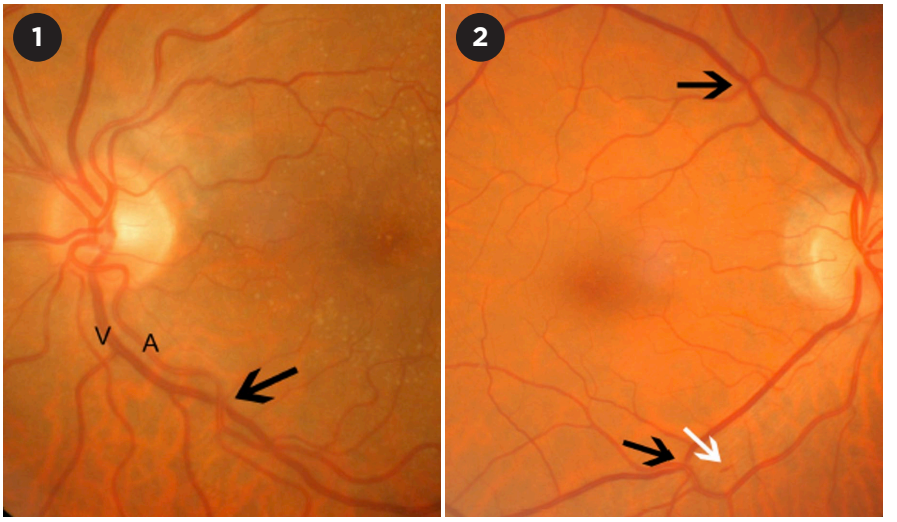
RETINA

Impact of Sleep Apnea on Retinal Microvasculature



RETINOPATHY. *Retinal images showing (1) mild and (2) moderate microvascular retinopathy in patients with obstructive sleep apnea. Arteriovenous or microvascular nicking (black arrows) and hemorrhage (white arrow) are evident.*

OBSTRUCTIVE SLEEP APNEA (OSA) and chronic obstructive pulmonary disease (COPD) are both associated with high blood pressure, which contributes to small vessel narrowing and microvascular retinopathy. However, the effects of OSA alone on the retinal microvasculature remain unclear because approximately one in three people with OSA also have COPD.

Researchers from the University of Melbourne in Australia investigated the alterations in retinal microvasculature in patients with OSA or COPD alone, excluding those who had both conditions.[1] They found that OSA affected the blood vessels throughout the body, causing blood vessel narrowing. Additionally, patients with OSA had higher blood pressure than did those with COPD, despite being younger in age.

"Although OSA and COPD often coexist, OSA causes hypertension on its own," said coauthor Judy Savige, MBA, PhD, at the University of Melbourne. "OSA often occurs in young adults, increasing the risk of heart disease, stroke, and diabetic retinopathy. Our findings highlight the importance of treating the underlying hypertension by managing OSA through weight control and continuous positive airway pressure."

Study design. To evaluate the effects of OSA on the retinal microvasculature, the team reviewed the medical history and retinal photographs of patients with OSA alone (n = 79), COPD alone (n = 132), or a control group of hospitalized patients with neither condition (n = 143). "Our hypothesis was that people with OSA and COPD would have hypertension. However, we did not know if OSA alone would cause hypertension or if changes in the microvasculature would be worse in OSA than in COPD," said Dr. Savige.

Results. When compared with controls, people with OSA had significantly higher mean arterial pressure (93.2 ± 12.2 mm Hg vs. 89.2 ± 8.9 mm Hg; p = .02), narrower retinal arterioles (134.2 ± 15.9 µm vs. 148.0 ± 16.2 µm; p < .01), and higher prevalence of retinopathy (97% vs. 50%; p < .001).

When compared with individuals with COPD, people with OSA still had higher mean arterial pressure (93.2 ± 12.2 mm Hg vs. 89.7 ± 12.8 mm Hg; p = .07), narrower arterioles (134.2 ± 15.9 µm vs. 152.3 ± 16.8 µm; p < .01), and a higher prevalence of microvascular retinopathy (97% vs. 80%; p = .001).

The nocturnal challenge. The findings indicate a disparity between diagnosed hypertension, blood pressure readings taken in the clinic, and the occurrence of retinal microvascular changes. This may be because OSA-associated hypertension is primarily nocturnal and thus difficult to assess, Dr. Savige noted.

Looking ahead. "Our next steps are to assess the effects of OSA treatment methods and weight loss on microvascular retinopathy by measuring the changes in vessel caliber and blood pressure," Dr. Savige said.

Reflecting on the implications of their findings, Dr. Savige said that physicians need to change the way they measure hypertension in the clinic. As microvascular retinopathy reflects poor blood pressure control over several months, it actually provides a more accurate picture of hypertension than even 24-hour blood pressure monitoring, she said. —*Christos Evangelou, PhD*

1 Chew S et al. *Sci Rep.* 2022:12(1):13350.

Relevant financial disclosures: Dr. Savige—None.

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COMPREHENSIVE

Guidelines for Perioperative Management of Antithrombotics

THE AMERICAN COLLEGE OF CHEST Physicians has updated its clinical practice guidelines on the perioperative management of anticoagulant and antiplatelet therapy.[1] And although many of the recommendations are general and speak to a broad medical audience, some are specific to ophthalmology.

A continuing concern. The scope of the problem relating to if and when to stop or continue antithrombotic therapy in patients about to undergo an elective surgery/procedure is considerable, given the widespread use of anticoagulant and antiplatelet drugs, particularly in an aging population. Approximately 15% to 20% of patients receiving anticoagulant therapy will undergo surgery each year, the report noted.

A how-to guide. The report offers 44 evidence-based recommendations covering 43 scenarios to assist the surgeon in decisions relating to perioperative management of antithrombotic therapy. The clinical guidance is anchored on the strongest available evidence that will inform best practices in patients who are receiving a vitamin K antagonist (VKA), a direct oral anticoagulant, or antiplatelet drugs.

"We provide practical advice on how to manage such patients, taking into account the surgeon's perspective whenever possible," said lead author James D. Douketis, MD, FCCP, at St. Joseph's Healthcare and McMaster University in Hamilton, Ontario, Canada.

Of interest to ophthalmologists. Recommendations tailored to minor ophthalmological procedures cover phacoemulsification, iridotomy, vitrectomy, and panretinal photocoagulation. The preponderance of evidence was related to cataract surgery.

"A lot of our conditional recommendations would apply to minor eye surgeries, but we tried to make comments for specific procedures such as cataract surgery," Dr. Douketis said. "Eye procedures are very common in the older population, many of whom are taking an anticoagulant or anti-

NEURO-OPHTHALMOLOGY

AI-Based Screening Tool Detects Homonymous Defects

CANADIAN RESEARCHERS HAVE HARNESSED DEEP learning to create a screening tool that is both highly accurate and effective in identifying homonymous visual field (VF) defects on automated perimetry.[1] This tool can alert clinicians to possible defects, which are often subtle and difficult to detect, even by skilled ophthalmologists. This work expands the boundaries of AI in ophthalmology.

Urgency. Homonymous VF defects can indicate the presence of serious intracranial pathology, including stroke, brain tumors, demyelinating disease, and metastasis from cancers elsewhere in the body. When detected, they indicate the need for urgent neuroimaging to examine the chiasmal and retrochiasmal visual pathways for the presence of lesions.

However, timely detection of these defects may not occur, leading to significant patient morbidity and mortality. "Many ophthalmologists have grappled with cases where, on follow-up visits, they realize that they'd missed a subtle homonymous visual field defect," said coauthor Edward Margolin, MD, FRCSC, Dipl. ABO, at the University of Toronto.

Study design. For this retrospective proof-of-concept study, the researchers considered medical records of 416 patients, 18 years or older, with known homonymous defects seen during a five-year period at a university-affiliated high-volume neuro-ophthalmology practice.

In addition, they randomly collected VF tests from 820 patients seen during the same time frame. This control dataset included normal VFs and those with non-neurological VF defects, such as glaucomatous defects.

VF testing was done in both eyes by Humphrey Field Analyzer 24-2 SITA-Fast, the most commonly performed automated perimetry in ophthalmology practices. All data underwent 7-fold cross validation for training and evaluation of the proposed AI model, which the researchers dubbed Deep Homonymous Classifier (DHC).

Better than the benchmark. The DHC model proved superior to the benchmark neurological hemifield test (NHT), a score-based approach built on a mathematical rather than AI algorithm. "Our model demonstrated very high sensitivity and specificity," Dr. Margolin commented.

Specifically, the DHC model achieved an average accuracy of 87% for detecting homonymous VF defects in previously unseen VFs. It also achieved an average recall or sensitivity of 92% and an average specificity of 88%. In contrast, the NHT achieved an average accuracy of 66%, a recall/sensitivity of 92%, and a specificity of 47%.

The researchers noted that their DHC model is currently limited by the size of the dataset. "As with all deep learning models, the proposed model will improve in generalizability with a larger training set and will be able to further validate the presented recall and accuracy with a larger testing set," they wrote.

—Miriam Karmel

1 Tan AH et al. *Br J Ophthalmol.* Published online Aug. 3, 2022.

Relevant financial disclosures: Dr. Margolin—None.

platelet drug, so we felt it important to single out these procedures."

Managing your patients. Two recommendations reached the level of "strong," one of which is applicable to eye surgery. It advises against the use of perioperative heparin bridging in patients with atrial fibrillation who are receiving warfarin and require its interruption around the time of surgery.

Two additional recommendations specific to ophthalmology state the following:

- In patients receiving VKA therapy who require a minor ophthalmologic procedure, the report supports continuation of VKA over VKA interruption. (Very low certainty of evidence.) Warfarin is the primary drug in this class, as most evidence has addressed warfarin-treated patients.
- In patients receiving an antiplatelet drug who are undergoing a minor ophthalmologic procedure, the report suggests continuing the antiplatelet drug throughout the surgery, versus stopping the agent before the procedure. (Low certainty of evidence.) Drugs in this class include aspirin and P2Y12 inhibitors such as Plavix.

Bottom line. When the report mentions eye procedures, it focuses on the most common ones, Dr. Douketis said. "The ones we don't highlight specifically, we leave to the surgeon's discretion."

His overall advice: first, decide the patient's level of risk for bleeding. If it is minimal, the surgeon might be able to continue anticoagulant or antiplatelet therapy. On the other hand, if the risk for bleeding is low/moderate or high, anticoagulant/antiplatelet interruption will be required—and the level of bleed risk will determine the duration of interruption. "All in all, management is very patient- and procedure-centric," he said. *—Miriam Karmel*

1 Douketis JD et al. *Chest.* Published online Aug. 11, 2022.

Relevant financial disclosures: Dr. Douketis—Canadian Institute of Health Research: S; Heart and Stroke Foundation of Canada: S; Janssen: C; Leo Pharma: L; *Merck Manual:* PS; Pfizer: L; PhaseBio: C; Sanofi: L; Servier: C; UpToDate: PS.

PEDIATRIC OPHTHALMOLOGY

Assessing Visual Issues Following Concussion

MILD TRAUMATIC BRAIN INJURY (mTBI), such as concussion, is a common childhood injury. While most youngsters and teens recover within four weeks, persisting visual symptoms can affect some for more than a year. The findings of a recent study emphasize the importance of screening for oculomotor (OM) and vestibulo-ocular reflex (VOR) dysfunction in pediatric patients following an mTBI.[1]

Study objectives. This study was part of a larger multinational evaluation of mTBI. The researchers wanted a longitudinal perspective on OM and VOR function in youth post-mTBI, said coauthor Adrienne Crampton, PhD, at McGill University in Montreal, Quebec, Canada. They sought to determine the extent to which performance on clinical and computerized tests of OM and VOR function varied at 21 days, three months, and six months following an mTBI and to identify the proportion of affected youths presenting with abnormal scores on these tests at each timepoint, Dr. Crampton said. Participants (n = 36) were a mean of 13.98 years of age (range, 7-17 years), and 52.8% were female.

Results. Older children performed better on visual motion sensitivity (odds ratio [OR] 1.43; p = .03), and female participants did worse on near point of convergence (OR .19; p = .03). Change over time (toward recovery) was demonstrated by vestibular-ocular motor screening tool (OR 9.90; p = .012), vertical smooth pursuit (OR 4.04; p = .03), voluntary saccade performance (OR 6.06; p = .005), and right VOR gain (.068; p = 0.013).

Importance of detailed assessment. Although the results aligned with the researchers' expectations, some nuances were especially informative, Dr. Crampton said. For example, the research team found "impairments to the VOR pathway in particular could be driving the symptom provocation" that was observed, she said. She also said the directionality of oculomotor findings was interesting, "with significant change over time recorded in performance on vertical saccade and smooth pursuit tasks."

RISK AND RECOVERY. *The researchers set out to track the evolution of visual function post-mTBI.*

Dr. Crampton said the findings "support the potential value of adding performance quantifiers when assessing OM and VOR function, and they underline the importance of assessing OM movements in all directions, as different neurophysiological contributions are associated with various movements."

Next steps. The researchers will "continue to explore and refine assessments in this patient population, allowing us to better understand what abnormalities may be present," Dr. Crampton said. Ideally, this will inform the development of targeted treatment approaches that will aid in full recovery. And she referenced a personal experience that led to her interest in this field of research. As a former ice hockey player, Dr. Crampton said, "due to the nature of the sport, concussions/mTBI frequently occur, and I suffered one too many. My last one took me a very long time to recover fully from. I had lingering symptoms for years."

—Patricia Weiser, PharmD

1 Crampton A et al. *Front Neurol.* 2022;13:904593. eCollection 2022.

Relevant financial disclosures: Dr. Crampton—Canadian Institute of Health Research: S; Fonds de recherche du Quebec: S.

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