

Comparison of visual field assessments between three perimeters
An investigator-initiated clinical trial

1. TITLE PAGE

Protocol Number: CB-24-01

Amendment Number Version 1.0

IRB / ERC Advarra IRB
6940 Columbia Gateway Drive, Suite 110
Columbia, MD 21046

Sponsor Name & Address: Clayton Blehm, MD
North Georgia Eye Associates
2061 Beverly Rd Gainesville, GA 30501

(funding only, this is an investigator-initiated study)
Topcon Healthcare
111 Bauer Dr, Oakland, NJ 07436, United States

Test Articles: TEMPO (Topcon)
Virtual Eye ELITE (Virtual Vision)
Humphrey Field Analyzer (Zeiss)

Investigator: Clayton Blehm, MD

2 . INVESTIGATOR AGREEMENT

I confirm that I have read and that I understand this protocol and understand the use of the study products. I agree to conduct this study in accordance with the requirements of this protocol and also protect the rights, safety, privacy, and well-being of study subjects in accordance with the following:

- The ethical principles that have their origin in the Declaration of Helsinki.
- All applicable laws and regulations, including, without limitation, data privacy laws and regulations.
- Regulatory requirements for reporting serious adverse events defined in Section 13 of this protocol.

Signature of Investigator (Date)

Investigator Name (print or type)

Investigator's Title

Name of Facility

Location of Facility (City)

3. GENERAL INFORMATION

Objective	<p>To compare test duration and the agreement of summary metrics between the TEMPO, Virtual Eye ELITE, and HFA perimeters.</p> <p>The hypothesis is that the total time to complete visual field assessment will be shorter with the TEMPO perimeter compared to the Virtual Eye ELITE and HFA perimeters.</p>
Test Article(s)	TEMPO (Topcon) Virtual Eye ELITE (Virtual Vision) Humphrey Field Analyzer (Zeiss)
Sample size	54 subjects total
Study Population	Adult patients presenting with best-corrected visual outcomes of 20/30 or better.
Number of sites	One
Study Design	Single center, prospective, randomized, comparative study.
Masking	None.
Variables	<p>Primary:</p> <ul style="list-style-type: none">• Total acquisition time (both eyes) between devices. <p>Secondary:</p> <ul style="list-style-type: none">• Mean deviation (MD)• Pattern standard deviation (PSD)• Foveal threshold (FT)• Patient questionnaire• Optical coherence tomography (OCT) <p>Exploratory:</p> <ul style="list-style-type: none">• Visual field index (VFI)• Set up time• False positives, false negatives
Duration / Follow-up	1 Visit

The study will be registered with clinicaltrials.gov.

The study will be conducted in compliance with the protocol, GCP and applicable regulatory requirements

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5. INTRODUCTION

Standard automated perimetry (SAP) is the gold standard in diagnosing and managing glaucoma. Two of the most widely used perimeters are the Humphrey Field Analyzer (HFA; Carl Zeiss Meditec) and the Octopus perimeter (Haag-Streit). However, measurements with these 2 devices can be burdensome on patients and time consuming for both clinicians and patients. One reason for this is that eyes are typically tested separately.

Recent alternatives to HFA and Octopus have been developed that offer testing in a small form factor without a large projection bowl. This includes the Virtual Eye ELITE (Virtual Vision) and the Tempo (Topcon).^{1,2} However, there is minimal data to date comparing these 2 devices to HFA.

6. OBJECTIVE(S)

To compare test duration and the agreement of summary metrics between the TEMPO, Virtual Eye ELITE, and HFA perimeters.

7. SUBJECTS

7.1. Subject Population

Eligible test subjects will be adult patients presenting with best-corrected visual acuity of 20/30 or better.

A total of 54 subjects at one site will be enrolled. Subjects must meet the inclusion criteria. Prior to enrollment, subjects will be provided information on the study and asked to sign a patient information and consent form to participate. The patient information and consent form will be approved by an appropriate ethics committee.

7.2. Inclusion Criteria

Subjects are eligible for the study if they meet the following criteria:

- Adult patients with best-corrected visual outcomes of 20/30 or better.

7.3. Exclusion Criteria

If any of the following exclusion criteria are applicable to the subject or either eye, the subject should not be enrolled in the study.

- Unable to tolerate ophthalmic imaging
- Any ocular or systemic conditions, that could affect VF test results, such as age-related macular degeneration, peripheral retinal disease, or severe glaucoma.

The principal investigator reserves the right to declare a patient ineligible or non-evaluable based on medical evidence that indicates they are unsuitable for the trial.

8. STUDY DESIGN

8.1. Study Design

This study is a single center, prospective, randomized, comparative study of visual field assessments between the TEMPO, Virtual Eye ELITE, and HFA perimeters. Subjects will be assessed at 1 visit. Clinical evaluations will include MD, PSD, FT, VFI, OCT, and a questionnaire.

The primary outcome measure will be the total bilateral acquisition time (both eyes) between the devices.

Secondary outcome measures are as follows:

- Mean deviation (MD)
- Pattern standard deviation (PSD)
- Foveal threshold (FT)
- Patient questionnaire
- Optical coherence tomography (OCT)

Exploratory outcome measures are as follows:

- Visual field index (VFI)
- Set up time (time from instructions to acquisition start)
- False positives, false negatives

8.2. Methods Used to Minimize Bias

Patient selection will be based on the patient's interest and the surgeon's opinion as to whether they are a suitable candidate. Subjects will be randomized to perimeter order.

The measurement of visual fields will be conducted in a systematic fashion to minimize bias.

All data collection will be completed through provided Case Report Forms (CRFs) or computer files generated by automated test equipment. All site personnel involved in the study will be trained in regard to conducting study-specific procedures.

8.3. Method of Assigning Subjects to Treatment Arms

Subjects will receive visual field testing with TEMPO, Virtual Eye ELITE, and HFA perimeters in a randomized order using the method of randomly permuted blocks.

9. STUDY PROCEDURE

9.1. *Informed Consent / Subject enrollment*

No subject will be enrolled into the study who does not meet the inclusion/exclusion criteria and does not sign the current approved informed consent document. Informed consent will be obtained prior to collecting any data for the study. The original signed documents will be maintained by the investigator as a permanent part of the subject's medical records. A signed copy will be provided to the subject.

9.2. *Visits and Examinations*

Subjects will participate in one study visit. The visit schedule, complete with window and associated CRF forms, are displayed in Table 9.2-1. Details of each study visit, including testing to be conducted, are provided below.

Table 9.2-1. Visit Schedule

Visit Number	Visit Window	CRF Number
1	Day 0	1

9.2.1. Visit 1

At Visit 1, subjects will be consented, qualified for the study (compared with inclusion/exclusion criteria), and assigned a study ID/subject number. Subject numbers will be assigned sequentially at each site in the order of enrollment.

A medical history will be taken and exams will include the tests described below:

- Total bilateral acquisition time (both eyes) between the devices
- Mean deviation (MD)
- Pattern standard deviation (PSD)
- Foveal threshold (FT)
- Visual field index (VFI)
- Patient questionnaire
- Optical coherence tomography (OCT)
- Set up time (time from instructions to acquisition start)
- False positives, false negatives

In addition, all site-specific, routine, usual standard of care measures should be undertaken.

Measurements should be made as described in section 9.3 below.

9.3. Study Methods and Measurements

All routine testing and basic eye examinations should be carried out at each study visit. Abnormalities should be recorded in the CRF “Comment” section. Specific study examination procedures are outlined below.

9.3.1. Visual Field Testing

Conduct visual field testing using the TEMPO (24-2 AIZE-Rapid), Virtual Eye ELITE (24-2 SITA-Fast), and HFA (24-2 SITA-Fast) perimeters with test using normal protocol testing per usual clinical standards. Record the total set up time and total bilateral acquisition time (both eyes). Give patients a 5-minute rest period in between devices.

9.3.2. Optical Coherence Tomography (OCT)

Acquire OCT scans using the Spectralis (Heidelberg) device.

9.4. Unscheduled Visits

Unscheduled exams may be conducted at the discretion of the Investigator with all relevant information from the exam recorded in the source documents and on the Unscheduled Visit pages within the CRF booklet.

9.5. Discontinued Subjects

Discontinued subjects are those who do not have an exit visit. Subjects may be discontinued from the study at any time if, in the opinion of the investigator, their continued participation in the study poses a risk to their health. The reasons for discontinuation include:

- a. Adverse event;
- b. Lost to follow-up;
- c. Subject decision unrelated to an adverse event;
- d. Protocol violation;
- e. Treatment failure;
- f. Other.

To ensure the safety of all subjects who discontinue prior to the final visit, investigators should assess each subject and, if necessary, advise them of any therapies and/or medical procedures that might be needed to maintain their health. Any changes in medical health and/or use of concomitant medications should also be captured.

10. ANALYSIS PLAN

10.1. Analysis Data Sets

All subjects who are enrolled in the study will be evaluated for safety. Efficacy analyses will be performed based on data from those eyes where the visit was completed.

10.2. Statistical Methodology

A summary of the data will be prepared for all measurement time points.

10.2.1. Within-treatment Changes

For variables measured on a continuous scale, these summaries will include the sample size, as well as the mean, standard deviation, median, minimum, and maximum. For variables measured on a categorical scale, summaries will provide the number and percentage of eyes in each category. These summaries will be provided for all eyes completing the study.

Comparisons between devices will be done using linear mixed effect models that are adjusted for perimeter order and for multiple measurements with the same patient.

10.3. General Statistical Considerations

The statistical analyses will be performed using R, version 4.4.0 or higher. Any statistical tests of hypotheses will employ a level of significance of $\alpha=0.05$.

11. SAMPLE SIZE JUSTIFICATION

Assuming an effect size of 0.5, α 0.05, and power 90%, we estimate the study will require 46 subjects. To account for 15% dropout, the sample size will be increased to 54.

12. CONFIDENTIALITY/PUBLICATION OF THE STUDY

The existence of this Study is confidential and should not be discussed with persons outside of the Study. Results will be submitted for publication and presentation at national and/or international meetings. A manuscript will be submitted to peer-review journals for publication but there is no guarantee of acceptance.

All study data will be collected on appropriate Case Report Forms (CRFs). No protected health information will be included on the forms. CRFs will be retained in the patient's file for a minimum period of 3 years. Collected information will only be used for purposes of this study and no information will be sold to third parties. The following people will have access to your study records:

- Study Doctor and staff involved with the study
- Study Monitor or Auditor
- Sponsor Company or Research Institution
- Review boards or accrediting agencies
- Other State or Federal Regulatory Agencies

The de-identified data may be shared with other researchers for future analysis.

13. QUALITY COMPLAINTS AND ADVERSE EVENTS

All subjects will be monitored for adverse events over the course of the study. A place to record any adverse event is included on each case report form.

13.1. General Information

An Adverse Event (AE) is any untoward medical occurrence in a subject who is administered a study treatment regardless of whether or not the event has a causal relationship with the treatment. An AE, therefore, can be any unfavorable or unintended sign (including an abnormal laboratory finding), symptom, or disease temporally associated with the study treatment, whether or not related to the treatment. In clinical studies, an AE can include an untoward medical occurrence occurring at any time, including run-in or washout periods, even if no study treatment has been administered.

13.2. Monitoring for Adverse Events

At each visit, after the subject has had the opportunity to spontaneously mention any problems, the Investigator should inquire about AEs by asking if the patient has any problems.

13.3. Procedures for Recording and Reporting AEs and SAEs

Subsequent to signing an informed consent form, all untoward medical occurrences that occur during the course of the study must be documented on an Adverse Event Form (AEF). A separate AEF must be filled out for each event. When possible, signs and symptoms indicating a common underlying pathology should be documented as one comprehensive event. For each recorded event, the AE documentation must include the onset date, outcome, resolution date (if event is resolved), intensity (i.e., severity), any action with study treatment taken as a result of the event, and an assessment of the adverse event's relationship to the study treatment.

Nonserious Adverse Events

A nonserious AE is defined as any untoward change in a subject's medical health that does not meet serious criteria noted below (e.g., is not life-threatening, does not require hospitalization, does not prolong a current hospitalization, is not disabling, etc.). All adverse events must be reported regardless of whether or not they are related to the study treatment.

For nonserious adverse events, an AEF containing all available information will be collected on a routine basis and submitted to the Medical Monitor at the close of the study.

Serious Adverse Events

A serious adverse event (SAE) is defined as any adverse experience that meets any of the following criteria:

- Results in death.
- Is life-threatening.

- NOTE: Life-threatening means that the subject was at immediate risk of death from the reaction as it occurred; i.e., it does not include a reaction which hypothetically might have caused death had it occurred in a more severe form.
- Requires inpatient hospitalization or prolongation of existing hospitalization.
NOTE: In general, hospitalization signifies that the individual remained at the hospital or emergency ward for observation and/or treatment (usually involving an overnight stay) that would not have been appropriate in the physician's office or an out-patient setting. Complications that occur during hospitalization are AEs. If a complication prolongs hospitalization or fulfills any other serious criteria, the event is serious. When in doubt as to whether "hospitalization" occurred, the event should be considered serious.
 - Results in persistent or significant disability/incapacity. Disability is defined as a substantial disruption of a person's ability to conduct normal life functions.
NOTE: The term disability means a substantial disruption of a person's ability to conduct normal life functions. This definition is not intended to include experiences of relatively minor medical significance such as uncomplicated headache, nausea, vomiting, diarrhea, influenza, or accidental trauma (e.g., sprained ankle) which may interfere or prevent everyday life functions but do not constitute a substantial disruption.
 - Is an important medical event. An important medical event is an event that may not result in death, be life-threatening, or require hospitalization but may be considered an SAE when, based upon appropriate medical judgment, it may jeopardize the subject and may require medical or surgical intervention to prevent one of the outcomes listed in the definitions for SAEs. Examples of such medical events include allergic bronchospasm requiring intensive treatment in an emergency room or at home, blood dyscrasias or convulsions that do not result in subject hospitalization, or the development of drug dependency or drug abuse.
All available information on a serious adverse event(s) and any other associated AE, if applicable, must be forwarded to the study coordinator for forwarding to the Medical Monitor immediately (i.e., within one working day of the Investigator's or site's knowledge of the event) as follows:
 - In studies utilizing EDC (electronic data capture), all available information for the SAE and any associated AE(s) must be entered immediately into the EDC system.
 - Additional information for any applicable event is to be reported as soon as it becomes available.

In addition to the reporting of serious adverse events to the study Medical Monitor, the SAE must be reported to the IRB / IEC according to their requirements.

The investigator must document all adverse device events (serious and nonserious but related) and all serious adverse events (related and unrelated) on the Adverse Device Effect and Serious Adverse Event Form. Any device quality complaints will also be documented.

- **Both the Quality Complaint Form and the Adverse Device Effect and Serious Adverse Event Form must be e-mailed immediately to the study coordinator.**
- **Additional relevant information is to be reported as soon as it becomes available.**

Study coordinator contact information is provided below.

**Table 13.3.-1:
Contact Information for the Study**

Study Staff (Coordinator)	Business Phone	e-mail	24-hour Office Phone
Maryann Thomas	770-532-4444	mthomas@gainesvilleeye.com	770-532-4444

Further, depending upon the nature of the adverse event (serious or nonserious) or quality complaint being reported, the study sponsor may request copies of applicable portions of the subject's medical records. The investigator must also report all adverse events and quality complaints according to the relevant IRB requirements.

12.3.1 Intensity and Causality Assessments

For every adverse event and quality complaint, the investigator must assess the causality as Related or Not Related to the medical device under investigation. An assessment of causality will also be performed by the Medical Monitor utilizing the same definitions, as shown below:

Causality

- | | |
|-------------|--|
| Related | An adverse event or quality complaint classified as related may be either definitely related or possibly related where a direct cause and effect relationship with the medical device has not been demonstrated, but there is a reasonable possibility that the adverse event or quality complaint was caused by the medical device. |
| Not Related | An adverse event or quality complaint classified as not related may either be definitely unrelated or simply unlikely to be related (i.e., there are other more likely causes for the adverse event or quality complaint). |

Where appropriate, the investigator must assess the intensity (severity) of the adverse event as mild, moderate, or severe based on medical judgment with consideration of any subjective symptom(s), as defined below:

Intensity (Severity)

Mild	An adverse event is mild if the subject is aware of but can easily tolerate the sign or symptom.
Moderate	An adverse event is moderate if the sign or symptom results in discomfort significant enough to cause interference with the subject's usual activities.
Severe	An adverse event is severe if the sign or symptom is incapacitating and results in the subject's inability to work or engage in their usual activities.

The investigator must document any action taken (i.e., medication, intervention, or treatment plan) and outcome of the adverse event or quality complaint when applicable.

13.4. Follow-Up of Adverse Events and Quality Complaints

The investigator is responsible for adequate and safe medical care of subjects during the study and for ensuring that appropriate medical care and relevant follow-up procedures are maintained after the study. Any additional data from these follow-up procedures must be documented and available to the study coordinator who, with the Medical Monitor, will determine when the data need to be documented on the CRFs.

13.5. Safety Analyses

The type, severity, duration and frequency of reported ocular adverse events will be tabulated. Adverse events will also be summarized for events that were considered treatment-related.

14. GCP, ICH and ETHICAL CONSIDERATIONS

This study will be conducted in compliance with Good Clinical Practices (GCPs), including International Harmonization (ICH) Guidelines, and in general, consistent with the 1996 version of the Declaration of Helsinki. In addition, all applicable local, state and federal requirements will be adhered to.

This study is to be conducted in accordance with Institutional Review Board regulations. The investigator will obtain appropriate IRB/ethics committee approval prior to initiating the study.

The study will be registered with clinicaltrials.gov.

14.1 Confidentiality

The data collected will be data typical for the procedure(s) when performed on eyes outside the study. Any data collected will become part of the patient's clinical record. The data will be subject to the same privacy and confidentiality as other data in the clinical record.

Only the principal investigator, research consultant and clinic staff will have access to the data collected. All data shared outside the practice will be de-identified; patients' protected health information will not be available and will not be reported in any analyses or publications. No data will be sold to third parties. De-identified data may be used for future research.

15. STANDARD EVALUATION PROCEDURES

Table 15.1. Proposed Visits and Study Assessments

Activity	Visit 1
Informed Consent	X
Demographics	X
General Information: Medical History	X
Visual Field Testing with: TEMPO Virtual Eye ELITE HFA	X
Total set up time	X
Total acquisition time	X
Mean deviation (MD)	X
Pattern standard deviation (PSD)	X
Foveal threshold (FT)	X
Visual field index (VFI)	X
False positives/negatives	X
Optical coherence tomography (OCT)	X
Patient Questionnaire	X
Monitor for Adverse Events and Device Deficiencies	X
Complete Exit Form ¹	X

¹ Complete Exit Form upon termination of subject participation, or at the final visit, whichever occurs first.

16. DATA CONFIDENTIALITY

No protected health information (PHI), including the patient's name and date of birth, will be collected; to ensure this, no PHI information is permitted to be entered on any of the Case Report Forms (CRFs). Subjects will only be identified by subject IDs and identities will be removed at the initial visit so that there is no further need to protect or destroy the information. Collected information will only be used for purposes of this study and no information will be sold to third parties. The non-PHI information collected may be used for future research, though there is currently no plan to do so.

17. FINANCIAL AND INSURANCE INFORMATION/STUDY RELATED INJURIES

Every effort to prevent study-related injury will be taken by the Study Doctor and staff. In the event a patient is injured as a direct result of the study while following the Study Doctor's instructions and the study requirements, the patient will be instructed to contact his or her doctor immediately. The Study Doctor is to treat the injured subject as needed for those injuries caused directly by this research study. In the event of injury or illness

caused by or occurring during a subject's participation in this research study, all charges for medical care provided to the subject will be billed to his or her insurance company. The Study Doctor or Sponsor does not offer to cover the medical care costs for injuries or illnesses that are not caused directly by the research study. The Sponsor does not offer to provide any other compensation, unless specifically agreed to elsewhere in this document. This information will be provided to each study subject before the start of the study in the consent form.

18. STUDY ENDPOINT CRITERIA

18.1. Patient Completion of Study

If a study patient has completed the final visit of the study, he/she is considered to have completed the study.

18.2. Patient Discontinuation

Each study patient may voluntarily discontinue the study at any time they choose. Study patients who cannot complete the study for administrative reasons (e.g., non-compliance, failure to meet visit schedule, etc.) will be discontinued from the study. Study patients discontinued during the enrollment phase of the study will be replaced.

18.3. Patient Termination

A study patient will be terminated if the study patient develops any severe adverse event that may be related to the study. A study patient will receive appropriate treatment at the discretion of the investigator. Notification of termination will be clearly documented. These study patients are considered to have completed the study and will not be replaced.

18.4. Study Termination

The investigator with appropriate notification may terminate the study. If, after clinical observations, the investigator feels that it may be unwise to continue the study, he may stop the study.

18.5. Study Completion

The study will be complete when all enrolled patients have completed the final visit or have been terminated from the study.

19. SUMMARY OF RISKS AND BENEFITS

19.1. Summary of risks

The risks with this study are similar to those for any patient receiving visual field testing.^{1,2} There is no increased risk associated with the proposed study.

19.2. Summary of benefits

Subjects may be compensated up to \$125 for completing the study.

REFERENCES

1. Montelongo M, Gonzalez A, Morgenstern F, Donahue SP, Groth SL. A Virtual Reality-Based Automated Perimeter, Device, and Pilot Study. *Transl Vis Sci Technol.* 2021;10(3):20.
2. Nishida T, Eslani M, Weinreb RN, et al. Perimetric Comparison Between the IMOVifa and Humphrey Field Analyzer. *J Glaucoma.* 2023;32(2):85-92.