


## CASE REPORT

# Stereotactic body radiation therapy for an octogenarian with pulmonary carcinosarcoma

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**Abstract**

Pulmonary carcinosarcoma is a rare lung tumor accounting for <1% of primary lung cancers, characterized by biphasic components with both carcinomatous and sarcomatous mesenchymal features. This report describes a case of pulmonary carcinosarcoma in an octogenarian who was treated with stereotactic body radiation therapy (SBRT) and whose therapeutic response was sustained for 2 years. Along with other treatment modalities, SBRT might be considered for the treatment of medically inoperable localized stage pulmonary carcinosarcoma.

**KEYWORDS**

Octogenarian, pulmonary carcinosarcoma, SBRT, stereotactic body radiation therapy

**INTRODUCTION**

Pulmonary carcinosarcoma (PC) is a rare lung tumor making up <1% of primary lung cancer cases and characterized by biphasic components of both carcinomatous and sarcomatous mesenchymal features.<sup>1,2</sup> Few cases have been reported in the literature, and even fewer large cohort studies have been published, most focusing on pathology.<sup>3-5</sup> Because of its rarity, the clinicopathological features and factors affecting survival of PC are not thoroughly understood. Although surgery remains the mainstay treatment for potentially operable disease and physically fit lung cancer patients, we demonstrate how we used stereotactic body radiation therapy (SBRT) to successfully treat a male octogenarian patient with advanced chronic obstructive pulmonary disease (COPD) diagnosed as having localized PC.

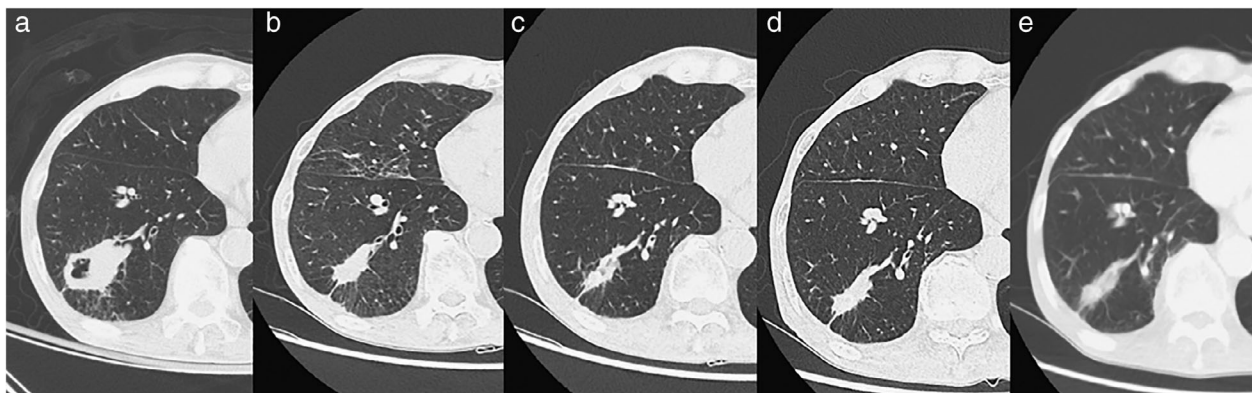
**CASE REPORT**

An 85-year-old male heavy-smoker presented with chronic cough and shortness of breath that had lasted over 2 months. Chest radiography revealed suspicious right lung mass and chest computed tomography (CT) showed a 5.5 cm mass over right lower lobe (Figure 1(a)). CT-guided

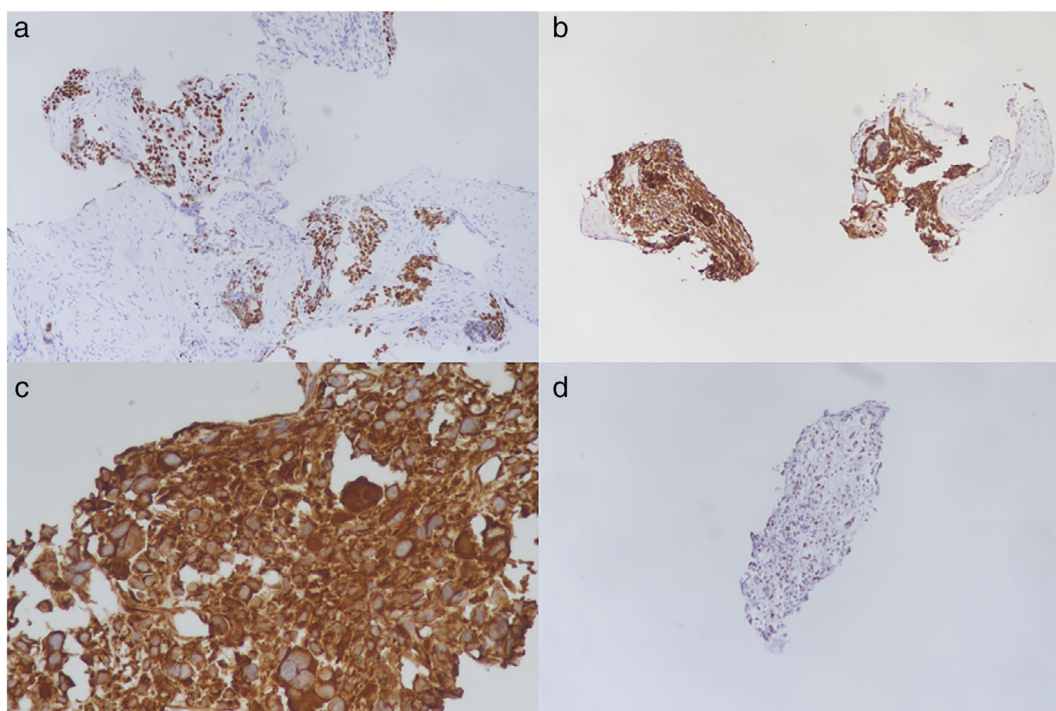
tumor biopsy was performed in December 2018. Pathology report and immunohistochemistry suggested high probability of carcinosarcoma with squamous and osteogenic differentiations (Figure 2). After a complete staging investigation of positron emission tomography scan (Figure 3) and brain magnetic resonance imaging, we finally diagnosed the patient as having clinical T3N0M0 stage IIB pulmonary carcinosarcoma. Because the patient had poor lung function (FEV1 = 0.4 L; FEV1/FVC = 55%) resulting from advanced COPD and medically inoperable condition, we treated him using SBRT. Standard four-dimensional CT simulation was performed. The maximum intensity projection of gross lesion was defined as internal target volume (ITV). The planning target volume (PTV) was determined based on the ITV with a margin of 5 mm. Treatment was delivered using volumetric modulated arc therapy (VMAT). Prescribed SBRT dose was 60 Gy in eight fractions (7.5 Gy per fraction) (Figure 4). SBRT plan was optimized to achieve D95 PTV (dose received by 95% volume) of 100%. Mean bilateral lung dose was 6.129 Gy. The volume of lung receiving a dose of 5 Gy (V5) was 24.2%, 10 Gy (V10) was 19.2%, and 20 Gy (V20) was 10%. Maximum dose to spinal cord was 18.319 Gy. The patient tolerated the therapy well without grade 2-5 toxicities throughout the treatment period. Thereafter, he received regular outpatient clinical follow-ups and

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**FIGURE 1** Chest computed tomography (CT) of the pulmonary carcinosarcoma. (a) Chest CT showed a 5.5 cm right lower lung mass. (b) Follow-up CT 6 months after SBRT revealed a notable shrinkage in the lung tumor. (c) Follow-up CT 12 months after SBRT revealed sustained therapeutic response. (d) Follow-up CT 18 months after SBRT still showed sustained therapeutic response. (e) Follow-up CT 24 months after SBRT revealed sustained therapeutic response of the lung tumor without evidence of recurrence



**FIGURE 2** Microscopic features of the tumor. (a) Squamous cell carcinoma component of the tumor positive for the p40 ( $\times 100$ ). (b) Epithelial component of the tumor positive for cytokeratin AE1/AE3 ( $\times 100$ ). (c) Sarcoma component showing spindle tumor cells positive for vimentin ( $\times 200$ ). (d) Focally positive for SATB2 ( $\times 100$ )

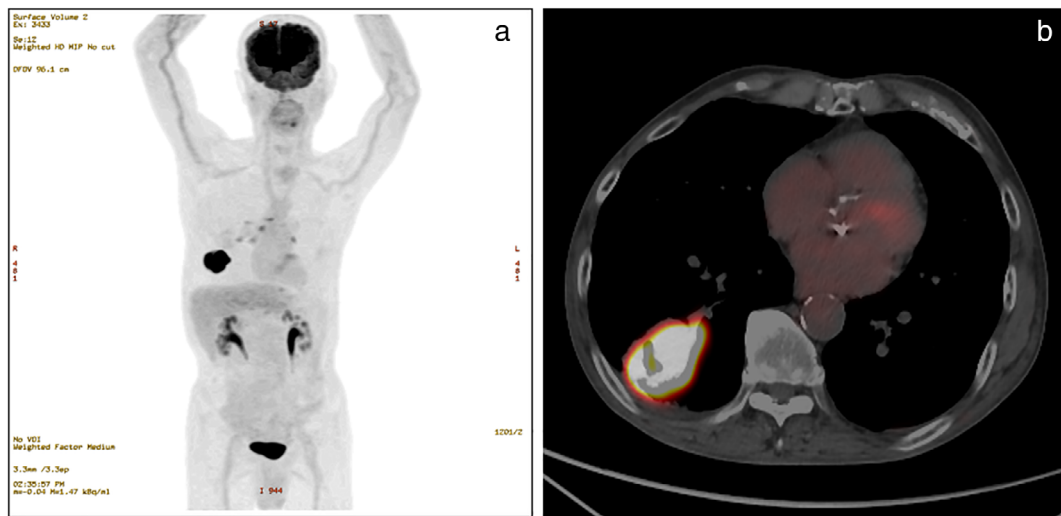
chest CT scan every 6 months for 2 years, demonstrating sustained good local control of the tumor (Figure 1(b)–(e)). At present, the patient has been physically well and free from any clinical suspicion of recurrence for 24 months since SBRT.

## DISCUSSION

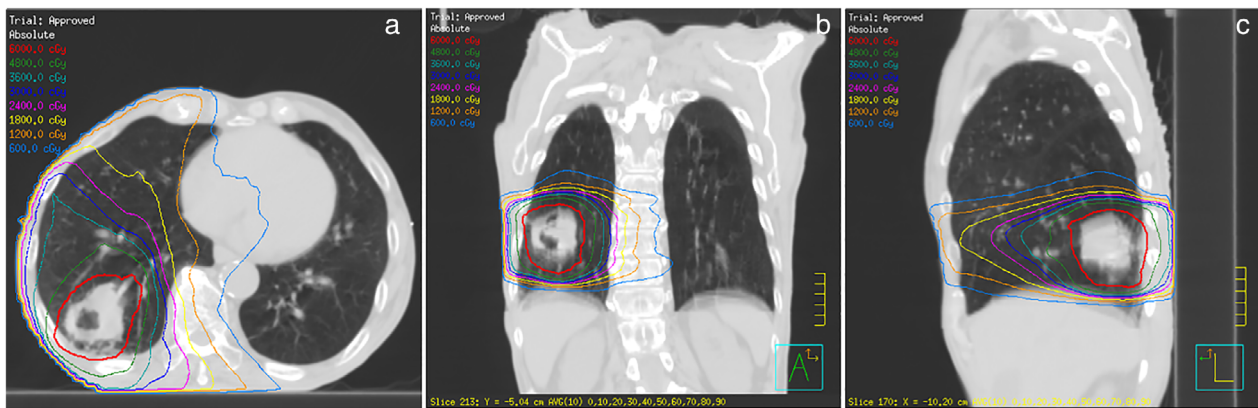
The results of our staging work-ups showed localized disease that is usually treated surgically. However, after weighing

the risks and benefits of surgery on an elderly person with extremely poor lung function, we believed that nonsurgical therapy would be safer and opted to use SBRT. To the best of our knowledge, this is the first report of the successful use of SBRT to treat localized PC.

Recently, Ersek et al.<sup>6</sup> reporting an analysis of the surveillance, epidemiology, and end results (SEER) for PC, found that surgical resection alone had better survival than other treatment modalities or combination therapies for this disease. Furthermore, another study, also using SEER database, sought to identify the prognostic factors and determine



**FIGURE 3** Positron emission tomography scan of the patient. (a) and (b) The scan revealed an increased F-18 fluorodeoxyglucose (FDG) uptake mass lesion ( $SUV_{max} = 31.8$ ) over right lower lung without evidence of hilar/mediastinal lymph node metastasis



**FIGURE 4** The prescription isodose level in SBRT plan. Isodose distribution of the patient receiving total dose of 60 Gy of radiation in eight fractions in the axial plane (a), coronal plane (b), and sagittal plane (c)

optimal treatment for PC.<sup>7</sup> That study found the factors male gender, age, T4 stage, M1 stage, surgery, and chemotherapy to be independently associated with PC survival. If we considered the two SEER analyses together without more investigation, the standard treatment for managing pulmonary carcinosarcoma with localized disease would undoubtedly be surgical resection. However, chemotherapy or radiotherapy is preferred over surgical resection for the treatment of advanced stage PC, making survival outcome inherently poor and possibly explaining their reported differences in survival outcome in those studies. In addition, the authors of the former SEER analysis<sup>6</sup> suggested that because radiotherapy may be performed less in the localized stage PC patients who potentially prefer operative therapy. It is not known what the precise dosage of delivered radiotherapy was to the patients across the long timespan of the survey (1973–2012).

SBRT has become an effective treatment modality for medically or surgically inoperable lung cancer, and in one

study, it has proven to provide superior survival benefit to the conventional fractionated radiotherapy.<sup>8</sup> Over the past decade, more clinicians have become aware of SBRT and have begun using it more often to treat early-stage lung cancer in both medically inoperable and operable patients.<sup>9,10</sup> It has also been used to treat much older patients (>80 years old) with high efficacy and tolerable toxicities.<sup>11,12</sup> Therefore, the potential benefit of SBRT in medically inoperable patients with PC should not be underestimated.

According to the literature to date, for medically inoperable or advanced PC patients, in addition to radiotherapy, chemotherapy has demonstrated some therapeutic efficacy.<sup>13,14</sup> Targeted therapy with pazopanib has also been found to have a favorable treatment response in metastatic PC.<sup>15</sup> Therefore, our report of this case may bring welcome news to those seeking more therapeutic options for inoperable or advanced PC.

In conclusion, we reported the first use of SBRT to treat pulmonary carcinosarcoma to have an evident beneficial

therapeutic response. SBRT might be considered an additional therapeutic option along with other treatment modalities when determining optimal care for pulmonary carcinosarcoma in some patients.

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### DISCLOSURE

The authors have nothing to disclose.

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