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Mini Review

Radiosurgery for Choroidal Metastases- Mini Review

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Abstract

Choroidal metastases are a rare and unique challenge to oncologists. The preservation of vision and resolution of metastatic disease needs a careful and multidisciplinary discussion. With the advent of curative intent treatment for limited metastatic disease and also availability of expertise in terms of radiosurgery ushered new hope in this scenario. This mini review with give an overview about available sparse literature on radiosurgery for choroidal metastases.

Keywords: *Choroidal Metastases (CM); Radiosurgery*

Introduction

Choroidal metastases (CM) are the site of metastases in breast cancer and lung cancer in case of females and males, respectively. Other sites of primary include gastrointestinal tract, testis, thyroid, kidney, pancreas, skin and prostate [1]. Metastatic carcinoma to the uveal structures is recognized as the most common intraocular neoplasm and uveal structures are involved in 88% cases probably due to high blood flow [2-4]. Radiosurgery utilizes high dose focused radiation to treat cancers in many sites. There are few literatures available for radiosurgery in the treatment of choroidal metastases using gamma knife or other modalities of radiosurgery [5]. This mini review would specifically focus upon application of radiosurgery in the treatment of CM.

Clinical overview of CM

The most common symptom of CM is reduced visual acuity, diplopia, floaters, photophobia, ptosis, exophthalmos, pain and secondary glaucoma. 10% patients are asymptomatic. Diagnosis is through dilated fundoscopic examination, fluorescein angiography and optical coherence tomography [1]. In ophthalmoscopy, choroidal metastases appear as at orange lesions located most often at the posterior pole of the eye [2].

Treatment options include external beam radiotherapy (EBRT), stereotactic radiotherapy, gamma knife radiosurgery, brachytherapy, and charged particle radiotherapy. Stereotactic radiotherapy or radiosurgery (RS) is non-invasive and has potential advantage as compared to brachytherapy and charged particle radiotherapy, as charged particle centers are very few. Gamma knife poses the disadvantage of treating with Co-60, as disposal remained a major undertaking and the single session treatment for ocular structures may be challenging [3]. RS is considered superior to EBRT due to high focused dose to the tumor and better sparing of surrounding structures [1].

RS in CM

RS can be performed by Gamma knife (single session), Cyberknife or modern linear accelerator with high dose rate capability and few other technical details. The data to support or substantiate RS in CM are sparse and few given the rarity of the scenario. Since this would be high dose per fraction, few technical details need to be kept in mind:

- Issues related to immobilization- either by retro-bulbar block or lid retractor with looking straight up or laser light for eye to follow. Patient needs to co-operate in the same.
- Stereotactic mask preparation in RS- either custom made or commercial vendor specified with strict immobilization.
- Radiation planning scans with minimum slice thickness (1 - 2 mm).
- Supporting MRI and ophthalmology evaluation reports.
- Contouring or target delineation usually would be the entire posterior chamber, spare lens and anterior chamber as far as possible. High risk consent for radiation related complications.
- Treatment delivery with Image guided radiotherapy (IGRT) and modulated radiation planning (IMRT or VMAT by arc).
- Avoid opposite eye completely and follow standard international guideline in dose evaluation.

Haider., *et al,* treated a patient of Choroidal metastases to a dose of 25 Gy in 5 fractions by stereotactic radiotherapy and follow up MRI at 4 months post treatment showed significant reduction in size of the lesion with improvement in vision [1]. Wiegel., *et al.* treated 56 patients external beam irradiation to a dose of 40 Gy in 20 fractions for symptomatic and asymptomatic choroidal metastases and 90% of their patients showed an increase or stabilization of visual acuity [5-9]. Maor., *et al*. published a case series of 42 patients treated to a dose of 30 Gy in 10 fractions or 25 Gy in 5 fractions used a treatment portal of 4 x 4 cm with posterior tilt of 5 degrees for unilateral Choroidal metastases or parallel-opposed for bilateral Choroidal metastases, noted a median survival of 10 months and no difference in visual control between the dose regimens followed [6].

Complications of RS

Radiation related complications include cataract (7%), radiation retinopathy (3%), exposure keratopathy (3%), optic neuropathy (2%), and neovascularization of iris (2%) [4]. Radiation induced optic neuropathy (RION) is the most dreaded side effect of RS. The literature regarding the same is given in the following table (Table 1).

RS fractions	Dmax for 1% risk of RION	2% risk of RION	5% risk of RION
1	12.7	14.6	17.5
2	17.5	20.2	24.2
3	20.9	24.2	29.1
5	26.1	30.3	36.6

Table 1: *Optic pathway dose max (Dmax) in Gy and risk of RION [10].*

The usual dose constraints for optic nerve in RS (single or fractionated) would be to avoid more than prescription dose. This would entail some underdosing in the target and that discrimination should be discussed in detail.

Conclusion

RS in rare scenario like CM is an exciting field. Further clinical studies using radiosurgery in ocular disease are necessary to optimize the effective doses and to analyze the factors influencing the length of survival and careful evaluation of the side effects.

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