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Editorial Open Access

Linear Accelerator Based Stereotactic Ablative Radiation of Orbital Malignancies

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Editorial

Orbit has a complex anatomy with multiple structures embedded in it. Primary malignant tumors of the orbit are rare. Orbital neoplasms are usually multifaceted and require an interdisciplinary approach. They occur in adults over the age of 60 years. But benign orbital conditions can occur at young age [1]. After confirming the diagnosis of orbital tumors; various treatment methods performed are either surgery, chemotherapy, hormone therapy or radiation therapy (external beam, plaque brachytherapy, proton beam therapy). Treating the tumors located in the orbital apex region with radiation therapy is always challenging with dose limits to the optic nerve, optic chiasm and retina. Each treatment modality can have different tumor responses depending on the size, type and location of the tumor. Advanced radiation treatment techniques have achieved high tumor control rate of approximately 90% with globe preservation [1,2]. Stereotactic body radiotherapy (SBRT) or stereotactic radiosurgery (SRS) is an advanced radiation delivery method in the treatment of orbital and periorbital tumors. SBRT using either Gamma knife (frame based SRS), Cyber Knife (CK; frameless fractionated image-guided radiosurgery) or linear accelerator (e.g. True Beam) delivers high dose radiation precisely to the local orbital tumors thereby avoiding damage to the neighboring structures [3]. The orbital tumors that can treated by SBRT are orbital lymphoma, orbital apex tumors (optic nerve sheath meningioma, neurofibroma, schwannoma, optic nerve glioma), cavernous hemangioma, orbital melanoma, orbital metastasis, basal cell carcinoma, orbital pseudotumor, and few benign orbital conditions such as Graves' disease and chronic orbital inflammation [4-10]. Indications for using the SBRT are non-resectable or surgically complicated tumors, recurrent or previously irradiated tumors [3,4]. This procedure spares the patient of extensive orbital surgeries like orbitotomy and exenteration.

Published reports on orbital SBRT up to date were mostly using Gamma knife and CyberKnife. Recently, True beam linear accelerator (True Beam™ Radiotherapy System, Varian Medical systems, Inc.) with capabilities of delivering advanced treatments like SBRT is being adopted into practice at many community centers. Additionally, treatment times are shorter on True Beam system due to the high dose rate. Comparison of clinical outcomes, dosimetry data and the treatment times with True beam and CK are going on but there is no mature data with long-term follow up. Klingenstein et al. [4] published the outcomes data on 16 patients treated with CK-SRS for orbital metastases to doses of 16.5-25 Gy (median 18 Gy) with stable disease in 87% of cases. No serious adverse events observed in their series. Fractionated stereotactic radiation therapy (SFRT) to doses of 4.5-5.5 Gy in 4 sessions was found effective using GK-SRS [11] system on 23 patients with orbital apex tumors with the tumor shrinkage in 17 patients (74%) and improved visual function in 16 patients (70%). Clinical and radiographic responses were better in patients with cavernous hemangiomas. Five patients with cavernous venous heamangiomas [12] were treated with SFRT to doses of 4000 cGy in 20 fractions (in 3 patients, 4563 cGy in 28 fractions in one patient and other with 4959 cGy in 29 fractions) and the overall tumor shrinkage was 60% without any treatment related side effects at a median follow up of 23 months. No later side effects were noted in 5 patients with optic nerve sheet meningioma [13] treated with 5040 cGy in 28 fractions using multiple non-coplanar arcs with micro multi leaf-collimator and none of the patients had any evidence of disease progression.

Patients are followed up by the visual acuity, colour vision, visual fields and CT/MRI images of the orbit. SBRT is usually well tolerated by most of the patients. It helps in rapid tumor regression with good to excellent remission. It relieves the local orbital pain, preserves/improves the visual acuity and has low morbidity. It has fewer acute and chronic complications (dry eyes, cataract) unlike the other methods such as external beam radiation therapy, plaque brachytherapy or proton beam therapy (keratitis, neovascular glaucoma, radiation optic neuropathy, retinopathy, maculopathy, vitreous hemorrhage or chorioretinal atrophy) [4-10].

SBRT is a safe and efficacious method to treat orbital tumors. This advanced technique using CK, GK or True Beam system gives excellent success especially in tumors involving the optic apparatus with little toxicity and less morbidity.

References

1. Héran F, Bergès O, Blustajn J, Boucenna M, Charbonneau F, et al. (2014) Tumor pathology of the orbit. Diagn Interv Imaging 95: 933-944.
2. Kuhnt T, Müller AC, Werschnik C, Janich M, Gerlach R, et al. (2004) Radiotherapy of eye and orbit tumors. Klin Monbl Augenheilkd 221: 1033-1045.
3. Hirschbein MJ, Collins S, Jean WC, Chang SD, Adler JR Jr (2008) Treatment of intraorbital lesions using the Accuray CyberKnife system. Orbit 27: 97-105.
4. Klingenstein A, Kufeld M, Wowra B, Muacevic A, Fürweger C, et al. (2012) CyberKnife radiosurgery for the treatment of orbital metastases. Technol Cancer Res Treat 11: 433-439.
5. Pacelli R, Cella L, Conson M, Tranfa F, Strianese D, et al. (2011) Fractionated stereotactic radiation therapy for orbital optic nerve sheath meningioma-a single institution experience and a short review of the literature. J Radiat Res 52: 82-87.

6. Bianciotto C, Shields CL, Lally SE, Freire J, Shields JA (2010) CyberKnife radiosurgery for the treatment of intraocular and periocular lymphoma. Arch Ophthalmol 128: 1561-1567.
7. Chino K, Tanyi JA, Stea B (2009) Stereotactic radiotherapy for unilateral orbital lymphoma and orbital pseudo-tumors: a planning study. Med Dosim 34: 57-62.
8. Uslu N, Karakaya E, Dizman A, Yegen D, Guney Y (2013) Optic nerve glioma treatment with fractionated stereotactic radiotherapy. J Neurosurg Pediatr 11: 596-599.
9. Andrews DW, Faroozan R, Yang BP, Hudes RS, Werner-Wasik M, et al. (2002) Fractionated stereotactic radiotherapy for the treatment of optic nerve sheath meningiomas: preliminary observations of 33 optic nerves in 30 patients with historical comparison to observation with or without prior surgery. Neurosurgery 51: 890-902.
10. Khan AA, Niranjan A, Kano H, Kondziolka D, Flickinger JC, et al. (2009) Stereotactic radiosurgery for cavernous sinus or orbital hemangiomas. Neurosurgery 65: 914-918.
11. Kim BS, Im YS, Woo KI, Kim YD, Lee JI (2015) Multisession Gamma Knife Radiosurgery for Orbital Apex Tumors. World Neurosurg 84: 1005-1013.
12. Rootman DB, Rootman J, Gregory S, Feldman KA, Ma R (2012) Stereotactic fractionated radiotherapy for cavernous venous malformations (hemangioma) of the orbit. Ophthal Plast Reconstr Surg 28: 96-102.
13. Pacelli R, Cella L, Conson M, Tranfa F, Strianese D, et al. (2011) Fractionated stereotactic radiation therapy for orbital optic nerve sheath meningioma - a single institution experience and a short review of the literature. J Radiat Res 52: 82-87.