# Scanning Computerized Ophthalmic Diagnostic Imaging

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| **Policy ID:** | HHO-DE-MP-1180 |
| **Approved By:** | Highmark Health Options – Market Leadership |
| **Provider Notice Date:** | 12/15/2021; 03/01/2023; 09/22/2023 |
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| **Last Revision Date:** | 11/30/2022; 11/20/2023 |
| **Products:** | Medicaid |
| **Application:** | All participating hospitals and providers |
| **Page Number(s):** | 1 of 11 |

## Disclaimer

Highmark Health Options medical policy is intended to serve only as a general reference resource regarding coverage for the services described. This policy does not constitute medical advice and is not intended to govern or otherwise influence medical decisions.

### POLICY STATEMENT

Highmark Health Options may provide coverage under the medical-surgical benefits of the Company's Medicaid products for medically necessary scanning computerized ophthalmic diagnostic imagining services.

This policy is designed to address medical necessity guidelines that are appropriate for the majority of individuals with a particular disease, illness, or condition. Each person's unique clinical circumstances warrant individual consideration, based upon review of applicable medical records.

The qualifications of the policy will meet the standards of the National Committee for Quality Assurance (NCQA) and the Delaware Department of Health and Social Services (DHSS) and all applicable state and federal regulations.

### DEFINITIONS

**Highmark Health Options (HHO)** – Managed care organization serving vulnerable populations that have complex needs and qualify for Medicaid. Highmark Health Options members include individuals and families with low income, expecting mothers, children, and people with disabilities. Members pay nothing to very little for their health coverage. Highmark Health Options currently services Delaware Medicaid: Delaware Healthy Children Program (DHCP) and Diamond State Health Plan Plus LTSS (DSHP Plus LTSS) members

**Confocal Scanning Laser Opthamalmoscopy (CSLO)** – A laser-based image acquisition technique, which is intended to improve the quality of the examination compared to 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 the thickness of the RNFL. In addition, this technique does not require maximal mydriasis, which may be a problem in patients with glaucoma. The Heidelberg Retinal Tomograph is probably the most common example of this technology.

**Optical Coherence Tomography (OCT)** – A noninvasive, noncontact imaging system that 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 3-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 patient's pupil.

**Scanning Laser Polarimetry (SLP)** – The retinal nerve fiber layer (RNFL) is birefringent, causing 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 RNFL thickness. Unlike CSLO, SLP can directly measure the thickness of the RNFL. GDx® is a common example of a scanning laser polarimeter. GDx® contains a normative database and statistical software package to allow comparison to 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 done in about 10 minutes. Current instruments have added enhanced and variable corneal compensation technology to account for corneal polarization.

**PROCEDURE**

Prior Authorization is not required.

1. Anterior segment SCODI will be considered medically reasonable and necessary for evaluation of specified forms of glaucoma (narrow angle, suspected narrow angle, mixed and open angle) and certain disorders of the cornea (corneal edema or opacity), iris, and ciliary body.

2. Posterior segment SCODI will be considered medically reasonable and necessary under the following circumstances:

    - For the diagnosis and management of a patient who has mild, moderate, severe, or indeterminate stage glaucoma or who is suspected of having glaucoma.
    - Monitoring patients being treated with chloroquine (CQ) and/or hydroxychloroquine (HCQ) for the development of retinopathy.
    - The evaluation and treatment of patients with conditions affecting the optic nerve (e.g., optic neuropathy) or retinal disease (e.g., macular degeneration, diabetic retinopathy) and in the evaluation and treatment of certain macular abnormalities (e.g., macular edema, atrophy associated with degenerative retinal diseases).

The following are considered not reasonable and necessary, and therefore will be denied:

- SCODI is usually not medically reasonable and necessary when performed to provide additional confirmatory information regarding a diagnosis which has already been determined. Documentation should support that the SCODI test result was used for establishing a diagnosis, establishing a baseline prior to treatment, or for monitoring purposes.
- Fundus photography and posterior segment SCODI performed on the same eye on the same day are generally mutually exclusive of one another (National Correct Coding Initiative [NCCI] Policy Manual). The provider is not precluded from performing both on the same eye on the same day when each service is necessary to evaluate and treat the patient. The medical record should clearly document the medical necessity of each service.
- Screening (patient without signs or symptoms) for any condition is not medically reasonable and necessary.

Note: This medical policy imposes frequency limitations as well as diagnosis limitations that support diagnosis to procedure code automated denials. However, services performed for any given diagnosis must meet all of the indications and limitations stated in this policy.

3. Documentation Requirements

1) All documentation must be maintained in the patient's medical record and made available to the contractor upon request.
2) Every page of the record must be legible and include appropriate patient identification information (e.g., complete name, dates of service[s]). The documentation must include the legible signature of the physician or nonphysician practitioner responsible for and providing the care to the patient.
3) The submitted medical record must support the use of the selected ICD-10-CM code(s). The submitted CPT/HCPCS code must describe the service performed.
4) The medical record documentation must support the medical necessity of the services as stated in this policy.
5) Medical record must include the test results, comparison with prior tests when applicable, computer analysis of the data, and appropriate data storage for future comparison in follow-up exams.
6) If applicable, medical record documentation must clearly indicate the rationale which supports the medical necessity for performing the fundus photography and posterior segment SCODI on the same day on the same eye. Documentation should also reflect how the test results were used in the patient's plan of care.
7) If bilateral studies are performed, the documentation maintained by the provider must demonstrate medical need for the performance of the test for each eye.
8) When reporting ICD-10 code Z79.899, the medical record must reflect the medication administered as well as the underlying condition for which it was given.

4. Utilization Guidelines

- CPT code 92132: No more than two (2) exams per year will be considered medically reasonable and necessary for covered indications.
- CPT code 92133: No more than two (2) exams per year will be considered medically reasonable and necessary for the patient who has or is suspected of having glaucoma.
- CPT code 92134: No more than one (1) exam every two (2) months will be considered medically reasonable and necessary to manage the patient whose primary ophthalmological condition is related to a retinal disease that is not undergoing active treatment. *

* Note: Please see next paragraph if undergoing active treatment.

No more than one (1) exam per month will be considered medically reasonable and necessary to manage the patient with retinal conditions undergoing active treatment. These conditions include wet AMD, choroidal neovascularization, macular edema, diabetic retinopathy (proliferative and nonproliferative), branch retinal vein occlusion, central retinal vein occlusion, and cystoid macular edema. With the development of treat and extend protocols for patients with wet AMD treated with antiangiogenic drugs, it is expected that SCODI (unilateral or bilateral) will be used for therapeutic decision making and utilized at maximum of monthly with subsequent less frequency based on the patient treatment protocol and patient response as documented in the medical record.

In addition, other conditions which may undergo rapid clinical changes monthly requiring aggressive therapy and frequent follow-up (e.g., macular hole and traction retinal detachment) may also require monthly scans.

No more than one (1) exam per year will be considered medically reasonable and necessary for patients being treated with CQ and/or HCQ. These patients should receive a baseline examination within the first year of treatment and as an annual follow-up after five years of treatment. For higher-risk patients, annual testing may begin immediately (without a 5-year delay).

5. Post-payment audit statement

   The medical record must include documentation that reflects the medical necessity criteria and is subject to audit by Highmark Health Options at any time pursuant to the terms of your provider agreement.

6. Place of service

   The place of service for scanning computerized ophthalmic diagnostic imaging is outpatient.

7. Governing bodies approval

   A number of scanner devices have been approved by the FDA. A few examples include:

   - RTVue XR OCT Avanti is a system indicated for the in vivo imaging and measurement of retina, retinal fiber layer, and optic disc as a tool and aid in the diagnosis and management of retinal diseases by a clinician.
   - In 2016, the RTVue XR OCT with Avanti and AngioVue software was approved by FDA as an aid in the visualization of vascular structures of the retina and choroid.
   - The iExaminer was cleared by the FDA in 2012. This is a device consisting of hardware adapter and software to capture, store, send and retrieve images from the Welch Allyn PanOptic Ophthalmoscope using an iPhone.
   - First Coast Service Options, Inc. Local Coverage Determination (LCD): Scanning Computerized Ophthalmic Diagnostic Imaging (L33751).
   - Novitas Solutions, Inc. Local Coverage Determination (LCD): Scanning Computerized Ophthalmic Diagnostic Imaging (L35038) with effective date of 04/18/2019.

**COVERED PROCEDURE CODES**

| CPT Codes | Description |
|---|---|
| 92132 | Scanning computerized ophthalmic diagnostic imaging, anterior segment, with interpretation and report, unilateral or bilateral. |
| 92133 | Scanning computerized ophthalmic diagnostic imaging, posterior segment, with interpretation and report, unilateral or bilateral. |
| 92134 | Scanning computerized ophthalmic diagnostic imaging, posterior segment, with interpretation and report, unilateral or bilateral, retina. |

**COVERED DIAGNOSIS CODES FOR PROCEDURE CODE 92132**

| Codes | | | | | | |
|---|---|---|---|---|---|---|
| C69.01 | C69.02 | C69.11 | C69.12 | C69.41 | C69.42 | H17.01 |
| H17.02 | H17.03 | H17.11 | H17.12 | H17.13 | H17.811 | H17.812 |
| H17.813 | H17.821 | H17.822 | H17.823 | H17.89 | H18.20 | H18.211 |
| H18.212 | H18.213 | H18.222 | H18.223 | H18.231 | H18.232 | H18.233 |
| H21.271 | H21.272 | H21.273 | H21.301 | H21.302 | H21.303 | H21.311 |
| H21.312 | H21.313 | H21.321 | H21.322 | H21.323 | H21.89 | H40.021 |
| H40.022 | H40.023 | H40.031 | H40.032 | H40.033 | H40.061 | H40.062 |
| H40.063 | H40.211 | H40.212 | H40.213 | H40.2211 | H40.2212 | H40.2213 |
| H40.2214 | H40.2221 | H40.2222 | H40.2223 | H40.2224 | H40.2231 | H40.2232 |
| H40.2233 | H40.2234 | H40.231 | H40.232 | H40.233 | H40.241 | H40.242 |
| H40.243 | H40.31X1 | H40.31X2 | H40.31X3 | H40.31X4 | H40.32X1 | H40.32X2 |
| H40.32X3 | H40.32X4 | H40.33X1 | H40.33X2 | H40.33X3 | H40.33X4 | |
| T86.8401 | T86.8402 | T86.8403 | T86.8409 | T86.8411 | T86.8412 | T86.8413 |
| T86.8419 | T86.8421 | T86.8422 | T86.8423 | T86.8429 | | |

**COVERED DIAGNOSIS CODES FOR PROCEDURE CODE 92133**

| Codes | | | | | | |
|---|---|---|---|---|---|---|
| H40.001 | H40.002 | H40.003 | H40.009 | H40.011 | H40.012 | H40.013 |
| H40.019 | H40.021 | H40.022 | H40.023 | H40.039 | H40.041 | H40.042 |
| H40.043 | H40.049 | H40.051 | H40.052 | H40.053 | H40.059 | H40.061 |
| H40.062 | H40.063 | H40.069 | | | | |

**COVERED DIAGNOSIS CODES FOR PROCEDURE CODE 92134**

| Codes | | | | | | |
|---|---|---|---|---|---|---|
| A18.53 | B39.4 | C69.21 | C69.22 | C69.31 | C69.32 | D31.31 |
| D31.32 | E08.3211 | E08.3212 | E08.3213 | E08.3291 | E08.3292 | E08.3293 |
| E08.3311 | E08.3312 | E08.3313 | E08.3391 | E08.3392 | E08.3393 | E08.3411 |
| E08.3412 | E08.3413 | E08.3491 | E08.3492 | E08.3493 | E08.3511 | E08.3512 |
| E08.3513 | E08.3521 | E08.3522 | E08.3523 | E08.3531 | E08.3532 | E08.3533 |
| E08.3541 | E08.3542 | E08.3543 | E08.3551 | E08.3552 | E08.3553 | E08.3591 |
| E08.3592 | E08.3593 | E08.37X1 | E08.37X2 | E08.37X3 | E09.3211 | E09.3212 |
| E09.3213 | E09.3291 | E09.3292 | E09.3293 | E09.3311 | E09.3312 | E09.3313 |
| E09.3391 | E09.3392 | E09.3393 | E09.3411 | E09.3412 | E09.3413 | E09.3491 |
| E09.3492 | E09.3493 | E09.3511 | E09.3512 | E09.3513 | E09.3521 | E09.3522 |
| E09.3523 | E09.3531 | E09.3532 | E09.3533 | E09.3541 | E09.3542 | E09.3543 |

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|---|---|---|---|---|---|---|
| E09.3551 | E09.3552 | E09.3553 | E09.3591 | E09.3592 | E09.37X1 | E09.37X2 |
| E09.37X3 | E10.3211 | E10.3212 | E10.3213 | E10.3291 | E10.3292 | E10.3393 |
| E10.3411 | E10.3412 | E10.3413 | E10.3491 | E10.3492 | E10.3493 | E10.3511 |
| E10.3512 | E10.3513 | E10.3521 | E10.3522 | E10.3523 | E10.3531 | E10.3532 |
| E10.3533 | E10.3541 | E10.3542 | E10.3543 | E10.3551 | E10.3552 | E10.3553 |
| E10.3591 | E10.3592 | E10.3593 | E10.37X1 | E10.37X2 | E10.37X3 | E11.3211 |
| E11.3212 | E11.3213 | E11.3313 | E11.3391 | E11.3392 | E11.3393 | E11.3411 |
| E11.3412 | E11.3413 | E11.3491 | E11.3492 | E11.3493 | E11.3511 | E11.3512 |
| E11.3513 | E11.3521 | E11.3522 | E11.3523 | E11.3531 | E11.3532 | E11.3533 |
| E11.3541 | E11.3542 | E11.3543 | E11.3551 | E11.3552 | E11.3553 | E11.3591 |
| E11.3592 | E11.3593 | E11.37X1 | E11.37X2 | E11.37X3 | E13.3211 | E13.3212 |
| E13.3213 | E13.3291 | E13.3292 | E13.3293 | E13.3311 | E13.3312 | E13.3313 |
| E13.3391 | E13.3392 | E13.3393 | E13.3411 | E13.3412 | E13.3413 | E13.3491 |
| E13.3492 | E13.3493 | E13.3511 | E13.3512 | E13.3513 | E13.3521 | E13.3522 |
| E13.3523 | E13.3531 | E13.3532 | E13.3533 | E13.3541 | E13.3542 | E13.3543 |
| E13.3551 | E13.3552 | E13.3553 | E13.3591 | E13.3592 | E13.3593 | E13.37X1 |
| E13.37X2 | E13.37X3 | G45.3 | H30.011 | H30.012 | H30.013 | H30.021 |
| H30.022 | H30.023 | H30.031 | H30.032 | H30.033 | H30.041 | H30.042 |
| H30.043 | H30.111 | H30.112 | H30.113 | H30.121 | H30.122 | H30.123 |
| H30.131 | H30.132 | H30.133 | H30.141 | H30.142 | H30.143 | H30.21 |
| H30.22 | H30.23 | H30.811 | H30.812 | H30.813 | H30.891 | H30.892 |
| H30.893 | H31.021 | H31.022 | H31.023 | H31.101 | H31.102 | H31.103 |
| H31.111 | H31.112 | H31.113 | H31.121 | H31.122 | H31.123 | H31.411 |
| H31.412 | H31.413 | H31 | H31.421 | H31.422 | H31.423 | H32 |
| H33.011 | H33.012 | H33.013 | H33.021 | H33.022 | H33.023 | H33.031 |
| H33.032 | H33.033 | H33.041 | H33.042 | H33.043 | H33.051 | H33.052 |
| H33.053 | H33.111 | H33.112 | H33.113 | H33.191 | H33.192 | H33.193 |
| H33.21 | H33.22 | H33.23 | H33.311 | H33.312 | H33.313 | H33.321 |
| H33.322 | H33.323 | H33.331 | H33.332 | H33.333 | H33.41 | H33.42 |
| H33.43 | H33.8 | H34.01 | H34.02 | H34.03 | H34.11 | H34.12 |
| H34.13 | H34.211 | H34.212 | H34.213 | H34.231 | H34.232 | H34.233 |
| H34.8110 | H34.8111 | H34.8112 | H34.8120 | H34.8121 | H34.8122 | H34.8130 |
| H34.8131 | H34.821 | H34.822 | H34.823 | H34.8310 | H34.8311 | H34.8312 |
| H34.8320 | H34.8321 | H34.8322 | H34.8330 | H34.8331 | H34.8332 | H35.011 |
| H35.012 | H35.013 | H35.021 | H35.022 | H35.023 | H35.031 | H35.032 |
| H35.033 | H35.041 | H35.042 | H35.043 | H35.051 | H35.052 | H35.053 |
| H35.061 | H35.062 | H35.063 | H35.071 | H35.072 | H35.073 | H35.09 |
| H35.171 | H35.172 | H35.173 | H35.21 | H35.22 | H35.23 | H35.3110 |

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|---|---|---|---|---|---|---|
| H35.3111 | H35.3112 | H35.3113 | H35.3114 | H35.3120 | H35.3121 | H35.3122 |
| H35.3123 | H35.3124 | H35.3130 | H35.3131 | H35.3132 | H35.3133 | H35.3134 |
| H35.3210 | H35.3211 | H35.3212 | H35.3213 | H35.3220 | H35.3221 | H35.3222 |
| H35.3223 | H35.3230 | H35.3231 | H35.3232 | H35.3233 | H35.33 | H35.341 |
| H35.342 | H35.343 | H35.351 | H35.352 | H35.353 | H35.361 | H35.362 |
| H35.363 | H35.371 | H35.372 | H35.373 | H35.381 | H35.382 | H35.383 |
| H35.40 | H35.411 | H35.412 | H35.413 | H35.421 | H35.422 | H35.423 |
| H35.431 | H35.432 | H35.433 | H35.441 | H35.442 | H35.443 | H35.451 |
| H35.452 | H35.453 | H35.461 | H35.462 | H35.463 | H35.50 | H35.51 |
| H35.52 | H35.53 | H35.54 | H35.61 | H35.62 | H35.63 | H35.70 |
| H35.711 | H35.712 | H35.713 | H35.721 | H35.722 | H35.723 | H35.731 |
| H35.732 | H35.733 | H35.81 | H35.82 | H35.89 | H40.831 | H40.832 |
| H40.833 | H40.89 | H43.811 | H43.812 | H43.813 | H43.821 | H43.822 |
| H43.823 | H44.2A1 | H44.2A2 | H44.2A3 | H44.2B1 | H44.2B2 | H44.2B3 |
| H44.2C1 | H44.2C2 | H44.2C3 | H44.2D1 | H44.2D2 | H44.2D3 | H44.2E1 |
| H44.2E2 | H44.2E3 | H47.11 | H47.12 | H47.13 | H47.141 | H47.142 |
| H47.143 | H53.15 | H53.411 | H53.412 | H53.413 | H53.421 | H53.422 |
| H53.423 | H53.431 | H53.432 | H53.433 | H53.451 | H53.452 | H53.453 |
| H53.481 | H53.482 | H53.483 | H59.031 | H59.032 | H59.033 | Z79.899* |

***= Z79.899 is to be reported for the baseline evaluation and for annual monitoring of patients on CQ and HCQ**

**REIMBURSEMENT**

Participating facilities will be reimbursed per their Highmark Health Options contract.

**SUMMARY OF LITERATURE**

Scanning computerized ophthalmic diagnostic imaging (SCODI) allows for the early detection of glaucomatous damage to the nerve fiber layer or optic nerve and has demonstrated clinical utility in facilitating earlier diagnosis and treatment as well as monitoring for progression and response to treatment. Evidence-based guidelines (2015 Academy of Ophthalmology [AAO] Preferred Practice Pattern [PPP] on Primary Open-Angle Glaucoma and 2010 American Optometric Association [AOA] Optometric Clinical Practice Guideline on Care of the Patient with Open Angle Glaucoma) identify SCODI as one technique that may be used to examine the optic nerve head (ONH) and/or retinal nerve fiber layer (RNFL). SCODI is often used to provide quantitative information to supplement the clinical exam of the optic nerve. SCODI is widely used in the posterior segment, whereas in the anterior segment, the use is still limited.

The evidence-based guideline from the AAO (2015 AAO PPP on Primary Angle Closure) indicates that anterior segment imaging should be considered when angle anatomy is difficult to assess on gonioscopy. There is good evidence demonstrating general agreement between findings on gonioscopy and anterior segment imaging, including ultrasound biomicroscopy and anterior segment optical coherence tomography (AS-OCT). However, AS-OCT is limited to evaluating the iridocorneal angle. AS-OCT is one

technology that may prove useful in evaluating secondary causes of angle closure and elucidating plateau iris.

SCODI is also a valuable tool for the evaluation of patients with retinal disease, especially those with macular abnormalities. SCODI is often used in conjunction with clinical examination of the eye. It is at times used as a baseline and also used in monitoring for progression or response to treatment. The clinical utility of OCT imaging in retinal conditions has been demonstrated as providing an objective, accurate assessment of the amount and location of retinal thickening. Evidence-based guidelines from the AAO (PPP Diabetic Retinopathy [2016] and the PPP Idiopathic Macular Hole [2014, updated 2017]) support that in clinical practice, decisions are often based on OCT findings.

Finally, Marmor et al. (AAO Statement 2016) published recommendations on screening patients who are being treated with chloroquine and hydroxychloroquine. A baseline test is performed, and then ongoing monitoring at regular intervals is recommended. Marmor et al. recommend beginning annual screening after 5 years for patients on acceptable doses of chloroquine or hydroxychloroquine and without any major risk factors.

In an observational case study, Leite et al. (2010) looked at 99 patients with glaucomatous eyes and 47 control patients. The severity of disease was graded using the visual field index (VFI) from standard automated perimetry. The authors looked to determine if disease severity had any impact on the diagnostic accuracy of OCT. The average VFI was 85.5% for the glaucomatous eyes and 99.4% for the control eyes, indicating very minimal visual field loss. The results show that for those with mild disease (VFI near 100%) the sensitivity of OCT was 47% and the specificity was 95%. For those patients with a VFI of 70%, the sensitivity increased to 84% and the specificity was 95%.

Bowd et al. (2017) published a study that looked to estimate the measurement floors for spectral-domain optical coherence tomography (SD-OCT) measurements (minimum rim width [MRW], ganglion cell-inner plexiform layer thickness [GC-IPLT], and circumpapillary retinal nerve fiber layer thickness [cpRNFLT]), and compared global change over time in advanced glaucoma eyes. The study included a variability group of 41 eyes of 27 glaucoma patients with moderate to advanced glaucoma to estimate the measurement floors and 87 eyes of 59 patients with advanced to severe glaucoma in a longitudinal group. Average structural loss of MRW, macular GC-IPLT, and cpRNFLT in the variability group eyes (over 5 weeks of follow-up) and the longitudinal group eyes (over 2 years of follow-up) was presented. The results indicated the mean percentage of image area that did not reach the floor in the baseline images of eyes in the longitudinal group (i.e., the image percentage that changed after 2 years of follow-up) was 19% for MRW, 36% for GC-IPLT, and 14% for cpRNFLT, indicating that GC-IPLT likely is the most robust measurement for assessing localized changes in eyes with advanced glaucoma. Authors concluded that a significant percentage of SD-OCT-measured retinal tissue is spared from the measurement floor in advanced glaucoma eyes. In addition, progressive thinning of the spared tissue is observable well into late-stage disease, particularly when GC-IPLT is the structural parameter measured. These results indicate that optical imaging, particularly SD-OCT imaging, has a place in detecting structural change in eyes with advanced glaucoma.

Belghith et al. (2016) did a study to compare SD-OCT standard structural measures MRW, ganglion cell-inner plexiform layer (GC-IPL), and cpRNFL and a new three-dimensional (3D) volume optic nerve head (ONH) change detection method for detecting change over time in severely advanced-glaucoma (open-angle glaucoma [OAG]) patients. The study included three groups of participants. The first group was composed of 35 eyes of 35 advanced-glaucoma patients followed for an average of 3.5 years. The stable glaucoma group consisted of 50 eyes from 27 early-, moderate-, and advanced-glaucoma patients with five serial OCT exams imaged every week for 5 weeks. A third group of 46 eyes from 30 healthy subjects followed for an average of 2.8 years was used to estimate the aging effects. Results suggest that even in very advanced glaucoma, structural loss can be detected in some eyes using standard global structural measures. Specifically, macular GC-IPL had the highest proportion of eyes with detectable change (31%), followed by MRW (11%) and cpRNFL (4%). In addition, the 3D whole-volume Bayesian-kernel

detection scheme (BKDS) change method, which does not require extensive retinal layer segmentation, detected change in 37% of eyes. The authors concluded the results suggest that even in very advanced disease, structural change can be detected, and that monitoring macular GC-IPL and 3D whole-volume patients BKDS change shows promise for identifying progression in advanced glaucoma. However, a larger sample of advanced-glaucoma patients with longer follow-up is needed to validate these findings.

In a retrospective case note review, Hau et al. (2015) compared AS-OCT with ultrasound B-scan (USB) in evaluating iris and iridociliary body lesions. Patients with other anterior or posterior segment lesions or tumors were excluded from this study. The study included 126 patients (126 eyes), the mean age of the patient group was 57.8, who were imaged with both AS-OCT and USB presenting to the same ocular oncology center over a 2-year period of time. The three most common diagnoses were iris naevi, iris pigment epithelial cysts, and iris melanoma. The aim of the study was to evaluate which imaging modality (AS-OCT vs. USB) provided better visualization and characterization of a large cohort of iris and iridociliary body lesions. High-frequency ultrasound biomicroscopy (UBM) was not included in this study but was referenced as having some distinct advantages over USB and AS-OCT as well as limitations on use. The results revealed that USB was better than AS-OCT in visualizing all tumor margins, posterior tumor margin, and producing less posterior shadowing. USB was slightly better for resolving the overall tumor and posterior tumor surface, but AS-OCT was better for resolving the anterior and lateral tumor surface. In total, AS-OCT was able to detect more lesions than USB, especially in imaging iris lesions, but it was unable to detect any of the ciliary body lesions. The authors concluded that AS-OCT is superior to USB for imaging small lesions pertaining to the anterior iris, but USB is better for imaging larger iris lesions with posterior or ciliary body extension.

Janssens et al. (2016) conducted a systematic review to determine how accurate AS-OCT and UBM are in determining tumor margins and tumor depth of conjunctival and corneal tumors and if either of these techniques can provide additional information regarding the diagnosis. Fourteen sources were selected to analyze corneal and conjunctival tumor thickness and internal characteristics and extension in depth and size and shape measured by either of these two noninvasive techniques, AS-OCT or UBM, or a combination of both. The study designs included retrospective analysis, retrospective interventional case series, retrospective noninterventional case series, prospective studies, and unknown study designs. The number of patients in articles using UBM (alone) in conjunctival and corneal tumors totaled 44, the number of patients in articles using AS-OCT (alone) in conjunctival and corneal tumors totaled 211 (212 eyes), and the number of patients in articles using both UBM and AS-OCT in conjunctival and corneal tumors totaled 235 (238 tumors). The results show that both AS-OCT and UBM imaging techniques provide useful information about the internal features, extension, size, and shape of tumors. There is not enough evidence on the advantages and disadvantages of AS-OCT and UBM in certain tumor types. The authors concluded that more comparative studies are needed to investigate which imaging technique is most suitable for a certain tumor type.

**ANALYSIS OF EVIDENCE**

The clinical utility of SCODI has been established and validated in evidence-based guidelines and literature for early detection of glaucomatous damage to the retinal nerve fiber layer or optic disc, differentiation and diagnosis of other disorders of the optic nerve, as well as monitoring for progressive optic neuropathy, monitoring retinal conditions, and drug-related ocular toxicity.

A number of studies have been published to evaluate the usefulness of posterior OCT for individuals with advanced glaucomatous damage as well as the potential applications of anterior segment OCT (AS-OCT and SD-OCT with anterior segment imaging capabilities) to image and provide measurements of anterior segment structures in a number of clinical situations. Overall, these studies have small sample sizes, relatively limited follow-up, and no documentation of improved health outcomes.

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