



Case report

A rare presentation of choroidal metastasis from primary esophageal adenocarcinoma successfully treated with intensity-modulated radiation therapy

Rishabh C. Date^a, Matthew K. Adams^a, Bin S. Teh^b, Amy C. Scheffler^{c,d}, Benjamin L. Musher^e, Andrew Farach^b, Christina Y. Weng^{a,*}

^a Department of Ophthalmology, Baylor College of Medicine, 6565 Fannin St., NC-205, Houston, TX 77030, USA

^b Department of Radiation Oncology, Houston Methodist Hospital, 6565 Fannin St., DB1-077, Houston, TX 77030, USA

^c Retina Consultants of Houston, 6560 Fannin Street, Suite 750, Houston, TX 77030, USA

^d Blanton Eye Institute, Houston Methodist Hospital, 6500 Fannin Street, Houston, TX 77030, USA

^e Department of Medicine, Baylor College of Medicine, Dan L. Duncan Comprehensive Cancer Center, 6620 Main St., Suite 1350, Houston, TX 77030, USA

ARTICLE INFO

Keywords:

Choroidal metastasis
Esophageal adenocarcinoma
Intensity-modulated radiation therapy
External beam radiation therapy
Retina

ABSTRACT

Purpose: In this case report, we present a case of choroidal metastasis from a primary esophageal adenocarcinoma that was treated successfully with intensity-modulated radiation therapy.

Observations: A 65-year-old male with known stage IV esophageal adenocarcinoma presented with a central scotoma in his left eye and was ultimately found to have a large choroidal metastatic lesion with overlying subretinal fluid. IMRT was administered over the course of four weeks, resulting in restoration of the patient's vision, regression of the metastatic lesion, and resolution of the subretinal fluid. As of 16 months following completion of radiation, there remains no evidence of choroidal recurrence or radiation-associated ocular complications.

Conclusions: and Importance: To our knowledge, this is the first published case report of a choroidal metastasis from esophageal cancer responding durably to IMRT. IMRT should therefore be considered a viable treatment option for this rare disease.

1. Introduction

The choroid is an uncommon but well-documented site for metastasis of solid tumors, most commonly breast and lung carcinomas. On autopsy, choroidal metastasis can be found histologically in 0–11% of patients with any known metastatic malignancy and 4–12% of patients with breast and lung cancer.^{1–4} However, choroidal metastases originating from the esophagus are exceedingly rare. In fact, a recent review of multiple case series found that only 8 of 918 cases (0.87%) of choroidal metastases were attributed to an esophageal origin.⁵ In this report, we summarize the presentation and management of a patient who developed a choroidal metastasis from primary esophageal adenocarcinoma and then review the limited published literature pertaining to this rare clinical entity.

1.1. Case report

A 65-year-old Caucasian male was diagnosed with Her-2 positive,

locally advanced adenocarcinoma of the lower esophagus and treated definitively with chemotherapy, radiation, and Ivor-Lewis esophagectomy. Eighteen months later, his cancer recurred in bone, non-regional lymph nodes, and the surgical bed. Palliative radiation to an iliac metastasis and systemic chemoimmunotherapy (capecitabine, oxaliplatin, trastuzumab) were initiated, and subsequent imaging showed response to therapy.

Ten months into treatment, however, the patient noticed a central scotoma in his left eye and was referred to an ophthalmologist who reported visual acuity of 20/20 in the right eye and 20/25 in the left eye without an afferent pupillary defect. Dilated funduscopic examination revealed a large, elevated yellow choroidal lesion in the temporal macula with RPE changes and overlying subretinal fluid (Fig. 1a). Spectral-domain optical coherence tomography (SD-OCT) revealed subretinal fluid overlying the area of choroidal infiltration with shaggy photoreceptors and RPE debris, as well as irregular foveal contour caused by the choroidal mass (Fig. 1b and c). Fluorescein angiography demonstrated window defects in areas of RPE atrophy

* Corresponding author. Department of Ophthalmology, Baylor College of Medicine, 1977 Butler Blvd., Houston, TX 77030, USA.
E-mail address: christina.weng@bcm.edu (C.Y. Weng).

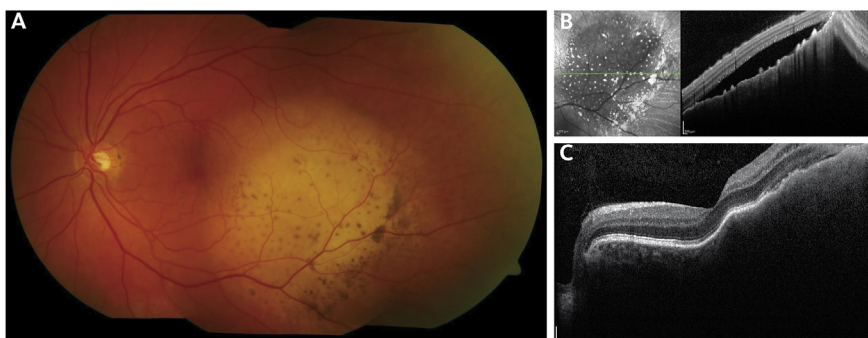


Fig. 1. (a) Color fundus photograph of the left eye revealing a yellow, creamy, elevated lesion in the posterior pole with overlying RPE changes; (b) Spectral-domain optical coherence tomography (SD-OCT) of the left eye through the lesion demonstrating choroidal elevation and infiltration with overlying subretinal fluid; (c) SD-OCT through the fovea demonstrating involvement of the choroid centrally causing irregular foveal contour. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

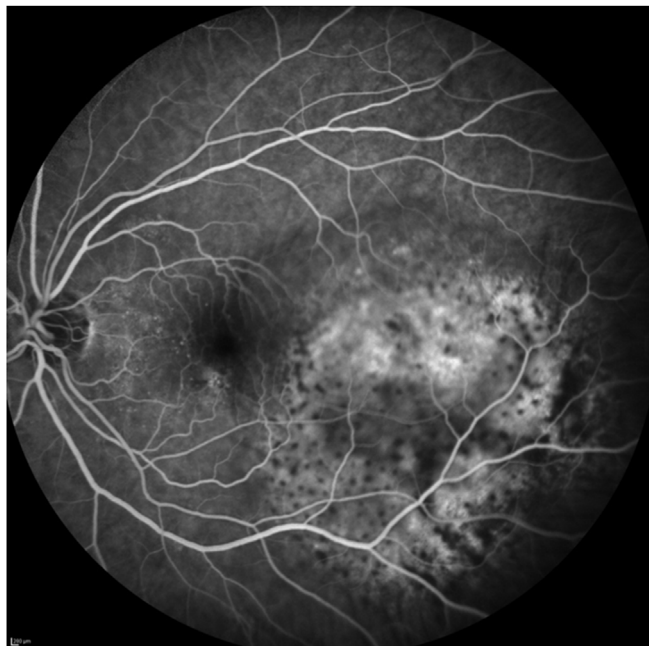


Fig. 2. Fluorescein angiography of the left eye revealing window defects in areas of RPE atrophy interspersed with blockage from RPE clumping.



Fig. 3. Pre-treatment T1-weighted MRI of the orbits, showing a 6 mm × 2 mm elevated enhancing lesion on the left posterolateral globe (arrow).

interspersed with blockage from RPE clumping (Fig. 2). Standardized A- and B-scan ultrasound demonstrated a choroidal mass with a largest basal dimension of 11.4 mm and an apical height of 3.4 mm with medium-high internal reflectivity. These findings were consistent with the clinical suspicion of choroidal metastasis. Neuroimaging including MRI (Fig. 3) revealed a flat lesion in the posterolateral left globe, but no evidence of intracranial lesions. The patient's multidisciplinary team recommended that he undergo targeted ocular therapy while continuing systemic chemotherapy.

The patient received 40 Gy of intensity-modulated radiation therapy (IMRT) in 20 fractions over a course of four weeks (Fig. 4) concurrently with radiosensitizing 5-fluorouracil and trastuzumab. The patient responded well, with resolution of the subretinal fluid, regression of the metastatic lesion (Fig. 5), and restoration of visual acuity (20/20) after the completion of IMRT. After 16 months of follow-up, there is no evidence of clinical or radiographical choroidal recurrence or radiation-induced toxicity. Repeat neuroimaging one year after treatment showed resolution of the previously noted choroidal mass (Fig. 6).

2. Discussion

To our knowledge, this is the first published report of a choroidal metastasis from primary esophageal cancer that responded in a complete and durable manner to radiotherapy. While esophageal cancer metastasizing to the choroid is exceedingly rare, choroidal metastases are the most common intraocular malignancy.⁵ A substantial portion of patients with choroidal metastases may be asymptomatic, but common presenting symptoms include blurred vision, metamorphopsia, floaters, and photopsias. Visual acuity at presentation can vary, depending on the extent of the lesions and the presence or absence of subretinal fluid. When Shields et al.⁶ examined 520 eyes in 420 patients with metastatic uveal lesions, they localized 88% of metastatic lesions to the choroid, while iris and ciliary body lesions were far less common.⁶ The propensity of tumor cells to seed the choroid preferentially likely stems from its rich vascular supply.

Uveal metastases are most commonly attributed to primary tumors of the breast and lung.^{2,7–9} Only 4% of uveal metastases arise from the gastrointestinal tract, and only a small percentage of these originate in the esophagus.^{6,10–19} Furthermore, most reported cases of esophageal cancer metastasizing to the uvea are of squamous histology. Only a few cases of uveal metastases from adenocarcinoma of the esophagus have been reported in the literature.^{10,11,15–18}

Management of choroidal metastases depends on a number of factors, including primary tumor site, tumor histology, extent and burden of extra-uveal disease, the patient's underlying health, overall prognosis, and symptomatology. Once choroidal metastases have arisen, prognosis is generally poor, so the goal of treatment is salvaging vision in a minimally-invasive manner.⁵ Whether or not systemic chemotherapy alone can effectively treat choroidal metastases is debatable, but most agree that local therapy is generally warranted.^{5,20} Standard fractionated external beam radiotherapy (EBRT) is the modality most commonly used to treat choroidal metastases, yielding tumor regression

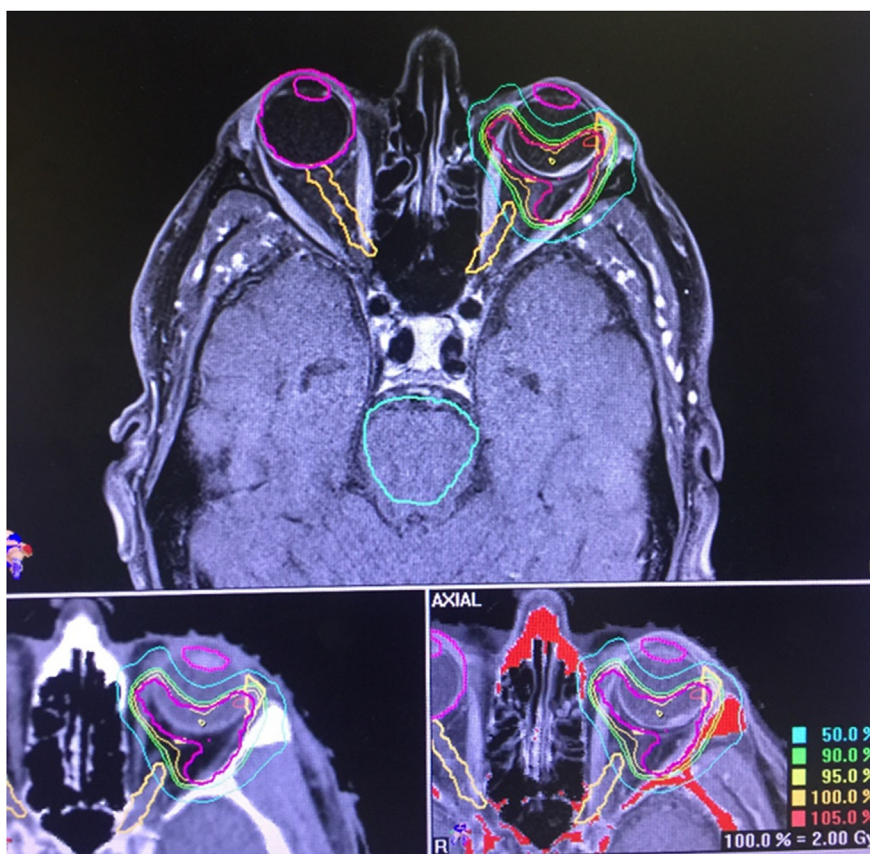


Fig. 4. Representative slice of IMRT plan shows conformal isodose distribution with sparing of nearby normal tissues (lens, lacrimal gland, brain, and contralateral orbit). The choroidal lesion is well-visualized with MRI fusion.

in 85–93% of patients.^{5,20}

Despite its anti-tumor activity, EBRT can cause cataracts, exposure keratopathy, iris neovascularization, and radiation retinopathy. Approximately 12% of EBRT patients will experience one or more of these side effects within six months of treatment.²⁰ EBRT is also intensive, requiring daily fractions for weeks to months in patients with limited life expectancy.²⁰ Other types of radiation therapy, including plaque brachytherapy, stereotactic radiosurgery, and proton beam therapy have also been utilized for treating choroidal metastases, but with variable success.^{20,21} Non-radiation therapeutic strategies including intravitreal anti-VEGF injections, transpupillary thermotherapy, laser photocoagulation, photodynamic therapy, cryotherapy, and surgical excision have also been attempted, but further evaluation and comparative studies are needed to establish their roles in the

management of metastatic disease.²⁰

Based on limited published data, choroidal metastases from esophageal adenocarcinoma have been treated with systemic chemotherapy, EBRT, and enucleation. However, outcomes have been poor, and no single modality has demonstrated clear benefit.^{15,17,18} Samuel et al. describe a patient whose first presentation of esophageal adenocarcinoma was retinal detachment due to a metastasis involving the macula. Systemic chemotherapy (carboplatin and 5-fluorouracil) induced regression of the macular lesion and subretinal fluid, but visual acuity did not improve. Within three months after chemotherapy was discontinued due to intolerance, the uveal metastasis lesion had clearly progressed.¹⁵ The same authors reported a patient with esophageal adenocarcinoma who presented with compromised visual acuity due to a foveal metastasis. He underwent external beam radiotherapy, yielding

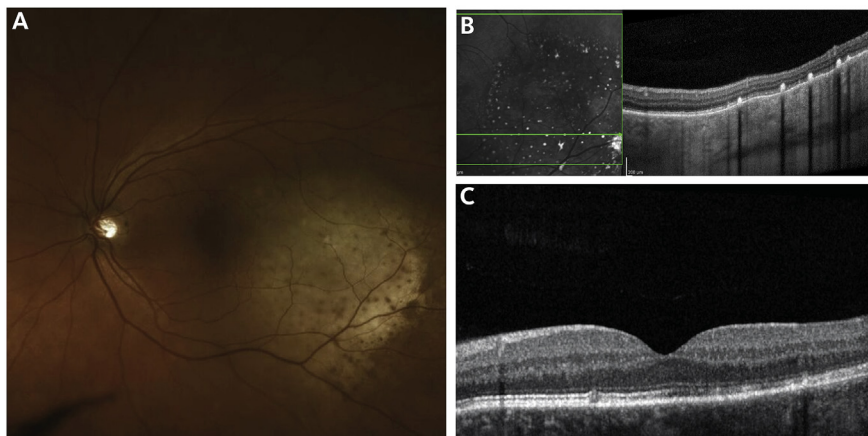


Fig. 5. (a) Color fundus photograph of left eye post-IMRT showing a regressed lesion marked by reduced elevation of the lesion and resolved subretinal fluid; (b) SD-OCT of the lesion (corresponding line scan to that shown in Fig. 1b) post-IMRT demonstrating resolution of the subretinal fluid and decreased elevation of the lesion; (c) SD-OCT through the macula showing significant reduction in lesion size with corresponding improvement in foveal contour. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

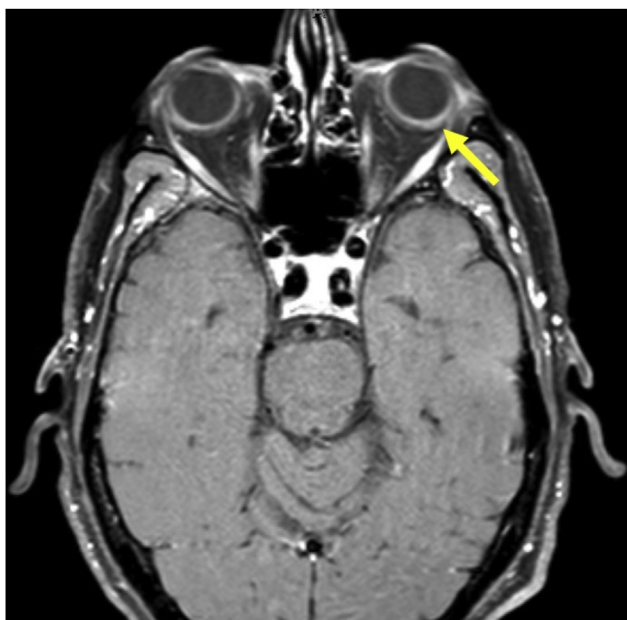


Fig. 6. Post-treatment T1-weighted MRI of the orbits taken approximately one year after treatment, showing continued resolution of the lesion (arrow).

partial regression of the metastasis and subretinal fluid and improvement of his visual acuity to 20/70 after one month of follow-up. However, the patient expired two months later due to progressive systemic disease.¹⁵ Similarly, Buskens, et al. report a choroidal metastasis from primary esophageal adenocarcinoma treated with palliative EBRT, but the patient expired before she could be assessed for any potential benefit of therapy.¹⁸

In contrast to the patients described in these reports, our patient manifested significant symptomatic and anatomic improvement after 40 Gy of IMRT. An advanced subtype of external beam radiation which utilizes 3-D imaging to determine the dose intensity pattern best conforming to the tumor contour, IMRT allows delivery of higher radiation doses to the tumor while minimizing radiation exposure of surrounding tissue (e.g., lens, lacrimal gland, brain). IMRT offers certain benefits over plaque radiotherapy such as the avoidance of an invasive surgical procedure and the associated anesthesia; however, the treatment duration is generally longer. IMRT has been used successfully as a treatment modality for choroidal metastasis from gastric adenocarcinoma²² and breast cancer.²³ The precision of IMRT over standard EBRT may therefore account for our patient's ongoing tumor response and absence of ocular toxicity 16 months post-radiotherapy. Clearly, tumor relapse and/or delayed radiation toxicity may still arise, so continued observation will be important. Nevertheless, to our knowledge, our patient has experienced the longest post-treatment overall survival and event-free ocular outcome reported in the medical literature. Future studies involving a larger cohort of patients treated for this rare primary malignancy are needed.

3. Conclusions

Choroidal metastasis from primary esophageal adenocarcinoma is exceedingly rare. IMRT may be an effective and well-tolerated treatment option.

Patient consent

Consent to publish the case report was obtained. This report does not contain any personal information that could lead to the identification of the patient.

Disclosures

No funding or grant support was received. The following authors have no relevant financial disclosures: RCD, MKA, BST, BLM, AMF, ACS, CYW. All authors attest that they meet the current ICMJE criteria for Authorship.

Acknowledgments

None.

References

- Bloch RS, Gartner S. The incidence of ocular metastatic carcinoma. *Arch Ophthalmol*. 1971;85(6):673–675.
- Nelson CC, Hertzberg BS, Klintonworth GK. A histopathologic study of 716 unselected eyes in patients with cancer at the time of death. *Am J Ophthalmol*. 1983;95(6):788–793.
- Wiegel T, Kreusel KM, Bornfeld N, et al. Frequency of asymptomatic choroidal metastasis in patients with disseminated breast cancer: results of a prospective screening programme. *Br J Ophthalmol*. 1998;82(10):1159–1161.
- Barak A, Neudorfer M, Heilweil G, et al. Decreased prevalence of asymptomatic choroidal metastasis in disseminated breast and lung cancer: argument against screening. *Br J Ophthalmol*. 2007;91(1):74–75.
- Jardel P, Sauerwein W, Olivier T, et al. Management of choroidal metastasis. *Canc Treat Rev*. 2014;40(10):1119–1128.
- Shields CL, Shields JA, Gross NE, et al. Survey of 520 eyes with uveal metastases. *Ophthalmology*. 1997;104(8):1265–1276.
- Ferry AP, Font RL. Carcinoma metastatic to the eye and orbit. I. A clinicopathologic study of 227 cases. *Arch Ophthalmol*. 1974;92(4):276–286.
- Stephens RF, Shields JA. Diagnosis and management of cancer metastatic to the uvea: a study of 70 cases. *Ophthalmology*. 1979;86(7):1336–1349.
- Freedman MI, Folk JC. Metastatic tumors to the eye and orbit. Patient survival and clinical characteristics. *Arch Ophthalmol*. 1987;105(9):1215–1219.
- Parikh HK, Deshpande RK, Swaroop DV, et al. Choroidal metastasis from primary adenocarcinoma of the esophagus. *J Surg Oncol*. 1993;52(1):68–70.
- Elliott D, Salehi-Had H, Plous OZ. Adenocarcinoma of the esophagus presenting as choroidal metastasis. *Dis Esophagus*. 2011;24(2):E16–E18.
- Mooy CM, de Jong PT, Verbeek AM. Choroidal metastasis of oesophageal squamous cell carcinoma. *Int Ophthalmol*. 1990;14(2):63–71.
- Mullaney J. Squamous cell carcinoma of the oesophagus with choroidal metastasis. *Br J Ophthalmol*. 1970;54(4):281–283.
- Golshahi A, Bornfeld N, Weinitz S, et al. Near-infrared autofluorescence in bilateral diffuse uveal melanocytic proliferation associated with esophageal carcinoma and choroidal metastasis. *Retin Cases Brief Rep*. 2016;10(3):254–258.
- Samuel J, Flood TP, Agbemadzo B, et al. Choroidal metastasis from adenocarcinoma of the esophagus. *Retina*. 2003;23(6):874–877.
- Hegde SR, Wagle AM, Au Eong KG. Retinal detachment as a presenting feature of metastatic esophageal adenocarcinoma. *Am J Gastroenterol*. 2010;105(2):474–476.
- Knezevic J, Radovanovic N, Simic A, et al. Isolated choroidal metastasis from primary adenocarcinoma of the distal esophagus: a case report. *Dis Esophagus*. 2003;16(1):41–43.
- Buskens CJ, Tan HS, Hulscher JB. Adenocarcinoma of the esophagus with choroidal metastasis. *Dis Esophagus*. 2001;14(1):70–72.
- McDonald JW, Proia AD. Ocular metastasis as the initial presentation of esophageal carcinoma. *Can J Ophthalmol*. 1997;32(1):50–52.
- Chen CJ, McCoy AN, Brahmer J, et al. Emerging treatments for choroidal metastases. *Surv Ophthalmol*. 2011;56(6):511–521.
- Shields CL, Shields JA, De Potter P, et al. Plaque radiotherapy for the management of uveal metastasis. *Arch Ophthalmol*. 1997;115(2):203–209.
- Shimada M, Amaya S, Sugita H, et al. Solitary choroidal metastasis from gastric adenocarcinoma: a case report. *Surg Case Rep*. 2017;3(1):35.
- Inoue T, Masai N, Oh RJ, et al. Adaptive replanning intensity-modulated radiotherapy for choroidal metastasis of breast cancer using optical coherence tomography. *J Radiat Res*. 2014;55(3):502–508.