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FRACTIONATED STEREOTACTIC RADIOTHERAPY FOR CAVERNOUS VENOUS MALFORMATIONS OF THE ORBITAL APEX

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PURPOSE

Cavernous venous malformation (CVM) is the most common vascular lesion of the orbit in adults. The management of CVM of the orbital apex can be complex due to the lesion sharing a tight space with critical nervous and vascular structures. Surgical approaches carry a significant risk of diplopia, ptosis, and profound vision loss. However, an attractive alternative is using fractionated stereotactic radiotherapy (FSRT).

The objective of the study is to assess the efficacy and toxicity of FSRT in treating CVM of the orbital apex.

MATERIALS AND METHODS

Study Group

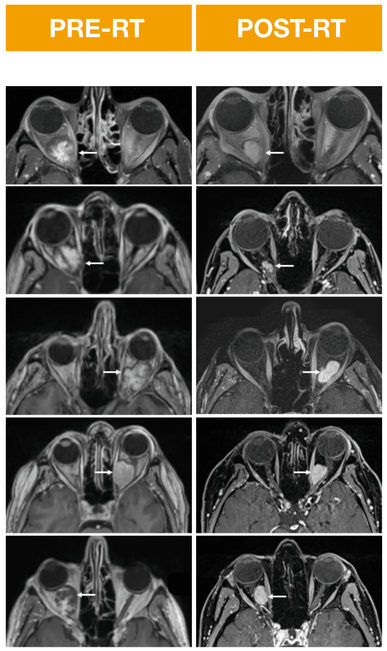
The institutional database was reviewed and patients were included who received FSRT for CVM at Alfred Health Radiation Oncology between January 2010 and December 2016. Patients with under 18 months of follow up were excluded. Alfred Health Human Research Ethics provided approval for the study.

Treatment Protocol

All patients underwent co-registration of a gadolinium-enhanced MRI with the planning computed tomography (CT) scan images for delineation of the gross tumour volume (GTV). A 1 mm planning target volume (PTV) expansion was placed on the GTV. No clinical target volume (CTV) expansion was used. The radiation dose was prescribed to the 85 %, 90 % or 95 % isodose line. All patients were planned using iPlan™ software and treated using a Novalis™ 6MV linac with ExacTrac™ image guidance (BrainLAB-AG, Heimstetten, Germany).

Follow Up

Patients were followed up after completion of FSRT for at least 12 monthly by a radiation oncologist and an ophthalmologist who completed visual function testing. MRI imaging with gadolinium contrast was completed on all patients at pre-treatment and within 6-24 months post-treatment. Tumour volume was calculated using the ABC/2 method.



RESULTS

6 patients were treated with FSRT for a CVM involving the orbital apex during the study period (Table 1).

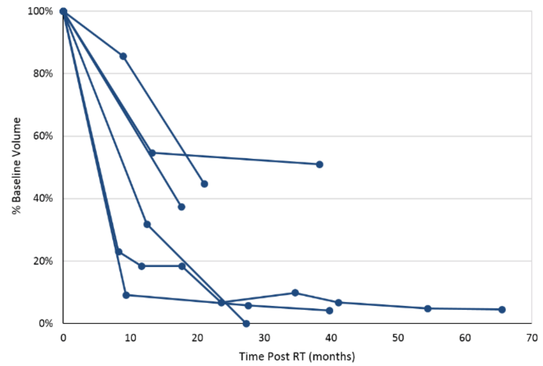
All patients had a volume reduction over time post radiotherapy. The average volume reduction at the first surveillance scan post the 12-month time point was 64 % (14 % to 77 %). No lesions progressed.

All patients with proptosis or a deficit in visual acuity, fields, pupil function or eye movement as a result of the tumour had an improvement in their clinical signs post radiotherapy (Table 2). There were no reported complications of the treatment.

Clinical Outcomes

CASE NUMBER	PRE/POST FSRT	VISUAL ACUITY	PUPILS	VISUAL FIELDS	EYE MOVEMENTS	PROPTOSIS	PAIN
1	Pre	6/5	RAPD*	Abnormal	Abnormal	Mild	Mild
	Post	6/5	Normal	Improved	Normal	Resolved	Resolved
2	Pre	6/5	Normal	Normal	Normal	Mild	Mild
	Post	6/5	Normal	Normal	Normal	Resolved	Resolved
3	Pre	6/5	Normal	Normal	Abnormal	Yes	None
	Post	6/5	Normal	Normal	Normal	Reduced	None
4	Pre	6/9	Normal	Abnormal	Normal	5 mm	None
	Post	NK†	Normal	NK	Normal	Reduced	None
5	Pre	6/12	Normal	Normal	Abnormal	4 mm	None
	Post	6/9	Normal	Normal	Normal	Reduced	None
6	Pre	6/12	Normal	Normal	Abnormal	4.5 mm	None
	Post	6/5	Normal	Normal	Normal	Resolved	None

Tumor Volume Post Radiotherapy



CASE	AGE(Y), SEX	BASELINE VOLUME (CM3)	DOSE(GY)/FRAC
1	37, M	4.25	45/25
2	32, F	3.43	50.4/28
3	63, M	6.12	50.4/28
4	76, M	3.21	50/25
5	41, F	4.39	50/25
6	39, F	0.068	50/25

CONCLUSIONS

We found that FSRT is a safe and effective treatment for CVM of the orbital apex with an average 64 % volume reduction at 12 months and improvement in visual function, proptosis and pain. There were no complications from the treatment in our limited cohort. FSRT is a safe and effective treatment modality to consider in CVM of the orbital apex.