Case report

Ciliary body metastasis treated with radiotherapy alone in a case of lung adenocarcinoma: A case report.

Abstract

Aim: To describe local treatment of ciliary body metastasis in a case of metastatic adenocarcinoma of the lung using radiotherapy only.**Presentation of case:** A 62-year-old lady, diagnosed case of metastatic non-small cell lung cancer, presented to us with blurred vision, diminution of near and distance vision and floaters in left eye in October 2023. She was further evaluated and treated with radiotherapy. **Discussion:**Ciliary body metastasis in a non-small cell lung cancer is extremely rare. Intraocular metastasis by any cancer most commonly involves choroid followed by iris and ciliary body. Symptoms include blurred vision, pain, floaters, visual field defects, red eyes, double vision and blindness. Management includes therapies for systemic control and radiotherapy for local control. **Conclusion:**Lung cancer patients with eye symptoms must be evaluated for the presence of ocular metastasis. External beam radiotherapy is deemed as a safe local therapy option in cases where other modalities have failed.

Keywords: ciliary body metastasis, non-small cell lung cancer, radiotherapy, IMRT, precision oncology

Introduction

Non-small cell lung carcinoma (NSCLC) is a leading cause of mortality worldwide, and some patients present with advanced metastatic disease involving the brain, bones, liver, lungs or adrenal glands commonly. [1] Ocular metastasis is extremely rare of all metastatic spread. [1,2] The most common area of ocular metastasis is the uvea, which includes the iris, ciliary body, and choroid. [3] We report a case of 62-year-old lady, diagnosed withlung adenocarcinoma, treated initially with chemotherapy, followed by stereotactic body radiation (SBRT)to lung lesions, and later presented with ocular metastasis.

Presentation of case

A 62-year-old female with no comorbiditiesbut a family history of ovarian cancer in mother, was evaluated for left sided chest pain and upper back pain in December 2019. General examination was normal, although grade I wheeze was auscultated on the left side of the chest. Baseline hematologic examination was within normal limits. Patient gave history of chewing tobacco for the last 40 years.

CT Thorax revealed a 4.3 x 3.8 x 4 cm para-hilar ill-defined mass of left upper lobe and a mild enhancement of 19 x 16 mm in the enlarged left adrenal gland. Malignant cells were found on endobronchial ultrasound-guided transbronchial fine needle aspiration. CT guided biopsy of the lung lesion was suggestive of moderately differentiated adenocarcinoma. The whole body 18FDG PET CT scan confirmed the primary lung lesion of SUV max 8.7 and the adrenal lesion of SUV max 8.5, along with multiple sub centimeter satellite lung nodules in both lungs. She was diagnosed with stage IVA lung cancer.

She received six cycles of Pemetrexed and Carboplatin from February to June 2021with partial response in size and metabolic activity of the left lung and left adrenal metastatic lesion, and mild reduction in size of the bilateral lung nodules. She continued maintenance therapy with Pemetrexed and Gefitinib from July 2021 till December 2021. Follow up PET CT showed further disease regression of the left lung primary and adrenal metastasis, with persistent bilateral lung nodules. Gefitinib alone was then continued till January 2023.

In January 2023, she presented to us with PET CT findings of a significant increase in metabolic activity of left lung lesion (SUV max 15.8) and left adrenal lesion (SUV max 6.5). She received SBRT to left lung lesion (50Gy in 5 fractions) and left adrenal metastasis (35Gy in 5 fractions) on alternate days as palliation at our institution.

On follow up in August 2023, she presented with blurring of vision in left eye. She was referred to an ophthalmologist. Clinical examination was normal, but the USG B scan showed mild chorio-retinal thickening without retinal detachment. She was managed symptomatically.

In October 2023, she complained of worsening left eye symptoms with diminution of near and distance vision along with floaters. Visual acuity was hand motionfor distance vision and N36 for near vision in the left eye. The intraocular pressure was 18 mm Hg. On slit lamp examination, the anterior chamber, conjunctiva, sclera, and iris were normal, although corneal surface showed degeneration. The lens was central, clear, and crystalline. The pupil was irregular in shape with absent direct and consensual light reflexes. Fundic examination

showed metastatic lesion in the choroid. USG B scan revealed no associated choroidal or retinal detachment with the choroidal lesion and a clear vitreous.

An MRI (Figure 1) and PET CT (Figure 2) were performed. A 1.1 x 0.8 x 0.7 cm focal nodular lesion was seen on the nasal side of the left globe in the inferior aspect involving ora serrata and ciliary body with focal thickening of adjacent sclera and focal chorio-retinal detachment, appearing isointense on T2W FSE images, hypointense on T1W images, showing diffuse nodular intense enhancement on post contrast MRI study. MRI also revealed multiple tiny nodules involving both cerebral hemispheres suggestive of brain metastasis. PET CT confirmed these findings revealing an uptake of SUVmax 6.5 in the choroidal lesion, reduction in uptake of the previously treated left lung lesion with post radiotherapy changes and a persistent left adrenal lesion.

We treated her for both ciliary body and brain metastases. Ciliary body metastasis was addressed by treating the entire left orbit with a 5mm PTV margin. Whole brain radiotherapy was delivered to the entire brain with a 5mm PTV margin. Both these PTVs were combined into a single planning volume which received a dose of 30Gy in 10 fractions using 6MV photons. Planning was done with Eclipse system version 17.0 with Rapid Arc Technique using two full arcs. 99% of the volume received 95% of the dose (V95 = 99%). Maximum dose to the right eye (D max) was 24.3Gy, and the right lens received only 4.5Gy. Treatment was delivered on TrueBeam STx machine. She did not develop any acute radiation related toxicities and tolerated the treatment well.

We followed her up with an MRI brain (Figure 3) aftertwo months, and PET CT afterthree months. MRI did not reveal any change in size of ciliary body lesion, but it did appear more necrotic. PET CT showed near complete resolution of the choroidal lesion, along with appearance of a new hypodense lesion in segment II of liver which was likely metastatic. PET CT (Figure 4) six months after treatment showed complete resolution of the ciliary body lesion. The patient is currently alive and on observation.

Discussion

Metastases is the most common form of intraocular malignancy with breast and lung being the most common primaries. Kreusel et al [4] highlighted choroid to be the sixth most

common site of metastasis from lung cancer. Posterior choroid is most involved and in 5% to 11% of the cases show ciliary body or iris involvement due to the rich blood flow. [5] A study of uveal metastases in 229 eyes from 194 patients showed that 88% of the tumours were in the choroid; iris (10%) and ciliary body metastases (2%) also occurred, and 18% had bilateral metastases. [6]

Ciliary body metastasis presents as a dome-shaped mass and is often difficult to visualise directly if present in the posterior chamber. This becomes even more challenging due to pupillary distortion, ectropion uvea and an episcleral sentinel vessel. [7,8] In around 63% to 72% of patients', the diagnosis of uveal metastasis precedes the diagnosis of lung cancer.[9]

Symptoms include blurred vision, pain, floaters, visual field defects, red eyes, double vision and blindness. Our patient had diminution of vision and floaters in left eye. However, some patients can be asymptomatic and were diagnosed only during routine screening.[10] Screening of asymptomatic patient is controversial but the knowledge of the existence of such metastasis is necessary so as not to miss the diagnosis.

Imaging plays a pivotal role in the diagnosis and treatment. For diagnosed case of lung cancer, the significance of new eye symptoms should be further evaluated clinically with an ophthalmoscopy or slit lamp examination by an ophthalmologist, supplemented by a USG of the eye, an MRI, and a PET CT. If any further uncertainty exists, a fine needle aspiration biopsy can also be considered for confirmation. [11]

The goal of management of ocular metastasis is vision preservation or prevention of complications like phthisis bulbi and ocular pain in cases where vision is already lost. [12] Current options in the management of choroidal metastasis include surgery (enucleation, exenteration or local resection), chemotherapy (systemic, intravitreal), radiotherapy (external beam radiotherapy (EBRT), brachytherapy) and laser therapy (photocoagulation, photodynamic therapy). That said, ciliary body metastasis has limited literature on management although systemic chemotherapy and radiotherapy (teletherapy with photons or charged particles, plaque brachytherapy) are the most used modalities. [8, 13-15]

In cases of ocular metastasis from a lung primary, systemic therapy which addresses both these sites can be considered as the initial management. Very few studies have proven systemic therapy alone to be effective, in most cases local therapy in the form of radiation is usually added. Systemic cisplatin given in a study by Kasturi et al showed partial but persistent response of the metastatic lesion, who later developed brain metastasis albeit

without any recurrence of the ciliary body lesion. This patient did not need any further local therapy of the ciliary body lesion. [13] In our case, the patient was a de novo metastatic NSCLC who had progressed even after chemotherapy and targeted therapy, therefore giving systemic therapy alone wasn't an option.

A study like ours by Clyde et al had an initial lung primary addressed by wedge resection followed by SBRT to lung nodule, who later developed left ciliary body and osseous metastasis. 30Gy was delivered to the left globe in 10 fractions using three-dimensional conformal radiotherapy (3DCRT) technique along with palliative management of the bone metastasis. 9 month follow up MRI of this patient revealed complete resolution of the lesion. [13]

Other modalities in treating ocular metastasis using radiation include giving SBRT or by plaque radiotherapy. SBRT is a technique of teletherapy which involves usage of higher dose per fraction whereas plaque radiotherapy is a type of brachytherapy using a curvilinear applicator over the ocular metastatic site. In a case series of 3 cases of iris metastasis from oesophageal carcinoma, one was treated with EBRT (30Gy over 16 days), another with SBRT (35Gy in 14 fractions over 21 days) and the last with plaque radiotherapy (35Gy over 4 days to the apex of the tumour using Iodine 125). Tumour regression and local symptomatic control was documented in all three cases, but plaque radiotherapy was the quickest treatment with the most rapid resolution. [13] Although these modalities depict good local control, they have been implemented in iris and not ciliary body metastasis. Thus, we must be cautious in extrapolating these results and more studies are needed to ascertain the use of SBRT and plaque radiotherapy in ciliary body metastasis. Based on the advancements in radiation therapy, one study treated a ciliary body metastatic mass from renal primary with protons. This lesion was progressing even on systemic and intravitreal targeted therapy hence warranted local therapy. The lesion was treated to the dose of 30 Cobalt Gray Equivalent in 3 fractions over 6 days and resulted in reduction in size. [13]

Conclusion

Lung cancer patients with eye symptoms must be evaluated for the presence of ocular metastasis and its management should be undertaken by a multidisciplinary team involving

the ophthalmologist, medical oncologist, and radiation oncologist. Our report has demonstrated complete resolution of the ciliary body metastasis at 3 month follow up, with the patient tolerating the treatment well. EBRT is deemed as a safe local therapy option in cases where other modalities have failed.

Consent

Written informed consent was obtained from the patient for the publication of the present case report and any accompanying images.

Ethical approval

Not applicable.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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Figures

Figure 1:A1.1 x 0.8 x 0.7 cm focal nodular lesion was seen in the nasal aspect of the left globe on MRI Brain 3D FLAIR sequence.

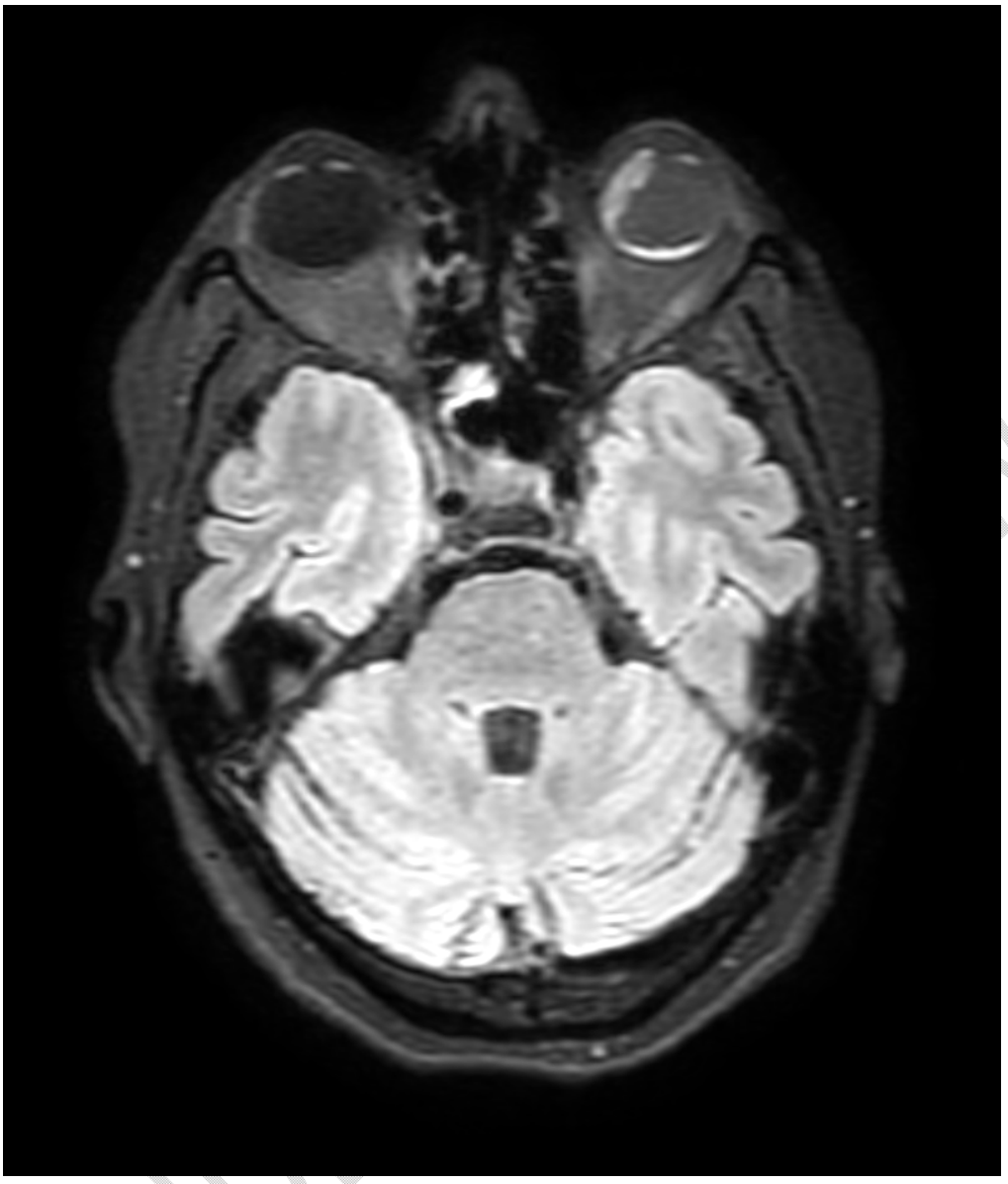

Figure 2: PET CT revealed a FDG uptake of SUV 6.5 in the choroidal lesion.

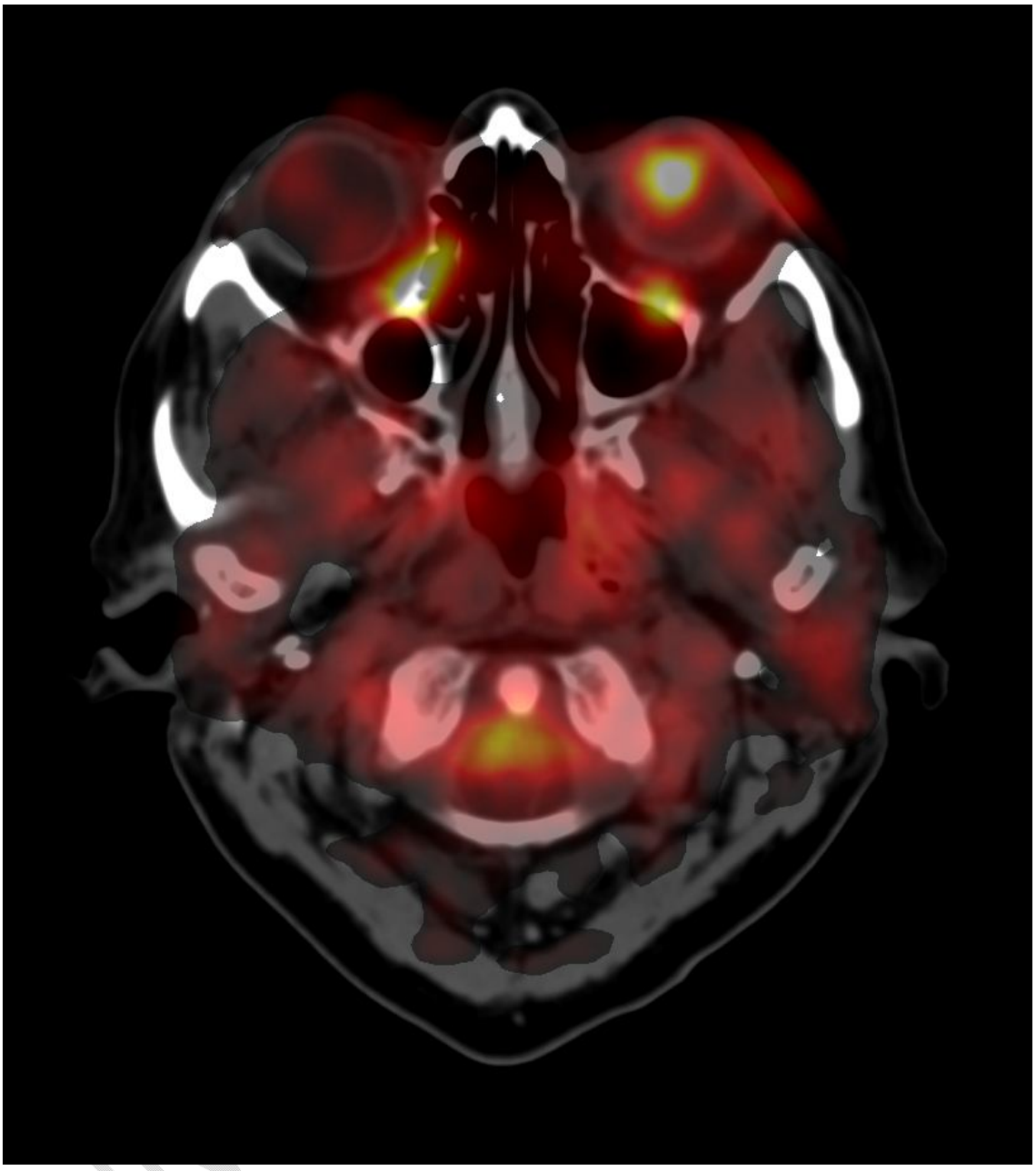

Figure 3: MRI Brain T1W sequence revealed no change in size of ciliary body lesion but appeared more necrotic two months after treatment.

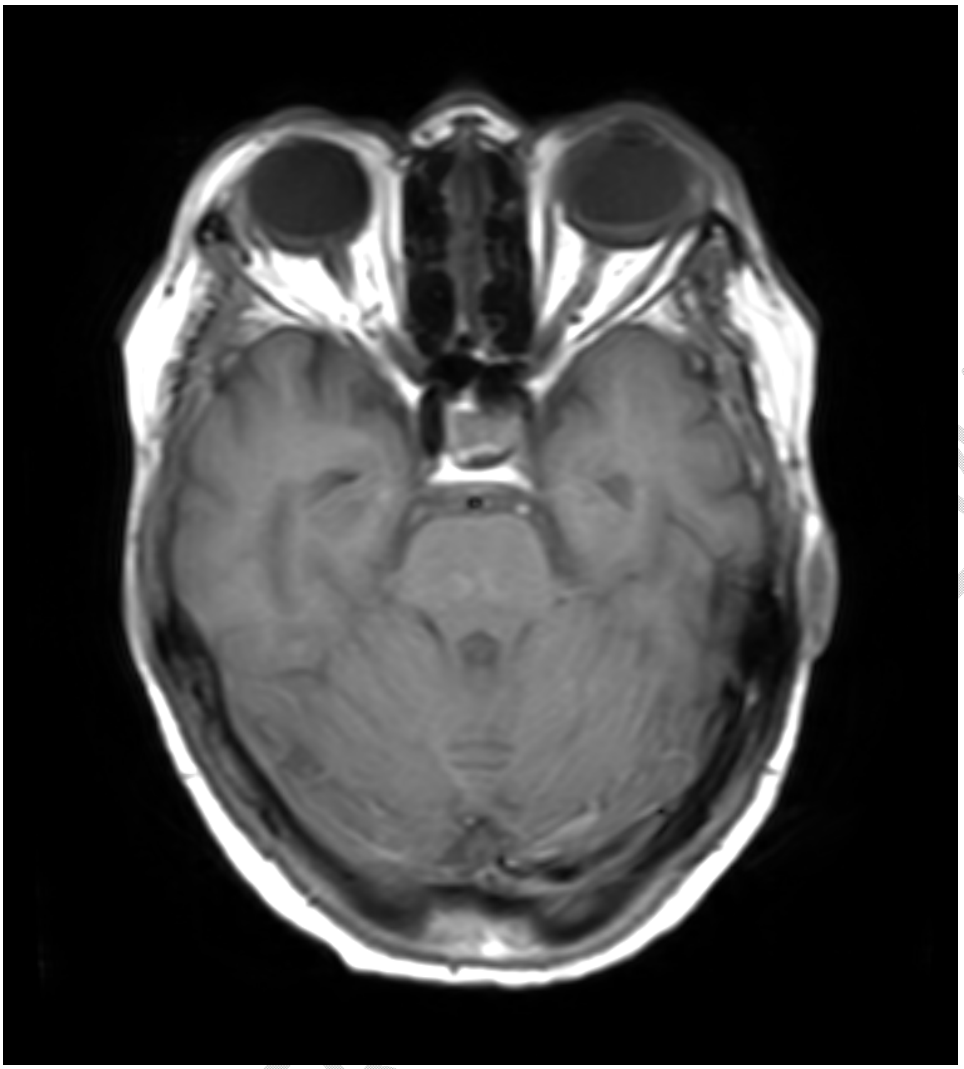

Figure 4:PET CT showed complete resolution of ciliary body lesion six months after treatment.