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Case study

Radiation treatment for newly diagnosed esophageal cancer with prior radiation to the thoracic cavity

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ABSTRACT

The purpose of this report is to communicate the use of single-positron emission computed tomography scan in planning radiation treatments for patients with a history of radiation to the thoracic cavity. A patient presented with obstructive esophageal cancer, having previously received chemotherapy and radiation therapy to the mediastinum for non-Hodgkin lymphoma 11 years earlier. Owing to a number of comorbidities, the patient was not a surgical candidate and was referred to the University of Washington Medical Center for radiation therapy. Prior dose to the spinal cord and lung were taken into account before designing the radiation treatment plan.

Introduction

The rate of esophageal cancer in the United States has been stable for many years. The disease is more common in men than in women, with rates of 1 in 125 *vs* 1 in 435.[1] Cancer of the esophagus is of 2 types: squamous cell carcinoma and adenocarcinoma, with squamous cell carcinoma being more common. Etiologic factors for esophageal cancer include obesity and tobacco and alcohol use. Traditionally, esophageal treatment fields included a simple 3-dimensional field arrangement using anteroposterior/posteroanterior fields with a posterior oblique to spare the spinal cord. However, more recently, intensity-modulated radiation therapy (IMRT) has been increasingly used in the treatment of esophageal cancer.

Case report

This report focuses on a 74-year-old man who was referred to the radiation oncology department at the University of Washington Medical Center for treatment of locally advanced esophageal squamous cell cancer causing complete obstruction. The patient had a history significant for non-Hodgkin lymphoma approximately 11 years earlier and had received chemotherapy combined with radiation to a dose of 4550 cGy to the mediastinum at an outside hospital. In addition to esophageal cancer, a number of comorbidities including diabetes, sleep apnea, morbid obesity, atrial fibrillation, and chronic obstructive pulmonary disease with a 20-pack-year smoking history made the patient a poor surgical candidate. At the time of diagnosis, the patient reported a 22 kg weight loss. Given the history of radiation therapy, a detailed record of the treatment was obtained and reviewed. The physician counseled the patient on the risks of reirradiation to previously treated tissue stating that, even with careful planning, an increased risk of side effects and toxicities exists, which can lead to permanent damage and morbidity. Following this discussion, the patient chose the most aggressive treatment option and opted to pursue combined chemotherapy and radiation therapy.

Treatment planning computed tomography (TPCT) simulation was performed as part of the initial treatment planning process. The patient was positioned supine on the CT simulation couch in an arm shuttle holding positioning rods so that the arms were maintained above the head. A standard Silverman headrest was placed under his head. A VAC-U-LOK cradle was then formed within the arm shuttle to ensure proper arm placement on the treatment unit (Fig. 1). CT radiopaque markers were placed at the level of the tattoos where the patient had received prior radiation treatment. A CT scan was performed with 100 mL of OMNIPAQUE 300. The TPCT scan was acquired from the middle of the cervical spine through both kidneys with 2.5-mm slice thickness. The TPCT

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Fig. 1. Patient position for radiotherapy. (Color version of figure is available online.)

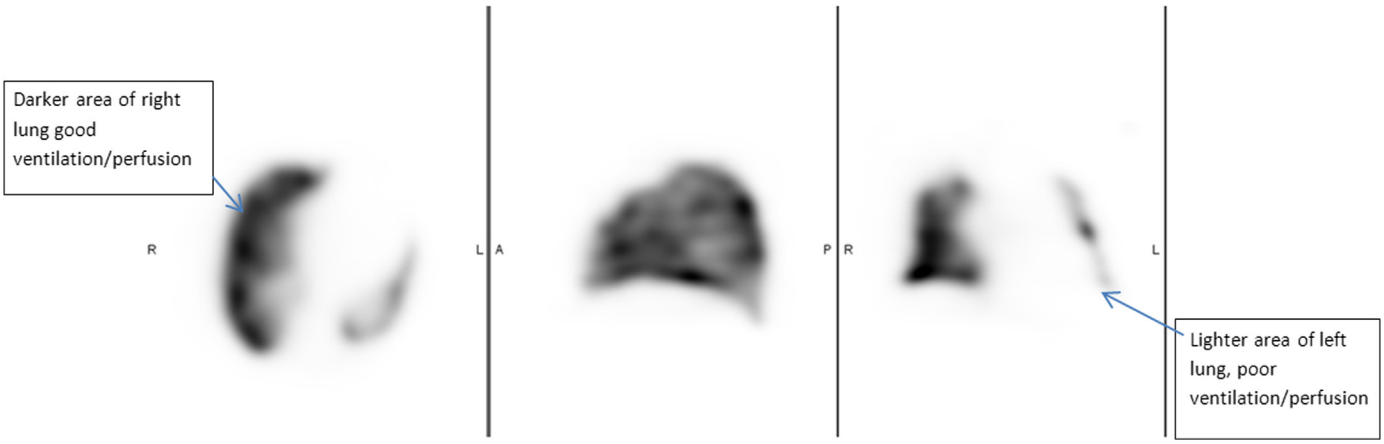

Fig. 2. SPECT perfusion/ventilation scan. (Color version of figure is available online.)

scan was then imported into Philips Pinnacle treatment planning system version 9.0.

Considering the prior anteroposterior/posteroanterior treatment to the mediastinum along with chemotherapy, close attention was paid to structures that had previously received radiation. Within the prior treatment field, the 2 dose-limiting structures for reirradiation were the spinal cord and the left lung. The spinal cord is a major dose-limiting structure in radiation therapy; therefore, doses that exceed the normal tissue tolerance may result in devastating injury causing malfunction one to several years after treatment.[2] As survival rates of patients with cancer have increased, radiation oncologists are faced with the situation of

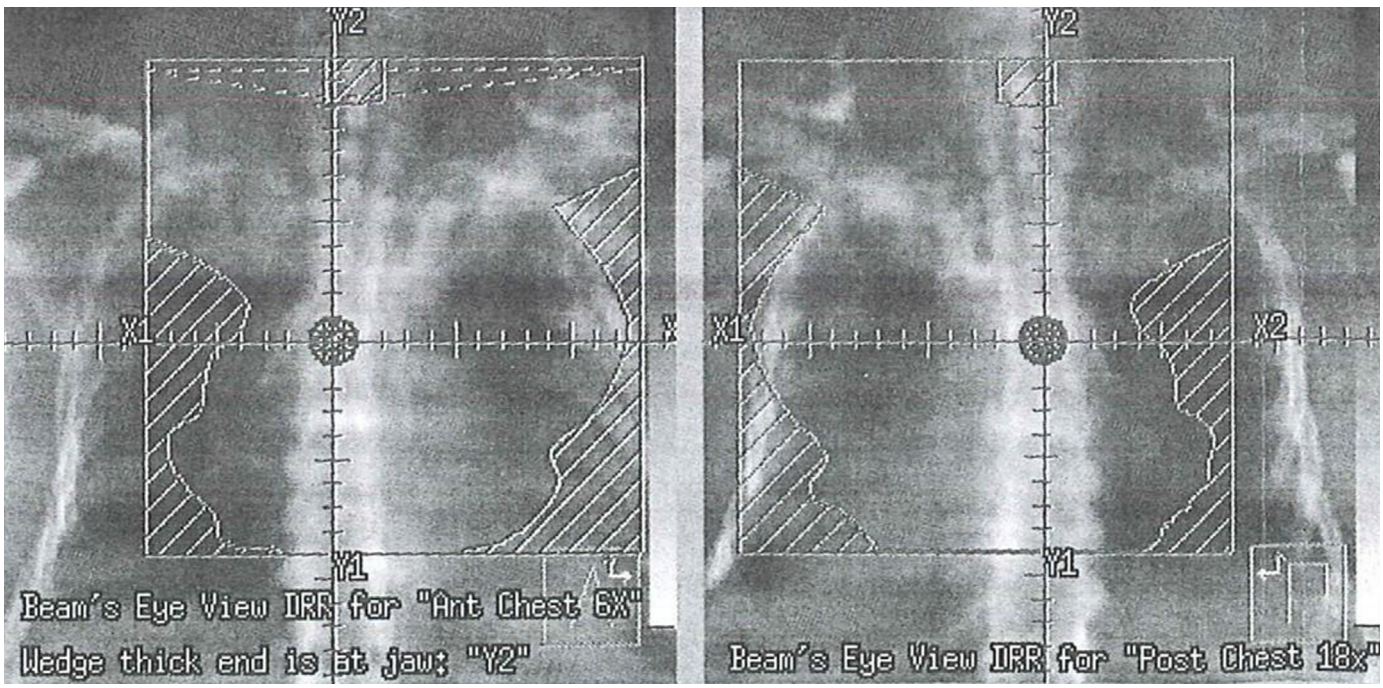

Fig. 3. Prior radiation treatment fields. (Color version of figure is available online.)