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Risk factors for ocular complications and poor visual acuity at presentation among patients with uveitis associated with juvenile idiopathic arthritis (JIA)

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Abstract

Purpose—To describe the frequencies of and risk factors for ocular complications and poor visual acuity at presentation in a cohort of patients with juvenile idiopathic arthritis (JIA)-associated uveitis.

Design—Cross-sectional study.

Setting Single-center, academic practice.

Study population Seventy-five patients with JIA-associated uveitis were evaluated from July 1984 through August 2005.

Procedures Data on patients diagnosed with JIA-associated uveitis were entered retrospectively into a database and analyzed.

Outcome measures Visual acuity of 20/50 or worse or 20/200 or worse, and presence of ocular complications (including cataract, posterior synechiae, band keratopathy, elevated intraocular pressure, hypotony, macular edema, and epiretinal membrane) at presentation.

Results—At presentation, ocular complications were seen in 67% of eyes affected by JIA-associated uveitis. Presence of ≥ 1+ anterior chamber flare, a positive antinuclear antibody, and a shorter duration between the diagnosis of arthritis and uveitis were significantly associated with the presence of ocular complication. The frequencies of 20/50 or worse and of 20/200 or worse visual acuities at presentation in affected eyes were 36% and 24%, respectively. The presence of ≥ 1+ anterior chamber flare and a history of intraocular surgery prior to presentation were significantly associated with 20/50 or worse and 20/200 or worse vision. Presence of posterior synechiae also was associated with 20/200 or worse vision at presentation. The main causes of poor vision at presentation for affected eyes and better-seeing eyes were cataract, band keratopathy within the visual axis, and glaucoma.

Conclusions—Ocular complications and poor vision at presentation were common in our patients with JIA-related uveitis.

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Introduction

Juvenile idiopathic arthritis (JIA) comprises a heterogeneous group of arthritides of unknown etiology that begins before 16 years of age and persists for at least 6 weeks duration.[1-3] It is the most common systemic disorder associated with uveitis in childhood, accounting for approximately 75% of all pediatric anterior uveitis cases.[1] Risk factors for development of uveitis in patients with JIA have been reported as female gender, oligoarticular type of arthritis, young age at onset of arthritis, antinuclear antibody (ANA) seropositivity, and rheumatoid factor (RF) seronegativity.[2,4-6] Uveitis is estimated to occur in approximately 30% of patients who are ANA positive regardless of whether they have persistent oligoarticular, extended oligoarticular, or RF-negative polyarticular arthritis.[7] Typically the uveitis in these patients is a chronic, bilateral, nongranulomatous anterior uveitis that is insidious in onset and asymptomatic. In the majority of cases, the uveitis is diagnosed within four years of the diagnosis of the arthritis.[8-10]

Severe visual impairment has been reported in up to 38% of patients.[11,12] Increased severity of ocular disease at the initial examination has been reported as a risk factor for poor visual acuity outcomes at the last follow-up visit, but the follow-up time in these series are variable.[5,13,14] Other factors reported to predictive for visual impairment during follow-up include: uveitis onset prior to or at the time of arthritis diagnosis;[15,16] short duration between onset of arthritis and uveitis;[8,9] and male sex.[9,10,14] However, less is reported about risk factors for poor visual acuity at the time of presentation to the uveitis clinic. Chronic intraocular inflammation can lead to structural damage of ocular tissue and subsequent vision loss. Long-term ocular complications of JIA associated uveitis include cataract, band keratopathy, posterior synechiae, glaucoma, hypotony, and maculopathy.[1] The degree of ocular disease at initial examination may be an important prognostic factor in terms of the development of ocular complications and loss of visual acuity during follow up.[3,10,12] Risk factors for presenting with “severe” uveitis have been reported as male sex and having uveitis diagnosed < 6 months after the diagnosis of arthritis, although less information is available for risk factors for presenting with an ocular complication.[16] We analyzed the frequencies of and risk factors for having poor vision or an ocular complication at presentation in a cohort of 75 consecutive patients with JIA-associated uveitis evaluated at a single center.

Methods

Study population

All patients with JIA-associated uveitis who were seen by the Division of Ocular Immunology at the Wilmer Eye Institute between July 1984 and August 2005 were included in this study. Although arthritis initially was classified according to the American College of Rheumatology (ACR) criteria for juvenile rheumatoid arthritis, when the charts of patients were reviewed at the time of patient inclusion, each patient’s arthritis was reclassified into one of the seven JIA subtypes according to the criteria from the International League of Association for Rheumatology (ILAR).[3] Chest radiographs and Lyme antibody testing were performed on patients to rule out other causes of pediatric uveitis. Results of testing for antinuclear antibodies (ANA) were available for 66 of the 75 patients (88%). Additional diagnostic testing was performed when clinically indicated, including testing for the human leukocyte antigen (HLA)-B27 haplotype. The study was performed with the approval of the Johns Hopkins University School of Medical Institutional Review Board in accordance with the Declaration of Helsinki.

Data collection

Patients with JIA-related uveitis were identified from a database established in 1984. Clinical information at presentation of each patient evaluated for JIA-associated uveitis was collected

by retrospective chart review. Cross-sectional data included demographic characteristics, past medical and ophthalmic histories, ophthalmologic examination at presentation, results of diagnostic testing, and medications that patients were taking at the time in which the patients presented to our clinic. Ophthalmologic examinations included measurement of best-corrected visual acuity using Snellen charts, intraocular pressure assessment, and findings from the slit lamp and dilated fundus examinations at presentation. Use of corticosteroids and of immunosuppressive drugs, either prior to or at the time of presentation also was collected. Data were entered on a computer-based, standardized data entry form for statistical analysis.

Main outcome measures

Frequencies of poor visual acuity at presentation were assessed. Visual acuity cut-offs of 20/50 or worse (low vision) and 20/200 or worse (legal blindness) were used according to recommendations from the Standardization of Uveitis Nomenclature (SUN) Working Group.[17] Frequencies of ocular complications observed at presentation were assessed. Complications included presence of cataract, posterior synechiae, band keratopathy, ocular hypertension, hypotony, macular edema, and optic nerve edema. Cataract was defined as the presence of 1+ nuclear sclerosis or 1+ cortical change or trace posterior subcapsular changes. Macular edema was defined as the presence of macular thickening with or without cyst formation that was seen by clinical examination. Ocular hypertension was defined as intraocular pressure elevation > 21 mmHg and hypotony was defined as an intraocular pressure < 5 mmHg. The presence of band keratopathy and posterior synechiae were diagnosed by slit lamp examination. Epiretinal membrane formation and optic disc edema were diagnosed by indirect ophthalmoscopy.

Statistical analysis

Frequencies of variables were tabulated for patients and for affected eyes. For the risk factor analyses, crude and adjusted odds ratios (OR) were calculated using univariate and multivariate logistic regression. For the analyses of poor visual acuity, “by patient” analyses of the better-seeing eye and “by eye” analyses of all affected eyes are presented in separate tables. All “by eye” analyses accounted for correlation between eyes in patients with bilateral events using robust techniques.[18] All analyses were performed using Intercooled Stata 9.0 statistical software (Stata Corporation, College Station, TX).

Results

Study Population

Characteristics of the study population at presentation are summarized as Table 1. The median age at the diagnosis of arthritis for all types of JIA was 5 years (range: 1 to 16 years), and among patients with the persistent oligoarticular type of JIA, the median age at the time of diagnosis of the arthritis was 4 years. The median age at the time of diagnosis of uveitis for all patients in the study population was 7 years (range: 1 to 36 years). Among patients with persistent oligoarthritis, the median age at diagnosis of uveitis was 5 years. The majority of patients were female (73%), had persistent oligoarticular arthritis (81%) and were ANA positive (70%). When a sensitivity analysis was performed to evaluate the frequency of positive ANA in our population if all patients not tested for ANA were either all negative (lower bound) or all positive (upper bound), the range in the frequency of positive ANA at presentation was 61% to 73%. Seventy-one percent of patients had bilateral disease at presentation; 87% had anterior uveitis and 13% had anterior and intermediate uveitis. Prior to presentation, 35% of patients had been treated with oral corticosteroids for their uveitis, 19% with methotrexate, and 4% with cyclosporine at some point during their disease course. At presentation, 12% of patients were taking systemic corticosteroids, 16% were taking methotrexate, and 3% were taking cyclosporine for their uveitis.

There was a considerable delay between the diagnosis of uveitis in our patients and referral to our clinic. The median duration of uveitis prior to presentation was 6 years. Forty-eight of 75 patients (64%) developed uveitis after their arthritis was diagnosed; 13 patients (17%) were diagnosed with arthritis and uveitis simultaneously; and 14 patients (19%) developed arthritis after the diagnosis of uveitis was made. Among patients that developed uveitis after the diagnosis of arthritis, the median time to diagnosis of uveitis was 6 months and 75% of patients were diagnosed within 3 years of being diagnosed with arthritis.

Frequency of complications at presentation

Among the 75 patients with JIA-associated uveitis, 132 eyes were affected by uveitis. At least one ocular complication was present in 64% of patients and in 67% of eyes affected with uveitis at presentation (Table 1). In the 132 affected eyes, band keratopathy was the most frequent complication observed (32%), followed by posterior synechiae (28%), cataract (22%), and ocular hypertension (15%). Gonioscopy was performed in 15 patients (30 eyes) at presentation, and 17/30 eyes (57%) were found to have peripheral anterior synechiae. Less frequent complications included hypotony (9%), epiretinal membrane (4%), optic nerve edema (4%), and macular edema (3%). Active intraocular inflammation, as evidenced by $\geq$ 0.5+ anterior chamber cells, was observed in 44% of affected eyes at presentation. Anterior chamber flare of $\geq$ 1+ was present in 49% of affected eyes. Active intraocular inflammation was associated with presence of at least one ocular complication at presentation (odds ratio [OR] = 2.88; 95% confidence interval [CI]: 1.40, 5.92; P = 0.004).

Risk factors for presenting with an ocular complication

Risk factors for presenting to our clinic with at least one ocular complication in an eye with uveitis are summarized as Table 2. In the univariate analysis, younger age, bilateral uveitis, shorter duration between the diagnosis of arthritis and uveitis, longer duration of uveitis, positive ANA, persistent oligoarthritis type of JIA, use of corticosteroids or methotrexate prior to presentation, and presence of anterior chamber cell or flare at presentation all were statistically significant risk factors for having at least one ocular complication at presentation. After controlling for potentially confounding variables, shorter duration between the diagnosis of arthritis and uveitis, positive ANA, and the presence of anterior chamber flare $\geq$1+ at presentation remained statistically significant risk factors for having an ocular complication at presentation.

Frequency of poor visual acuity at presentation

Forty-eight eyes (36%) had 20/50 or worse visual acuity at presentation and 31 eyes (24%) had 20/200 or worse visual acuity at presentation. Fourteen patients (19%) had bilateral 20/50 or worse vision at presentation and nine patients (12%) had bilateral 20/200 or worse vision at presentation. If the 8 affected eyes of the 5 patients with episodic uveitis (3 patients with enthesitis-related arthritis, 1 patient with psoriatic arthritis, and 1 patient with systemic JIA) are excluded, 39% of affected eyes had a visual acuity of 20/50 or worse and 25% of affected eyes had a visual acuity of 20/200 or worse at presentation. In fact all of the affected eyes of patients with systemic, psoriatic, or enthesitis-related arthritis had visual acuities at presentation of 20/30 or better.

Risk factors for poor vision at presentation

Because none of the eyes of patients with systemic, psoriatic, or enthesitis-related arthritis had chronic uveitis and nor did they have poor vision at presentation, these patients (n = 5) were excluded from the analyses of the risk factors and causes of reduced vision at presentation in order to analyze a more homogeneous group of patients with JIA-associated chronic uveitis. Risk factors for poor vision at presentation for affected eyes and better-seeing eyes of patients

with JIA-associated chronic uveitis are summarized as Tables 3 and 4, respectively. The presence of anterior chamber flare ≥ 1+ and a history of surgery prior to presentation were statistically significant risk factors for 20/50 or worse vision at presentation for affected and better-seeing eyes of patients with JIA-associated chronic uveitis after controlling for other variables. A history of ocular hypertension or glaucoma prior to presentation and treatment of uveitis with oral corticosteroids prior to presentation also appeared to increase the odds of having a visual acuity of 20/50 or worse at presentation among affected eyes, but the results did not achieve conventional statistical significance. Use of methotrexate at presentation was the only tested variable found to be protective against poor vision at presentation but only for the outcome of 20/50 or worse visual acuity in affected eyes (odds ratio [OR] = 0.03; 95% confidence interval [CI]: 0.001, 0.96; P = 0.05). For the 20/200 or worse visual acuity outcome, the presence of posterior synechiae, anterior chamber flare ≥ 1+, and a history of surgery prior to presentation were statistically significant risk factors for affected eyes of patients with JIA-associated chronic uveitis, whereas only presence of anterior chamber flare ≥ 1+ was a statistically significant risk factor among better-seeing eyes after adjusting for potentially confounding variables. There was a suggestion that boys had a higher risk of 20/200 or worse vision at presentation after controlling for other variables, but the result did achieve conventional statistical significance (OR = 3.70; 95%CI: 0.92, 14.3; P = 0.07).

Causes of reduced vision at presentation

Causes of poor vision at presentation for affected and better-seeing eyes of patients with JIA-associated chronic uveitis are summarized as Tables 5 and 6, respectively. The most common causes of 20/50 or worse and 20/200 or worse visual acuity at presentation for affected eyes and better-seeing eyes were cataract, band keratopathy present within the visual axis, and a history of glaucoma prior to presentation to our clinic. Macular edema was an uncommon cause of reduced vision at presentation, accounting for 6% to 11% of the reduced vision at presentation, and in all cases, the macular edema was secondary to hypotony. Optic nerve edema accounting for poor vision at presentation was either associated with moderately to severely active intraocular inflammation (≥ 2+ anterior chamber cell) or with hypotony.

Discussion

JIA associated uveitis is the most common cause of chronic uveitis in childhood and may result in significant visual impairment as a consequence of ocular complications such as cataract, band keratopathy, glaucoma, and macular pathology.[1,4,8] We reviewed our experience with JIA-associated uveitis over 21 years. As in all retrospective studies, our results must be interpreted with caution. A referral bias exists because our institution is a tertiary care medical center, and it is possible that only the most severe cases of JIA associated uveitis were referred to our center as suggested by high frequencies of ocular complications and poor visual acuity as well as the long duration of uveitis prior to presentation to our clinic. The frequency of ocular complications in our cohort is similar to that reported from other tertiary care centers,[1,13] and approximately 33% higher than that found in a population-based study in which the frequency of ocular complication at presentation was 45%.[19] There also are limitations inherent to the use of cross-sectional data, such as the difficulty in assessing temporal associations or cohort effects. The number of events was small for some outcomes, which may have limited the precision of odds ratios for certain risk factors and increased the likelihood of a type II error. Despite these limitations, this study suggests that visual impairment and structural ocular complications still occur frequently in JIA-related uveitis seen in the tertiary care setting.

There appeared to be a significant delay in the referral of patients with JIA-related uveitis to our clinic as the median duration of uveitis at the time of presentation to our clinic was 6 years. In our cohort, a longer duration of uveitis at presentation was associated with the presence of

at least one structural ocular complication and of poor vision at presentation in the univariate analyses but the association did not remain statistically significant after controlling for other potentially confounding variables. Because patients with durations of uveitis longer than 6 years were more likely to have had intraocular surgery prior to presentation and more likely to have anterior chamber flare at presentation (data not shown) and these two variables were statistically significant risk factors poor vision at presentation, it is possible that prior surgery and anterior chamber flare are surrogates for chronic disease in our patients. Delay in referral to a tertiary care center or uveitis specialist has been reported to be a risk factor for poor clinical and visual outcomes in uveitis,[13] presumably due to the delay in aggressive management of the inflammation. The fact that only ~20% of the cohort received immunosuppressive drug therapy prior to or at the time of presentation coupled with the high frequencies of ocular complications and reduced visual acuity at presentation and lengthy duration of uveitis at presentation in our patients support this premise. We also observed that 44% of eyes affected with JIA-related uveitis had ≥ 1+ anterior chamber cell at the time of presentation and that this was associated with an almost 3-fold increase in the odds of having an ocular complication (OR = 2.88; P = 0.004). Furthermore, since the leading causes of poor vision at presentation in this cohort were largely reversible causes of vision loss (e.g., cataract and band keratopathy), and since many children with JIA-related uveitis are at risk of developing amblyopia, prompt and aggressive control of intraocular inflammation in these patients in order to avoid sight-threatening complications is critical. Fortunately in our cohort the number of patients with poor vision due to cataract or band keratopathy who were at risk for developing amblyopia was low (n = 3).

Although many clinical characteristics were observed to be significant risk factors for the presence of visual impairment and ocular complications at presentation in the univariate analyses, the presence of ≥ 1+ anterior chamber flare appeared to be consistently associated with both poor vision and with ocular complications at presentation after controlling for other variables. Presence of anterior chamber flare as measured by laser flare photometry has been reported previously to be associated with the presence of any ocular complication and with poorer visual acuity at the initial examination in a cohort of 59 children with chronic uveitis, 29% of whom were diagnosed with JIA.[20] The presence of posterior synechiae at presentation also has been reported to be a risk factor for the development of ocular complications and loss of visual acuity over follow-up time and likely is a surrogate for disease severity at presentation.[5,14] In our cohort, presence of posterior synechiae was associated with 20/200 or worse vision at presentation after controlling for other variables. A history of intraocular surgery prior to presentation was strongly associated with poor vision at presentation for better-seeing eyes and affected eyes. Prior surgery may be a marker for disease severity or a marker for longer duration of uveitis. Further, we have no information on the degree of uveitis activity or the use of anti-inflammatory therapy during the perioperative period. Operations performed on eyes with ongoing active inflammation have been demonstrated to result in poor visual acuity outcomes,[13,21] which potentially could explain part of the large risk for visual impairment at presentation seen among our patients with prior intraocular surgery.

We found that patients who were receiving methotrexate for their uveitis at the time of presentation had a significantly lower risk of 20/50 or worse visual acuity in affected eyes at presentation after controlling for other potentially confounding variables. A similar protective effect was suggested for better-seeing eyes, but the result did not achieve conventional statistical significance. However, patients receiving methotrexate prior to or at the time of presentation had a 3 to 4-fold higher odds of having an ocular complication at presentation than did patients with no history of methotrexate use. Additionally, methotrexate appeared to be a mild risk factor for poor vision in the univariate analyses, although these results were not found to be statistically significant. These findings, in conjunction with the increased risk of poor vision and ocular complications among those patients who had received oral

corticosteroids, likely represent a treatment bias by indication in which patients with more severe uveitis (who would be more likely to have ocular complications and visual impairment) are more likely to receive aggressive treatment than those patients with milder disease. It is possible that by controlling for other variables that are associated with the presence of ocular complications that could cause poor visual acuity at presentation (e.g. increased duration of uveitis, presence of anterior chamber flare), we were able to demonstrate a protective effect of methotrexate for visual acuity of 20/50 or worse despite the treatment bias. Furthermore, patients who were receiving methotrexate at presentation had been treated with methotrexate for longer periods of time than had patients who received methotrexate only prior to presentation (methotrexate therapy for ≥ 1 year in all patients receiving methotrexate at presentation versus 36% of patients receiving methotrexate prior to presentation; P = 0.02). It is possible that these patients experienced better control of their intraocular inflammation and thus had better vision at presentation than those patients who received methotrexate for shorter durations. The effect of immunosuppressive drugs on the incidence of visual impairment will require longitudinal data.

In summary, poor vision and ocular complications still occur commonly among children with JIA-related uveitis, particularly if there is a long delay in referral to a tertiary care center. Duration of uveitis, short duration between diagnosis or arthritis and uveitis, a positive ANA, and presence of ≥ 1+ anterior chamber flare were associated with the presence of any ocular complication at presentation. Presence of anterior chamber flare was associated with poor vision at presentation in affected and better-seeing eyes. The two most common causes of poor vision at presentation were cataract and band keratopathy within the visual axis, both of which are reversible causes of poor vision. Prompt referral of these patients to a uveitis specialist and early aggressive therapy with immunosuppressive agents may decrease the odds of poor vision.

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Biography

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Table 1

Characteristics of Patients with Juvenile Idiopathic Arthritis and Uveitis

Number of patients	75
Median age at diagnosis of uveitis, yr (range)	7 (1-36)
Median age at diagnosis of arthritis, yr (range)	5 (1-16)
Gender	
% female	73.3
% male	26.7
Race	
% white	84.9
% black	6.9
Median duration of arthritis prior to presentation, yr (range)	10 (1 month-52)
Median duration of arthritis prior to diagnosis of uveitis, yr (range)	1 (0-36)
Median duration of uveitis prior to presentation, yr (range)	6 (1 month-48)
Bilateral uveitis, %	70.7
Type of JIA	
% Persistent oligoarticular (n)	81.3 (61)
% Systemic	1.3 (1)
% Polyarticular, RF negative	6.7 (5)
% Polyarticular, RF positive	5.3 (4)
% Enthesitis-related	4.0 (3)
% Psoriatic arthritis	1.3 (1)
Type of uveitis	
% Anterior uveitis	86.7
% Anterior and intermediate uveitis	13.3
% ANA positive	69.7
Median ANA titer (range)	1:160 (1:10 - 1:640)
Therapies prior to presentation	
Oral corticosteroids, %	35.1
Methotrexate, %	18.7
Cyclosporine, %	4.0
Periocular corticosteroid injection, %	18.7
Therapies at presentation	
Oral corticosteroids, %	12.0
Methotrexate, %	16.0
Cyclosporine, %	2.7
Visual acuity, %	
Better eye, 20/50 or worse	18.7
Better eye, 20/200 or worse	12.0
Eye-specific characteristics	
Number of affected eyes	132
Ocular findings at presentation, %	
Band keratopathy	31.5
Posterior synechiae	27.5
Cataract	22.5
Aphakic	17.0
Pseudophakic	6.1
Keratic precipitates	15.4
Macular edema	3.0
Epiretinal membrane	3.8
Optic nerve edema	4.5
Anterior chamber cell (≥ 0.5+)	44.3
Anterior chamber flare (≥ 1+)	49.0
Vitreous cell (≥ 0.5+)	23.2
Ocular hypertension	15.3
Hyptony	9.3
Visual acuity at presentation, affected eyes, %	
20/50 or worse	36.4
20/200 or worse	23.7
Surgeries prior to presentation	
Cataract extraction	26.7
YAG laser capsulotomy	1.3
Band keratopathy chelation	5.3
Trabeculectomy	2.6
Tube shunt placement	0.7
Laser peripheral iriditomy	1.3
Vitrectomy	7.3

ANA = antinuclear antibody; JIA = juvenile idiopathic arthritis; yr = years; (n) = number of patients with characteristic; (n/N) = number of eyes with characteristic/number of eyes at risk

Table 2

Risk factors for having at least one ocular complication at presentation in eyes with JIA-related uveitis.

Characteristic	Crude OR (95% CI)*	P-value	Adjusted OR (95% CI)†	P-value
Age at uveitis diagnosis	0.92 (0.88, 0.97)	0.03	0.83 (0.68, 1.01)	0.06
Gender (male vs female)	1.09 (0.48, 2.44)	0.85		
Race (other vs white)	2.49 (0.50, 12.45)	0.27		
Bilateral disease	6.24 (2.83, 13.74)	<0.001		
Duration between diagnosis of arthritis and uveitis (years)	0.92 (0.87, 0.97)	0.005	0.89 (0.82, 0.96)	0.005
Duration of uveitis (years)	1.09 (1.03, 1.15)	0.002	1.06 (0.99, 1.13)	0.10
Persistent oligoarthritis	3.44 (1.39, 8.53)	0.008		
ANA-positive	5.99 (2.49, 14.41)	<0.001	3.92 (1.19, 12.87)	0.02
Anterior chamber cell (≥ 0.5+ cells vs ≤ rare cell)	2.88 (1.40, 5.92)	0.004		
Anterior chamber flare (≥ 1+ vs 0)	5.25 (2.63, 10.50)	<0.001	3.82 (1.39, 10.49)	0.009
Prior systemic corticosteroids	8.81 (2.86, 27.1)	<0.001		
Prior methotrexate	3.70 (1.02, 13.4)	0.05		
Systemic corticosteroids at presentation	1.91 (0.50, 7.30)	0.34		
Methotrexate at presentation	3.45 (0.95, 12.56)	0.06		

JIA = juvenile idiopathic arthritis

Table 3

Risk factors for poor visual acuity at presentation in eyes affected with JIA-related uveitis

Characteristic	20/50 or worse		20/200 or worse	
	Crude OR (95% CI, P)*	Adjusted OR (95% CI, P)†	Crude OR (95% CI, P)*	Adjusted OR (95% CI, P)†
Age at uveitis diagnosis	0.98 (0.94-1.03, 0.44)		0.93 (0.87-0.99, 0.03)	
Gender (male vs female)	0.92 (0.46-1.85, 0.83)		1.06 (0.44-2.56, 0.88)	3.70 (0.92-14.3, 0.07)
Race (other vs white)	1.41 (0.92-2.16, 0.12)		1.28 (0.82-1.98, 0.28)	
Bilateral disease	2.19 (0.81-5.92, 0.12)		4.33 (0.95-9.65, 0.06)	
Duration of uveitis (years)	3.77 (1.74-8.17, 0.001)		3.38 (1.37-8.29, 0.008)	
Persistent oligoarthritis	1.36 (0.54-3.44, 0.51)		0.84 (0.30-2.15, 0.66)	
ANA-positive	3.40 (1.27-9.08, 0.02)		2.71 (0.85-8.61, 0.09)	
Posterior synechiae	3.51 (1.62-7.64, 0.002)		2.23 (1.00-5.14, 0.05)	8.56 (1.67-43.8, 0.01)
Band keratopathy (peripheral)	3.17 (1.84-5.46, <0.001)		3.51 (2.10-5.87, 0.001)	
Anterior chamber flare	3.23 (1.96-5.32, <0.001)	7.16 (1.48-34.6, 0.01)	2/03 (1.28-3.21, 0.003)	1.82 (1.04-3.18, 0.04)
Abnormal IOP (<5 or >21 mm Hg)	3.28 (1.44-7.42, 0.004)		4.58 (1.90-11.03, 0.001)	2.56 (0.81-8.11, 0.11)
Prior hypotony	13.26 (2.62-67.07, 0.002)		8.55 (2.15-33.90, 0.002)	
Prior ocular hypertension	2.50 (1.01-6.19, 0.05)	4.26 (0.71-25.5, 0.11)	2.17 (0.79-5.94, 0.13)	
Prior systemic corticosteroids	5.08 (2.33-11.04, <0.001)	4.43 (0.88-22.2, 0.07)	4.32 (1.84-10.20, 0.001)	
Prior methotrexate	1.26 (0.53-3.01, 0.60)		1.86 (0.74-4.73, 0.19)	
Prior surgery	9.16 (3.94-21.31, <0.001)	12.11 (2.44-21, 0.008)	7.27 (2.99-17.66, 0.001)	12.92 (1.90-88.1, 0.009)
Systemic corticosteroids at presentation	3.00 (0.99-9.07, 0.05)		6.41 (2.06-19.98, 0.001)	
Methotrexate at presentation	1.06 (0.42-2.66, 0.90)	0.13 (0.01-0.96, 0.05)	1.83 (0.69-4.81, 0.22)	

JIA = juvenile idiopathic arthritis

* OR = odds ratio (95% Confidence interval, P-value)

Table 4

Risk factors for poor visual acuity at presentation in better-seeing eyes of patients with JIA-related uveitis

Characteristic	20/50 or worse		20/200 or worse	
	Crude OR (95% CI, P)*	Adjusted OR (95% CI, P)†	Crude OR (95% CI, P)*	Adjusted OR (95% CI, P)†
Age at uveitis diagnosis	0.97 (0.89-1.06, 0.49)		0.93 (0.84-1.04, 0.21)	
Gender (male vs female)	1.06 (0.39-2.88, 0.91)		1.61 (0.43-6.25, 0.47)	
Race (other vs white)	1.57 (0.86-2.88, 0.14)		1.50 (0.78-2.88, 0.22)	
Bilateral disease	6.83 (0.82-56.6, 0.08)		No events	
Duration of uveitis (years)	5.81 (1.18-28.46, 0.03)		2.92 (0.56-15.27, 0.20)	
Persistent oligoarthritis	1.62 (0.32-8.28, 0.56)		0.86 (0.16-4.68, 0.86)	
ANA-positive	5.28 (0.62-45.12, 0.13)		2.32 (0.25-21.59, 0.46)	
Posterior synechiae	3.16 (0.90-11.15, 0.07)	6.95 (0.71-67.5, 0.09)	2.67 (0.63-11.32, 0.18)	
Anterior chamber flare	2.54 (1.30-4.98, 0.006)	6.65 (1.62-27.3, 0.008)	3.37 (1.46-7.77, 0.004)	3.55 (1.18-10.7, 0.02)
Abnormal IOP (<5 or >21 mm Hg)	2.59 (0.78-8.56, 0.12)		1.84 (0.44-7.65, 0.40)	
Prior hypotony	20.67 (2.54-168, 0.005)		16.00 (1.82-140.5, 0.01)	
Prior ocular hypertension	1.43 (0.32-6.30, 0.64)		1.80 (0.32-10.24, 0.51)	
Prior systemic corticosteroids	4.95 (1.43-17.14, 0.01)		9.14 (1.71-48.8, 0.01)	
Prior methotrexate	0.76 (0.15-3.92, 0.74)		1.43 0.26-7.91, 0.68)	
Prior surgery	10.21 (2.70-38.56, 0.001)	13.26 (1.44-122, 0.02)	6.25 (1.39-28.2, 0.02)	7.54 (1.74-30.7, 0.01)
Systemic corticosteroids at presentation	3.05 (0.63-14.85, 0.17)		6.10 (1.15-32.4, 0.03)	
Methotrexate at presentation	0.85 (0.16-4.45, 0.85)	0.17 (0.01-2.08, 0.16)	1.60 (0.29-8.94, 0.59)	

JIA = juvenile idiopathic arthritis

*OR = Odd ratio

†CI = Confidence interval.

Table 5

Causes of poor visual acuity at presentation in eyes affected by JIA-related uveitis

Cause	20/50 or worse, % (n = 48)*	20/200 or worse, % (n = 31)*
Cataract	29.2 (14)	22.6 (7)
Band keratopathy in visual axis	31.2 (15)	45.2 (14)
History of glaucoma	37.5 (18)	38.7 (12)
Requiring trabeculectomy	6.2 (3)	6.4 (2)
Requiring tube shunt	2.1 (1)	0 (0)
Optic nerve edema	6.2 (3)	6.4 (2)
Macular edema	8.3 (4)	6.4 (2)
Epiretinal membrane	6.2 (3)	3.2 (1)

JIA = juvenile idiopathic arthritis

* Percentages add to >100% because an eye could have more than one mechanism for poor visual acuity at presentation.

Table 6

Causes of poor visual acuity at presentation in better-seeing eyes in patients with JIA-related uveitis

Cause	20/50 or worse, % (n = 14)*	20/200 or worse, % (n = 9)*
Cataract	28.5 (4)	22.2 (2)
Band keratopathy in visual axis	28.5 (4)	44.4 (4)
Glaucoma	28.5 (4)	33.3 (3)
Requiring trabeculectomy	7.1 (1)	11.1 (1)
Requiring tube shunt	0 (0)	0 (0)
Optic nerve edema	0 (0)	0 (0)
Macular edema	7.1 (1)	11.1 (1)
Epiretinal membrane	7.1 (1)	0 (0)

JIA = juvenile idiopathic arthritis

* Percentages add to >100% because an eye could have more than one mechanism for poor visual acuity at presentation.