Published in final edited form as:

Ophthalmology. 2009 August ; 116(8): 1544–1551.e1. doi:10.1016/j.ophtha.2009.05.002.

Epidemiology and course of disease in childhood uveitis

Janine A. Smith, MD¹, Friederike Mackensen, MD³, H. Nida Sen, MD, MHSc¹, Julie F. Leigh, MD², Angela S. Watkins, MD³, Dmitry Pyatetsky, MD², Howard H. Tessler², Robert B. Nussenblatt, MD, MPH¹, James T. Rosenbaum, MD³, George F. Reed, PhD¹, Susan Vitale, PhD, MHS¹, Justine R. Smith, MBBS, PhD^{*,3}, and Debra A. Goldstein, MD, FRCS(C)^{*,2}

¹National Eye Institute, NIH/ DHHS, Bethesda, MD

²Department of Ophthalmology, University of Illinois, Chicago

³Casey Eye Institute, Oregon Health Sciences University

Abstract

Purpose—To describe the disease characteristics and visual outcome of pediatric uveitis.

Design—Retrospective longitudinal observation.

Participants—527 pediatric uveitis patients from the National Eye Institute, University of Illinois, Chicago and Oregon Health Sciences University.

Methods—Retrospective chart review.

Main outcome measures—Demographics, uveitis disease characteristics, complications, treatments, and visual outcomes and were determined at baseline and at 1, 3, 5 and 10 year time points.

Results—The patient population was 54 % female; 62.4% White, 12.5% Black, 2.7% Asian, 2.1 % multiracial and 14.61% Hispanic. Median age at diagnosis was 9.4 years. The leading diagnoses were idiopathic uveitis (28.8%), juvenile idiopathic arthritis-associated uveitis (20.9%), and pars planitis (17.1%). Insidious onset (58%) and persistent duration (75.3%) were most common. Anterior uveitis was predominant (44.6%). Complications were frequent, and cystoid macular edema (Odds Ratio: OR 2.94, p=0.006) and hypotony (OR 4.54, p=0.026) had the most significant visual impact. Ocular surgery was performed in 18.9% of patients. The prevalence of legal blindness was 9.23% at baseline, 6.52% at 1 year, 3.17% at 3 years, 15.15% at 5 years and 7.69% at 10 years. Posterior uveitis and panuveitis had more severe vision loss. Hispanic ethnicity was associated with a higher prevalence of infectious uveitis and vision loss at baseline.

Conclusions—The rate and spectrum of vision threatening complications of pediatric uveitis are significant. Prospective studies using standard outcome measures and including diverse populations are needed to identify children most at risk.

Address for reprints: Janine Austin Clayton, MD (Formerly Smith), Office of Research on Women's Health / Office of the Director, National Institutes of Health, 6707 Democracy Blvd, Suite 400, Bethesda, MD 20892-5484, Phone 301-435-3735, Fax 301-402-1798, jsmithja2@od.nih.gov.

*Justine R. Smith and Debra A. Goldstein contributed equally to this work and share senior authorship of this paper.

Meeting presentation: Presented as a poster at the AAO Annual Meeting, November 2007, New Orleans, Louisiana.

This article contains online-only material. The following should appear online-only. Table 2: Prevalence of uveitis diagnoses by anatomic location.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Introduction

Children account for only 2.2 to 13.8 % of patients in many uveitis clinics, and most published series of pediatric uveitis are limited to a small number of patients.^{1, 2, 3} Some authors have proposed that uveitis in children has a relatively severe course and is more likely to lead to vision loss.⁴ Delayed diagnosis, extended burden of disease over a lifetime, limited treatment options in children, difficult examinations, and the risk of amblyopia are all challenges specific to childhood uveitis.^{5, 6} The purpose of this study is to describe the etiologies, disease activity, complications and visual outcome of pediatric uveitis in a large, diverse cohort of patients. A previous lack of standardization of outcome measures and definitions in uveitis prohibits large scale comparison and meta-analysis of smaller studies. The development of standardized uveitis nomenclature (SUN) in 2005 provided definitions of outcome measures related to disease activity, onset and course of uveitis.⁷

Methods

Databases from the National Eye Institute (NEI), University of Illinois at Chicago (UIC) and Oregon Health Sciences University (OHSU) were reviewed to identify uveitis patients diagnosed from 0 to 18 years of age, with at least one visit prior to August 2005. Data were retrieved retrospectively from visits at standard time intervals, i.e., baseline and 1, 3 and 5 years (+/-3 months) and 10 years (+/-2 years); review periods were therefore non-contiguous. No minimum follow-up period was required and if there were multiple visits within the interval; the visit with the most complete data on six specific variables (visual acuity, manifest refraction, intraocular pressure (IOP), slit lamp examination, dilated fundus examination and vitreous haze) was selected. Approval from the relevant Institutional Review Boards was obtained for this study; the work was Health Insurance Portability and Accountability Act (HIPAA)-compliant. A standardized data sheet of outcome variables was developed, and trained reviewers abstracted the study data from all available charts at each site. Data retrieved included date of birth, age at presentation, date of diagnosis, sex, self-reported race and ethnicity, uveitis diagnosis, anatomic location, and laterality. Detailed clinical information regarding the nature of uveitis, including presenting symptoms, intraocular inflammation, anterior segment complications, posterior segment complications, optic nerve related complications, disease course and duration, visual acuity, treatments, complications, treatment-related side effects, and reviewer-assigned activity status based on overall assessment (active or inactive) were recorded in a standardized manner. Best available visual acuity was recorded for the better eye for bilateral cases and for the affected eye for unilateral cases. Free text and “not specified” options were available for all time points and variables such that missing data did not result in data being carried forward.

The Standardized Uveitis Nomenclature (SUN) criteria were used to report the clinical data.⁷ Treatments specific for uveitis were recorded; the options were: corticosteroids (topical, local injection, oral, intravenous or combinations thereof), nonsteroidal anti-inflammatory drugs or sulfasalazine, methotrexate, azathioprine, mycophenolate mofetil, leflunomide, cyclosporine, tacrolimus/ FK506, cyclophosphamide, chlorambucil, etanercept, infliximab, intravenous immunoglobulin, alpha interferon, adalimumab, and daclizumab. The presence of treatment limiting side effects for medications other than corticosteroids were noted (though not specified). Complications were recorded if they occurred at any time point and categories included: band keratopathy, posterior synechiae, cataract, vitreous hemorrhage, cystoid macular edema (CME), epiretinal membrane, ocular hypertension (defined as IOP > 21 mm Hg requiring intervention), glaucoma (defined as ocular hypertension and optic nerve damage or visual field deficit), hypotony (defined as IOP ≤ 5 mm Hg), and disc edema. Ocular surgery was divided into cataract, glaucoma, cornea, posterior segment (including laser and cryotherapy) and other.

The proportions of patients who met the disease outcome variables were calculated at baseline, 1, 3, 5 and 10 year time points, and examined for association with visual outcome and clinical variables. Statistical analysis methods included descriptive statistics, chi square, and multiple logistic regression analyses, based on the type of variable and data distributions.

Results

Patient characteristics are summarized in Table 1. 527 pediatric patients with uveitis were identified, of whom 285 (54 %) were female, 329 (62.4%) White, 66 (12.5%) Black, 14 (2.7%) Asian, 11 (2.1 %) multi-racial, and 105 (19.9%) were of unknown race. Across all races, 77 (14.61%) were Hispanic, 398 (75.52%) were non-Hispanic and 52 (9.9%) were of unknown ethnicity. There were no significant female/male differences among sites; however, the proportion of White patients differed significantly by site ($p < 0.001$): 78% at NEI, 64.2% at OHSU and 51% at UIC. Further, the prevalence of Hispanic ethnicity varied between sites: 7.9% at NEI, 10% at OHSU and 26.1% at UIC. Within the patients of Hispanic ethnicity, the racial distribution was 19 (24.7%) White, 3 (3.9%) multiracial, 2 (2.6%) Black, and 53 (68.8%) of unknown race. Other baseline characteristics are summarized in Table 1.

The most common primary reasons for referral to eye care provider were red eye (25.0%), reduced vision (23.0%), routine examination (16.5%), pain (6.8%), not specified (8.9%), floaters (6.0%), school eye exam (6.0%), other (5.0%) and photophobia (3.4%). The three most common diagnoses were idiopathic uveitis (28.8%), juvenile idiopathic arthritis (JIA)-associated uveitis (20.9%), and pars planitis (17.1%). Anterior uveitis was most common (235/527, 44.6%), followed by intermediate uveitis (148/527, 28.0%), posterior uveitis (76/527, 14.4%) and panuveitis (68/527, 13.0%). The most common etiology was idiopathic for anterior and panuveitis, pars planitis for intermediate, and infection for posterior uveitis (toxoplasmosis: 5.6% and other infections: 4.2%), see Table 2 (available at <http://aaojournal.org>). The majority of cases, 399 (75.7%), were bilateral and this predominance over unilateral presentation was demonstrated in anterior, intermediate and panuveitis; however, the frequency of unilateral presentation significantly exceeded that of bilateral presentation in posterior uveitis (62% unilateral versus 38% bilateral), ($p < 0.001$). Further, bilateral presentation was significantly more common in the most prevalent uveitis diagnoses, i.e., idiopathic (79.6%), JIA-associated (89.1%) and pars planitis (85.5%), as compared to other etiologies combined (overall 58.8%) ($p < 0.001$).

Disease activity

Of patients in whom disease activity could be classified, uveitis was most commonly insidious in onset (295, 55.9%) as compared to sudden (192, 36.4%). Duration was most commonly persistent (397, 75.3%) as compared to limited (68, 12.9%). A chronic disease course (139, 26.4%) was more common than acute (52, 9.9%) or recurrent (51, 9.7%). Applying the SUN definition of chronic disease⁷, 144, (27.3%) cases relapsed after discontinuation of therapy and 39 (26.4%) were unable to discontinue therapy due to persistent inflammation, see Table 3. In a logistic regression model including duration (persistent, limited) and course (acute, recurrent, chronic), with limited disease used as reference category, acute disease was significantly associated with baseline vision worse than 20/200 as compared with persistent, recurrent or chronic presentations (Odds Ratio: OR 5.89, $p = 0.021$). Posterior and panuveitis were associated with greater risk for vision loss at all levels at baseline. Odds ratios ranged from 2.69-9.40, ($p < 0.0001$ -0.012), (Table 4).

Treatments

449 patients (85.2%) were treated with corticosteroids (topical, periocular, intraocular, oral or intravenous), 78 patients (14.8%) with non-steroidal anti-inflammatory medications or

sulfasalazine, 31 patients (5.9%) with biologic agents, and 141 patients (26.8%) with systemic immunosuppressive agents other than steroids or biologics. Systemic immunosuppression with immunomodulatory or biologic agents or combinations thereof was employed in 172 patients (32.6%). Treatment limiting side effects (excluding those corticosteroid-related) were reported in 27 (5.2%). Ocular surgery was performed in 18.9% of total 527 patients, with cataract extraction being the most commonly performed (13.4%); other surgeries included posterior segment surgeries (9.7%) glaucoma surgeries (6.5%), corneal procedures (2.5%), and other operations (1.9%).

Complications

Complications were highly prevalent at baseline and throughout the follow-up period: at the first visit, the most common were posterior synechiae (177/527, 33.8%), cataract (104/527, 19.9%), and band keratopathy (109/527, 20.8%), (Table 5). The prevalence of ocular complications, particularly cataract, followed by ocular hypertension, glaucoma and CME, increased at subsequent time points. For example, one third of subjects had CME (15/63, 23.8%) and over half of subjects developed cataract (31/63, 49.2%) at 3 years. At baseline, the mean number of complications per person, regardless of visual acuity, was significantly greater for panuveitis and anterior uveitis compared to posterior uveitis; however, when adjusted for duration of disease, this difference became insignificant. There was no significant difference in rate of complications with regard to sex, race or ethnicity with the exception that White patients were more likely to develop glaucoma at 5 years and CME at 1 year compared to non-White patients ($p=0.02$ and $p=0.01$, respectively). Small numbers in these groups and lack of correction for multiple comparisons limit the certainty of these findings. The mean number of complications in patients with vision of 20/100 or worse was 2.29, Standard Deviation: SD 1.49 ($n=69$); the mean number of complications for those with vision better than 20/100 was significantly lower at 1.29, SD 1.36 ($n=450$), $p=0.0005$. Further, the mean difference in number of complications for patients with vision of 20/50 or worse versus better than 20/50 was 0.57, 95% Confidence Interval: CI 0.30-0.84, $p<0.0001$, (Table 5). Multiple logistic regression of odds of vision worse than 20/50 in relation to complications revealed that CME (OR 2.94, $p=0.006$) and hypotony (OR 4.54, $p=0.026$) had the most significant impact on vision.

Visual outcomes

The proportion of patients with vision 20/200 or worse was 9.2% (48/ 527) at baseline, 6.5% (9/139) at 1 year, 3.2% (2/63) at 3 years, 15.1% (5/22) at 5 years and 7.7 % (1/13) at 10 years, (Table 5). Posterior uveitis and panuveitis were both associated with statistically significantly greater risk of vision loss at all levels: 20/200 or worse, 20/100 or worse and 20/50 or worse at baseline. The odds ratios for posterior uveitis ranged from 5.62 to 9.40, and those for panuveitis ranged from 2.69 to 4.02, see Table 4. Subjects whose uveitis met the SUN definition of “limited” disease course were significantly more likely to have presented with severe vision loss (20/200 or worse) at baseline than those with a “persistent” disease course (17.6% (12/68) vs 7.9 % (31/391), $p=0.007$). Similarly, while 17.6% of patients with a limited course had vision of 20/200 or worse at baseline, no patients with limited course had this degree of vision loss at subsequent follow-up.

The effect of Hispanic ethnicity on clinical outcome measures was examined (Table 6). There was no difference in the mean number of complications, median age at diagnosis or presentation or female/male ratio between Hispanic and non-Hispanic children. There were important differences, however, in characteristics of uveitis in the Hispanic group when compared to non-Hispanics. For example, the distribution of anatomic location differed significantly with a lower prevalence of anterior (26/77, 33.8%, Hispanic, 185/398, 46.5%, non-Hispanic), intermediate (16.9% vs. 29.6%) and panuveitis (10.4% vs 13.8%), but a higher prevalence of

posterior uveitis at 39.0% in the Hispanic group as compared to 10.0% in non-Hispanics ($p < 0.0001$). Further, while the prevalence of idiopathic uveitis was comparable at 27.4% in Hispanic and 29.8% in non-Hispanics, the prevalence of JIA-related uveitis and pars planitis were both significantly lower in Hispanics at 12.3% vs. 24.1% and 9.6% vs 19.2%, respectively ($p = 0.0004$). In contrast, the ratio of infectious to non-infectious etiologies for uveitis was significantly greater in Hispanics than in non-Hispanics; the prevalence of toxoplasmic uveitis was 14/72, 19.2% vs. 11/398, 2.8% and that of uveitis due to other infectious causes was 9/72, 12.3% in Hispanics as compared to 23/398, 6.0% in non-Hispanics ($p < 0.0001$). There were no cases of ankylosing spondylitis, Crohn's disease, sympathetic ophthalmia or Blau syndrome in the Hispanic group, while these diagnoses were seen in the non-Hispanic group.

In the Hispanic group non-infectious uveitis accounted for 21.7% of all unilateral cases, while toxoplasmosis and other infectious accounted for 43.5% and 34.8% of unilateral cases, respectively. This differed significantly from the non-Hispanic group in which non-infectious uveitis accounted for a larger proportion of unilateral disease at 69.2% and toxoplasmosis and other infectious accounted for a smaller fraction at 11.0% and 19.8% respectively ($p < 0.001$). However, there were no differences in causes of bilateral uveitis presentation, the vast majority of which was due to non-infectious causes in both Hispanic (90.0%) and non-Hispanic children (98.0%). Hispanic ethnicity had no impact on the tendency of non-infectious uveitis to present as bilateral disease. Logistic regression analysis revealed that Hispanic ethnicity was associated with significantly greater risk of vision loss at baseline: 20/200 or worse (OR 2.83, 95% CI 1.45-5.55, $p = 0.002$), 20/100 or worse (OR 2.59, 95% CI 1.43-4.69, $p = 0.002$) and 20/50 or worse (OR 2.76, 95% CI 1.67-4.57, $p < 0.0001$, (Table 7). When uveitis diagnoses of idiopathic, JIA-related, pars planitis, toxoplasmosis, and other infections were added to the model, Hispanic ethnicity no longer predicted poor visual outcome, and toxoplasmosis (OR 8.86, 95% CI 2.35-33.44, $p = 0.0013$) and infections (OR 9.81, 95% CI 2.82-34.15, $p = 0.0003$) emerged as significant risk factors. However, when examining the effect of ethnicity and non-infectious etiologies only, Hispanics were still more likely to have visual acuity of 20/50 or worse at baseline ($p = 0.03$) and test for linear trend indicated that at baseline Hispanics were more likely to have worse vision for all cutoffs ($p = 0.026$).

Discussion

The results from this large cohort show the spectrum of disease as well as the breadth of complications and visual outcomes in a study population that is geographically, racially and ethnically diverse, with a sizeable fraction of non-White patients. Table 8 shows the results of a comparison of our data to that of other studies that included 100 or more children published after 2000.

Visual acuity has been characterized in various ways in previous publications of pediatric uveitis cohorts. Edelsten et al defined vision loss as visual acuity of 6/12 or worse in at least one eye and found a prevalence of vision loss of 17% (43/249 patients)³. In that study, performed in the United Kingdom, a high rate of toxoplasmosis and idiopathic posterior uveitis resulted in a higher prevalence of posterior uveitis than reported in other studies. We used similar vision cutoffs and time points to a study performed in Miami⁸ but found lower prevalence of vision loss with a baseline prevalence of legal blindness (vision of 20/200 or worse in the better eye) of 9.23% (48/527) as compared to 18% (11/61 bilateral cases) and 53% (17/32 unilateral cases) reported by Rosenberg and co-authors.⁸ Edelsten, Rosenberg and our study all found that posterior uveitis is a risk factor for poor visual outcome.^{3, 8}

In addition to looking at the prevalence of legal blindness, we examined the prevalence of vision of 20/100 or worse and 20/50 or worse, since this defines the visual requirement for an unrestricted driver's licenses in many states and may be likely to affect vision-specific pediatric

activities of daily living. We found the proportion of children with vision worse than 20/200 remained about 10% (mean 8.4%, range 3.4-13.3%) at each of the follow-up time points; however, on average, the proportion of children with moderate visual compromise with visual acuity of 20/50 or worse was 26.4% (18.1% - 36.4%). Children with vision of 20/100 or worse may be more likely to have difficulty with school work and the prevalence of this visually impaired group was 69/527 (13.3%) at baseline, 9/139 (9.4%) at 1 year, 5/63 (7.9%) at 3 years and 5/22 (15.1%) at 5 years. These data highlight the need for close monitoring and aggressive treatment of children with uveitis, as well as the need to ascertain the impact of uveitis on age appropriate activities of daily living relevant to children. The more common diseases, i.e., idiopathic, JIA-associated and pars planitis, were more often bilateral, and therefore lack of disease control may be more likely to result in bilateral loss of vision, with major functional impact. Infectious uveitis was more likely to present as posterior or panuveitis, and was associated with higher risk for poor visual outcome. In fact, when we looked at infectious and toxoplasmic uveitis in a logistic regression model including the leading 3 uveitis diagnoses and ethnicity, both toxoplasmosis and other infections combined were significantly associated with visual outcome of visual acuity of 20/200 or worse at baseline. Posterior and panuveitis in children may therefore be viewed as a poor prognostic marker and warrant further specific study and close intervention.

We did find some differences to suggest that race and ethnicity were associated with different patterns of etiology, disease presentation and progression, and this observation warrants further study. Our findings suggest that Hispanic patients were more likely to have infectious uveitis and to present with vision loss even with non-infectious uveitis. Because toxoplasmosis represented a sizeable proportion of infectious uveitis and due to its propensity to affect the macula, it was particularly associated with loss of visual acuity, a public health issue of import. With the changing demographics of the United States and globalization, patterns of uveitis in the population may be affected. There are global variations in the epidemiology of uveitis. A meta-analysis of worldwide studies of uveitis that included 7% pediatric patients reported parasitic anterior uveitis (49.3%) as the most common etiology for disease in children but idiopathic was the second most common at 25.5%.⁹

The weaknesses of our study include its retrospective nature and examination by different ophthalmologists. Despite the large number of patients at baseline, data on fewer patients were available at each subsequent time point. We recognize that patients with longer follow-up especially at tertiary centers tend to be those with more severe disease, which could increase the prevalence of complications and poor outcomes. Estimates of severity and complications from academic referral centers are likely to exceed community-based prevalence. Strengths of our study include the geographic distribution of study sites, ethnic and racial diversity, large patient population, the use of standardized outcome variables at specific time points and the availability of data for up to 10 years of follow-up. The effectiveness of the SUN definitions of disease activity to separate patients into groups that behave differently supports the application of standardized outcome variables and highlights the need for additional codification of outcome measures in uveitis.⁷

While several studies have sought to identify prognostic factors for pediatric uveitis, relatively small numbers, lack of standardized definitions of outcome variables, and non-uniform, retrospective data collection have made this challenging. By combining 3 uveitis centers with different referral patterns and geographic locations, we attempted to maximize the number and diversity of subjects, and this is the largest study of pediatric uveitis to date. Standardized composite outcome measures such as those developed by the American College of Rheumatology, and the core outcome measures developed by the Pediatric Rheumatology International Trials Organization have enhanced the ability to critically evaluate new treatments.¹⁰ There is a need for standardized outcome measures and evaluation tools to

measure the functional impact of pediatric uveitis and age-appropriate quality of life assessment tools to assess activities of daily living relevant to children.

Acknowledgments

Financial Support: Supported in part by grants from Research to Prevent Blindness (Career Development Award to JRS, unrestricted grant to Casey Eye Institute and unrestricted grant to University of Illinois, DAG). Supported in part by the intramural research program of the National Eye Institute / National Institutes of Health/ Department of Health and Human Services (JAS). The funding organizations participated in conducting the study, data collection, data management, and data analysis for the manuscript.

References

1. BenEzra D, Cohen E, Maftzir G. Uveitis in children and adolescents. *Br J Ophthalmol* 2005;89:444–8. [PubMed: 15774921]
2. Azar D, Martin F. Paediatric uveitis: a Sydney clinic experience. *Clin Experiment Ophthalmol* 2004;32:468–71. [PubMed: 15498056]
3. Edelsten C, Reddy MA, Stanford MR, Graham EM. Visual loss associated with pediatric uveitis in English primary and referral centers. *Am J Ophthalmol* 2003;135:676–80. [PubMed: 12719076]
4. Cunningham ET Jr. Uveitis in children. *Ocul Immunol Inflamm* 2000;8:251–61. [PubMed: 11262655]
5. Smith JR. Management of uveitis in pediatric patients: special considerations. *Paediatr Drugs* 2002;4:183–9. [PubMed: 11909010]
6. Holland GN, Stiehm ER. Special considerations in the evaluation and management of uveitis in children. *Am J Ophthalmol* 2003;135:867–78. [PubMed: 12788128]
7. Standardization Of Uveitis Nomenclature (SUN) Working Group. Standardization of uveitis nomenclature for reporting clinical data: results of the First International Workshop. *Am J Ophthalmol* 2005;140:509–16. [PubMed: 16196117]
8. Rosenberg KD, Feuer WJ, Davis JL. Ocular complications of pediatric uveitis. *Ophthalmology* 2004;111:2299–306. [PubMed: 15582090]
9. Rathinam SR, Namperumalsamy P. Global variation and pattern changes in epidemiology of uveitis. *Indian J Ophthalmol* 2007;55:173–83. [PubMed: 17456933]
10. Ruperto N, Bazso A, Ravelli A, et al. The Paediatric Rheumatology International Trials Organization (PRINTO). *Lupus* 2007;16:670–6. [PubMed: 17711906]
11. Kadayifcilar S, Eldem B, Tumer B. Uveitis in childhood. *J Pediatr Ophthalmol Strabismus* 2003;40:335–40. [PubMed: 14655981]
12. de Boer J, Wulffraat N, Rothova A. Visual loss in uveitis of childhood. *Br Ophthalmol* 2003;87:879–84.
13. Kump L, Cervantes-Castaneda R, Androudi S, Foster CS. Analysis of pediatric uveitis cases at a tertiary referral center. *Ophthalmology* 2005;112:1287–92. [PubMed: 15921752]

Patient characteristics

Table 1

Patient Characteristics		
Demographics		
SEX	Number (n)	%
Male	242	45.9
Female	285	53.1
RACE		
American Indian/Alaska Native	1	0.2
Asian	14	2.7
Hawaiian/ Pacific Islander	1	0.2
African American	66	12.5
White	329	62.4
Multi-racial	11	2.1
Not specified/ unknown	105	19.9
ETHNICITY		
Hispanic	77	14.61
Non-Hispanic	398	75.52
Unknown	52	9.9
DATES		
Date of presentation		
1980-1989	63	12
1990-1999	207	39.2
2000-2005	256	49.6
AGES		
Median age in years		
At diagnosis (dx)	9.4	0-18.9
At presentation	11.2	1.5-18.3
Age at diagnosis	n	%
5 years & under	129	24.8
6 -10 years	190	36.5
11 – 15 years	160	30.8
16 years and over	41	7.9
unknown	7	1.3
Time from dx to presentation		
6 months or less	245	51.4
7 months - 2 years	114	23.9
more than 2 years	118	24.7

Table 2
Prevalence of uveitis diagnoses by anatomic location (Online-only material)

(Available at <http://aaojournal.org>)

Diagnosis	Number of patients	Percentage
Anterior		
JIA	103	19.54
Idiopathic	83	15.75
Other	10	2.0
TINU	8	1.7
Not Specified	8	1.7
Infections	7	1.3
HLA-B27	6	1.1
AS	4	0.7
Fuchs' iridocyclitis	2	0.4
Crohn's Disease	1	0.2
Sarcoidosis	1	0.2
VKH	1	0.2
Intermediate		
Pars planitis	84	16.0
Idiopathic	41	7.8
HLA-B27	1	0.2
JIA	6	1.3
Not Specified	6	1.3
Sarcoidosis	3	0.6
TINU	2	0.4
Other	2	0.4
Infections	1	0.2
Posterior		
Toxoplasmosis	27	5.1
Other Infections	20	3.8
Idiopathic	5	1.0
White dot	5	1.0
Not Specified	4	0.8
Retinal vasculitis	3	0.6
Pars planitis	3	0.6
Sarcoidosis	3	0.6
VKH	2	0.4
Behcet's Disease	1	0.2
Blau syndrome	1	0.2
TINU	1	0.2

Diagnosis	Number of patients	Percentage
Other	1	0.2
Panuveitis		
Idiopathic	23	4.4
VKH	12	2.3
Behcet's Disease	8	1.5
Sarcoidosis	7	1.3
Sympathetic Ophthalmia	4	0.8
Infections	4	0.8
Pars planitis	3	0.6
Not Specified	3	0.6
JIA	1	0.2
TINU	1	0.2
Blau syndrome	1	0.2
Other	1	0.2
All combined		
Idiopathic	152	29
Juvenile Idiopathic Arthritis related Uveitis	110	21
Pars planitis	90	17
Infections*	33	6
Toxoplasmosis	27	5
Not specified	21	4
VKH disease	15	3
Other specific diagnoses	15	3
Sarcoidosis	14	3
Tubulointerstitial nephritis and uveitis	12	2
Behcet's Disease	10	2
HLA-B27	7	1
White dot syndrome ^{&}	5	1
Ankylosing Spondylitis	4	1
Sympathetic Ophthalmia	4	1
Retinal vasculitis	3	< 1

AS: Ankylosing Spondylitis, JIA: Juvenile Idiopathic Arthritis related uveitis, TINU: Tubulointerstitial nephritis and uveitis, VKH: Vogt Koyanagi Harada disease, White dot syndromes[&]: Acute Multifocal Placoid Pigmentary Epitheliopathy, Birdshot retinochoroidopathy, Multifocal evanescent white dot syndrome, multifocal choroiditis, punctate inner choroidopathy, serpiginous, Infections* (Bartonella, Borrelia, CMV, Diffuse unilateral subacute neuroretinitis, (DUSN) EBV, HIV, HSV, HZV, Syphilis, Toxocara, Tuberculosis, West Nile virus, etc), malignancies: retinoblastoma, juvenile xanthogranuloma, lymphoma, melanoma, other specific diagnoses and not specified. Note: The data were collected over a thirty year time period. This may impact the anatomical classification of uveitis subtypes as classification systems have changed, and new entities have been described.

Table 3
Anatomic location and characteristics (Standardized Uveitis Nomenclature: SUN criteria⁷)

Anatomic location	Number	Percentage
Anterior	235	44.59
Intermediate	148	28.08
Posterior	76	14.42
Panuveitis	68	12.9
Laterality		
Unilateral	128	24.3
Bilateral	399	75.7
Onset		
Sudden	192	36.5
Insidious	295	58.08
Not specified	39	7.41
Duration		
Persistent	397	75.33
Limited	68	12.9
Not specified	53	10.06
Does not meet SUN criteria ⁷	7	1.33
Course		
Acute	52	9.87
Recurrent	51	9.68
Chronic-with relapse	144	27.32
Chronic-unable to stop treatment	139	26.38
Not specified	89	16.89

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 5
The prevalence of complications, relationship to anatomic location and visual acuity outcomes at standard intervals

Complications and visual acuity						
Visual acuity	Baseline	Year 1	Year 3	Year 5	Year 10	
Number (n) (%)	527	139 (26.4%)	63 (11.9%)	22 (6.3%)	13 (2.5%)	
Prevalence of visual acuity outcomes n (%)						
20/40 or better	417 (80.19)	115 (84.1)	51 (80.9)	24 (72.3)	9 (69.2)	
20/50 or worse	138 (26.54)	25 (18.12)	13 (20.63)	12 (36.36)	4 (30.77)	
20/100 or worse	69 (13.27)	13 (9.42)	5 (7.94)	5 (15.15)	2 (15.4)	
20/200 or worse	48 (9.23)	9 (6.52)	2 (3.17)	5 (15.15)	1 (7.69)	
Mean number of complications by visual acuity outcome (mean #/ person)						
20/40 or better	1.34	1.83	2.65	2.17	2.22	
20/50 or worse	2.12	3.32	3.15	2.75	3.5	
20/100 or worse	2.29	3.23	3.4	2.4	5	
20/200 or worse	2.15	2.88	4	2.4	3	
Prevalence of complications n (%)						
Band keratopathy	109 (20.8)	36 (26.5)	29 (46)	10 (30.3)	3 (25)	
Cataract	104 (19.9)	65 (48.9)	31 (51.7)	18 (56.2)	10 (83.3)	
Posterior synechiae	177 (33.8)	58 (43.9)	30 (8.39)	9 (29)	5 (41.7)	
Glaucoma	22 (4.3)	12 (9)	7 (11.1)	6 (19.4)	3 (25)	
Ocular hypertension	51 (9.9)	30 (22.1)	17 (17)	9 (29)	3 (25)	
Cystoid macular edema	84 (16.6)	20 (17.6)	15 (30)	7 (30.4)	1 (11.1)	
Hypotony	16 (3.1)	5 (3.7)	6 (63)	2 (6.5)	3 (25)	
Disc edema	68 (13.4)	10 (8.4)	6 (11.1)	2 (8)	2 (20)	
Vitreous hemorrhage	14 (2.7)	6 (5.2)	3 (6)	1 (4)	0	
Epiretinal membrane	22 (4.4)	14 (12.3)	8 (16.3)	6 (25)	1 (11.1)	
Anterior chamber cells	275 (52.5)	61 (44.2)	23 (36.5)	15 (45.5)	5 (41.67)	
Vitreous haze	114 (22.8)	13 (11.3)	3 (6)	3 (13)	0	
Active disease	395 (75.1)	78 (56.5)	35 (55.6)	18 (54.6)	7 (53.9)	
Complications/ person at baseline						
			Intermediate	Posterior	Panuveitis	

Complications and visual acuity					
Visual acuity	Baseline	Year 1	Year 3	Year 5	Year 10
Anatomic location	Mean, +/- SD (N)		P value		
Anterior (reference)	1.4 +/- 1.4, (235)		0.439	<0.001	0.009
Intermediate	1.3 +/- 1.3, (148)			0.004	0.003
Posterior	0.8 +/- 1.0, (75)				<0.001
Panuveitis	1.9 +/- 1.4, (68)				

SD= Standard deviation

Table 6
Summary of ethnicity, uveitis characteristics and clinical outcomes

	Hispanic	Non-Hispanic	P value
Number (n) complications	Mean, Standard Deviation: SD, n	Mean, SD, n	
Baseline	1.18 (1.28), 77	1.45 (1.43), 396	0.14
1 year	2.00 (1.71), 26	1.88 (1.41), 101	0.97
3 years	2.09 (1.76), 11	2.52 (1.68), 50	0.44
5 years	1.44 (1.13), 09	2.57 (1.89), 21	0.16
10 years	1.00 (1.42), 02	2.64 (2.16), 11	0.31
Prevalence (Unilateral)	N (%)	N (%)	
Non-infectious	5 (21.7%)	63 (69.2%)	P< 0.001
Toxoplasmosis	10 (43.5%)	10 (11.0%)	
Other infections	8 (34.8%)- Total 23	18 (19.8%)- Total 91	
Prevalence (Bilateral)	N (%)	N (%)	
Non-infectious	45 (90%)	289 (98.0%)	Not significant (NS)
Toxoplasmosis	4 (8%)	1 (0.3%)	
Other infections	1 (2%)- Total 50	5 (1.7%)- Total 295	
Ethnicity /race by site	Hispanic ethnicity and race		White
	N (%)	N (%)	N/ total (%)
National Eye Institute	10 (7.9%)	7 White, 3 Multiracial	99/127 (78%)
Oregon Health Sciences University	15 (10%)	11 White 4 Unknown	129/201 (64.2%)
University of Illinois, Chicago	52 (26.1%)	2 Black, 1 White, 49 Unknown	101/199 (50.8%)
Uveitis diagnosis (top 3)	N (%)	N (%)	P value
Idiopathic	20 (27.4%)	115 (28.8%)	P= 0.0004
Juvenile idiopathic arthritis related uveitis	09 (12.3%)	93 (24.1%)	
Pars planitis	7 (9.6%)	74 (19.2%)	
All others	37 (50.7%)	104 (26.9%)	
Infectious vs. non-infectious			
Toxoplasmosis	14 (19.2%)	11 (2.8%)	P< 0.0001
Other infections	9 (12.3%)	23 (6.0%)	
Non-infectious	50 (68.5%)	355 (91.2%)	
Anatomic location			
Anterior	26 (33.8%)	185 (46.5%)	P<0.0001
Intermediate	13 (16.9%)	118 (29.6%)	
Posterior	30 (39.0%)	40 (10.0%)	
Panuveitis	8 (10.4%)	55 (13.8%)	
Age			
Median age at diagnosis	9.6 years	10.6 years	P=0.63
Median age at presentation	9.4 years	11.8 years	P=0.10
5 years and under	19 (24.7%)	103(26.3%)	

	Hispanic	Non-Hispanic	P value
Number (n) complications	Mean, Standard Deviation: SD, n	Mean, SD, n	
6 to 10 years	32 (41.6%)	141 (36.1%)	
11-15 years	19 (24.7%)	115 (29.4%)	
16 years and older	7 (9.1%)	32 (8.2%)	
Male	41 / 77 (53%)	171 / 398 (43%)	P=0.10

Table 7
Effect of Hispanic ethnicity on visual acuity outcomes, laterality and infectious uveitis etiology

Baseline Visual Acuity	20/200 or worse	20/100 or worse	20/50 or worse
	OR (95% CI) p value	OR (95% CI) p value	OR (95% CI) p value
Hispanic ethnicity	1.84 (0.85, 3.98) p=0.12	1.7 (0.86, 3.38), p=0.13	1.93 (1.1, 3.4) p=0.02*
Idiopathic	1.80 (0.55, 5.89)p=0.33	1.2 (0.48, 3.00) p=0.13	1.1 (0.58, 2.08) p=0.78
JIA associated	1.56 (0.44, 5.56) p=0.50	1.3 (0.51, 3.44) p=0.68	0.72 (0.35, 1.49) p=0.37
Pars planitis	0.81 (2.35, 33.44) p=0.78	0.5 (0.15, 1.78) p=0.30	0.96 (0.46, 1.99) p=0.90
Toxoplasmosis	8.86 (2.35, 33.44) p=0.0013*	7.14 (2.4, 21.5) p=0.0005*	5.35 (1.96, 14.6) p=0.001*
Other infections	9.81 (2.82, 34.15) p=0.0003*	7.92 (2.88, 21.79) p<0.0001*	4.38 (1.83, 10.5) p=0.0009*
Non infectious	OR=1	OR=1	OR=1
Risk of vision loss in Hispanic vs. non-Hispanic patients			
Visual acuity	20/200 or worse	20/100 or worse	20/50 or worse
Baseline	2.83 (1.45, 5.55) p=0.0024*	2.6 (1.43, 4.7) p=0.0017*	2.76 (1.67, 4.57) p<0.0001*
1 year	0.537 (0.06, 4.57) p=0.57	1.34 (0.33, 5.32) p=0.68	1.82 (0.66, 5.00) p=0.24
Unilateral N (%)	Non-infectious	Toxoplasmosis	Other infectious uveitis
Hispanic	5 (21.7%)	10 (43.5%)	8 (34.8%)
Non-Hispanic	63 (69.2%)	10 (11%)	18 (19.8%)
Bilateral N (%)			
Hispanic	45 (90%)	4 (8%)	1 (2%)
Non-Hispanic	289 (98%)	1 (0.3%)	5 (1.7%)

JIA= juvenile idiopathic arthritis related uveitis

OR= Odds Ratio; CI= Confidence Interval

Table 8
Comparison of distributions of uveitis etiology and anatomic location in large studies (100 or more cases) of pediatric uveitis published after 2000

Author Year (Number)	Current 2007 (527)	Benezra ¹ 2005 (276)	deBoer ¹² 2003 (123)	Kadayifcilar ¹¹ 2003 (219)	Edelsten ³ 2003 (249)	Rosenberg ⁸ 2004 (148)	Kump ¹³ 2004 (269)
Location	MD, IL, OR	Jerusalem, Israel	Utrecht, Netherlands	Ankara, Turkey	London, UK	Miami, FL	Boston, MA
Anterior	44.6%	13.4%	36%	43.4%	70%	30.4%	56.9%
Intermediate	28%	-	24%	11.9%	-	27.7%	20.8%
Posterior	14.4%	-	19%	31%	30%	23.7%	6.3%
Panuveitis	12.9%	-	21%	13.7%	-	18.2%	16%
JIA	21%	14.9%	20%	13.2%	47%	23%	33%
Idiopathic	29%	25.4%	53.7%	36%	44%	26.4%	51.7%
Toxoplasmosis	5%	7.2%	10%	21%	2%	7.4%	3.35%

JIA= juvenile idiopathic arthritis related uveitis

MD= Maryland; IL= Illinois; OR= Oregon; MA= Massachusetts

FL= Florida; UK= United Kingdom