of the patients who were treated required modification of their systemic chemotherapy. Successful treatment of chest wall disease can have a positive psychological effect for the patient and often represents the most disturbing aspect of a patient's recurrent disease. This study emphasizes that it is possible to obtain meaningful palliation of chest wall disease while continuing systemic treatment. Because of their markedly different mechanisms of action, PDT and chemohormonal therapy may be given simultaneously without an increase in the toxicity of either modality. The ability to administer PDT concurrently with existing treatments is often overlooked. Many patients with progressive chest wall disease can be significantly palliated without interrupting systemic therapy. ❖

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EDITORIAL GROUP HEAD: Glen Harris.
MARKETING PRODUCT MANAGER:
Schandale Kornegay.
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robert.kimball@ahcpub.com

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MRI Prediction of Rectal Cancer Resectability

ABSTRACT & COMMENTARY

Synopsis: *Local recurrence after rectal cancer surgery remains a problem. It is probable that tumor resection margins are predictive of local control, but the preoperative assessment to define those likely to have adequate margins has not been established. In the current report, magnetic resonance imaging (MRI) with phased-array coil was used preoperatively to define stage and predict tumor margins in 76 patients with rectal cancer treated at a single institution. Although the MRI was not highly accurate with regard to staging, it was in predicting the surgical margins. Beets-Tan and colleagues suggest that this information may have clinical importance in determining which patients are at risk for local recurrence and who might, therefore, benefit from preoperative radiation therapy.*

Source: Beets-Tan RG, et al. *Lancet*. 2001;357: 497-504.

Modern mri techniques with endorectal and phased-array coils offer spatial-resolution advantages when compared to standard MRI, computerized tomography (CT), or ultrasonograpy (US). Beets-Tan and colleagues from the University Hospital of Maastricht, Netherlands used this technique in the preoperative assessment of 76 patients with rectal cancer. Two observers independently scored, on 2 occasions, the tumor stage and measured distance to the mesorectal fascia. Their findings were compared to histological measurements of the resected tumor specimens.

There was some discrepancy between the 2 reviewers, particularly with regard to tumor stage. For the

first, the MRI-determined stage agreed with the histological stage in 63 (83%) of the 76 patients, whereas for the second the agreement was 67%. However, the results with regard to tumor margin were more favorable and reliable. In all 12 patients with an obvious T4 lesion, a margin of 0 mm was correctly predicted. Of the 29 patients with a pathological margin of greater than 10 mm, a distance of at least 10 mm was predicted in 28 by observer 1, and 27 by observer 2. For the remaining 35 patients, a regression curve revealed that the clinically important 1 mm tumor-free margin was confidently predicted when the measured distance (by MRI) of tumor from the mesorectal fascia was more than 5 mm.

Beets-Tan et al conclude that a high level of accuracy with regard to circumferential resection margin is afforded by this MRI technique (with a phased-array coil) and that this provides important clinical information. They suggest that such a preoperative assessment may assist in determining which patients would benefit from neoadjuvant radiation (plus chemotherapy) and defining optimal surgical approaches.

COMMENT BY WILLIAM B. ERSHLER, MD

Local recurrence after curative-intention surgery for rectal cancer varies from 3-32%[1] and it is generally believed that extension of the tumor to, or beyond the mesorectal fascia with residual malignant cells after total mesorectal excision (TME) is the primary factor affecting local recurrence.[2,3] Preoperative radiotherapy has been shown to reduce local recurrence rates and improve survival,[4] and this approach is commonly used. Alternatively, postoperative radiation therapy and chemotherapy have been frequently used in patients with T3 and/or N1 lesions.

However, even without radiation therapy, overall recurrence rates for T2 or T3 lesions are estimated to be 10% or less after total mesorectal resection if there is a tumor-free resection margin of more than 1 mm.[5,6] Thus, if a preoperative imaging technique is developed which accurately defines anticipated resection margins, it may identify individuals who would not require perioperative radiation.

Before such an approach becomes commonly used, however, it is clear that additional research is needed. Even at the university hospital reporting this study and committed to this technique, there was considerable inter-observer variability. Certainly, standardized approaches and interpreter training will be necessary if these exciting findings are confirmed.

If it is true that resection margins are, as expected, a critical factor predicting local recurrence, future trials are necessary to determine if preoperative radiation to those with high-risk (as determined by MRI) benefit in terms of local recurrence or enhanced survival. Furthermore, the cost effectiveness of such an approach will need investigation before the technique can be adapted on a large scale. From a financial perspective, this analysis might indicate that preoperative MRI is cost effective if a substantial percent of rectal cancer patients are spared radiation therapy or unnecessarily aggressive surgery as a result. ❖

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Prognostic Significance of Postchemoradiation

ABSTRACT & COMMENTARY

Synopsis: *Ongoing randomized trials seek to define the optimal adjuvant therapy for locally advanced rectal cancer. Neoadjuvant chemoradiation is one approach that is being explored. Tumor response to preoperative therapy may have important postoperative ramifications in terms of the necessity for additional therapy. Mohiuddin and associates retrospectively reviewed their experience with a cohort of patients who had unfavorable rectal cancers and found that pathologic stage was prognostically significant.*

Source: Mohiuddin M, et al. *Int I Radiat Oncol Biol Phys*. 2000;48:1075-1080.

The use of preoperative radiotherapy and chemotherapy in sphincter-conserving surgery for low-lying rectal cancers and in the resection of fixed/tethered rectal tumors is now widely acknowledged. However, the prognostic significance of the degree of tumor response following up-front chemoradiation has not been described. Mohiuddin et al reviewed their experience with patients who presented with fixed or tethered primary or locally recurrent lesions in order to define the prognostic effect of tumor response on

local control and survival.

Mohiuddin et al reported on 77 patients who presented with fixed or tethered lesions of the upper and lower rectum. These patients were treated with neoadjuvant chemoradiation and then followed for a median of 3 years (range, 1-8 years) after surgery. All patients were treated with 4-field irradiation to the pelvis to 45 Gy at 1.8-2 Gy per fraction, followed by a conedown boost for an additional 5-15 Gy. Median RT dose was 55.8 Gy. 5-fluorouracil was given to all patients during RT, either as a weekly 1000 mg/m^2 bolus, as a 3-5 day 1000 mg/m^2 infusion during weeks 1 and 5, or towards the end of the study period as a 225 mg/m^2 continuous infusion. Surgery was then performed after a median of 7.5 weeks (range, 6-10 weeks). Twenty-eight patients underwent APR and the remainder had sphincter-sparing procedures. No patient received additional chemotherapy following surgery.

Twelve patients (16%) achieved a pathologic complete response (pT0N0) following neoadjuvant therapy, and an additional 10 (13%) were downstaged to pT1-2N0. There were 31 patients (40%) who were noted to be node-positive at surgery. Multivariate analysis was done to assess the significance of pathologic response, gender, age, tumor location, and type of surgery on local control and survival.

Actuarial five-year disease-free survival for the entire group was 85%. No patients with pT0-2N0 disease failed locally or distantly at 5 years. This was statistically significantly better than the 80% disease-free survival for pT3 patients and 73% for node-positive patients (P = .001). The local recurrence rate was 14% for pT3-4N0 patients and 16% for node-positive patients (P = .08).

Mohiuddin et al concluded that pathologic stage post-chemoradiation was the only prognostically important variable among those studied, and that patients with pT3-4 and/or node-positive disease at surgery may benefit from further adjuvant therapy.

COMMENT BY EDWARD J. KAPLAN, MD

Guidelines for the treatment of locally advanced rectal cancer are currently being developed, and ultimately will be based on the outcomes of several ongoing randomized trials. At present, it is generally acceptable to treat these types of tumors with either preoperative or postoperative adjuvant therapy.

Postoperative radiotherapy, like that reported for the NSABP R-01 trial by Fisher et al in 1988, has failed to yield an improvement in survival despite the fact that better local control has been demonstrated.[1] In 1991, Krook published the results of NCCG-Mayo randomized trial and showed that the addition of 5-FU + semustine to radiotherapy resulted in a statistically significant improvement in local control and survival compared to radiotherapy alone.[2] Based on these types of results, postoperative adjuvant treatment is still considered standard therapy for pT3-4 and/or node-positive patients.

A recent overview of the results of 14 trials evaluating preoperative radiotherapy vs. surgery alone was published as a meta-analysis by Camma et al and included data on 6426 patients.[3] A significant benefit in overall mortality, cancer-related mortality, and local recurrence was reported. Postoperative morbidity was not significantly increased as a result of the RT. So far, though, no randomized trials incorporating preoperative chemoradiation have been reported, but several are under way. These include the four-arm EORTC 22921 trial for patients with T3-4 lesions which compares preoperative 45 Gy vs. 45 Gy + 5-FU/LV vs. 45 Gy + postoperative 5-FU/LV vs. 45 Gy + pre- and postoperative 5-FU/LV; the NSABP R-03 trial which compares pre- vs. postoperative combined modality therapy for resectable T3 lesions; and the MRC-CR07 trial which randomizes patients to preoperative RT or postoperative chemoradiation. The Intergroup trial R9401 comparing 50.4 Gy + 5-FU/LV pre- vs. postoperatively was closed prematurely because of poor patient accrual and will not yield useful data.

If pre- and postoperative chemoradiation prove to be of equivalent efficacy in the randomized trials mentioned above, then the prognostic information gained from analysis of the pathologic specimens following neoadjuvant therapy may make it the more valuable approach. The prognostic information gained from downstaged tumors may allow clinicians to select out those patients who can benefit from additional systemic therapy, thereby improving outcomes further. The Mohiuddin et al paper suggests that such patient selection may be possible. Such a hypothesis would have to be tested in a randomized setting. (*Dr. Kaplan is acting Chairman, Department of Radiation Oncology, Cleveland Clinic Florida, Ft. Lauderdale, Fla, and Medical Director, Boca Raton Radiation Therapy Regional Center, Deerfield Beach, Fla.)* ❖

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Breast Cancer Surveillance for High-Risk Women

ABSTRACT & COMMENTARY

Synopsis: *The effectiveness of breast cancer surveillance in high-risk women, including BRCA1/2 mutation carriers, was evaluated in a retrospective study of 1198 women — 449 moderate risk, 15-30% estimated lifetime breast cancer risk; 621 high risk, 30-50% estimated lifetime breast cancer risk; and 128 BRCA1/2 mutation carriers, and 60-85% estimated lifetime breast cancer risk. Screening consisted of instructions for monthly breast self-examination, clinical breast exam every 6-12 months, yearly mammography, optional use of breast MRI in more recently screened patients, and median follow-up was 3 years. Thirty-one invasive breast cancers and 4 ductal carcinoma-in-situ lesions were detected, and the ratio of observed vs. expected numbers of invasive breast cancer varied from 23.7 (95% CI, 1.2 to 483) in BRCA1/2 carriers to 7.0 (95% CI, 1.9 to 26.1) in the high-risk group and 2.7 (95% CI, 0.4 to 17.6) in the moderate-risk group. Screening parameters were comparable to population screening data. Screening detected a significantly greater number of cancers in these high-risk groups than would be expected in an average risk population.*

Source: Brekelmans CT, et al. *J Clin Oncol.* 2001; 19:924-930.

Breast cancer screening of average-risk women using mammography and clinical examination has been shown to decrease breast cancer mortality for women aged 50-69 years, and benefit is suggested, but controversial, for average-risk women aged 40-49 years and older than 70 years of age.[1] Guidelines for screening of average-risk women include regular (monthly) breast self-exam as well as annual clinical breast exam and mammogram starting at age 50, with consideration of starting the screening process at 1-2 year intervals at the age of 40 years.[1] While these recommendations are for average-risk women, the identification of risk factors for breast cancer allow identification of women who have an increased risk of developing this disease.[2,3] It is possible that increased screening of women with a high risk of breast cancer would be beneficial, as a greater number of breast cancer events is expected in high-risk groups. However, biological differences may exist in breast cancers occurring in BRCA1/2 carriers or individuals at increased genetic risk of breast cancer.[4,5] The potential clinical importance of some of these biological differences is under investigation.[6] The current study was performed to evaluate the effectiveness of breast cancer screening in high-risk women, including BRCA1/2 mutation carriers.

This study by Brekelmans and colleagues evaluated 1198 women with an increased risk for breast cancer. The risk categories evaluated included individuals with a moderate increased breast cancer risk (15-30% estimated lifetime breast cancer risk, 449 women); a high increased breast cancer risk (30-50% estimated lifetime breast cancer risk, 621 women); and proven carriers of a BRCA1/2 mutation (60-85% lifetime breast cancer risk, 128 women). The screening intervention consisted of monthly breast self-examination, yearly mammogram, and clinical breast exam every 6 months except in some moderate-risk individuals who had a yearly screening interval. Data collection was primarily retrospective and included patients evaluated between 1978 and the late 1990s. Since 1995, breast MRI was optionally included with the screening for individuals with dense mammographic breast tissue and/or BRCA1/2 mutations. Overall, 35 breast tumors (31 invasive breast cancer and 4 ductal carcinoma in situ) were detected within the median follow-up period of 3 years (range, 0-22 years). Twenty-six of the 35 tumors were detected at the screening intervals, and 9 tumors were detected in the intervals between screens. The detection rates of invasive breast cancer were 33 per 1000 person-years in BRCA1/2 mutation carriers (observed vs expected breast cancer case ratio of 23.7 [95% CI, 1.2-483]); 8.4 per 1000 in the high-risk group (observed vs expected breast cancer case ratio of 7.0 [95% CI, 1.9-26.1]); and 3.3 per 1000 in the moderate-risk group (observed vs expected breast cancer case ratio of 2.7 [95% CI, 0.4-17.6]). A clear trend of increasing detection rates with age was demonstrated.

The characteristics of the invasive tumors were reported, and 20 of 31 (65%) were node negative. The percent of node-positive tumors was similar for the incident screen detected and the interval cancers. Interval cancers were defined as cancers detected between screens. Overall, the sensitivity of the screening test was 74% and had an expected increase with age. Brekelmans et al conclude that it is clearly possible to identify young women at high familial risk, and screening this population detected approximately seven times more breast cancers than expected in an average-risk population of comparable age. The problem of interval cancers was considered due to either missed cancers (ie, poor mammographic visibility) or due to tumors with a high growth rate between screening sessions. Consideration

of either more intensive screening efforts or new technologies, such as MRI, was suggested for evaluation in these high-risk patients.

COMMENT BY MARK R. ALBERTINI, MD

Patients with an increased risk of breast cancer can be identified, and these patients are appropriate candidates for intensified breast cancer screening efforts. The opportunity to design breast cancer screening efforts that reflect overall breast cancer risk provides a means for increased surveillance in patients with the highest expected number of events. The important outcome of detection of a large number of cancers by screening was demonstrated in this study. However, another important outcome of this study was the identification of cancers developing during the intervals between screening events for BRCA1/2 mutation carriers and women with high familial risk. Additional evaluation is needed to determine the relationship of the surrogate end points of screen detected and interval cancers with the overall end point of breast cancer mortality.[7]

Additional genetic determinants, such as polygenes that may act in conjuction with environmental factors, are being recognized as potentially important determinants of overall breast cancer risk.[8] Detailed risk assessment profiles will likely be possible to identify larger numbers of individuals at an increased risk for breast cancer. Many of these patients may be candidates for chemoprevention studies, and these high-risk patients may benefit from increased breast cancer surveillance. Prospective studies to evaluate more intensive screening strategies, as well as screening strategies using more sensitive imaging modalities such as breast MRI, are needed for women at high-genetic risk for breast cancer. ❖

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Palliative High-Dose Rate Endobronchial Brachytherapy

ABSTRACT & COMMENTARY

Synopsis: *Endobronchial obstruction and/or hemoptysis from intrinsic bronchial lesions may develop at some point in the disease process in those patients with inoperable or recurrent lung cancer. For many patients, particularly those who have been previously treated with external beam radiotherapy, endobronchial high-dose rate brachytherapy is an attractive palliative modality. Kelly and colleagues from the M.D. Anderson Cancer Center reviewed their experience with one of the largest series in the literature and concluded that most patients treated in this fashion exhibit an objective response that confers a statistically significant survival benefit.*

Source: Kelly JF, et al. *Int J Radiat Oncol Biol Phys*. 2000;48:697-702.

During the years 1988 through 1997, 175 patients with primary or recurrent lung cancer presented for palliative evaluation to the M.D. Anderson Cancer Center with debilitating dyspnea (85%), cough (76%), hemoptysis (34%), and wheezing (27%) due to intraluminal tumor. Most patients presented with non-small cell lung cancer, with the predominant histologic subtype being squamous carcinoma (90 cases, 51%). Only 2 patients (5%) had small cell carcinoma. One hundred sixty-three patients (92%) had a history of prior thoracic radiotherapy (RT) which precluded further external-beam RT. Median age for the group was 60 years (28-79), and the median Karnofsky Performance Score (KPS) was 70 (50-100). Lesions involved the trachea in 9% of cases, carina in 2%, mainstem bronchus in 40%, and lobar bronchi in 66%.

Following the administration of intravenous sedation, all lesions were visualized bronchoscopically. Thereafter, a 6-French-nylon-brachytherapy catheter was inserted through the bronchoscope to a point at least 4 cm beyond the tumor. If necessary, a Nd:YAG laser was used for tumor ablation to permit passage of the catheter through any area of complete airway obstruction (20 patients, 11%). In some instances, 2 catheters were inserted in order to treat more than 1 disease site. The procedure was repeated at 2-week intervals from 1 to 4 times per patient, with 2 being the most commonly prescribed number of treatments (115 patients, 66%). The radiation dose was prescribed as 15 Gy to a radial dis-

tance of 6-7.5 mm from the line of the iridium-192 radioactive source, which was fed down the nylon brachytherapy catheter along a stainless steel cable. A Nucletron Microselectron HDR remote afterloading unit was used. The iridium-192 source had the capacity to move along a potential treatment length of 24 cm at 5 mm incremental dwell settings. Doses ranged from 5-45 Gy, with 23% receiving 15 Gy in one fraction, 30 Gy to 58% in 2 fractions, and 45 Gy to 7% in 3 fractions.

Tumor response was evaluated subjectively via a patient questionnaire, and objectively with repeat bronchoscopy and chest x-ray within 2 weeks of completion. One hundred fifteen patients (66%) noted subjective symptomatic improvement, equally divided between considerable and slight. There was a 78% overall objective response rate among patients undergoing repeat endoscopy (116, 66%), including 14 complete responses (8%) and 76 (43%) greater than 50% partial responses. Twenty-three patients (13%) had no response, and 2 patients (1%) showed progression of disease. There was a significant association between subjective assessment and objective response (P = .02). The mean response duration was 3.8 months. Overall mean actuarial survival was 6 months (0-54). Actuarial survival was significantly longer in the responders (7 vs 4 months, P = .003). No pretreatment factors predicted for response to endobronchial HDR therapy.

The actuarial-hazard rate for all complications was 13% at one year. The most common fatal complication resulting from endobronchial HDR was pulmonary hemorrhage (3 patients, 2%). Five other patients bled to death, but their hemoptysis was not attributed to the HDR therapy. There was 1 fatal complication each secondary to necrosis with fistula formation, and necrosis with stenosis. The most common nonfatal complication was pneumothorax (4 patients, 2%), followed by nonfatal hemoptysis (2 patients, 1%), necrosis (2 patients, 1%) and esophageal stricture (1 patient, 0.6%). There was no correlation between the number of HDR applications and toxicity.

COMMENT BY EDWARD J. KAPLAN, MD

The purpose of the Kelly paper was to evaluate the toxicity and efficacy of endobronchial HDR brachytherapy in the palliative setting. Kelly et al illustrated that toxicity from reirradiation using the HDR approach was acceptable, and palliation was immediate. Disparities in types of symptoms relieved, if any, were not described. Those patients whose lesions regressed with therapy enjoyed a 75% increase in survival, which was a statistically significant benefit. Although the mean duration of symptom relief was 3.8 months, it is unclear whether actuarial symptom relief correlated with actuarial survival.

In some instances, laser ablation was used in conjunction with HDR by the M.D. Anderson group in order to traverse areas of complete airway occlusion. This sort of dual modality technique was recently reported by Chella, who conducted a small, randomized comparison of length of symptom relief following laser alone vs. laser with endobronchial brachytherapy. The symptom-free period grew from 2.8 months without HDR to 8.5 months with HDR (P < .05). The fractionation scheme and prescription parameters selected by Kelly et al were similar to those used in other series cited in their paper. The most common number of applications was 2, where patients who only received 1 treatment tended to have deteriorated, and patients who received 3 treatments tended to exhibit a slower response. Where most series report 5-10 Gy per fraction prescribed to a radial distance of 10 mm from the source, the present study used 15 Gy prescribed to 6 mm. In fact, that prescription is dosimetrically equivalent to 8.4 Gy prescribed to 10 mm, ie, an average dose. Since there are no rigid prescription guidelines, the prescription parameters are flexible, and are left up to the discretion of the treating physician.

As mentioned, there are many advantages to HDR therapy. Radiation exposure to the clinical staff is minimized by virtue of the afterloading technique used with HDR therapy. That is, the radioactive source is housed in a shielded repository until it is deployed into the nylon catheter and reeled down to the area of lesion where it dwells at a string of sequential stations along a designated length for the time required to impart the prescription dose. The patient is kept in a shielded room during the actual deployment of the source. The dosimetry plan is customized for each patient's tumor. The procedure is fairly short, so displacement of the catheter is less likely than might be expected using low dose rate brachytherapy, which is typically done on an inpatient basis over several days. HDR can be used for either tracheal or bronchial lesions, and is done on an outpatient basis using intravenous sedation. HDR administration can be repeated as needed depending upon the tumor's response and the patient's overall status.

The integration of chemotherapy, possibly as a radiosensitizer, along with HDR remains under investigation. Likewise, for those patients who are candidates for external beam RT, its relative advantages and disadvantages in comparison to HDR for relief of endobronchial obstruction are not clear. A randomized trial was attempted by the MRC in an effort to answer that question, but was abandoned in 1996 because of poor accrual. Finally, photodynamic therapy has also been

investigated and may have a role along with RT and chemotherapy for relief of intraluminal obstruction. ❖

Suggested Reading

1. Chella A, et al. *Lung Cancer*. 2000;27:169-175.
2. Moghissi K, et al. *Clin Oncol (R Coll Radiol)*. 1999; 11:179-183.
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CME Questions

16. Initial data regarding preoperative MRI scan in patients with rectal tumor indicates:

a. it is likely to be a highly accurate staging tool.
b. it is likely to be of assistance in determining which patients will have adequate resection margins after surgery.
c. it is likely to indicate which patients should have combined chemotherapy and radiation therapy postoperatively.
d. it offers anatomic information that is likely to be of little clinical value.

17. The following statements regarding photodynamic therapy (PDT) are true *except*:

a. Systemic chemotherapy does not need to be interrupted or modified when giving PDT for patients with breast cancer with chest wall disease.
b. PDT can be safely given to women who have previously received extensive chest wall radiation for chest wall disease.
c. Local toxicity from PDT is a function of the dose of photosensitizer administered and the amount of light delivered.
d. All of the above are true

18. Which of the following statements is *false* about the effectiveness of breast cancer surveillance in BRCA1/2 gene mutation carriers and women with high familial risk?

a. The sensitivity of screening increases with age.
b. The detection rates of breast cancer are less than expected for an average risk, age matched population.
c. Cancers can occur in the interval between screening and represent an important challenge for screening strategies.
d. High-risk populations can be identified for possible increased breast cancer screening.

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