Iodine I 125 Plaque Radiotherapy for Vasoproliferative Tumors of the Retina in 30 Eyes

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Objective: To report the efficacy of iodine I 125 plaque radiotherapy for the treatment of vasoproliferative tumors (VPTs) of the ocular fundus.

Methods: The clinical features and outcomes of patients with VPTs who underwent iodine I 125 plaque radiotherapy were evaluated. Univariate and multivariate logistic regression analyses were performed to assess the effect of preoperative findings on visual acuity and complications. Kaplan-Meier survival estimates for the probability of adverse outcomes were performed.

Results: Of the 30 eyes treated, 17 (57%) had primary and 13 (43%) had secondary VPTs. The median tumor base was 8.6 mm (range, 3.5-18.0 mm) and median tumor thickness was 3.7 mm (range, 2.5-6.3 mm). Exudative retinal detachment was present in 23 eyes (77%). Tumor regression was observed in 29 of 30 eyes (97%) and retinal detachment completely resolved in 15 of 23 eyes (65%). Visual acuity improved or remained stable in 22 eyes (73%). The only factor predictive of visual improvement was the classification of primary VPT (relative risk, 19; 95% confidence interval, 2-185; $P=.01$). Kaplan-Meier estimates of radiation complications at 5 years predicted cataract in (48%), transient vitreous hemorrhage in (16%), and neovascular glaucoma in (8%) of eyes. No patient developed radiation maculopathy or papillopathy.

Conclusions: Iodine I 125 plaque radiotherapy is an effective method of treating larger (>2.5-mm thickness) VPTs with extensive exudative retinal detachment.

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VASOPROLIFERATIVE TUMOR (VPT) of the ocular fundus is a benign, vascular retinal lesion that has recently been recognized as a distinct clinical entity. The first 12 cases of VPT described by Shields and colleagues[1] were termed *presumed acquired retinal hemangioma*. The authors described a nonfamilial, peripheral, red-yellow retinal vascular tumor with confluent retinal exudation extending toward the macular region. Subsequently, Shields et al[2] coined the term *vasoproliferative tumor of the ocular fundus* and described the clinical manifestations in 103 patients. The authors classified VPTs as primary (preceding ocular disease absent) or secondary (preceding ocular disease present). Despite its benign histopathologic features[3-5] and peripheral location, visual loss can occur owing to associated vitreoretinal findings, including cystoid macular edema, macular exudation, subretinal fluid, preretinal fibrosis, and vitreous hemorrhage.[1,2] Total exudative retinal detachment with secondary glaucoma can lead to eventual enucleation.[6]

Several treatments have been used for VPTs, including photocoagulation,[2] cryotherapy,[2,7] photodynamic therapy,[8,9] transcleral local resection,[3] and plaque brachytherapy.[2,4,6] The choice of treatment is based on tumor size, location, and associated vitreoretinal findings.[10,11] Plaque radiotherapy has been used successfully in the treatment of other vascular lesions, such as retinal capillary hemangioma[12] and choroidal hemangioma.[13,14] Anastassiou and colleagues[6] reported tumor regression in all 35 VPTs treated with ruthenium 106 plaque radiotherapy; however, 2 eyes (6%) were enucleated. Kaplan-Meier analysis of complications was not performed. In this study, we evaluated the efficacy of iodine I 125 plaque radiotherapy for the treatment of VPTs in 30 eyes of 29 patients and used Kaplan-Meier survival analysis to predict the incidence of complications after 2, 5, and 10 years. Multivariate analysis was performed to evaluate the effect of clinical findings on visual acuity.

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METHODS

The clinical records of all patients with VPTs referred to the Ocular Oncology Service at Wills Eye Institute between November 1978 and January 2007 were reviewed. Eyes treated with iodine I 125 plaque radiotherapy were selected for further analysis. Clinical data re-

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Table 1. Ocular Findings of Patients With Primary vs Secondary Tumors

Features	No. (%) Primary (n=17)	Secondary (n=13)	Total (N=30)
Ocular history			
Retinal surgery	0 (0)	3 (23)	3 (10)
Pars planitis	0 (0)	2 (15)	2 (7)
Retinitis pigmentosa	0 (0)	2 (15)	2 (7)
Toxoplasmosis	0 (0)	1 (8)	1 (3)
Retinoschisis	0 (0)	2 (15)	2 (7)
Aniridia	0 (0)	1 (8)	1 (7)
Ocular trauma	0 (0)	2 (15)	2 (7)
CHRPE	0 (0)	1 (8)	1 (3)
Retinopathy of prematurity	0 (0)	2 (15)	2 (7)
Prior treatment of VPT	4 (23)	2 (15)	6 (20)
Cryotherapy	1 (6)	1 (8)	2 (7)
Cryotherapy laser	1 (6)	0 (0)	1 (3)
Intravitreal Avastin[a]	0 (0)	1 (8)	1 (3)
Vitrectomy and membranectomy	2 (12)	0 (0)	2 (7)
Visual acuity at time of plaque treatment			
20/20-20/40	5 (29)	0 (0)	5 (17)
20/50-20/200	7 (41)	9 (70)	16 (53)
≤20/400	5 (29)	4 (30)	9 (30)

Abbreviations: CHRPE, congenital hypertrophy of the retinal pigment epithelium; VPT, vasoproliferative tumor.
[a] Genentech Inc, South San Francisco, California.

garding patient demographics, tumor features, radiation treatment parameters, responses to radiation treatment, and complications were gathered retrospectively. This study was approved by the Wills Eye Institute review board.

Clinical information gathered from patients' medical records included age, race (African American, white, or Hispanic), sex (male or female), and medical history of hypercholesterolemia. The ocular data included best-corrected Snellen visual acuity, intraocular pressure, preoperative neovascular glaucoma (absent, present), status of lens (absent, present, pseudophakic), and anterior chamber cells (absent, present). The tumor data included the classification of the tumor (primary, secondary), number of tumors (multiple, solitary), laterality (bilateral, unilateral), retinal conditions associated with secondary VPT, and previous treatments. The tumor data included the meridian location of the tumor epicenter (superior, superotemporal, temporal, inferotemporal, inferior, inferonasal, nasal, superonasal); the anteroposterior location (ora to the equator, equator to macula, within the macula [≤3 mm from foveola]); largest tumor thickness measured on A-scan and B-scan ultrasonography (in millimeters); largest basal tumor diameter measured on B-scan ultrasonography (in millimeters); and presence of surrounding retinal exudation, premacular fibrosis, macular exudation, subfoveal fluid, cystoid macular edema, exudative retinal detachment, and retinal hemorrhages. The approximate percentage of retina involved with exudative retinal detachment (25%, 50%, 75%, 100%) was recorded. Iodine I 125 plaque radiotherapy was performed using a standard technique.[15] The selection criteria for iodine I 125 plaque radiotherapy included larger tumor size at diagnosis (thickness >2.5 mm), presence of extensive subretinal fluid with a threat to visual acuity, and tumors for which previous cryotherapy or laser photocoagulation was not effective. Plaque sizes were selected using the standard Collaborative Ocular Melanoma Study guidelines with a 2-mm safety margin around the tumor. Intraoperative localization was performed using indirect ophthalmoscopy with scleral indentation.

The radiation data included plaque size, hours of radiation exposure, radiation dose (centigray) to the tumor apex, tumor base, optic disc, foveola, and lens, and radiation rate (centigrays per hour) to the tumor apex, tumor base, optic disc, foveola, and lens. Follow-up examinations were made at 3- to 6-month intervals for up to 5 years and at 6- to 12-month intervals thereafter. Follow-up data included the date and type of radiation complication, including retinopathy (proliferative and nonproliferative), maculopathy, papillopathy, cataract, neovascular glaucoma, vitreous hemorrhage, and scleral necrosis. The date of treatment, date last seen, and date of resolution of macular exudation, exudative retinal detachment, and cystoid macular edema were recorded.

STATISTICAL ANALYSIS

Data analysis was performed using SPSS 13.0 (SPSS Inc, Chicago, Illinois). The main outcome measures were tumor regression, resolution of exudative retinal detachment, retention of visual acuity, and absence of neovascular glaucoma. Regarding the visual acuity and neovascular glaucoma, the effect of individual preoperative clinical variables was analyzed using univariate logistic regression. The variables that were significant on a univariate level ($P < .05$) were entered into a multivariate logistic regression analysis. A final multivariate model fitted variables that were identified as significant predictors ($P < .05$; 95% confidence interval). The *Student t test* was used to analyze the change in the tumor thickness after treatment. Kaplan-Meier survival estimates of the probability of visual acuity loss of 2 or more Snellen lines and probability of cataract, vitreous hemorrhage, and neovascular glaucoma were performed as a function of time from plaque radiotherapy.

RESULTS

For a period of 28 years there were 215 VPTs in 203 eyes of 200 patients managed at the Ocular Oncology Service at Wills Eye Institute. Of these, 30 eyes (14%) of 29 patients were treated with iodine I 125 plaque radiotherapy. The median age of the patients was 35 years (range, 14-67 years). Systemic evaluation and germline mutation analysis excluded the diagnosis of von Hippel-Lindau disease in 22 patients. Seventeen of 30 eyes (57%) were classified as having primary VPTs and 13 (43%) as having secondary VPTs. **Table 1** illustrates the ocular findings and previous treatments of primary and secondary VPTs. Preoperative tumor characteristics are presented in **Table 2**. Preoperative neovascular glaucoma was present in 2 eyes (7%). After plaque radiotherapy, glaucoma control deteriorated in both eyes and 1 eye underwent enucleation. Preoperative macular pathology (including macular edema, subfoveal exudative detachment, or epiretinal membrane) was present in 12 of 13 eyes (92%) with secondary VPTs and 10 of 17 eyes (59%) with primary VPTs. Eyes with secondary VPTs also had a higher incidence of preoperative cataract, vitreous cells, and macular exudates (Table 2).

Iodine I 125 plaque radiotherapy was the first line of treatment in 24 eyes (80%) and the second line of intervention in 6 eyes (20%) (Table 2). The median apex dose

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Table 2. Preoperative Tumor Characteristics

Features Present at Initial Visit	No. (%) Primary (n=17)	Secondary (n=13)	Total (N=30)
No. of tumors	17	13	30
Solitary	16 (94)	10 (77)	26 (87)
Multiple	1 (6)	3 (23)	4 (13)
Bilateral	0	2 (15)	2 (6)
Anteroposterior tumor location			
Macular to the equator	4 (23)	3 (23)	7 (23)
Equator to ora serrata	13 (77)	10 (77)	23 (77)
Tumor meridian			
Superior	3 (17)	1 (8)	4 (13)
Superotemporal	1 (6)	0	1 (3)
Temporal	2 (12)	0	2 (7)
Inferotemporal	8 (47)	8 (62)	16 (53)
Inferior	1 (6)	2 (15)	3 (10)
Inferonasal	1 (6)	2 (15)	3 (10)
Nasal	1 (6)	0	1 (3)
Tumor appearance			
Surrounding exudates	15 (88)	10 (77)	25 (83)
Surrounding hemorrhage	6 (35)	3 (23)	9 (30)
Tumor base, mm			
Median	7.7	9.9	8.6
Mean	8.0	9.9	8.6
Range	3.5-12	6-18	3.5-18.0
Tumor thickness, mm			
Median	3.5	3.8	3.7
Mean	3.8	3.8	3.7
Range	2.5-6.2	2.5-6.3	2.5-6.3
Intraocular pressure, mm Hg			
Median	15	14	15
Mean	16	15	16
Range	11-36	12-28	11-36
Neovascular glaucoma	1 (6)	1 (8)	2 (7)
Anterior chamber inflammatory cells	1 (6)	3 (23)	4 (13)
Pseudophakia	1 (6)	1 (5)	2 (7)
Cataract	1 (6)	6 (46)	7 (23)
Vitreous cells	5 (29)	11 (85)	16 (53)
Subretinal fluid			
Present	12 (71)	11 (85)	23 (77)
>50% of retina detached	6 (50)	6 (46)	12 (40)
>75% of retina detached	3 (18)	3 (23)	6 (20)
Macular pathology			
Present	10 (59)	12 (92)	22 (73)
Cystoid macular edema	3 (18)	5 (38)	8 (26)
Foveal detachment	6 (35)	6 (46)	12 (40)
Epiretinal membrane	1 (6)	1 (8)	2 (7)
Macular exudates	4 (23)	7 (54)	11 (37)

was 40 Gy (range, 20-90 Gy) and the median base dose was 110 Gy (range, 42-256 Gy) (to convert grays to rads, multiply by 100). The median follow-up interval was 40 months (mean, 44 months; range, 6-120 months). There was no loss to follow-up. Tumor regression was observed in 29 eyes (97%). Postoperatively, the median tumor thickness decreased from 3.7 mm (mean, 3.8 mm; range, 2.5-6.3 mm) to 2.9 mm (mean, 3 mm; range, 1.4-4.1 mm; $P<.05$). Exudative retinal detachment was present in 23 eyes (77%). Following plaque radiotherapy, of 23 eyes the exudative detachment completely resolved in 15 (65%), reduced in 6 (26%), and persisted in 2 (9%). The median time for complete resolution of exudative retinal detachment was 8 months (mean, 10 months; range, 3-30 months). **Table 3** illustrates the change in macular pathology following plaque brachytherapy. Macular edema related to the presence of VPT was present in 3 of 30 eyes (10%) and complete resolution of edema was found in all 3 cases within 6 months following plaque brachytherapy. The median time for resolution of macular exudation was 15 months (mean, 15 months; range, 10-21 months).

Table 3. Visual Acuity and Macular Outcomes

Outcome	No. (%) Primary (n=17)	Secondary (n=13)	Total (N=30)
Visual acuity			
Improvement by 2 or more Snellen lines	3 (18)	0	3 (10)
No change or <2 Snellen lines' change	13 (76)	6 (46)	19 (63)
Reduction by ≥2 Snellen lines	1 (6)	7 (54)	8 (27)
New onset of epiretinal membrane	9 (53)	2 (16)	9 (30)
Resolution of subretinal fluid	8/11 (67)	7/12 (64)	15/23 (65)
Resolution of subretinal fluid by >50%	10/11 (92)	10/12 (83)	21/23 (91)
Resolution of subfoveal fluid	4/6 (67)	5/6 (83)	9/12 (75)
Resolution of cystoid macular edema	3/3 (100)	0/5 (0)	3/8 (38)
Resolution of macular exudation	4/4 (100)	5/7 (71)	9/11 (82)

The visual acuity outcomes are summarized in Table 3. At the last follow-up, 11 of 30 eyes (37%) had Snellen visual acuity of 20/40 or better, 5 eyes (17%) had Snellen visual acuity between 20/50 and 20/200, and 12 eyes (40%) had Snellen visual acuity of 20/400 or worse. Two eyes (7%) were enucleated for neovascular glaucoma. Resolution of subfoveal exudative detachment was associated with 2 or more lines of visual acuity improvement in 3 eyes (10%) (**Figure 1**). Univariate analysis revealed the only factor predictive of improvement in visual acuity by 2 or more lines was the tumor classification of primary VPT (relative risk, 19; 95% confidence interval, 2-185; $P=.01$). Preoperative macular pathology, cataract size, and tumor size were not predictive of poor visual acuity. Using Kaplan-Meier analysis, the probability of losing 2 or more Snellen visual acuity lines was 26% at 2 and 5 years and 40% at 10 years (**Table 4**).

No patients suffered from radiation retinopathy, maculopathy, papillopathy, or scleral necrosis. Kaplan-Meier estimates for cataract development, vitreous hemorrhage, and neovascular glaucoma are presented in Table 4 and **Figures 2**, **3**, and **4**. Radiation cataract was found in 6 of 13 eyes (35%) with primary VPTs and 7 of 17 eyes (54%) with secondary VPTs. Postoperative transient vitreous hemorrhage occurred in 1 of 17 eyes (6%) with primary VPTs and 3 of 13 eyes (23%) with secondary VPTs. All hemorrhages spontaneously resolved. Postoperative neovascular glaucoma occurred in 2 eyes (7%), both with secondary VPTs and neither with neovascular glaucoma prior to treatment. The first tumor was 4.5 mm thick without an exudative detachment. Neovascular glaucoma developed 21 months after plaque radiotherapy. The second tumor had total exudative retinal detachment and

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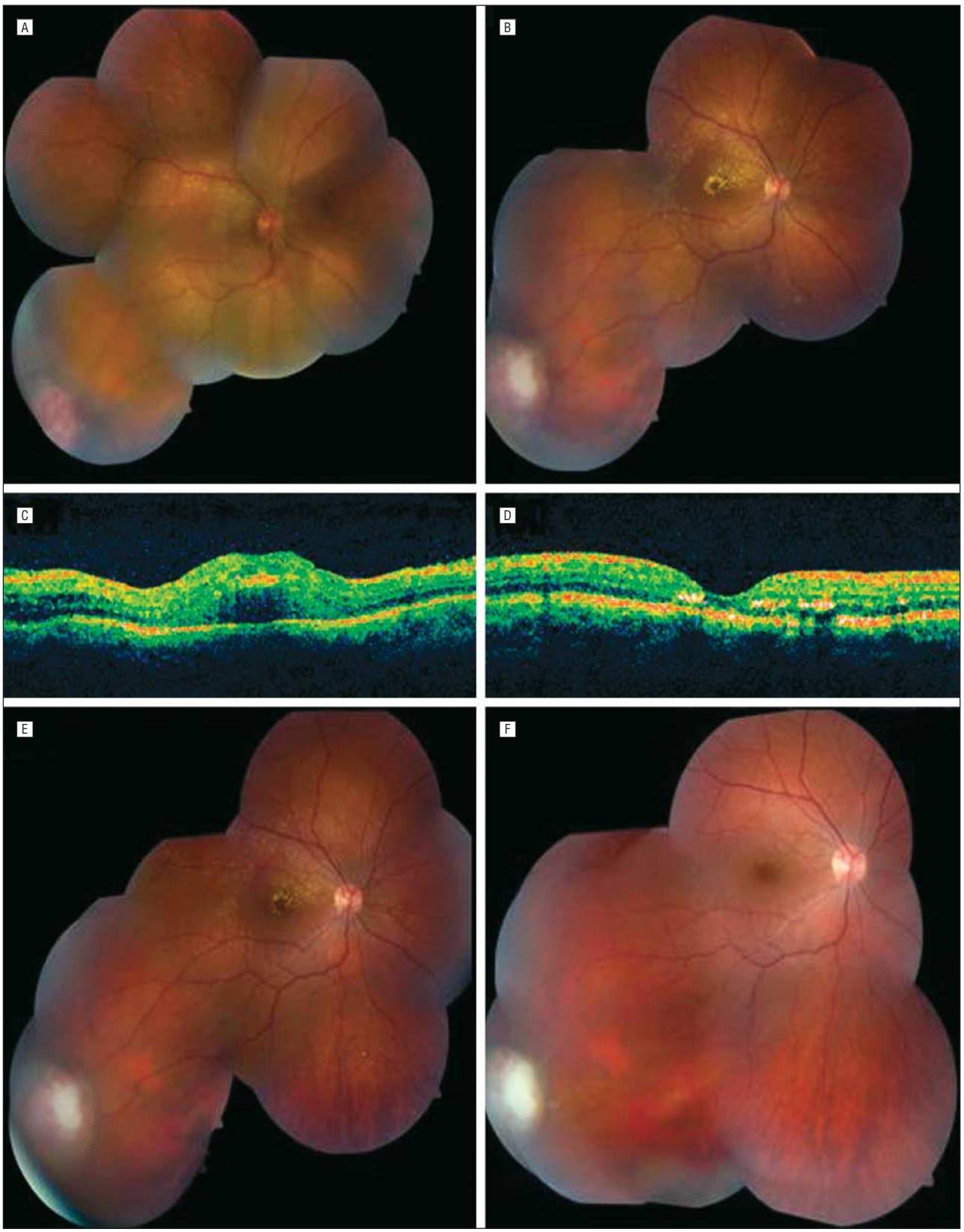

Figure 1. A 35-year-old woman with a primary vasoproliferative tumor on examination had a visual acuity of counting fingers. A, Fundus photography showing vasoproliferative tumor at the inferotemporal ora serrata with extensive exudative shallow retinal detachment. B, Four months after iodine I 125 plaque radiotherapy, fundus photography showing white avascular fibrotic vasoproliferative tumor and resolution of exudative retinal detachment, but with exudation in the fovea. C, Preoperative optical coherence tomography revealing subfoveal exudative detachment. D, Postoperative optical coherence tomography revealing complete resolution of subfoveal exudative detachment. Her visual acuity improved to 20/50. E, Six months after iodine I 125 plaque radiotherapy, fundus photography disclosing stellate exudation in the macula and retinal fibrosis at the site of the previous vasoproliferative tumor. F, One year after iodine I 125 plaque radiotherapy, fundus photography showing healthy macula and fibrotic tumor. Her visual acuity increased to 20/20.

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Table 4. Summary of Complications Using Kaplan-Meier Estimates

Outcomes	Patients at Follow-up, %		
	2 y	5 y	10 y
Visual acuity reduction by 2 Snellen lines or more	26	26	40
Complications			
Cataract	36	48	65
Neovascular glaucoma	8	8	8
Vitreous hemorrhage	11	16	16

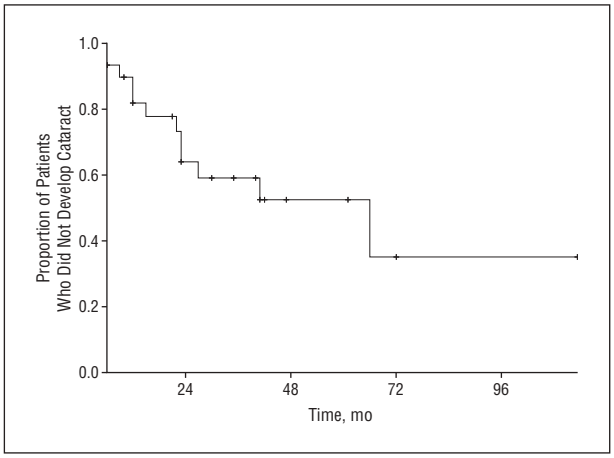

Figure 2. Kaplan-Meier estimates of cataract formation following iodine I 125 plaque radiotherapy.

did not respond to plaque radiotherapy. Neovascular glaucoma developed at 4 months, necessitating enucleation. Multivariate analysis revealed the factors predictive of postoperative neovascular glaucoma were the presence of anterior chamber inflammatory cells and exudative retinal detachment involving more than 75% of the retina (**Table 5**).

COMMENT

The clinical criteria for the diagnosis of VPT are well established.[1,2] One particularly useful clinical sign is the absence of a dilated feeder arteriole and draining vein. Systemic screening and mutation analysis for von Hippel-Lindau disease is only useful when the diagnosis is in doubt. However, the indications for treatment of VPTs and the optimum treatment modality are not well established. Many patients maintain stable vision without treatment.[2] Observation is recommended for a small peripheral VPT with minimal exudation posing no threat to vision.[16] Direct photocoagulation may be difficult owing to the far peripheral location of the tumor.[7] Triple-freeze thaw cryotherapy can induce dramatic tumor regression and restore vision,[1,7] but heavy cryotherapy for larger tumors can result in paradoxical massive subretinal exudation, fluid, and hemorrhage.[6] This study demonstrates that iodine I 125 plaque radiotherapy is effective in the treatment of larger VPTs (>2.5 mm thick).

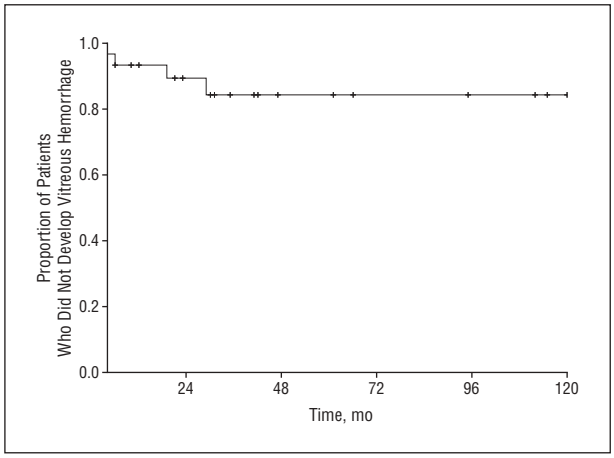

Figure 3. Kaplan-Meier estimates of development of vitreous hemorrhage following iodine I 125 plaque radiotherapy.

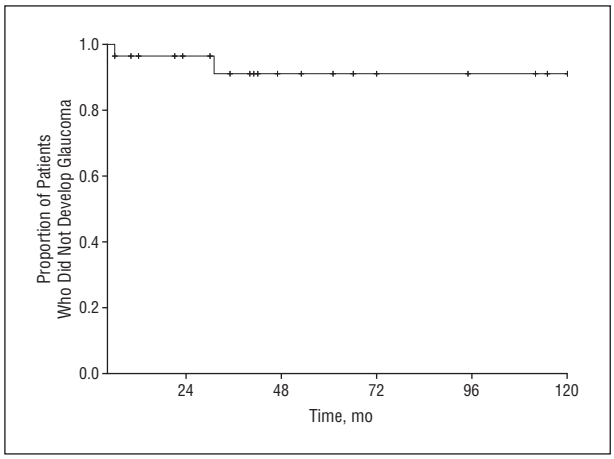

Figure 4. Kaplan-Meier survival estimates of development of neovascular glaucoma following iodine I 125 plaque radiotherapy.

Table 5. Univariate and Multivariate Analyses of Clinical Factors Predictive of Postoperative Neovascular Glaucoma

Clinical Factor	RR (95% CI)	*P* Value
Univariate analysis		
Tumor thickness >5 mm	12 (1.1-135)	.04
Subretinal fluid >75%[b]	36 (2.5-527)	.009
Anterior chamber cells	75 (3.7-1536)	.005
Multivariate analysis		
Subretinal fluid >75%[b]	Semiperfect predictor[a]	
Anterior chamber inflammatory cells	Semiperfect predictor[a]	

Abbreviations: CI, confidence interval; RR, relative risk.
[a] A semiperfect predictor was a clinical finding that was always associated with the complication of neovascular glaucoma.
[b] Exudative retinal detachment involving more than 75% of the retina.

In a comprehensive review of 129 VPTs, Shields and colleagues[2] found that tumor management consisted of observation in 49%, cryotherapy in 42%, laser photocoagulation in 5%, and iodine plaque radiotherapy in 2% of tumors. In the current study, only 30 of 215 VPTs (14%) were treated with iodine I 125 plaque radiotherapy. In contrast, in a study of 22 VPTs, Heimann and col-

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leagues[4] reported observation in 14% of tumors, cryotherapy in 9%, enucleation in 4%, and ruthenium 106 plaque radiotherapy in 73%. The higher use of plaque radiotherapy by these authors may be related to their selection criteria or preference for treatment. A further publication from the same center revealed that ruthenium 106 plaque radiotherapy was selected for smaller tumors with a mean thickness of 2.8 mm (range, 1.4-4.8 mm)[6] and an exudative detachment involving more than half of the retina was only present in 6%.[6] They reported tumor regression in all eyes and resolution of exudative detachment in 91% of eyes.[6] In this current analysis, iodine I 125 plaque radiotherapy was used for larger VPTs with a mean tumor thickness of 3.8 mm (range, 2.5-6.3 mm). An exudative detachment involving more than half of the retina was present in 40% of eyes. Despite the more advanced features in this current series, tumor regression was achieved in 97% of eyes and a significant reduction in exudative detachment was seen in 91% of eyes. Ruthenium 106 emits β particles that have reduced tissue penetration when compared with the γ radiation of ^{125}I. Therefore, ^{125}I allows for the treatment of thicker tumors.[17]

The primary goal of treatment of VPTs is to preserve the globe and vision. In a review of 35 eyes with VPTs treated with ruthenium 106 plaque radiotherapy, Anastassiou and colleagues[6] reported that postoperative visual acuity stabilized or improved in 57% of eyes.[6] In the current study, visual acuity stabilized or improved in 73% of eyes. The slightly better final visual acuity in our series could be due to the reduced dose prescribed to the tumor apex. Ruthenium 106 was prescribed with a larger mean radiation dose of 108 Gy to the apex and 416 Gy to the base.[6] In the current study, iodine I 125 was prescribed with a mean dose of 40 Gy to the apex and 110 Gy to the base of the tumor. Anastassiou and colleagues[6] found chronic maculopathy was a factor for loss of vision following ruthenium 106 plaque radiotherapy, but this was not a significant factor for loss of vision following iodine I 125 plaque radiotherapy.[6] In this cohort, multivariate analysis revealed loss of visual acuity was only associated with the classification of secondary VPT.

This study highlights the differences in visual outcomes between primary and secondary tumors. Patients with primary VPTs had a 19 times greater chance of visual improvement following plaque brachytherapy than those with secondary VPTs. There are several reasons that might explain this observation. Resolution of preoperative macular edema was found in all eyes with primary VPTs but in no eyes with secondary VPTs. The presence of coexisting retinal disease such as pars planitis or retinitis pigmentosa might have impeded the resolution of macular edema or could have even be the underlying cause of macular edema, especially in those with chronic edema. In addition, only patients with primary VPTs experienced an improvement in visual acuity following the resolution of exudative detachment. Eyes with secondary VPTs had more adverse outcomes following treatment with plaque brachytherapy. Postoperative neovascular glaucoma was only found in eyes with secondary VPTs. Vitreous hemorrhage and radiation cataract were more frequent findings in eyes with secondary VPTs. The only finding that was more common in eyes with primary VPTs was epiretinal membrane formation.

We feel that treatment of VPT with plaque radiotherapy using our parameters has an acceptably low complication rate. Based on clinical examination and fluorescein angiography, no eyes developed radiation retinopathy, papillopathy, or maculopathy. These complications were avoided owing to the peripheral tumor location and the low dose of radiation required for tumor regression. In our series, epiretinal membrane formation following iodine I 125 plaque brachytherapy was seen in 30% of eyes, whereas only 2% of eyes had an epiretinal membrane before treatment. A similar rate of epiretinal membrane formation was noted following ruthenium 106 plaque radiotherapy.[6] Epiretinal membrane formation is a well-known finding in eyes with VPTs.[18] Therefore the occurrence of an epiretinal membrane may be related to the natural course of the disease rather than brachytherapy. In our study postoperative cataract developed in 43% of eyes. Radiation cataract is a frequent complication of plaque brachytherapy for anterior intraocular tumors.[19,20] However, VPTs can induce cataract formation and cataracts can also develop in eyes with chronic retinal diseases. Eyes with preoperative neovascular glaucoma had a particularly poor outcome following iodine I 125 plaque radiotherapy. Anatassiou and colleagues[6] reported similar findings following ruthenium 106 plaque treatment of VPTs, and they cautioned against the use of plaque radiotherapy in patients with preoperative neovascular glaucoma. In our study, 2 eyes with no glaucoma on presentation eventually developed postoperative neovascular glaucoma. Multivariate analysis revealed that extensive subretinal fluid and the presence of anterior chamber cells were significant factors for the development of secondary glaucoma. More recently, we have successfully used anti–vascular endothelial growth factor therapy for eyes with neovascular glaucoma caused by intraocular tumors and believe that this approach might benefit similar eyes with a VPT.

In conclusion, iodine I 125 plaque radiotherapy is an effective treatment of larger (>2.5-mm thickness) VPTs. An apex dose of 40 Gy was successful in achieving tumor regression in 97% of eyes and resolution or reduction of exudative retinal detachment in 91% of eyes. Visual acuity improved or remained stable in 73% of eyes, with no evidence of radiation retinopathy, maculopathy, or papillopathy in any case. Eyes with primary VPTs had a better visual outcome than eyes with secondary VPTs.

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Correction

Error in Tables. In the Clinical Sciences article titled "A Randomized, Placebo-Controlled Clinical Trial of High-Dose Supplementation With Vitamins C and E, Beta Carotene, and Zinc for Age-Related Macular Degeneration and Vision Loss: AREDS Report No. 8" by the Age-Related Eye Disease Study Research Group, published in the October 2001 issue of the *Archives* (2001;119[10]:1417-1436), an error occurred in Table 9 on page 1430. Also, in the Clinical Sciences article titled "A Randomized, Placebo-Controlled Clinical Trial of High-Dose Supplementation With Vitamins C and E and Beta Carotene for Age-Related Cataract and Vision Loss" by the Age-Related Eye Disease Study Research Group, published in the October 2001 issue of the *Archives* (2001;119[10]:1439-1452), an error occurred in Table 7 on page 1449. In both, the third footnote should have read as follows: "‡Value is the ratio of vitamin E (in micrograms per deciliter) and total cholesterol levels (in milligrams per deciliter), which adjusts for potential differences in vitamin E."

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