

WORKUP FOLLOWING RETINAL ARTERY OCCLUSION—EXPERIENCE FROM AN OUTPATIENT RETINA CLINIC

Gautam Vangipuram MD, Louise Yang BS, M. Parker Weigle BS, Barton Blackorby MD, Sabin Dang MD, Kevin J. Blinder MD, Gaurav K. Shah MD

DISCLOSURES

- No relevant financial disclosures

SUMMARY

- We review compliance and timeliness of completing the required imaging testing in patients presenting with an acute retinal artery occlusion in a strictly outpatient setting
- Mean time to imaging workup (TTW):
 - ED: 2.20 days (\pm 1.10 STDM range 0-29)
 - Outpatient: 13.6 days (\pm 2.23 STDM range 0-149)
 - **p=0.003**
- Our study gives objective data to and confirms the delay suspected in referring patients with acute symptomatic RAO for outpatient workup.
- We recommended all outpatient ophthalmology and retina practices establish a relationship with a **comprehensive or primary stroke center** to facilitate urgent testing through an emergency department.

INTRODUCTION

- Acute retinal artery occlusion (RAO) is an urgent ophthalmic condition often indicative of ischemic or inflammatory pathology.
- Patients diagnosed at an outpatient facility must then independently present to an emergency department (ED) or outpatient clinic to obtain the necessary systemic workup.
- No prior objective data has been published on suspected delay in outpatient imaging testing.
- We review compliance and timeliness in completing the required imaging testing of patients initially seen in an outpatient setting.

METHODS

- A retrospective chart review was conducted from June 2009 to January 2019 at a tertiary, multiple-physician vitreoretinal practice (The Retina Institute, St. Louis, MO).
- Inclusion criteria:
 - All patients presenting with an acute (<2 week duration) symptomatic RAO
- Exclusion criteria:
 - Transient monocular vision loss
 - Amaurosis symptoms
 - No PCP documentation
 - Prior Emergency Department testing or referral

METHODS

- Outcome variables:
 - Completion rate of imaging workup (%)
 - Time to complete workup (days)
- Co-variates:
 - Age
 - Gender
 - Systemic comorbidities
 - Presenting visual acuity (< 20/200)
 - Year of diagnosis
 - Duration of symptoms
 - Type of occlusion (branch retinal artery occlusion [BRAO] vs. central retinal artery occlusion [CRAO])
 - Evidence of arterial emboli
- Documentation of carotid vascular imaging and echocardiography was requested from each patient's PCP, cardiologist or neurologist.
- Laboratory testing for inflammatory etiologies such as GCA was not included in this study.

RESULTS

- 147 patients were included in the study.
- BRAO and CRAO were found in 85 (57.8%) and 62 (42.2%) patients, respectively.
- A majority (118 of 147, 80.3%) of patients in this study were diagnosed with a symptomatic RAO in or after 2016.
- The mean duration of visual symptoms was 5.35 days (0.405 STDM, range 0-14 days).

Baseline demographics of patients presenting with acute symptomatic retinal artery occlusion (n=147)	
Age (years), STD	72.5 ±11.2
Gender	
Males (%)	63 (42.9)
Females (%)	84 (57.1)
Type of RAO	
CRAO (%)	62 (42.2)
BRAO (%)	85 (57.8)
Year of diagnosis	
2009-2015	29 (19.7)
2016-2019	118 (80.3)
Presence of retinal emboli	
Yes (%)	57 (38.8)
No (%)	90 (61.2)
Duration of symptoms (days), STDM	5.35 (.405)
Presenting visual acuity	
>20/200 (%)	70 (47.6)
<20/200 (%)	77 (52.4)
Presence of comorbidities	
Diabetes mellitus	
Yes (%)	44 (29.9)
No (%)	103 (70.1)
Hypertension	
Yes (%)	95 (64.6)
No (%)	52 (35.4)
Hyperlipidemia	
Yes (%)	58 (39.5)
No (%)	89 (60.5)

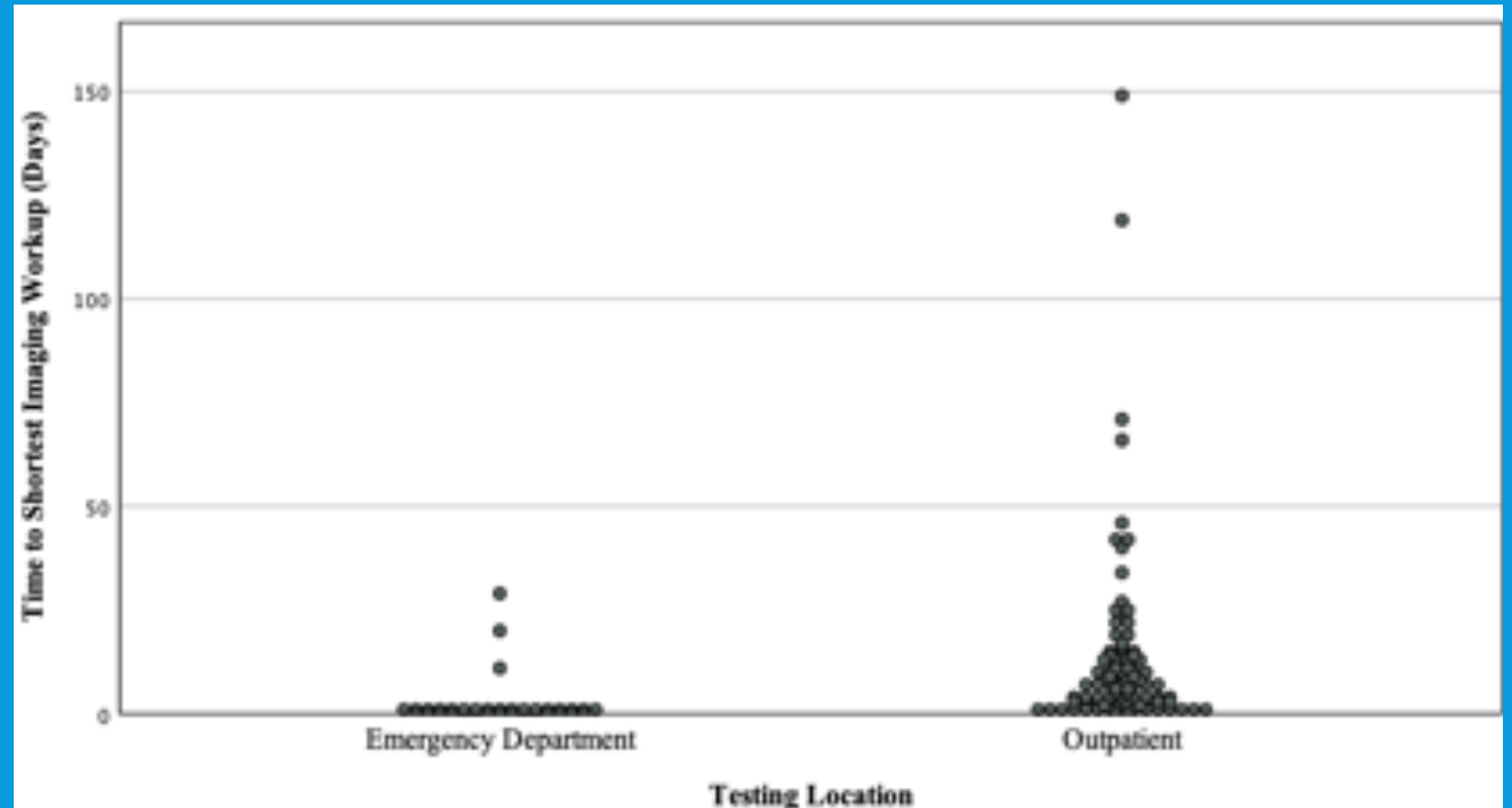
RESULTS

- 132 of 147 patients (89.8%) completed at least one type of cardiovascular or carotid imaging.
- 77 patients (52.3 %) were documented to have completed both carotid and echocardiographic imaging.
- Of patients receiving at least one type of imaging:
 - 35 (23.8%) ED
 - 97 (66.0%) Outpatient
- Mean time to workup (TTW):
 - ED: 2.20 days (\pm 1.10 STDM range 0-29)
 - Outpatient: 13.6 days (\pm 2.23 STDM range 0-149)
 - p=0.003**

Type and site of imaging workup for patients presenting with acute symptomatic retinal artery occlusion		
Type of workup		P value
Any imaging (%)	132 (89.4)	
All Neck Imaging (%)	118 (80.4)	
Carotid (%)	99	
CTA Neck (%)	17	
MRA Neck (%)	2	
Echocardiogram (%)	91 (61.9)	
Both Neck/Head (%)	77 (52.3)	
Location of referral		
Outpatient (%)	35 (23.8)	
Emergency Department (%)	97 (66.0)	
Time to workup (Days)		
Shortest time (STDM)	10.6 (1.71)	
All Neck Imaging (STDM)	9.62 (1.49)	
Carotid (STDM)	10.7 (1.7)	
CTA neck (STDM)	4.71 (2.55)	
MRA Neck (STDM)	0.5 (0.5)	
Echocardiogram (STDM)	14.6 (2.93)	
Time to soonest workup by location (days)		
Emergency Department (STDM)	2.2 (1.01)	
Outpatient (STDM)	13.6 (2.22)	0.003

RESULTS

- Time to workup
 - ED: 2.20 days (± 1.10 STDM range 0-29)
 - Outpatient: 13.6 days (± 2.23 STDM range 0-149)
- **$p=0.003$**



RESULTS

- Duration of symptoms upon presentation:
 - ED 3.23 (\pm 0.603 STDM) days
 - Outpatient 6.12 (\pm 0.532 STDM) days
 - p=0.003**
- Factors not influencing time to workup:
 - Type of RAO (BRAO vs. CRAO)
 - Presence of arterial emboli on exam

	Testing location			
	ED	Outpatient	Total	P value
Type of RAO				
CRAO	18	37	55	0.172
BRAO	17	60	77	
Presence of retinal emboli				
Yes	13	39	52	0.751
No	22	58	80	
Duration of symptoms (days, STDM)	3.23, 0.603	6.12, 0.532		0.003

DISCUSSION

- The risk of coincident ischemic stroke from symptomatic RAO ranges from 13.0-37.3%.^{1,9-10}
- AAO practice pattern guidelines (2016, 2019):
 - Acute RAO should be referred immediately to an emergency department or stroke center due to the increased risk of central nervous system stroke.¹¹⁻¹²
- 2013 survey of 281 retina specialists, 82 % indicated he or she would pursue an outpatient imaging workup for an acute RAO.¹⁷
- Urgent same day ED workup following a TIA reduced the 90-day risk of recurrent ischemic stroke by 80% compared to similar cohort that underwent routine outpatient workup.¹⁴
- Early surgical intervention (< 2 weeks) in patients with severe carotid stenosis have the highest 5-year absolute risk reduction of ischemic stroke following TIA.¹⁶

DISCUSSION

- Strengths:
 - Relatively large sample size over 10 years
 - Documentation of a discrete time interval between presentation and testing
 - Majority of patients (80.3%) seen after 2016
- Weaknesses:
 - Retrospective single institution study
 - Recall of non-institutional medical records
 - No head imaging records requested

CONCLUSION

- Our study gives objective data to the delay suspected in referring patients with acute symptomatic RAO for outpatient workup.
- We recommended all outpatient ophthalmology and retina practices establish a relationship with a **comprehensive or primary stroke center** to facilitate urgent testing through an emergency department.

REFERENCES

2. Avery MB, Magal I, Kherani A, Mitha AP. Risk of Stroke in Patients With Ocular Arterial Occlusive Disorders: A Retrospective Canadian Study. *J Am Heart Assoc.* 2019;8(3):e010509.
3. Chang YS, Chu CC, Weng SF, et al. The risk of acute coronary syndrome after retinal artery occlusion: a population-based cohort study. *Br J Ophthalmol* 2015;99:227-31.
4. Brown GC, Magargal LE. Central retinal artery obstruction and visual acuity. *Ophthalmology* 1982;89:14-9.
5. Brown GC, Shields JA. Cilioretinal arteries and retinal arterial occlusion. *Arch Ophthalmol* 1979;97:84-92.
6. Hayreh SS, Zimmerman MB. Central retinal artery occlusion: visual outcome. *Am J Ophthalmol* 2005;140:376-91.
7. Leavitt JA, Larson TA, Hodge DO, Gullerud RE. The incidence of central retinal artery occlusion in Olmsted County, Minnesota. *Am J Ophthalmol* 2011;152:820-3.
8. Park SJ, Choi NK, Yang BR, et al. Risk and risk periods for stroke and acute myocardial infarction in patients with central retinal artery occlusion. *Ophthalmology.* 2015; 122:2336-2343.
9. Lavin P, Patrylo M, Hollar M, Espaillet KB, Kirshner H, Schrag M. Stroke Risk and Risk Factors in Patients With Central Retinal Artery Occlusion. *Am J Ophthalmol.* 2018;196:96-100. doi:10.1016/j.ajo.2018.08.027
10. Golsari A, Bittersohl D, Cheng B, et al. Silent Brain Infarctions and Leukoaraiosis in Patients With Retinal Ischemia: A Prospective Single-Center Observational Study. *Stroke.* 2017;48(5):1392-1396. doi:10.1161/STROKEAHA.117.016467
11. Olsen TW, Pulido JS, Folk JC, Hyman L, Flaxel CJ, Adelman RA. Retinal and Ophthalmic Artery Occlusions Preferred Practice Pattern®. *Ophthalmology.* 2017;124(2):P120-P143. doi:10.1016/j.ophtha.2016.09.024
12. Flaxel CJ, Adelman RA, Bailey ST, et al. Retinal and Ophthalmic Artery Occlusions Preferred Practice Pattern®. *Ophthalmology.* 2020;127(2):P259-P287. doi:10.1016/j.ophtha.2019.09.028
13. Chang YS, Jan RL, Weng SF, et al. Retinal artery occlusion and the 3-year risk of stroke in Taiwan: a nationwide population-based study. *Am J Ophthalmol.* 2012;154(4):645-652.e1. doi:10.1016/j.ajo.2012.03.046
14. Rothwell PM, Giles MF, Chandratheva A, et al, Early use of Existing Preventive Strategies for Stroke (EXPRESS) study. Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison. *Lancet.* 2007;370:1432e1442.
15. Gladstone DJ, Oh J, Fang J, et al. Urgency of carotid endarterectomy for secondary stroke prevention: results from the Registry of the Canadian Stroke Network. *Stroke.* 2009;40(8):2776-2782. doi:10.1161/STROKEAHA.109.547497
16. Rothwell PM, Eliasziw M, Gutnikov SA, et al, Carotid Endarterectomy Trialists Collaboration. Endarterectomy for symptomatic carotid stenosis in relation to clinical subgroups and timing of surgery. *Lancet.* 2004;363:915e924.
17. Abel AS, Suresh S, Hussein HM, Carpenter AF, Montezuma SR, Lee MS. Practice Patterns After Acute Embolic Retinal Artery Occlusion. *Asia Pac J Ophthalmol (Phila).* 2017;6(1):37-39. doi:10.22608/APO.201690
18. Biousse V, Nahab F, Newman NJ. Management of Acute Retinal Ischemia: Follow the Guidelines!. *Ophthalmology.* 2018;125(10):1597-1607. doi:10.1016/j.ophtha.2018.03.054
19. Ross MA, Compton S, Medado P, et al. An emergency department diagnostic protocol for patients with transient ischemic attack: A randomized controlled trial. *Ann Emerg Med* 2007;50:109-119.
20. Nahab F, Leach G, Kingston C, et al. Impact of an emergency department observation unit transient ischemic attack protocol on length of stay and cost. *J Stroke Cerebrovasc Dis.* 2012;21(8):673-678. doi:10.1016/j.jstrokecerebrovasdis.2011.02.017
21. Lauda F, Neugebauer H, Reiber L, Jüttler E. Acute silent brain infarction in monocular visual loss of ischemic origin. *Cerebrovasc Dis.* 2015;40:151e156.
22. Cho KH, Kim CK, Woo SJ, et al. Cerebral small vessel disease in branch retinal artery occlusion. *Invest Ophthalmol Vis Sci.* 2016;57:5818e5824.
23. Tanaka K, Uehara T, Kimura K, et al, Japan TIA Research Group 2009-2011. Features of patients with transient monocular blindness: a multicenter retrospective study in Japan. *J Stroke Cerebrovasc Dis.* 2014;23:e151ee155.