Orbital Lymphoproliferative Tumors: Analysis of Clinical Features and Systemic Involvement in 160 Cases

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Objective: To evaluate the risk for systemic lymphoma (SL) in the patients with orbital lymphoproliferative tumor (OLT).

Design: Observational, retrospective case series.

Participants: One hundred sixty consecutive cases with OLT.

Methods: Clinical features and treatment method were collected retrospectively. Data from 106 patients without systemic disease at presentation were analyzed for their impact on the main outcome measure using univariate and multivariate regression models.

Main Outcome Measure: Occurrence of SL diagnosed based on the 6 monthly systemic evaluation.

Results: Of 106 patients with OLT alone, SL subsequently developed in 16% of patients and 84% patients remained free of SL. Of 17 patients in whom SL developed subsequently, 29% had marginal zone, B-cell lymphoma of the mucosa-associated lymphoid tissue (MALT), 24% had small lymphocytic lymphoma (SLL), 24% had atypical lymphoid hyperplasia (ALH), 6% each had mantle cell, follicular, and diffuse large B-cell lymphoma (DLCL). In these 17 patients, systemic disease appeared after a mean interval of 152 months, and the involved systemic sites were abdominal lymph nodes (LN) in 44% patients, pelvic LN in 40%, and head and neck LN in 31%. Of 17 patients, 53% had the same SL classification with orbital tumor and 47% had a different SL classification. Among 8 patients with different systemic and orbital lymphoma classifications, systemic SLL developed in 4 patients with orbital ALH and in 2 patients with MALT. Two patients with orbital SLL manifested systemic DLCL. Using Kaplan-Meier estimates of 106 OLT patients without systemic involvement, SL developed in 14% at 3 years, in 17% at 5 years, and in 33% at 10 years. Using Kaplan-Meier estimates of 24 patients with bilateral OLT alone, SL developed in 18% at 3 years, in 29% at 5 years, and in 72% at 10 years. In 82 patients with unilateral OLT alone, SL developed in 12% at 3, 5, and 10 years. Multivariate analysis showed that bilateral involvement at presentation was the only significant factor predictive of SL.

Conclusions: In patients with OLT alone at presentation, SL eventually developed in 33% by 10 years in this retrospective case series. Classification of SL can be the same or different from OLT. Development of SL is significantly associated with bilateral involvement.

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The lymphoproliferative lesions are the most common primary orbital tumor in older adults and occur in all age groups.[1,2] Orbital lymphoma is the most common orbital lymphoproliferative lesion, comprising 67% to 90% of all orbital lymphoproliferative tumors in the large series.[3–5] Orbital lymphoma generally is a low-grade malignancy, and marginal zone B-cell lymphoma of the mucosa-associated lymphoid tissue (MALT) is the major type of lymphoma, accounting for 40% to 70% of orbital lymphomas.[6–10]

Orbital lymphoproliferative lesions include a range of disease such as reactive lymphoid hyperplasia, atypical lymphoid hyperplasia, and lymphoma based on histopathologic and immunophenotypic features.[3,4,11] Reactive lymphoid hyperplasia is composed of diffuse, densely cellular polymorphous infiltrate of small, bland lymphocytes with the formation of reactive germinal center.[4,6,12] Atypical lymphoid hyperplasia is an indeterminate lesion with diffuse infiltrate of small lymphocytes with some degree of atypia without frank evidence of cytologic indications of malignancy.[4,6,12,13]

A few publications have been published addressing the histopathologic features and treatment of orbital lymphoma, but little is known about the relationship of orbital lymphoma to the development of systemic disease.[3–16] In a review of 108 cases with lymphoma of the ocular adnexa including eyelid, conjunctiva, and orbit, Knowles et al[4] reported that systemic lymphoma was associated with orbital lymphoma in 35% of cases, with conjunctival lymphoma in 20% of cases, and with eyelid lymphoma in 67% of cases. They found that the extent of ocular involvement

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at the time of presentation was the only significant prognostic factor for systemic lymphoma. However in that study, the data were not analyzed by using the current statistical analysis methods such as Kaplan-Meier survival analysis or univariate and multivariate regression analysis. In a subsequent, recent review of 326 patients with ocular adnexal lymphoma, Jenkins et al[17] found, using Kaplan-Meier survival estimates, that systemic lymphoma developed in 25% of the patients with solely orbital disease at 5 years. In a smaller analysis review of 192 patients with ocular adnexal lymphoma including eyelid, conjunctiva, and orbit, Jenkins et al[9] showed that systemic lymphoma was associated with diffuse large cell lymphoma in 81% and with MALT in 47% at 5 years. In this study, we specifically reviewed in detail the clinical features, management, and prognosis of 160 consecutive patients with biopsy-proven orbital lymphoma and analyzed the occurrence of systemic lymphoma and the impact of clinical factors.

Patients and Methods

A retrospective review was performed on the medical records of all patients with histopathologically confirmed orbital lymphoid tumors managed at the Oncology Service of Wills Eye Institute between January 1974 and September 2006. The Institutional Review Board at the Wills Eye Institute approved this study.

The data included information on both orbital and systemic lymphoid tumors. The patient's age at the time of ocular diagnosis, gender, race, and ocular symptoms were noted. The ocular data included laterality, affected eye, best-corrected Snellen visual acuity, involvement of other ocular sites (extraocular muscle, lacrimal gland, conjunctiva, and eyelid), anteroposterior location of the epicenter of the tumor (anterior, middle, posterior), quadrant location (superior, nasal, inferior, temporal, and diffuse), relation to muscle cone (intraconal, extraconal, both), general histopathologic category diagnosis (benign reactive hyperplasia, atypical lymphoid hyperplasia, and lymphoma), histopathologic type of orbital lymphoma (MALT, small lymphocytic, follicular, lymphoplasmacytic, mantle cell, and diffuse large B-cell), and treatment of orbital lymphoid tumor (excision, external beam radiotherapy [EBRT], and chemotherapy). The following clinical features of orbital lymphoid tumor were noted: extraocular dysmotility; proptosis; orbital, eyelid, or conjunctival edema; and erythema and palpable mass. Extraocular motility restriction was judged as mild (less than 20% in any direction), moderate (20%–50% restriction in any direction), or severe (more than 50%). The imaging features of the orbital lymphoid tumor on computed tomography (CT) and magnetic resonance imaging (MRI) were recorded.

Data regarding systemic lymphoma were collected by verbal and written communication with the patient and their physicians. Information on systemic lymphoma included diagnosis of systemic lymphoma (present, absent), date of diagnosis, interval between the diagnosis of systemic lymphoma and orbital lymphoma, and temporal relation of systemic lymphoma with orbital lymphoma (before, simultaneous with, or subsequent to orbital lymphoma). The type of systemic lymphoma and involved organs were recorded.

Follow-up information was collected regarding visual acuity at last visit, response to therapy (regression, stable, recurrence, no response), and the patient outcome (alive with no systemic lymphoma, alive with systemic lymphoma, dead as a result of systemic lymphoma, dead as a result of other cause).

Statistical Analysis

Data analysis was performed with SPSS software version 13.0 (SPSS, Inc., Chicago, IL). Kaplan-Meier survival estimates were used to analyze the development of systemic lymphoma as a function of time from the initial presentation at the Oncology Service, Wills Eye Institute. Kaplan-Meier survival estimates has been found to be the most suitable test for survival analysis; however, if there is one more than one type event (or failure), and if these events are dependent, Kaplan-Meier survival estimates are biased. This bias arises because the Kaplan-Meier survival estimates assume that all events are independent.[18,19]

Only clinical data, not histopathologic data, were analyzed with regard to the development of systemic lymphoma. The effect of each individual demographic datum (age, gender, laterality at presentation), clinical variable (presence of symptoms, visual acuity, restriction in extraocular movements, presence of periocular edema, erythema, conjunctival chemosis, dilated episcleral veins, lagophthalmos, papilledema, choroidal folds, venous dilatation, palpable mass, afferent pupillary defect, palpable mass, proptosis, involved orbital location, and MRI and CT imaging features), treatment method (EBRT, surgical excision, systemic chemotherapy), and prognosis (development of recurrence) on the development of systemic lymphoma were analyzed by a series of univariate logistic regression analyses. The continuos variables such as age ($<$60 years vs $\geq$60 years), visual acuity ($<$20/100 vs $>$20/100), and restriction in extraocular movements were turned into discrete variables, and all variables were analyzed as discrete categories. The variables that were significant on a univariate level ($P<0.05$) were entered into a multivariate analysis using a forward stepwise approach (likelihood ratio). For variables that showed a high degree of correlation, only one variable from the set of associated variables was entered at a time in subsequent multivariate models. A final multivariate model fitted variables identified as significant predictors ($P<0.05$) in the stepwise model and variables considered clinically important for systemic lymphoma.

Results

Two hundred nine eyes of 160 patients with orbital lymphoid tumor treated at the Oncology Service, Wills Eye Institute, were included in this study. The mean patient age at presentation was 66 years (median, 69 years; range, 2–93 years). There were 98 (61%) men and 62 (39%) women. One hundred fifty-six patients (91%) were white, 7 (4%) were black, 4 (3%) were Asian, and 3 (2%) were Hispanic.

The ocular symptoms at presentation are shown in Table 1. The mean duration of symptoms was 6 months (median, 2 months; range, 0–12 months). Best-corrected Snellen visual acuity was between 20/20 and 20/40 in 171 (82%) patients, between 20/50 and 20/200 in 23 (14%) patients, and less than 20/400 in 15 (9%) patients. At presentation, the tumor was unilateral in 121 (76%) patients and bilateral in 39 (24%) patients (Figs 1A and 2A, available at http://aaojournal.org). During follow-up, bilateral disease evolved from initially unilateral disease in 10 (8%) patients. The clinical features at presentation are shown in Table 2 (available at http://aaojournal.org). The anatomic location of orbital lymphoid tumor is shown in Table 3 (available at http://aaojournal.org). The imaging features in CT and MRI are presented in Table 4 (available at http://aaojournal.org; Figs 1B and 2B, available at http://aaojournal.org).

Histopathologic studies revealed benign reactive lymphoid hyperplasia in 14 (9%) patients, atypical lymphoid hyperplasia in 21 (13%) patients, and malignant lymphoma in 125 (78%) patients. Of 125 patients with malignant lymphoma, 47 (46%) patients had

Table 1. Symptoms in 160 Consecutive Patients with Histopathologically Confirmed Orbital Lymphoproliferative Tumor at Presentation

Symptoms	No. of Patients (%)
Eyelid swelling	52 (33%)
Palpable eyelid mass	41 (26%)
Double or blurred vision	21(13%)
Proptosis	20 (13%)
Mild pain	12 (8%)
Lid erythema	10 (6%)
Asymptomatic	4 (3%)

MALT lymphoma, 23 (22%) had small lymphocytic lymphoma, 22 (18%) had follicular lymphoma, 20 (16%) had diffuse large B-cell lymphoma, 10 (8%) had lymphoplasmacytic lymphoma, and 3 (3%) had mantle cell lymphoma.

Management and prognosis of patients are presented in Table 5 (available at http://aaojournal.org). Overall, the orbital tumor showed regression in 135 (84%) patients and remained stable in 25 (16%) patients after a mean follow-up of 43 months (median, 25 months; range, 6–316 months). There were 2 (3%) patients who had recurrence after EBRT, of whom one remained stable with observation and the other responded to Rituxan (Rituximab, Biogen Idec and Genetech, Inc, San Francisco, CA). Of 10 (28%) patients in whom recurrence developed after systemic chemotherapy, 4 (40%) patients were treated with a different chemotherapeutic protocol and 6 (60%) were managed with EBRT. In 2 (4%) patients, recurrence developed after excisional biopsy and were treated with EBRT.

Systemic lymphoma was detected in 71 (44%) patients. Systemic involvement was diagnosed before the orbital tumor in 40 (25%) patients, at the time of the diagnosis of orbital tumor in 14 (9%) patients, and subsequent to the diagnosis of orbital tumor in 17 (11%) patients. Using Kaplan-Meier survival analysis of those 106 patients with orbital lymphoid tumor and no evident systemic lymphoma at presentation, systemic disease eventually was discovered in 8% at 1 year, in 14% at 3 years, in 17% at 5 years, and in 33% at 10 years (Fig 3). In the patients with preexisting systemic lymphoma, systemic disease was present for a mean of 51 months (median, 36 months; range, 6–180 months), and the most commonly involved systemic site was head and neck lymph nodes in 20 (50%) patients, followed by abdominal lymph nodes in 16 (40%) patients and pelvic lymph nodes in 15 (38%) patients. In the patients in whom systemic lymphoma became apparent subsequent to orbital tumor, systemic disease appeared after a mean interval of 152 months (median, 64 months; range, 10–576 months), and the most common involved systemic site was abdominal lymph nodes in 7 (44%) patients, followed by pelvic lymph nodes in 6 (40%) and head and neck lymph nodes in 5 (31%) patients. Of 17 patients in whom systemic disease developed subsequent to orbital lymphoma, 9 (53%) had the same systemic lymphoma cell type as the orbital tumor and 8 (47%) had different types. Among these 8 patients with different systemic and orbital lymphoma types, in 4 patients (50%) with orbital atypical lymphoid hyperplasia, systemic small lymphocytic lymphoma developed. Two patients (25%) with orbital MALT lymphoma had systemic small lymphocytic lymphoma. Two patients (25%) with orbital small lymphocytic lymphoma manifested systemic diffuse large B-cell lymphoma. By univariate and multivariate analysis, the clinical factors at date first seen that were predictive of eventual development of systemic lymphoma are shown in Table 6. At date last seen, only 4 (3%) patients had died of systemic lymphoma.

Systemic lymphoma was diagnosed in 33 (67%) of 49 patients with bilateral orbital tumor, of whom systemic involvement preceded the orbital tumor in 16 (33%) patients, occurred simultaneous with orbital tumor in 8 (16%) patients, and occurred subsequent to the orbital tumor in 9 (18%) patients. Using Kaplan-Meier survival estimates, 24 patients with bilateral orbital lymphoid tumor and no systemic involvement at presentation, systemic disease eventually developed in 9% of the patients in 1 year, 19% in 2 years, 29% in 5 years, and 72% in 10 years (Fig 4).

Systemic lymphoma was diagnosed in 38 (34%) of 111 patients with unilateral orbital tumor. Of these 38 patients with unilateral orbital disease, systemic involvement preceded the orbital tumor in 24 (22%) patients, occurred simultaneous with orbital tumor in 6 (5%) patients, and occurred subsequent to the orbital tumor in 8 (7%) patients. Using Kaplan-Meier survival estimates of 82 patients with unilateral orbital lymphoid tumor and no systemic involvement at presentation, systemic lymphoma eventually developed in 6% of the patients at 1 year, in 8% at 2 years, in 11% at 5 years, and 11% at 10 years (Fig 4).

Discussion

Orbital lymphoid tumor usually presents as a diffuse, solid, enhancing mass with moulding to the globe on imaging studies, reflecting the irregular infiltration of orbital structures.[11] However, a circumscribed round or oblong mass does not rule out orbital lymphoid tumor. In our series, orbital lymphoid tumor presented as a diffuse ill-defined mass in 52% of the patients and as a circumscribed round or oblong mass in 48% on MRI or CT. On MRI, orbital lymphoid tumors appeared to be isointense compared with extraocular muscles on T1-weighted and T2-weighted images. This was contrary to the early studies that found orbital lymphoid tumors to be isointense compared with extraocular muscles on T1-weighted images and hyperintense compared with extraocular muscles on T2-weighted images.[20] Similarly, in a review of 87 cases with ocular

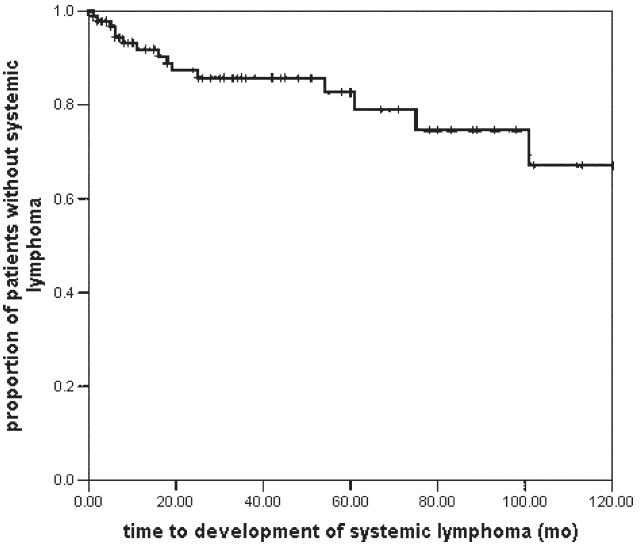

Figure 3. Graph showing Kaplan-Meier estimates for the development of systemic lymphoma in 106 patients with orbital lymphoid tumor and no systemic lymphoma at presentation.

Table 6. Univariate and Multivariate Analysis of Clinical Factors Predictive of Systemic Lymphoma in 106 Consecutive Patients with Orbital Lymphoproliferative Tumor and No Evident Systemic Lymphoma at Presentation

Clinical Factor	Relative Risk (95% Confidence Interval)	*P* Value
Univariate analysis		
Race (nonwhite vs. white*)	2.9 (1.1–7.6)	0.04
Laterality at presentation (bilateral vs. unilateral*)	3.6 (1.6–8.2)	0.002
Laterality during follow-up (bilateral vs. unilateral*)	2.9 (1.2–6.7)	0.015
Orbital mass shape (diffuse vs. circumscribed*)	2.9 (1.2–6.8)	0.017
Multivariate analysis		
Laterality at presentation (bilateral vs unilateral*)	5.3 (2.1–13.5)	0.001

*Reference variable.

adnexal lymphoproliferative tumor, Sullivan and Valenzuela[16] reported that 54% of the patients manifested a well circumscribed mass and 46% the patients had a moderate or poorly circumscribed mass. Orbital lymphoid tumor typically does not cause bone destruction except diffuse, large B-cell lymphoma type. In our study, 4 of 20 patients with diffuse, large B-cell lymphoma showed bone erosion on CT. Similarly, in a review of 42 patients with orbital lymphoid tumors, White et al[11] reported that 4 of the 5 patients with bone erosion had diffuse, large cell lymphoma.

The management of orbital lymphoid tumors includes surgical excision, chemotherapy, immunotherapy, or radiotherapy, depending on the size, shape, location, and grade of the lesion and on the systemic status of the patient. The authors' approach to the patient with an orbital lymphoid tumor starts with the evaluation of both the orbital tumor and systemic status. If a thorough systemic evaluation shows no systemic lymphoma and the orbital tumor is well-circumscribed and located in the anterior orbit, then the tumor can be removed surgically. If the tumor involves the lacrimal gland, then the involved part of the lacrimal gland is excised. By this approach, we observed 96% local tumor control rate, and these patients were spared the side effects of EBRT. If the orbital tumor is ill-defined or located in the posterior orbit, EBRT can be considered after histopathologic confirmation. In this study, EBRT was an effective treatment option for orbital lymphoid tumor with a 97% local rate at the median dose of 31 Gy. In a multicenter study from Europe, Martinet et al[21] reported a 97% local control rate after EBRT at a median dose of 34 Gy. Kennerdell et al[22] showed that low-dose radiation therapy (median dose, 26 Gy) was as effective as high-dose radiotherapy with a local control rate of 95% at 5 years or more. We recently began to use more conformal fields with CyberKnife radiotherapy for cases with diffuse or posteriorly located orbital tumor.

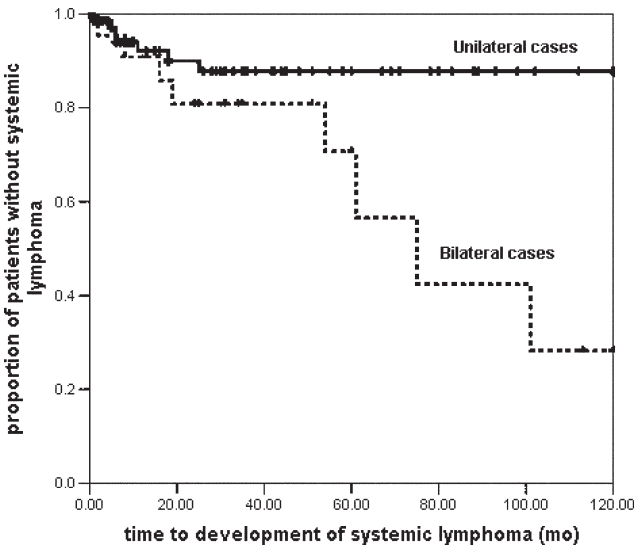

Figure 4. Graph showing Kaplan-Meier estimates for the development of systemic lymphoma in 25 patients with bilateral orbital lymphoid tumor and no systemic lymphoma at presentation and in 111 patients with unilateral orbital lymphoid tumor and no systemic lymphoma at presentation.

There are few reports about the response of orbital lymphoid tumors to systemic chemotherapy and immunotherapy. The authors observed 72% local tumor control rate after systemic therapy in affected patients. Ben Simon et al[23] evaluated the response to oral chlorambucil in 33 patients with orbital MALT lymphoma. They reported that 79% of patients showed complete response with mild residual thickening on imaging studies and 12% of patients showed recurrence. Esmaeli et al[24] reported their experience with systemic chemotherapy in 15 systemic lymphoma patients with orbital involvement and found complete regression in 73% of patients. Systemic chemotherapy and immunotherapy are options for patients who have systemic disease. However, 25% of the current patients had a prior history of systemic chemotherapy or immunotherapy, and such treatment did not prevent eventual development of the orbital tumor.

The anatomic location of adnexal lymphoma has been found to correlate with occurrence of systemic lymphoma. In a review of 117 cases with ocular adnexal lymphoid tumor, Knowles et al[4] reported systemic lymphoma associated with eyelid lymphoma in 67%, orbital lymphoma in 35%, and conjunctival lymphoma in 20%. In other studies, the incidence of systemic lymphoma has ranged from 31% to 37% in patients with conjunctival lymphoma, from 43% to 67% in patients with orbital lymphoma, and from 75% to 100% in patients with eyelid lymphoma.[7–9] These studies were focused on the association between the ocular adnexal

lymphoid tumor and systemic lymphoma. However, the clinicians are more interested in the development of systemic lymphoma for the patients with ocular adnexal lymphoid tumor alone. Recently, passive immunotherapy such as rituximab or active immunotherapy by cancer vaccine such as idiotype vaccination have been shown to improve the disease-free and overall survival.[25,26] Defining the risk of systemic disease in the patients with ocular involvement alone at presentation will assist in the long-term management of the patients with orbital lymphoma, especially in the application of immunotherapy. Using Kaplan-Meier estimates of patients with conjunctival lymphoid tumor alone and no systemic lymphoma at presentation, Shields et al[27] found that systemic lymphoma developed in 7% of patients at 1 year, in 15% at 5 years, and in 28% at 10 years. In the current study of patients with orbital lymphoid tumor alone and no systemic lymphoma at presentation, systemic lymphoma was discovered in 8% at 1 year, in 17% at 5 years, and in 33% at 10 years.

The clinical findings at presentation can provide clues regarding the development of systemic lymphoma. In a review of 326 patients with lymphoma of ocular adnexa, Jenkins et al[17] found that bilateral orbital involvement and eyelid and lacrimal gland lymphoma were significant factors for the development of systemic lymphoma. Other studies evaluating lymphoma-related death as a main outcome measure showed that the stage of lymphoma at presentation, cytologic atypia, MIB-1 (antibody against Ki-67 antigen) proliferation rate, tumor cell p53 positivity, and histologic type of tumor were significant predictive factors.[11,28,29] In this study, the aim was to assess clinical factors predictive of systemic lymphoma because this may serve as a general guide for the clinician when evaluating the patient. In this analysis, systemic lymphoma developed in patients with bilateral orbital disease significantly more often than in patients with unilateral orbital disease. Multivariate analysis showed that bilateral orbital involvement at presentation was the only significant predictive factor. In an earlier study, Shields et al[27] reported that in 47% of patients with bilateral conjunctival lymphoid tumors, systemic lymphoma developed, whereas in only 17% of patients with unilateral conjunctival lymphoma did systemic lymphoma manifest. Similarly, Jenkins et al[17] found that the patients with bilateral orbital disease have a 2.6 times risk of development of systemic lymphoma. Later, Sullivan et al[8] reported that bilateral orbital disease is a significant predictor for reduced disease-specific survival, local control, and distant control. These findings suggest that patients with bilateral orbital lymphoid tumor should be followed up more closely or even upstaged as having more advanced disease than the patients with unilateral periocular lymphoid tumor.

In summary, patients with orbital lymphoid tumor and no systemic disease at presentation had a 33% risk for developing systemic disease at 10 years. This risk increased to 72% in patients with bilateral orbital tumor and decreased to 12% in patients with unilateral orbital tumor. In this study, 97% of patients were white, a different racial distribution from the standard population of the United States. All patients with periocular lymphoid tumor should have long-term systemic follow-up twice yearly by a medical oncologist, internist, or family physician, including physical examination; complete blood count; CT or MRI examination of chest, abdomen, and pelvis; and positron emission tomography examination according to evolving guidelines.

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Footnotes and Financial Disclosures

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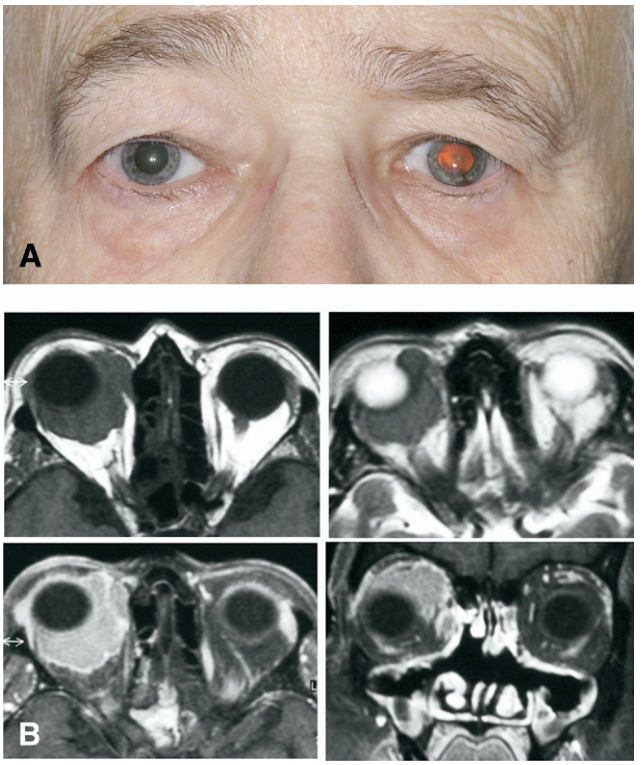

Figure 1. A, Photograph of a 75-year-old woman with left eye upper eyelid swelling and proptosis. **B**, Magnetic resonance imaging scans showing the orbital mass to be isointense to extraocular muscle on (upper left) T1-weighted images and (upper right) T2-weighted images and (bottom) showing intense contrast enhancement.

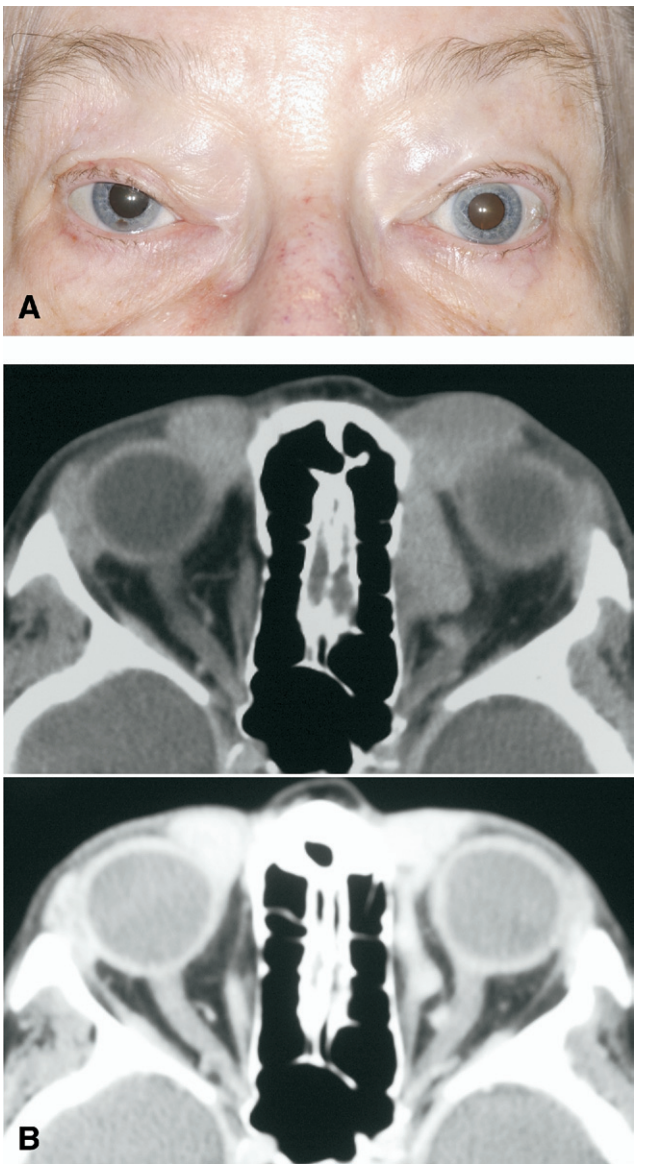

Figure 2. A, Photograph of an 84-year-old woman with bilateral proptosis and fullness to the supranasal eyelids. She was found to have bilateral salmon-colored conjunctival tumors in the supranasal fornix. **B**, Computed tomography scans showing bilateral solid orbital masses moulding to the globe supranasally.

Table 2. Clinical Features in 209 Eyes of 160 Consecutive Patients with Histopathologically Confirmed Orbital Lymphoproliferative Tumor at Presentation

Clinical Features	No. of Eyes (%)
Mildly restricted extraocular motility	37 (23%)
Moderately restricted extraocular motility	20 (13%)
Severely restricted extraocular motility	4 (3%)
Upper eyelid edema	38 (18%)
Lower eyelid edema	8 (4%)
Both upper and lower eyelids edema	34 (16%)
Upper eyelid erythema	16 (8%)
Lower eyelid erythema	2 (1%)
Both upper and lower eyelids erythema	15 (7%)
Palpable mass	139 (67%)
Proptosis	86 (54%)
Type of proptosis	
Axial	46 (29%)
Nonaxial	40 (25%)
Displacement of globe in nonaxial proptosis	
Inferior	36 (23%)
Superior	4 (3%)
Amount of proptosis (mm)	
Mean	5
Median	4
Range	2–13
Conjunctival chemosis	46 (22%)
Choroidal folds	8 (4%)
Dilatation of retinal vessels	7 (3%)
Papilledema	4 (2%)
Optic nerve pallor	2 (1%)

Table 3. Anatomic Localization of Tumor in 209 Eyes of 160 Consecutive Patients with Histopathologically Confirmed Orbital Lymphoproliferative Tumor

Location	No. of Eyes (%)
Anteroposterior location of orbital lymphoma	
Anterior orbit	154 (74%)
Midorbit	21 (10%)
Posterior orbit	20 (10%)
Entire orbit	14 (7%)
Radial location of orbital lymphoma	
Superior	134 (64%)
Inferior	19 (9%)
Temporal	16 (8%)
Nasal	16 (8%)
Central	24 (11%)
Conal location of orbital lymphoma	
Extraconal	173 (83%)
Intraconal	22 (11%)
Both	14 (83%)
Muscle involvement	60 (29%)
Involved muscle*	
Superior	29 (14%)
Lateral	26 (12%)
Medial	20 (10%)
Inferior	6 (3%)
Contiguous involvement	
Lacrimal gland	80 (38%)
Conjunctiva	60 (29%)
Sinus	5 (2%)
Brain	4 (2%)

*More than 1 muscle involved.

Table 4. Imaging Features in 209 Eyes of 160 Consecutive Patients with Histopathologically Confirmed Orbital Lymphoproliferative Tumor

	No. of Eyes (%)
Configuration	
Diffuse	108 (52%)
Circumscribed	101 (48%)
ConsistencyNo. of Eyes (%)	
Solid	208 (99%)
Cystic	1 (1%)
Moulding to globe	179 (86%)
Tumor size (mm)	
Mean	23
Median	20
Range	10–50
Changes in bone structure	
Erosion	4 (2%)
Hyperostosis	1 (1%)
Enhancement with contrast agent	207 (99%)
MRI (n = 54)	
T1-weighted images (compared with vitreous)	
Hypointense	3 (1%)
Isointense	22 (11%)
Hyperintense	29 (14%)
T1-weighted images (compared with muscle)	
Hypointense	3 (1%)
Isointense	43 (21%)
Hyperintense	8 (4%)
T2-weighted images (compared with vitreous)	
Hypointense	30 (14%)
Isointense	17 (8%)
Hyperintense	7 (3%)
T2-weighted images (compared with muscle)	
Hypointense	9 (4%)
Isointense	35 (17%)
Hyperintense	10 (5%)
Enhancement with gadolinium	
Present	53 (98%)
Absent	1 (2%)

MRI = magnetic resonance imaging.

Table 5. Management and Prognosis in 160 Consecutive Patients with Histopathologically Confirmed Orbital Lymphoproliferative Tumor

	No. of Patients (%)
Main treatment	
Excisional biopsy alone	49 (31%)
External beam radiotherapy	75 (47%)
Systemic chemotherapy or immunotherapy	36 (23%)
Dose of external beam radiotherapy (cGy)	
Mean	3239
Median	3060
Range	1440–6600
Response to external beam radiotherapy (n = 75)	
Regression	73 (97%)
Recurrence	2 (3%)
Response to systemic chemotherapy or immunotherapy (n = 36)	
Regression	19 (53%)
Stable	7 (19%)
Recurrence	10 (28%)
Response to excisional biopsy alone (n = 49)	
Regression	47 (96%)
Recurrence	2 (4%)