

# Stereotactic body radiotherapy with CyberKnife in solitary adrenal metastasis

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## ABSTRACT

Metastases to adrenal glands from solid tumors are fairly common. The incidence varies from 17.6% to 35% in lung primaries and 13-27% in other malignancies. Most of these lesions are clinically occult. Historically, the role of radiotherapy was limited to palliation of pain in symptomatic lesions. However, with the advent of more conformal techniques such as stereotactic body radiation therapy, the focus has shifted to treatment of such lesions with curative intent in selected situations. We treated a patient of non-small cell lung cancer with solitary adrenal metastasis, following partial response to chemotherapy. The adrenal lesion was treated with CyberKnife while the lung lesion was treated with intensity modulated radiotherapy, both with curative intent.

**Key words:** Adrenal gland, CyberKnife, metastasis

## INTRODUCTION

Metastases to the adrenal glands are fairly common with a reported incidence rate ranging from 17.6% to 35% (from lung primary) and from 13% to 27% (from other malignancies).<sup>[1]</sup> Often adrenal metastases remain occult during the course of the disease. Previous management strategies included open and laparoscopic adrenalectomy, radiofrequency ablation and transarterial chemoembolization.<sup>[2-5]</sup> Historically, the intent of radiotherapy in such cases has been palliative, mainly with the intention of achieving pain control. Recent studies have focused on the use of stereotactic body radiation therapy (SBRT) with curative intent in limited metastatic disease to reduce the tumor burden and prevent symptomatic progression.

We present a case of non-small cell lung cancer with solitary adrenal metastasis treated with curative intent using SBRT with CyberKnife.

## CASE REPORT

The present case report is about a 70-year-old gentleman with hypertension, controlled on medication, presented with the complaints of non-productive cough, chest pain and loss of appetite. Contrast-enhanced computed tomography (CECT) chest showed 5.3 cm × 4.9 cm × 3.0 cm mass in the left side of the mediastinum with involvement of left upper lobe bronchus, close to main pulmonary artery. CT guided biopsy from the mediastinal mass suggested a poorly differentiated adenocarcinoma. Immunohistochemistry showed the tumor cells positive for CK7, thyroid transcription factor-1 and negative for CK20, leucocyte common antigen and p63. Fluorescence *in situ* hybridization assay was positive for epidermal growth factor receptor amplification [Figure 1]. Positron emission tomography (PET-CECT) showed fluorodeoxyglucose (FDG) avid irregular soft-tissue density in the left prevascular region, likely to be the site of primary neoplasia. There were additional FDG avid mediastinal nodes and a left adrenal deposit suggesting metastases. Patient was planned for pemetrexed and carboplatin based chemotherapy. Evaluation CECT done after three cycles of chemotherapy showed partial response to treatment with a decrease in the prevascular component of the left parahilar mass (with interstitial spread) and left adrenal mass. He was planned for three more cycles of chemotherapy. PET-CECT carried out after six cycles of chemotherapy showed

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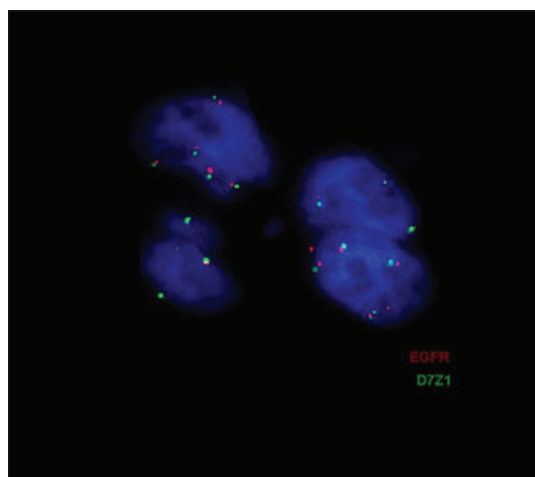
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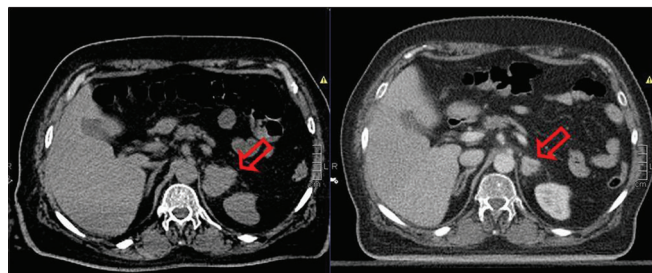
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slight morphological regression of the soft-tissue mass in the left perihilar and aortopulmonary region with no significant interval changes in hypermetabolic mediastinal lymphadenopathy and mild metabolic and morphological regression in the left adrenal gland lesion. In view of stable disease, patient was started on erlotinib. His case was discussed in multidisciplinary tumor board. In view of single solitary metastasis in the adrenal gland along with stable lung lesion, he was planned for radical radiotherapy to lung with intensity modulated radiotherapy (IMRT) and SBRT to adrenal metastasis with CyberKnife

He received a radiotherapy dose of 36 gray (Gy) in 3 fractions (alternate days) to left adrenal lesion with CyberKnife followed by definitive radiation to lung mass - 60 Gy to the planning target volume in 30 fractions over 6 weeks with IMRT. Cyberknife-based SBRT plan was constructed with 218 non-coplanar beams delivered over 46 min. Treatment delivery was in free breathing using spine tracking setup, ensuring submillimeter accuracy by real time imaging during treatment. Patient tolerated the treatment well. CECT 6 weeks after completion of radiotherapy showed partial response in lung disease and reduction in size of left adrenal mass, 10 mm × 14 mm when compared to previous 34.0 mm × 31.0 mm [Figure 2]. Patient was referred to medical oncology for further management.



**Figure 1:** Fluorescence in situ hybridization positive epidermal growth factor receptor



**Figure 2:** Pre- and post-treatment computed tomography showing treatment response

## DISCUSSION

Aggressive treatment of oligometastatic disease can often be considered curative as it prolongs disease free survival.<sup>[6-8]</sup> Several treatment modalities have been used in the management of adrenal metastases.<sup>[4,5]</sup> A meta-analysis by Tanvetyanon *et al.* have reported improved survival in approximately 25% of cases after adrenalectomy.<sup>[2]</sup> Open surgery still represents the “gold standard” approach, but the results are not satisfactory and depend on the extent of spread. Traditionally, the role of radiotherapy has been limited to palliation only. However, recent experiences with SBRT have indicated that it may contribute to survival in these patients.

Soffen *et al.* treated 16 patients with adrenal metastasis with palliative radiotherapy with doses ranging from 29.5 to 45 Gy with 2.5-3 Gy per fraction.<sup>[9]</sup> The authors achieved an overall response of 75% and concluded that a dose of 30 Gy in 10 fractions is reasonable, associated with minimal morbidity and a high probability of achieving effective palliation.

Casamassima *et al.*, in their SBRT experience of adrenal metastases, used 36 Gy in 3 fractions and reported 1- and 2-year local control rate of 90%.<sup>[7]</sup> Another study by Chawla *et al.* used dose fractionation ranging from 16 Gy in 4 fractions to 50 Gy in 10 fractions with a median dose of 40 Gy. They reported 1 year local control rate of 55% with no patient developing grade 2 or higher toxicity.<sup>[8]</sup> Both authors concluded that SBRT is a safe and effective option for treatment of adrenal metastases. We used SBRT with CyberKnife to treat the solitary adrenal metastasis to a dose of 36 Gy in 3 fractions and achieved good response.

## CONCLUSION

With the help of new technology like CyberKnife, patients with solitary metastasis can be treated with radical intent with limited toxicity and such therapy may contribute to improved survival in these patients. Radiotherapy for a painful adrenal metastatic lesion is non-invasive, ideal for patients with poor general condition, is an outpatient modality and achieves excellent pain control with limited toxicity.

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