



BlueCross BlueShield  
of Alabama

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**Name of Blue Advantage Policy:**

**Ophthalmologic Techniques That Evaluate the Posterior Segment  
for Glaucoma**

Policy: #465

Latest Review Date: April 2024

Category: Medical

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**BACKGROUND:**

*Blue Advantage medical policy does not conflict with Local Coverage Determinations (LCDs), Local Medical Review Policies (LMRPs) or National Coverage Determinations (NCDs) or with coverage provisions in Medicare manuals, instructions or operational policy letters. In order to be covered by Blue Advantage the service shall be reasonable and necessary under Title XVIII of the Social Security Act, Section 1862(a)(1)(A). The service is considered reasonable and necessary if it is determined that the service is:*

1. *Safe and effective;*
2. *Not experimental or investigational\*;*
3. *Appropriate, including duration and frequency that is considered appropriate for the service, in terms of whether it is:*
  - *Furnished in accordance with accepted standards of medical practice for the diagnosis or treatment of the patient's condition or to improve the function of a malformed body member;*
  - *Furnished in a setting appropriate to the patient's medical needs and condition;*
  - *Ordered and furnished by qualified personnel;*
  - *One that meets, but does not exceed, the patient's medical need; and*
  - *At least as beneficial as an existing and available medically appropriate alternative.*

*\*Routine costs of qualifying clinical trial services with dates of service on or after September 19, 2000, which meet the requirements of the Clinical Trials NCD are considered reasonable and necessary by Medicare. Providers should bill **Original Medicare** for covered services that are related to **clinical trials** that meet Medicare requirements (Refer to Medicare National Coverage Determinations Manual, Chapter 1, Section 310 and Medicare Claims Processing Manual Chapter 32, Sections 69.0-69.11).*

## **POLICY:**

**Blue Advantage** will treat **analysis of the optic nerve and retinal nerve fiber layer in the diagnosis and evaluation of patients with glaucoma or glaucoma suspects** as a **covered benefit** when using scanning laser ophthalmoscopy, scanning laser polarimetry, and optical coherence tomography.

*\*\*This testing is usually not considered medically necessary more than once in 12 months.*

**Blue Advantage** will treat **measurement of ocular blood flow, pulsatile ocular blood flow, or blood flow velocity (with Doppler ultrasonography)** as a **non-covered benefit** and **investigational** in the diagnosis and follow-up of patients with glaucoma.

*Blue Advantage does not approve or deny procedures, services, testing, or equipment for our members. Our decisions concern coverage only. The decision of whether or not to have a certain test, treatment or procedure is one made between the physician and his/her patient. Blue Advantage administers benefits based on the members' contracts and medical policies. Physicians should always exercise their best medical judgment in providing the care they feel is most appropriate for their patients. Needed care should not be delayed or refused because of a coverage determination.*

## **DESCRIPTION OF PROCEDURE OR SERVICE:**

Several techniques have been developed to measure the thickness of the optic nerve and retinal nerve fiber layer as a method to diagnose glaucoma. Measurement of ocular blood flow is also being evaluated as a diagnostic tool for glaucoma.

### **Diagnosis and Management**

A comprehensive ophthalmologic exam is required for the diagnosis of glaucoma, but no single test is adequate to establish diagnosis. A comprehensive ophthalmologic examination includes assessment of the optic nerve, evaluation of visual fields, and measurement of ocular pressure. The presence of characteristic changes in the optic nerve or abnormalities in the visual field, together with increased intraocular pressure (IOP), is sufficient for a definitive diagnosis. However, some individuals will show ophthalmologic evidence of glaucoma with normal IOPs. These cases of normal-tension glaucoma are considered to be a type of primary open-angle glaucoma. Angle-closure glaucoma is another type of glaucoma associated with an increase in IOP. The increased IOP in angle-closure glaucoma arises from a reduction in aqueous outflow from the eye due to a closed angle in the anterior chamber.

Conventional management of individuals with glaucoma principally involves drug therapy to control elevated IOPs, and serial evaluation of the optic nerve, to follow disease progression. Standard methods of evaluation include careful direct examination of the optic nerve using ophthalmoscopy or stereo photography or evaluation of visual fields. There is interest in developing more objective, reproducible techniques both to document optic nerve damage and to

detect early changes in the optic nerve and retinal nerve fiber layer before the development of permanent visual field deficits. Specifically, evaluating changes in retinal nerve fiber layer thickness has been investigated as a technique to diagnose and monitor glaucoma. However, IOP reduction is not effective in decreasing disease progression in a significant number of individuals, and in individuals with normal-tension glaucoma, there is never an increase in IOP. It has been proposed that vascular dysregulation is a significant cause of damage to the retinal nerve fiber layer, and there is interest in measuring ocular blood flow as both a diagnostic and a management tool for glaucoma. Changes in blood flow to the retina and choroid may be particularly relevant for the diagnosis and treatment of normal-tension glaucoma. A variety of techniques have been developed, as described below. (Note: This evidence review only addresses techniques related to the evaluation of the optic nerve, retinal nerve fiber layer, or blood flow to the retina and choroid in individuals with glaucoma.)

## **Techniques to Evaluate the Optic Nerve and Retinal Nerve Fiber Layer**

### **Confocal Scanning Laser Ophthalmoscopy**

Confocal scanning laser ophthalmoscopy is an image acquisition technique intended to improve the quality of the eye examination compared with standard ophthalmologic examination. A laser is scanned across the retina along with a detector system. Only a single spot on the retina is illuminated at any time, resulting in a high-contrast image of great reproducibility that can be used to estimate retinal nerve fiber layer thickness. In addition, this technique does not require maximal mydriasis, which may be problematic in individuals with glaucoma. The Heidelberg Retinal Tomograph is a commonly used technology.

### **Scanning Laser Polarimetry**

The retinal nerve fiber layer is birefringent (i.e., birefractive), meaning that it causes a change in the state of polarization of a laser beam as it passes. A 780-nm diode laser is used to illuminate the optic nerve. The polarization state of the light emerging from the eye is then evaluated and correlated with retinal nerve fiber layer thickness. Unlike confocal scanning laser ophthalmoscopy, scanning laser polarimetry can directly measure the thickness of the retinal nerve fiber layer. GDx is a common scanning laser polarimetry device. GDx contains a normative database and statistical software package that compares scan results with age-matched normal subjects of the same ethnic origin. The advantages of this system are that images can be obtained without pupil dilation and evaluation can be completed in 10 minutes. Current instruments have added enhanced and variable corneal compensation technology to account for corneal polarization.

### **Optical Coherence Tomography**

Optical coherence tomography uses near-infrared light to provide direct cross-sectional measurement of the retinal nerve fiber layer. The principles employed are similar to those used in B-mode ultrasound except light, not sound, is used to produce the two-dimensional images. The light source can be directed into the eye through a conventional slit-lamp biomicroscope and focused onto the retina through a typical 78-diopter lens. This system requires dilation of the individual's pupil. Optical coherence tomography analysis software is being developed to include optic nerve head parameters with spectral domain optical coherence tomography,

analysis of macular parameters, and hemodynamic parameters with Doppler optical coherence tomography and optical coherence tomography angiography.

### **Pulsatile Ocular Blood Flow**

The pulsatile variation in ocular pressure results from the flow of blood into the eye during cardiac systole. Pulsatile ocular blood flow can thus be detected by the continuous monitoring of IOP. The detected pressure pulse can then be converted into a volume measurement using the known relation between ocular pressure and ocular volume. Pulsatile blood flow is primarily determined by the choroidal vessels, particularly relevant to individuals with glaucoma because the optic nerve is supplied in large part by choroidal circulation.

### **Techniques to Measure Ocular Blood Flow**

A number of techniques have been developed to assess ocular blood flow. They include laser speckle flowgraphy, color Doppler imaging, Doppler Fourier domain optical coherence tomography, laser Doppler velocimetry, confocal scanning laser Doppler flowmetry and retinal functional imaging.

### **Laser Speckle Flowgraphy**

Laser speckle is detected when a coherent light source such as laser light is dispersed from a diffusing surface such as retinal and choroidal vessels and the circulation of the optic nerve head. The varying patterns of light can be used to determine red blood cell velocity and retinal blood flow. However, due to differences in the tissue structure in different eyes, flux values cannot be used for comparisons between eyes. This limitation may be overcome by subtracting background choroidal blood flow results from the overall blood flow results in the region of interest.

### **Color Doppler Imaging**

Color Doppler imaging has also been investigated as a technique to measure the blood flow velocity in the retinal and choroidal arteries. This technique delivers ultrasound in pulsed Doppler mode with a transducer set on closed eyelids. The examination takes 30 to 40 minutes and is most effective for the mean velocity of large ophthalmic vessels such as the ophthalmic artery, the central retinal artery, and the short posterior ciliary arteries. However, total blood flow cannot be determined with this technique, and imaging is highly dependent on probe placement.

### **Doppler Fourier Domain Optical Coherence Tomography**

Doppler Fourier domain optical coherence tomography is a noncontact imaging technique that detects the intensity of the light scattered back from erythrocytes as they move in the vessels of the ocular tissue. This induces a frequency shift that represents the velocity of the blood in the ocular tissue.

### **Laser Doppler Velocimetry**

Laser Doppler velocimetry compares the frequency of reflected laser light from a moving particle to stationary tissue.

### **Confocal Scanning Laser Doppler Flowmetry**

Confocal scanning laser Doppler flowmetry combines laser Doppler flowmetry with confocal scanning laser tomography. Infrared laser light is used to scan the retina, and the frequency and amplitude of Doppler shifts are determined from the reflected light. Determinations of blood velocity and blood volume are used to compute the total blood flow and create a physical map of retinal flow values.

### **KEY POINTS:**

This evidence review has been updated regularly with searches of the PubMed database. The most recent literature search was performed through January 18, 2024.

### **Summary of Evidence**

For individuals who have glaucoma or suspected glaucoma who receive imaging of the optic nerve and retinal nerve fiber layer, the evidence includes studies on diagnostic accuracy. Relevant outcomes are test accuracy, symptoms, morbid events, functional outcomes, and medication use. Confocal scanning laser ophthalmoscopy, scanning laser polarimetry, and optical coherence tomography can be used to evaluate the optic nerve and retinal nerve fiber layer in individuals with glaucoma and suspected glaucoma. Numerous articles have described findings from individuals with known and suspected glaucoma using confocal scanning laser ophthalmoscopy, scanning laser polarimetry, and optical coherence tomography. These studies have reported that abnormalities may be detected on these examinations before functional changes are noted. The literature and specialty society guidelines have indicated that optic nerve analysis using confocal scanning laser ophthalmoscopy, scanning laser polarimetry, and optical coherence tomography are established add-on tests that may be used to diagnose and manage individuals with glaucoma and suspected glaucoma. These results are often considered along with other findings to make diagnostic and therapeutic decisions about glaucoma care, including the use of topical medication, monitoring, and surgery to lower intraocular pressure. Thus, accurate diagnosis of glaucoma would be expected to reduce the progression of glaucoma. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome

For individuals who have glaucoma or suspected glaucoma who receive an evaluation of ocular blood flow, the evidence includes association studies. Relevant outcomes are test accuracy, symptoms, morbid events, functional outcomes, and medication use. Techniques to measure ocular blood flow or ocular blood velocity are used to determine appropriate glaucoma treatment options. The data for these techniques remain limited. Literature reviews have not identified studies addressing whether these technologies improve diagnostic accuracy or whether they improve health outcomes in individuals with glaucoma. Some have suggested that these parameters may inform understanding of the variability in visual field changes in individuals with glaucoma, i.e., they may help explain why individuals with similar levels of intraocular pressure develop markedly different visual impairments. However, data on the use of ocular blood flow, pulsatile ocular blood flow, and/or blood flow velocity are currently lacking. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

## **Practice Guidelines and Position Statements**

### **American Academy of Ophthalmology**

In 2020, the American Academy of Ophthalmology issued 2 preferred practice patterns on primary open-angle glaucoma suspect and primary open-angle glaucoma, both recommending evaluation of the optic nerve and retinal nerve fiber layer. The documents stated that stereoscopic visualization and computer-based imaging of the optic nerve head and retinal nerve fiber layer provide different information about the optic nerve and are complementary. Both imaging methods are useful adjuncts as part of a comprehensive clinical examination. The guidelines described 3 types of computer-based imaging devices (confocal scanning laser ophthalmoscopy, scanning laser polarimetry, optical coherence tomography) currently available for glaucoma, which are similar in their ability to distinguish glaucoma from controls and noted that "computer-based digital imaging of the optic nerve head and retinal nerve fiber layer is routinely used to provide quantitative information to supplement the clinical examination of the optic nerve.... computerized imaging may be useful to distinguish between glaucomatous and nonglaucomatous retinal nerve fiber layer thinning." In addition, the Academy concluded that, as device technology evolves, the performance of diagnostic imaging devices is expected to improve.

### **U.S. Preventive Services Task Force Recommendations**

The U.S. Preventative Task Force (USPSTF) published recommendations on screening for primary open-angle glaucoma in adults (40 years or older) in 2022. Based on findings from the systematic review by Chou et al (discussed in the Rationale section), the USPSTF concluded that the evidence is insufficient to assess the balance of benefits and harms of screening in these patients. This recommendation is consistent with the previous 2013 statement. With regard to screening tests, the USPSTF states: "Diagnosis of open-angle glaucoma is based on a combination of tests showing degenerative changes in the optic disc, increased IOP [intraocular pressure], and defects in visual fields... Imaging tests such as optical coherence tomography (OCT) or spectral-domain OCT (which analyzes the spectrum of reflected light on the retina) and optic disc photography (to view the optic nerve head, retina, or both) can supplement the clinical examination."

### **KEY WORDS:**

Doppler ultrasonography, glaucoma, GDx, Glaucoma scope, Heidelberg Retinal Tomograph, Nerve Fiber Analyzer, Ophthalmologic Evaluation, Glaucoma, Optic Nerve Head Analyzer, Optical Coherence Tomography (OCT), Pulsatile Ocular Blood Flow, Retinal Nerve Fiber Layer Analysis, Scanning Laser Ophthalmoscope, Scanning Laser Polarimetry, TopSS Device, RTVue® XR OCT Avanti™, The iExaminer™, 3D OCT-1 Maestro2, Phoenix ICON, Phoenix ICON GO, Eyer Retinal Camera Nm-Std

### **APPROVED BY GOVERNING BODIES:**

A number of confocal scanning laser ophthalmoscopy, scanning laser polarimetry, and optical coherence tomography devices have been cleared by the U.S. Food and Drug Administration (FDA) through the 510(k) process for imaging the posterior eye segment. For example, the

RTVue XR optical coherence tomography Avanti™ is an optical coherence tomography system indicated for the in vivo imaging and measurement of the retina, retinal nerve fiber layer, and optic disc as a tool and aid in the diagnosis and management of retinal diseases by a clinician. The RTVue XR optical coherence tomography Avanti™ with Normative Database is a quantitative tool for comparing retina, retinal nerve fiber layer, and optic disk measurements in the human eye with a database of known normal subjects. It is intended for use as a diagnostic device to aid in the detection and management of ocular diseases. In 2016, the RTVue XR optical coherence tomography and Avanti™ with AngioVue™ Software were cleared by the FDA through the 510(k) process (K153080) as an aid in the visualization of vascular structures of the retina and choroid.

FDA product code: HLI, OBO.

In 2012, the iExaminer™ (Welch Allyn) was cleared for marketing by the FDA through the 510(k) process. The iExaminer™ consists of a hardware adapter and associated software (iPhone® App) to capture, store, send, and retrieve images from the PanOptic™ Ophthalmoscope (Welch Allyn) using an iPhone.

FDA product code: HKI.

The 1 lists selected devices cleared by the U.S. FDA for imaging the posterior eye segment.

**Table 1. Selected Ocular Imaging Devices Cleared by the U.S. Food and Drug Administration**

Device	Manufacturer	Date Cleared	510. k No.	Indication
3D OCT-1 Maestro2	Topcon Corporation	10/30/2023	K231222	Imaging of optic nerve and retinal nerve fiber layer
Phoenix ICON and Phoenix ICON GO	NeoLight, LLC	09/06/2023	K223575	Imaging of optic nerve and retinal nerve fiber layer
Eyer Retinal Camera Nm-Std	Phelcom Technologies	02/22/2023	K221329	Imaging of optic nerve and retinal nerve fiber

				layer
SOLIX	Optovue Inc.	11/9/2022	K222166	Imaging of optic nerve and retinal nerve fiber layer
RESCAN 700 CALLISTO eye	Carl Zeiss Meditec AG	1/11/2019	K180229	Imaging of optic nerve and retinal nerve fiber layer
Retina Workplace	Carl Zeiss Meditec Inc	10/24/2018	K182318	Imaging of optic nerve and retinal nerve fiber layer
Spectralis HRA+OCT and variants with High Magnification Module	Heidelberg Engineering GmbH	10/18/2018	K182569	Imaging of optic nerve and retinal nerve fiber layer
Spectralis HRA+OCT and variants with OCT Angiography Module	Heidelberg Engineering GmbH	9/13/2018	K181594	Imaging of optic nerve and retinal nerve fiber layer
Spectralis HRA + OCT and variants	Heidelberg Engineering GmbH	8/30/2018	K173648	Imaging of optic nerve and retinal nerve fiber layer
Image Filing Software NAVIS-EX	Nidek Co. Ltd	7/19/2018	K181345	Imaging of optic nerve and retinal nerve fiber layer

Avanti	Optovue Inc.	6/8/2018	K180660	Imaging of optic nerve and retinal nerve fiber layer
P200TE	Optos plc	2/28/2018	K173707	Imaging of optic nerve and retinal nerve fiber layer
DRI OCT Triton	Topcon Corporation	1/19/2018	K173119	Imaging of optic nerve and retinal nerve fiber layer
IMAGEnet 6 Ophthalmic Data System	Topcon Corporation	11/1/2017	K171370	Imaging of optic nerve and retinal nerve fiber layer
Spectralis HRA + OCT and variants Spectralis FA+OCT Spectralis ICGA+OCT Spectralis OCT Blue Peak Spectralis OCT with Multicolor	Heidelberg Engineering GmbH	11/1/2017	K172649	Imaging of optic nerve and retinal nerve fiber layer
PRIMUS	Carl Zeiss Suzhou Co. Ltd.	6/21/2017	K163195	Imaging of optic nerve and retinal nerve fiber layer
Retina Workplace	Carl Zeiss Meditec AG	6/21/2017	K170638	Imaging of optic nerve and retinal nerve fiber layer

iVue	Optovue Inc.	6/9/2017	K163475	Imaging of optic nerve and retinal nerve fiber layer
3D OCT-1 Maestro	Topcon Corporation	3/3/2017	K170164	Imaging of optic nerve and retinal nerve fiber layer
EnFocus 2300 EnFocus 4400	Bioptigen Inc.	12/9/2016	K162783	Imaging of optic nerve and retinal nerve fiber layer
PLEX Elite 9000 SS-OCT	CARL ZEISS MEDITEC INC.	10/26/2016	K161194	Imaging of optic nerve and retinal nerve fiber layer
3D OCT-1 Maestro	Topcon Corporation	7/28/2016	K161509	Imaging of optic nerve and retinal nerve fiber layer
LSFG-NAVI	Softcare Co. Ltd	5/12/2016	K153239	Imaging of optic nerve and retinal nerve fiber layer
Spectralis HRA + OCT and variants (e.g.s below) Spectralis FA+OCT Spectralis ICGA+OCT Spectralis OCT Blue Peak Spectralis OCT with Multicolor	Heidelberg Engineering GmbH	5/6/2016	K152205	Imaging of optic nerve and retinal nerve fiber layer

RTVue XR OCT Avanti with AngioVue Software	OPTOVUE INC.	2/11/2016	K153080	Imaging of optic nerve and retinal nerve fiber layer
EnFocus 2300 EnFocus 4400	BIOPTIGEN INC.	12/2/2015	K150722	Imaging of optic nerve and retinal nerve fiber layer
Optical Coherence Tomography	CARL ZEISS MEDITEC INC	9/1/2015	K150977	Imaging of optic nerve and retinal nerve fiber layer
OCT-Camera	OptoMedical Technologies GmbH	3/4/2015	K142953	Imaging of optic nerve and retinal nerve fiber layer
RESCAN 700 CALLISTO EYE	CARL ZEISS MEDITEC AG	11/18/2014	K141844	Imaging of optic nerve and retinal nerve fiber layer
PROPPER INSIGHT BINOCULAR INDIRECT OPHTHALMOSCOPE	PROPPER MANUFACTURING CO.INC.	9/17/2014	K141638	Imaging of optic nerve and retinal nerve fiber layer
CENTERVUE MACULAR INTEGRITY ASSESSMENT	CENTERVUE SPA	4/23/2014	K133758	Imaging of optic nerve and retinal nerve fiber layer
AMICO DH-W35	AMICO	3/26/2014	K131939	Imaging of

OPHTHALMOSCOPE SERIES	DIAGNOSTIC INCORPORATED			optic nerve and retinal nerve fiber layer
IVUE 500	OPTOVUE INC.	3/19/2014	K133892	Imaging of optic nerve and retinal nerve fiber layer
RS-3000 ADVANCE	NIDEK CO. LTD.	2/19/2014	K132323	Imaging of optic nerve and retinal nerve fiber layer

**BENEFIT APPLICATION:**

Coverage is subject to member’s specific benefits. Group-specific policy will supersede this policy when applicable.

**CURRENT CODING:**

**CPT Codes:**

92133	Scanning computerized ophthalmic diagnostic imaging, posterior segment; with interpretation and report, unilateral or bilateral; optic nerve
0198T	Measurement of ocular blood flow by repetitive pressure sampling, with interpretation and report

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## **POLICY HISTORY:**

Adopted for Blue Advantage, February 2011

Available for comment February 9 – March 25, 2011

Medical Policy Group, February 2012

Medical Policy Group, February 2013

Medical Policy Group, February 2014

Medical Policy Group, February 2015

Medical Policy Group, September 2016

Medical Policy Group, April 2017

Medical Policy Group, December 2017

Medical Policy Group, April 2020: Reinstated policy effective March 24, 2020.

Medical Policy Group, March 2021

Medical Policy Group, March 2022

Medical Policy Group, March 2023

Medical Policy Group, April 2024

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*This medical policy is not an authorization, certification, explanation of benefits, or a contract. Eligibility and benefits are determined on a case-by-case basis according to the terms of the member's plan in effect as of the date services are rendered. All medical policies are based on (i) research of current medical literature and (ii) review of common medical practices in the treatment and diagnosis of disease as of the date hereof. Physicians and other providers are solely responsible for all aspects of medical care and treatment, including the type, quality, and levels of care and treatment.*

*This policy is intended to be used for adjudication of claims (including pre-admission certification, pre-determinations, and pre-procedure review ) in Blue Cross and Blue Shield's administration of plan contracts.*