# Visual Outcomes of Giant Cell Arteritis

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## Introduction

**Giant cell arteritis (GCA)** is a large vessel vasculitis classically affecting branches of the common carotid artery and is the leading cause of blindness in neuro-ophthalmology if left untreated.

- Temporal artery biopsy (TAB) is the gold standard for diagnosing GCA but has variable sensitivity due to urgent need for treatment with high-dose corticosteroids.[1]
- Previous studies on ocular manifestations have only included small cohorts.[2]
- Additionally, longitudinal evaluation of the visual outcomes have not yet been assessed.

We hypothesized that diagnosis of GCA, ocular manifestations, and treatment response can be better evaluated using neuro-ophthalmic evaluation and imaging techniques.

- We also hypothesized that changes in the retina & optic nerve correlate with disease status and can predict visual outcomes.

## Materials & Methods

**We retroactively reviewed neuro-ophthalmology visits of GCA patients performed at a tertiary center.**

- Patients split into TAB+ or clinically diagnosed (CD) groups
- Eyes sorted into visual involvement (VI) or no VI (NVI)
- Measurements separated into intervals of 0-6 months, 6-12 months, and beyond 12 from date of TAB or CD

**Assessments of ocular involvement:**

- Best-corrected visual acuity (“BCVA” in logMAR and Snellen)
- Intraocular pressure (“IOP” in mmHg)
- Humphrey visual fields (“HVF” in median deviation)
- 24-2, Ishihara color plates (“% Color” in % correct)
- Erythrocyte sedimentation rate (”ESR” in mm/hr) and C-reactive protein (“CRP” in mg/dL) were also recorded

**Optical Coherence Tomography (OCT) measurements:**

- Retinal nerve fiber layer (“RNFL” in µm)
- Ganglion cell complex (“GC-IPL” in µm)

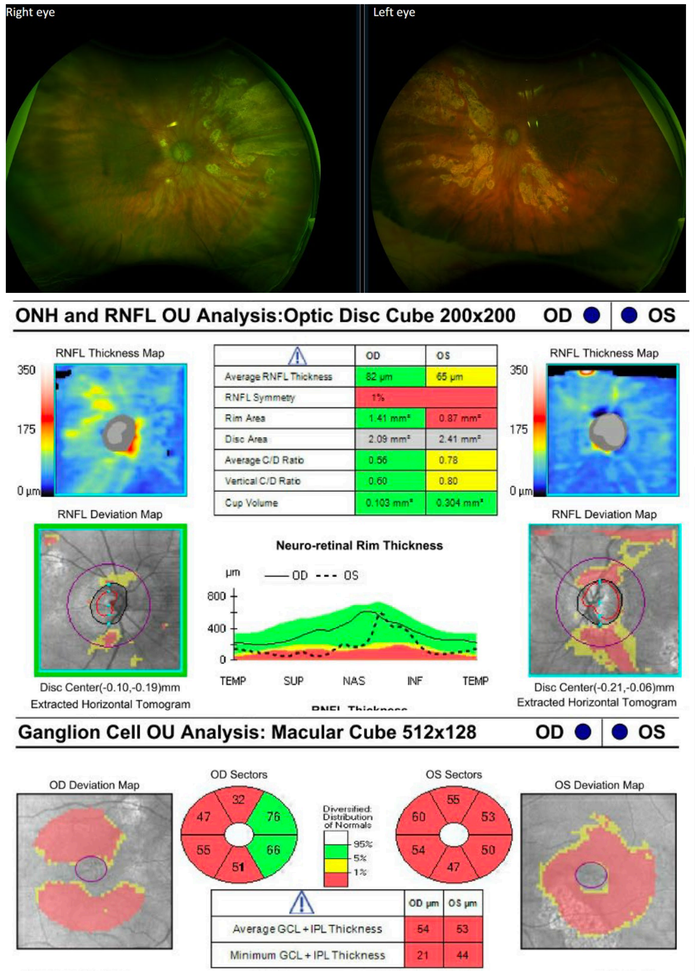
**OCT-Angiography (OCT-A) measurements:**

- Microvascular density of the inner retina (“ILM-IPL”)
- Outer retina (“IPL-OPL”)
- Radial peripapillary capillary (“RPC”) vessels
- Area of foveal avascular zone (“FAZ” in mm$^2$)

## Results

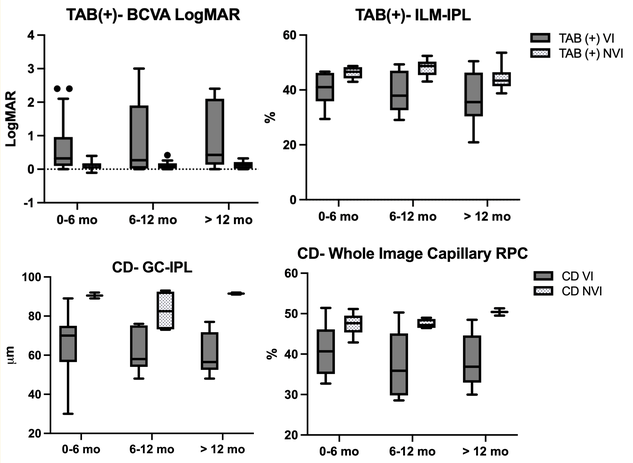
**A total of 219 visits from 25 patients were included (146 TAB+ eyes, 73 CD eyes).**

- All patients received high-dose intravenous steroids at the time of diagnosis in an emergency care setting.




| TAB (+) | Measurement | Visual Impairment | No Visual Impairment | P-value |
|---|---|---|---|---|
| 0-6 Months | BCVA | 20/90 | 20/26 | <0.001 |
| | % Color | 56.72% | 85.30% | 0.021 |
| | HVF | -16.73 | -1.90 | <0.001 |
| | GC-IPL | 59.27 | 78.35 | <0.001 |
| | ILM-IPL | 40.19 | 46.28 | 0.044 |
| 6-12 Months | BCVA | 20/139 | 20/26 | 0.006 |
| | % Color | 25.00% | 88.39% | 0.001 |
| | HVF | -17.23 | -1.58 | <0.001 |
| | RNFL | 71.31 | 93.17 | <0.001 |
| | GC-IPL | 54.12 | 71.70 | <0.001 |
| | RPC | 37.33 | 48.52 | 0.003 |
| | ILM-IPL | 39.10 | 47.85 | 0.005 |
| > 12 Months | BCVA | 20/166 | 20/26 | <0.001 |
| | % Color | 37.25% | 91.67% | <0.001 |
| | HVF | -11.13 | -2.43 | 0.01 |
| | RNFL | 68.07 | 87.75 | <0.001 |
| | GC-IPL | 57.07 | 75.82 | <0.001 |
| | RPC | 32.86 | 45.52 | <0.001 |
| | ILM-IPL | 37.34 | 44.44 | 0.01 |

| Clinically Diagnosed | Measurement | VI | NVI | P-Value |
|---|---|---|---|---|
| 0-6 Months | IOP | 16.26 | 11.25 | 0.008 |
| | CRP | 2.60 | 1.12 | 0.040 |
| | RNFL | 76.32 | 103 | <0.001 |
| | GC-IPL | 65.84 | 90.50 | <0.001 |
| | RPC | 40.81 | 47.41 | 0.024 |
| 6-12 Months | IOP | 15.64 | 10 | 0.008 |
| | CRP | 0.15 | 1.66 | <0.001 |
| | RNFL | 75.41 | 105.66 | <0.001 |
| | GC-IPL | 62.07 | 85.66 | 0.003 |
| | RPC | 37.40 | 47.75 | 0.008 |
| > 12 Months | RNFL | 72 | 106.50 | 0.003 |
| | GC-IPL | 60 | 91.50 | <0.001 |
| | RPC | 38.17 | 50.43 | 0.014 |
| | ILM-IPL | 37.38 | 49.40 | 0.008 |
| | IPL-OPL | 37.20 | 54.43 | 0.008 |




## Conclusions

- **Thinner RNFL and GC-IPL** in eyes with visual impairment: ischemic injury causing retinal thinning.
- **Decreased retinal density** in the capRPC and ILM-IPL layers at certain time points indicating GCA-related hypoperfusion in those respective layers.

**Visual relapse of GCA is rare after steroid initiation.**

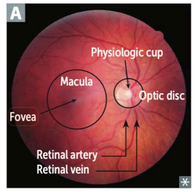
- Efficacy of steroids in managing symptoms several months post-diagnosis and the efficacy of tocilizumab in long-term prevention of GCA relapse.

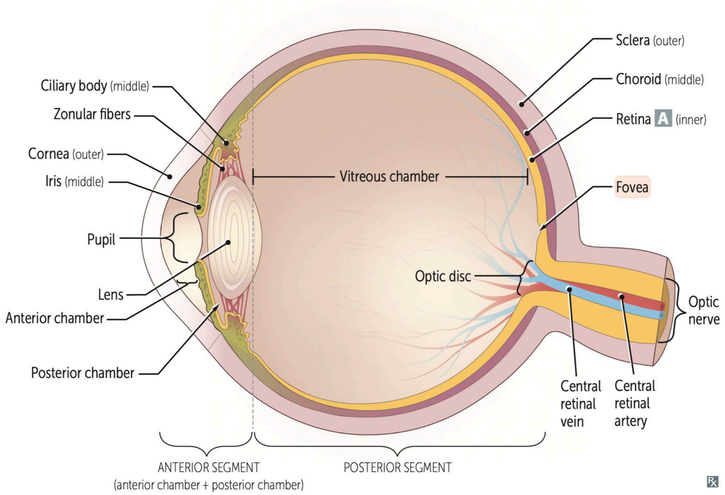
## References

[1] Davies CG, May DJ. The role of temporal artery biopsies in giant cell arteritis. Ann R Coll Surg Engl. 2011 Jan;93(1):4-5. doi: 10.1308/003588411X12851639107476. PMID: 21418754; PMCID: PMC3293260.

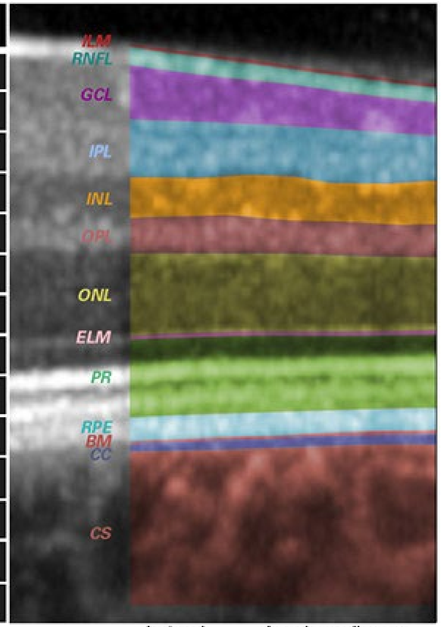
[2] Gaier ED, Gilbert AL, Cestari DM, Miller JB. Optical coherence tomographic angiography identifies peripapillary microvascular dilation and focal non-perfusion in giant cell arteritis. Br J Ophthalmol. 2018 Aug;102(8):1141-1146.

## Normal eye anatomy




| Retinal Layers | |
|---|---|
| **Abbr.** | **Name** |
| ILM | Internal Limiting Membrane |
| RNFL | Retinal Nerve Fibre Layer |
| GCL | Ganglion Cell Layer |
| IPL | Inner Plexiform Layer |
| INL | Inner Nuclear Layer |
| OPL | Outer Plexiform Layer |
| ONL | Outer Nuclear Layer |
| ELM | External Limiting Membrane |
| PR | Photoreceptor Layers |
| RPE | Retinal Pigment Epithelium |
| BM | Bruch's Membrane |
| CC | Choriocapillaris |
| CS | Choroidal Stroma |




## Arteries and veins in the RNFL