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CLINICAL STUDY

Ophthalmic presentation of giant cell arteritis in African-Americans

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Abstract

Purpose **To determine the differences in the presentation of ophthalmic giant cell arteritis between African-Americans and Caucasians.**

Methods **This was a multicenter retrospective case series comparing African-American patients with ophthalmic GCA to a previously published Caucasian cohort. Neuro-ophthalmic centers across the United States were contacted to provide data on African-American patients with biopsy-proven ophthalmic giant cell arteritis. The differences between African-American and Caucasian patients with respect to multiple variables, including age, sex, systemic and ophthalmic signs and symptoms, ocular ischemic lesions, and laboratory results were studied.**

Results **The Caucasian cohort was slightly older (mean = 76.1 years) than the African-American cohort (mean = 72.6 years, $P = 0.03$), and there was no difference in sex distribution between the two cohorts. Headache, neck pain, and anemia were more frequent, while jaw claudication was less frequent in African-Americans ($P < 0.01$, < 0.001, 0.02, and 0.03 respectively). Acute vision loss was the most common presentation of giant cell arteritis in both groups, though it was less common in African-Americans (78 *vs* 98% of Caucasians, $P < 0.001$). Eye pain was more common in African-Americans (28 *vs* 8% of Caucasians, $P < 0.01$).**

Conclusions **The presenting features of ophthalmic giant cell arteritis in African-Americans and Caucasians are not markedly different, although a few significant differences exist, including higher rates of headache, neck pain, anemia, and eye pain, and lower rates of jaw claudication and acute vision loss in African-Americans. Persons presenting with suspicious signs and symptoms should undergo evaluation for giant cell arteritis regardless of race.**

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Introduction

Giant cell arteritis (GCA) is a systemic vasculitis of large and medium-sized arteries, with an incidence across all races reported in the range of 1.58 to 100.6 per 100 000 persons >50 years old.[1,2] GCA is considered to be a true ophthalmologic emergency since it can cause permanent vision loss due to ischemia of the optic nerve, retina, and intracranial structures. Early diagnosis is critical in order to prevent blindness in GCA patients. It is thus important for physicians to know which patients are at risk for this disease, and to quickly recognize its presentation and begin treatment. GCA is generally believed to be most common in Caucasians, and as recently as 1977 it was thought that there were no documented cases of GCA in any other race.[3] Since then a few studies have reported on the occurrence of GCA in minority groups. The incidence in African-Americans is believed to be lower than in Caucasians,[1,4–7] but there is no clear consensus on the nature of disease presentation in this population, as the majority of studies of GCA in African-Americans are case reports or small case series.[8–17] One study did not find a difference in the presentation of GCA in African-Americans compared with Caucasians,[17] another reported higher rates of vision loss and jaw claudication,[15] and a third noted higher rates of male patients, vision loss, and anemia, and lower rates of constitutional symptoms.[16] The inconsistent associations in these studies may be due to the small sample size of patients with ophthalmic presentations in these studies. While African-American patients with visual symptoms have been reported in these studies, the numbers are fewer. Our study compares a cohort of African-American patients

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with biopsy-proven ophthalmic GCA with a similar published cohort of Caucasian patients.[18]

Methods

Neuro-ophthalmologists at 10 healthcare institutions provided the data in a retrospective manner on history, exam findings, and laboratory results in African-American patients with biopsy-proven GCA with ophthalmic manifestations attributed to GCA. Histopathologic criteria for a positive temporal artery biopsy included the presence of a chronic granulomatous vasculitis, characterized by mononuclear infiltrate in the media, or adventitia that contained epithelioid histiocytes and/or giant cells. All cases presenting through 2014 were included, with the earliest case presenting in 1994. The study protocols were approved by institutional review boards at each study site. All study sites complied with the Health Insurance Portability and Accountability Act. The research adhered to the tenets of the Declaration of Helsinki.

Patients were categorized as African-American based on self-identification upon initial registration with the hospital system. A data collection form was completed for each patient by the neuro-ophthalmologist involved in the care of the patient, after reviewing the patient chart which contained information regarding demographics, systemic and ophthalmic signs and symptoms at presentation, and laboratory results. Given the retrospective method of data collection, if specific symptoms were not inquired into by the physician, then this information was documented in the data collection form provided to the neuro-ophthalmologist. The patients were de-identified prior to submission of their data collection forms. Investigators also provided the total number of patients of all races with ophthalmic GCA seen at their institutions, within the review period if available.

The African-American cohort was compared with a cohort of 84 Caucasian patients with biopsy-proven ophthalmic GCA, extracted from a published study from the University of Iowa of 85 ophthalmic GCA patients that also included 1 African-American.[18] For comparisons with the African-American cohort in the current study, the data from 84 Caucasian patients with respect to age, sex, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) level, ophthalmic symptoms, and ischemic lesions were compared. The data from the single African-American patient was removed from the Caucasian cohort for these comparisons. The systemic signs and symptoms data were not available for the single African-American patient in the University of Iowa study, thus those comparisons with the current African-American cohort were made with respect to the full 85 patient cohort.

The African-American cohort and the Caucasian cohort were compared with respect to age, sex, systemic and ophthalmic signs and symptoms, ocular ischemic lesions, and ESR and CRP levels. The two-sample *t*-test was used to compare ages of the two groups. The χ^2-test was used to compare genders. The Wilcoxon rank-sum test was used to compare ESR and CRP levels. Comparisons of the systemic and ophthalmic signs and symptoms and ischemic lesions were made using the Fisher's exact test or chi-squared test depending on the number of affected patients, as indicated within the results section. The mean visual acuity (VA) of African-American eyes, by the type of ocular ischemic lesion, was calculated.[19]

Results

Thirty institutions were contacted to participate in the study. Institutions were selected based on demographics and the likelihood of having significant number of African-American patients. Ten did not have African-American patients with ophthalmic GCA, and 10 chose not to participate. The remaining 10 institutions provided a total of 32 African-American patients with biopsy-proven GCA, who presented with ophthalmic manifestations between 1994 and 2014.

The mean age of the African-American cohort was slightly lower than that of the Caucasian cohort (72.6 years *vs* 76.1 years, $P = 0.03$) (Table 1), due to inclusion of 1 African-American patient who was 46 years old. There was

Table 1 Demographics and Laboratory Results of Patients with Ophthalmic Giant Cell Arteritis

	African-American (n = *32*)	*Caucasian*[a] (n = *84*)	P-*value*[b]
Age (yrs)			
Mean ± SD	72.6 ± 9.2	76.1 ± 7.0	0.03
Range	46–91	57.1–93.4	
Sex			
Men	10 (31%)	24 (29%)	0.82
Women	22 (69%)	60 (71%)	
ESR			
No. of patients	31	71	0.23
Mean ± SD (mm/hr)	87.9 ± 34.5	79.6 ± 30.8	
CRP			
No. of patients	20	14	0.18
Mean ± SD (mg/dl)	26.2 ± 47.1	8.22 ± 14.44	

[a]Published cohort;[18] excludes the single patient who was African American. [b]Two-sample *t*-test for comparison of age, χ^2-test for comparison of proportions by sex, Wilcoxon rank-sum test for comparisons of ESR and CRP.

Table 2 Clinical Fefatures of Ophthalmic Giant Cell Arteritis

	African-American[a] (n = *32*)	*Caucasian*[b]	*Odds Ratio (95% CI)*	P-*value*[c]
Systemic Symptoms[d] *n = 85*				
Fever	2/19 (11%)	12 (14%)	0.72 (0.15, 3.50)	1.00
Weight loss	10/25 (40%)	29 (34%)	1.29 (0.51, 3.22)	0.59
Malaise	5/19 (26%)	27 (32%)	0.77 (0.25, 2.35)	0.79
Anorexia	4/18 (22%)	25 (29%)	0.69 (0.21, 2.29)	0.77
Headache	21/28 (75%)	38 (45%)	3.71 (1.43, 9.66)	<0.01
Jaw claudication	9/29 (31%)	46 (54%)	0.38 (0.16, 0.93)	0.03
Neck pain	9/16 (56%)	11 (13%)	8.65 (2.68, 28.0)	<0.001
Scalp tenderness	7/29 (24%)	15 (18%)	1.48 (0.54, 4.11)	0.44
Myalgia	3/18 (17%)	12 (14%)	1.22 (0.31, 4.84)	0.72
Anemia (Hgb<11 g/dl)	10/29 (34%)	12 (14%)	3.20 (1.20, 8.53)	0.02
Ophthalmic Symptoms n = 84				
Amaurosis fugax	5 (16%)	26 (31%)	0.42 (0.15, 1.21)	0.16
Acute vision loss	25 (78%)	82 (98%)	0.09 (0.02, 0.45)	<0.001
Diplopia (transient or permanent)	4 (13%)	5 (6%)	2.29 (0.57, 9.12)	0.25
Eye pain	9 (28%)	7 (8%)	4.36 (1.46, 13.0)	<0.01
Ophthalmic Signs n = 84				
Anterior ischemic optic neuropathy	20 (63%)	68 (81%)	0.39 (0.16, 0.96)	0.04
Central retinal artery occlusion	4 (13%)	12 (14%)	0.87 (0.26, 2.92)	1.00
Posterior ischemic optic neuropathy	2 (6%)	6 (7%)	0.88 (0.17, 4.59)	1.00

[a]Not all systemic symptom data was collected for all African-American patients. [b]Published cohort[18] Individual headings indicate the number of patients. [c]Fisher's exact test when there are five or fewer patients with any race/characteristic combination, χ^2-test otherwise. [d]Systemic symptoms data was not available for the single African-American patient, thus the Caucasian group includes the single African-American patient ($n = 85$) for these comparisons.

no difference in sex distribution between the two groups, with women more highly represented in both groups. ESR and CRP levels showed a nonsignificant trend toward higher levels in the African-American cohort than in the Caucasian cohort ($P = 0.23$ and $P = 0.18$, respectively).

In comparing systemic signs and symptoms at presentation, headache, neck pain, and anemia were more frequent in African-Americans, while jaw claudication was noted to be less frequent ($P < 0.01$, < 0.001, 0.02, 0.03, respectively) (Table 2). Acute vision loss was reported by the majority of African-Americans (78%) and Caucasian (98%) patients. Eye pain was more common in African-Americans (28 *vs* 8% of Caucasians, $P < 0.01$). Ocular ischemic lesions included anterior ischemic optic neuropathy (AION) (63% of African-Americans *vs* 81% of Caucasians, $P = 0.04$), central retinal artery occlusion (CRAO) (13% of African-Americans *vs* 14% of Caucasians, $P = 1.00$), and posterior ischemic optic neuropathy (PION) (6% of African-Americans *vs* 7% of Caucasians, $P = 1.00$). Bilateral ocular ischemic lesions were seen in seven of the African-American patients, with six patients having bilateral AION, and 1 patient with AION in 1 eye and CRAO in the other eye. In the African-American cohort, cotton wool spots were seen in three patients, while choroidal infarction was noted in 1 patient. In the Caucasian cohort, one-third of the eyes with visual loss seen during early stages showed the presence of cotton wool spots in the posterior pole, while 10 eyes had choroidal infarction. However, both these findings were seen in addition to other causes of retinal ischemia, therefore, both cohorts were not compared with respect to the prevalence of these findings alone.

In the African-American cohort, 40% of the eyes had VA of 20/40 or better at presentation, 35% had VA of 20/50 to 20/400, and 25% of the eyes ranged from counting fingers to no light perception. The average VA was 20/35 (LogMAR 0.24) for eyes without ocular ischemic lesions, 20/276 (LogMAR 1.14) for eyes with AION, 20/2518 (LogMAR 2.10) for eyes with CRAO, and 20/2000 (LogMAR 2.00) for eyes with PION (Table 3).

Four of the 10 institutions had comprehensive data on the total number of patients with biopsy-proven ophthalmic GCA that presented within the review period. Of the 155 patients seen at these four institutions, 8 (5.2%) were African-Americans.

Occult GCA is defined as ophthalmic GCA in the absence of systemic signs and symptoms. Six of the 32 (18.75%) African-American patients presented with occult GCA. All of the six patients with occult GCA were women presenting with vision loss, and they were, on average, older than the

Table 3 Mean Visual Acuity (VA) of African-Americans by Ocular Ischemic Lesion

Ocular ischemic lesion	*No. of Eyes (unmeasured or LP or NLP[a])*	*Mean LogMAR ± SD*	*Snellen Equivalent*
None	32 (2)	0.24 ± 0.31	20/35
Anterior ischemic optic neuropathy (AION)	26 (2)	1.14 ± 0.84	20/276
Central retinal artery occlusion (CRAO)	4 (1)	2.10 ± 0.85	20/2518
Posterior ischemic optic neuropathy (PION)	2 (1)	2.00	20/2000

[a]VA of 2 eyes without ocular ischemic lesions was not measured, 2 eyes with AION and 1 eye with CRAO had NLP vision and 1 eye with PION had LP vision.

non-occult patients. Due to the limited number of patients with occult GCA, statistical comparisons between the occult and non-occult groups were not performed.

Discussion

Giant cell arteritis is considered to be less common in African-Americans than in Caucasians, in whom the incidence ranges from 1.8 to 29 per 100 000 persons >50 years old.[1,4–6,20–23] There is limited data available on the incidence and presentation of GCA in African-Americans, especially with regard to the ophthalmic manifestations of the disease. The current results indicate that the presenting features of ophthalmic GCA in Africans-Americans and Caucasians are not dramatically different, although a few significant differences were identified.

The average age of our African-American cohort was lower than that of the Caucasian cohort (72.6 years *vs* 76.1 years, $P=0.03$). Notably, 1 African-American patient was 46 years old. The disease is rare amongst patients under 50 years old, with only ~40 such cases reported in the literature.[24] With exclusion of the 46-year-old patient, there would be no significant difference in the average age of African-Americans and Caucasians (73.5 years *vs* 76.1 years, $P=0.07$). Therefore, the data does not clearly support the conclusion that GCA typically presents at an earlier age in African-Americans.

The sex distributions of the two cohorts were nearly identical, as ~70% of patients in both the groups were females. This difference is consistent with most reports, with GCA affecting women at rates 2.5 to 3 times higher than men, similar to other autoimmune diseases.[25] However, another study reported a higher percentage of males with GCA in their African-American cohort than in their Caucasian cohort (38 *vs* 17%).[16] That study included all patients with GCA, and not just those with ophthalmic manifestations. Overall, the current data are consistent with most of the literature and suggests that African-American and Caucasian women have similar degrees of increased risk.

Although rates of most systemic signs and symptoms were similar between the two groups, the African-American cohort had significantly higher rates of headache, neck pain, and anemia but lower rates of jaw claudication, and a trend towards higher ESR and CRP levels as compared with the Caucasian cohort (Table 1). Due to a limited number of reports, no consensus on how GCA presents in African-Americans has emerged. A study comparing both systemic and ophthalmic GCA in African-Americans and Caucasians also noted higher rates of anemia in African-Americans.[16] It has been suggested that the overall frequency of classic disease manifestations (headache, jaw claudication, and polymyalgia rheumatica) and laboratory abnormalities (anemia, and thrombocytosis) may be decreasing due to higher suspicion of GCA among clinicians, with more diagnoses being made at an early stage.[26–29] Conversely, it has been postulated that due to the lower index of suspicion for GCA in minority groups, African-Americans may be diagnosed at a later stage.[15,16] Thus, disparities in the presentation of GCA in African-Americans and Caucasians might emerge, such as higher rates of headache, neck pain, and anemia as we observed.

Our finding of a lower rate of vision loss in the African-American cohort would be unexpected if African-Americans present at a more advanced stage. This result is also contrary to a study which noted higher rates of vision loss in African-Americans with GCA, though this study included all patients with GCA and not just those with ophthalmic manifestations.[16] Of note, 98% of our Caucasian cohort with ophthalmic GCA had vision loss of varying severity, higher than many other published studies, which have reported vision loss in 23 to 60% of patients with ophthalmic GCA.[29–33] If our comparison group, taken from a prospective single institution study, had unusually high overall rates of vision loss, perhaps due to referral bias, then our rate of 78% in African-Americans may not represent a true difference between African-Americans and Caucasians. If there is a true difference in overall rates of vision loss as our data suggests, then questions arise as to whether differences in environment or genetics may have a role.

GCA can present with systemic involvement, both systemic and ophthalmic involvement, or exclusively ophthalmic involvement. The exclusively ophthalmic presentation is known as occult GCA, and is reported to

account for 5 to 38% of ophthalmic GCA cases.[34–36] In our cohort, 6 of 32 (18.75%) African-American patients had occult GCA, similar to the 21.2% rate of occult GCA reported in Caucasian patients.[36] Clinicians must have a high index of suspicion for occult GCA or risk missing a significant portion of GCA cases. Based on the current data, the high index of suspicion must be extended to include African-American patients.

Although our study did not specifically address the occurrence of GCA in African-American populations, pooled data obtained from four institutions showed that, of the 155 biopsy-proven patients with ophthalmic GCA, African-American patients composed 5.2% of this group. Other published studies, including a recent report using Medicare, claims file data have suggested that GCA occurs less commonly in African-American populations, including areas where the population is composed of significant numbers of African-Americans.[1,7,37,38] Our findings are consistent with these reports.

Several limitations should be considered in evaluating the current results. The African-American cohort and Caucasian cohort were evaluated during different time periods. A recent report of GCA cases diagnosed from 1950 to 2004 indicated that the incidence of ophthalmic symptoms has declined over time, likely due to changes in physician awareness and standards of care, including the introduction of corticosteroids as a treatment for GCA.[32] Our study did not assess the incidence of ophthalmic GCA among all cases of GCA seen at an institution, and as such we are unable to comment on this reported decline. Additionally, if physicians had a lower index of suspicion and thus lower biopsy rates for African-Americans, or if African-Americans had less access to care, then these patients may have presented at a later stage, or may have gone undiagnosed. Finally, it is worth noting that our study assessed racial and not ethnic differences in GCA. In our study, patients self-identified their race, which may not accurately represent genetic background, especially in admixed populations such as African-Americans.[39] The retrospective nature of this study with multiple institutions, different demographics in each region, different referral patterns, and potential variations in clinical practice may also make some comparisons difficult to interpret accurately. However, by including only those patients with biopsy-proven GCA, our data likely reflects true differences between the two races.

The current data indicate that African-Americans compose a minority of patients with ophthalmic GCA. The African-American patients had a higher frequency of headache, neck pain, anemia, and eye pain, and a lower frequency of jaw claudication and vision loss than the Caucasian cohort. While these differences may represent a true racial disparity as discussed above, it is important to note that the similarities in presentation outnumbered the differences. Thus, GCA should be considered in the differential diagnosis of any patient who presents with suggestive signs or symptoms regardless of race.

Summary

What was known before

- Giant cell arteritis is less common in African-American population

What this study adds

- Presentation of giant cell arteritis in African-Americans is similar to that in Caucasians. Minor differences exist

Conflict of interest

The authors declare no conflict of interest.

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