Palliative radiotherapy: the union of advanced technology with prudent end-of-life care

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Introduction

Radiotherapy has been used for the treatment of symptoms caused by incurable cancer since shortly after the discovery of X-rays by Roentgen and of Radium 223 by the Curies over 100 years ago. Palliative radiotherapy provides symptom relief that is effective, time efficient, and associated with acceptable side effect profiles. Given that palliative care includes the management of disease symptoms and treatment toxicity in any patient with a life-threatening cancer, one can argue that the majority of radiotherapy courses are given with palliative intent. The growing incidence of cancer worldwide, when combined with the wider array of radiotherapy interventions now available through technological advances, demands close scrutiny of the data regarding the best approaches to palliative radiotherapy in a wide variety of clinical circumstances.

Clinical circumstances

Bone metastases

The most common use for palliative radiotherapy is to address painful bone metastases. Skeletal lesions may cause symptoms including pain, pathologic fracture, spinal cord compression, or hypercalcemia. Improvements in survival for many patients with metastatic neoplasms have created a need for better prevention of new symptomatic bone metastases,

lengthier durability of treatment response, and attention to side effects of therapy. The proper approach to the management of these patients depends upon factors related to the patient, tumor, and available technology. Patients with poor performance status and a limited life expectancy may receive a single 8 Gy fraction set up with the simplest field arrangements, while those with risks for significant functional loss may undergo extensive surgery or receive complex radiotherapy which requires the most up-to-date dose-planning and treatment-delivery capabilities. Recent guideline publications have helped to define the most appropriate fractionation schemes and treatment arrangements for standard radiotherapy treatment for this clinical scenario. The review from Dennis et al. provides guidance regarding existence controversies in this patient group, including those related to pain recurrence following previous radiotherapy, the use of stereotactic body radiation therapy (SBRT) for spine metastases, surgery for spinal cord compression or pathologic fracture, and systemic treatment with osteoclast inhibitors, chemotherapy, or radiopharmaceuticals. They also present new and important information about the measurement and optimization of health related quality of life in patients with bone metastases. Balagamwala et al. provide an in-depth and critical review of the use of SBRT for spine metastases. They present the important data in a complete yet concise fashion, while their overview of the technical approaches and dose regimens for this patient group will prove useful to radiation oncologists whose experience in SBRT ranges from novice to experienced.

Brain metastases

Brain metastases are similar to bone metastases both because they are a frequent manifestation of malignancy and because they may present with a variety of distressing symptoms, including headache, nausea, vomiting, unsteadiness, decreased memory, altered speech, and focal motor or sensory deficit. Moreover, the proper management of brain

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metastases also requires that the proper aggressiveness of treatment be divided by factors related to the patient, the tumor, and the technologies available to the treating radiation oncologist. Prognostic scoring systems have been developed to help guide these treatment decisions, with therapy ranging from standard hypofractionated whole brain treatment to surgical resection or highly conformal radiotherapy in the form of stereotactic radiosurgery (SRS). Chung et al. review the data regarding the use of these therapies in specific clinical circumstances, educating the reader about the relative merits and drawbacks of aggressive treatment in patients whose life expectancy may be limited. For those patients who have the potential for a more prolonged survival, the authors describe the ways that surgery or SRS may maximize that length of that survival or minimize the risk of treatment-related toxicity during that time frame. Louie et al. provide a more in-depth description of the technological advances involved in SRS for better prognosis patients with brain metastases. Their review of the historical advances in stereotactic technology allows the reader to frame the current status of this approach within the larger picture of all technologic advances in radiotherapy. They methodically focus on the data that has begun to suggest that some patients may be best served with either SRS for a limited number of unresectable metastases or as a resection bed adjuvant to those who have undergone surgical excision.

Locally advanced lung cancer and lung metastases

The usefulness of palliative radiotherapy for locally advanced lung cancer, and less frequently for symptomatic lung metastases, is adeptly addressed in the review by Louie et al. Neoplasms involving the lung and mediastinum can cause problematic symptoms such as shortness of breath, cough, chest pain, hemoptysis, post obstructive pneumonia, and brachial plexopathy. While prognosis may be difficult to predict in any given individual who suffers from these symptoms, the value of palliative radiotherapy is unquestioned. The data is reviewed in a manner that allows the reader to separate those patients who should take on increased side effect risks for the potential benefit of a prolonged survival versus those who should simply undergo hypofractionated treatment of as few as two large fractions. While highly conformal therapy may allow for admirable cure rates in patients with medically unresectable, low stage primary lung tumors, the authors critically review the value of these more intensive approaches in patients with tumor that is more likely to be life-limiting because of advanced stage or significant co-morbid disease status.

Liver metastases

Cheng et al. describe liver metastases as a common clinical affliction that has been more rarely treated with palliative radiotherapy than the other scenarios covered in the preceding chapters. Still, the prevalence of liver metastases is high and the resulting symptoms may be debilitating, including fatigue, urticarial, abdominal pain, nausea, vomiting, and altered mental status. While whole liver external beam radiotherapy has been used as a treatment for painful liver metastases over the past few decades, the relatively low normal tissue tolerance of the whole liver has limited both the dose and the accompanying effectiveness of this approach. Recent advances in the radiographic delineation of liver metastases, the delivery of SBRT, and the potential for image-guided radiation therapy have allowed for a more conformal dose delivery to liver lesions with a more favorable risk of side effects. Here, the authors update the reader to the most recent and meaningful data about these advances.

Gynecologic cancers

Finally, the radiotherapeutic palliation of pelvic symptoms caused by locally advanced or recurrent gynecologic tumors is presented by the review from Barnes et al. Pelvic malignancies may cause symptoms such as bleeding, pain, infection, and bowel or bladder obstruction. Bleeding can often be quite effectively managed by only a small number of doses, with existing studies documenting the most beneficial approaches. Chemotherapy may prove useful for these patients, depending upon the primary tumor histology of the disease. Highly conformal therapies such as SBRT have not been extensively evaluated in the management of symptoms from gynecologic tumors, though the potential for sparing of normal tissue structures in those with more favorable prognoses makes it an attractive topic for further evaluation.

Conclusion

Palliative radiotherapy is an effective means by which to address symptoms caused by a variety of tumors. The development of palliative radiotherapy as a full-fledged subspecialty will demand a better delineation of clinical circumstances between those deserving low-effort hypofractionated regimens for patients with poor prognoses versus more complex approaches for those with more favorable prognoses. The manuscripts contained herein define the range of current approaches and spell out the upcoming research results that will further aid radiation oncologists in their palliative treatment decisions.