Optical Coherence Tomography of the Anterior Eye Segment

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DESCRIPTION

Optical coherence tomography (OCT) is a non-invasive, high-resolution imaging method that can be used to visualize ocular structures. OCT creates an image of light reflected from the ocular structures. In this technique a reflected light beam interacts with a reference light beam. The coherent (positive) interference between the two beams (reflected and reference) is measured by an interferometer, allowing construction of an image of the ocular structures (cornea, anterior chamber, iris, and the central portion of the lens). This method allows cross-sectional imaging at a resolution of 6 to 25 microns.

These devices are designed to image the shape, size and position of anterior components and make precise measurements of the distances between them, including angle-to-angle, angle size in degrees, pupil diameter, anterior chamber depth, and thickness and radii of curvature of the crystalline lens. The anterior segment is measured pre- and postoperatively for laser surgery in refractive surgeries.

An early application of optical coherence tomography technology was the evaluation of the cornea before and after refractive surgery. Because this noninvasive procedure can be conducted by a technician, it has been proposed that this device may provide a rapid diagnostic and screening tool for detecting angle-closure glaucoma.

Other Diagnostic Tools

Optical coherence tomography of the anterior eye segment is being evaluated as a noninvasive diagnostic and screening tool with a number of potential applications. One proposed use of anterior segment optical coherence tomography is to determine whether there is a narrowing of the anterior chamber angle, which could lead to angle-closure glaucoma. Another general area of potential use is as a presurgical and postsurgical evaluation tool for anterior chamber procedures. This could include assessment of corneal thickness and opacity, calculation of intraocular lens power, guiding surgery, imaging intracorneal ring segments, and assessing complications following surgical procedures such as blockage of glaucoma tubes or detachment of Descemet membrane following endothelial keratoplasty. A third general category of use is to image pathologic processes such as dry eye syndrome, tumors, noninfectious uveitis, and infections. It is proposed that anterior segment optical coherence tomography provides better images than slit-lamp biomicroscopy/gonioscopy and ultrasound biomicroscopy due to higher resolution; in addition, anterior segment optical coherence tomography does not require probe placement under topical anesthesia.

Alternative methods of evaluating the anterior chamber are slit-lamp biomicroscopy or ultrasound biomicroscopy. Slit-lamp biomicroscopy is typically used to evaluate the anterior chamber; however, the chamber angle can only be examined with specialized lenses, the most common being the gonioscopic mirror. In this procedure, a gonio lens is applied to the surface of the cornea, which may result in distortion of the globe. Ultrasonography may also be used for imaging the anterior eye segment. Ultrasonography uses high-frequency mechanical pulses (10 to 20 MHz) to build a picture of the front of the eye. An ultrasound scan along the optical axis assesses corneal thickness, anterior chamber depth, lens thickness, and axial length. Ultrasound scanning across the eye creates a 2-dimensional image of the ocular structures. It has a resolution of 100 μm but only moderately high intraobserver and low interobserver reproducibility. Ultrasound biomicroscopy (»50 MHz) has a resolution of 30 to 50 μm. As with slit-lamp biomicroscopy with a gonioscopic mirror, this technique requires placement of a probe under topical anesthesia.

Clinical Context and Test Purpose

The purpose of optical coherence tomography (OCT) is to provide a diagnostic option that is an alternative to or an improvement on existing therapies, such as manual corneal topography measurements, in patients with disorders of corneal topography.

The question addressed in this evidence review is: Does optical coherence tomography (OCT) improve health outcomes for patients with disorders of the anterior eye segment?

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is individuals with disorders of the anterior eye segment.

Interventions
The test being considered is optical coherence tomography (OCT) of the anterior eye segment. Optical coherence tomography of the anterior eye segment is most likely to be administered in an outpatient facility by an ophthalmologist.

Comparators
Alternative tests are gonioscopy or ultrasound biomicroscopy, which are the most commonly used. Optical coherence tomography is proposed to be an improvement over gonioscopy and ultrasound biomicroscopy because optical coherence tomography has higher resolution and does not require a probe placed under topical anesthesia.

Gonioscopy and ultrasound biomicroscopy are most likely to be administered in an outpatient facility by an ophthalmologist.

Outcomes
The general outcomes of interest are test accuracy, other test performance measures, and functional health outcomes.

Identifying clinically validity and usefulness requires short-term follow-up. Evaluating functional outcomes may require longer follow-up.

Literature

Aqueous Tube Shunts
(2012) Jiang et al reported on a cross-sectional, observational study of the visualization of aqueous tube shunts by high-resolution optical coherence tomography, slit-lamp biomicroscopy, and gonioscopy in 18 consecutive patients (23 eyes).7, High-resolution optical coherence tomography demonstrated shunt position and patency in all 23 eyes. Compared with slit-lamp, 4 eyes had new findings identified by optical coherence tomography. For all 16 eyes in which tube entrance could be clearly visualized by optical coherence tomography, growth of fibrous scar tissue could be seen between the tube and the corneal endothelium. This scar tissue was not identified (retrospectively analyzed) in the patient records of the slit-lamp examination.

Endothelial Keratoplasty
Moutsouris et al (2011) reported on a prospective comparison of anterior segment optical coherence tomography, Scheimpflug imaging, and slit-lamp biomicroscopy in 120 eyes of 110 patients after Descemet membrane endothelial keratoplasty. All slit-lamp

biomicroscopy and optical coherence tomography examinations were performed by the same experienced technician, and all images were evaluated by 2 masked ophthalmologists. From a total of 120 Descemet membrane endothelial keratoplasty eyes, 78 showed normal corneal clearance by all 3 imaging techniques. The remaining 42 eyes showed persistent stromal edema within the first month, suggesting (partial) graft detachment. Biomicroscopy detected the presence or absence of a graft detachment in 35 eyes. Scheimpflug imaging did not provide additional information over biomicroscopy. In 15 eyes, only optical coherence tomography discriminated between a "flat" graft detachment and delayed corneal clearance. Thus, of the 42 eyes, optical coherence tomography provided added diagnostic value in 36% of cases. This led to further treatment in some of the additional cases. Specifically, a secondary Descemet stripping automated endothelial keratoplasty was performed for total graft detachment, while partial graft detachments were rebubbled or observed for corneal clearing. There were no false-negatives (graft detachment unrecognized) or false-positives (an attached graft recognized as a graft detachment). Additional studies are needed to further evaluate these results and to demonstrate the clinical utility of using OCT in this situation.

Glaucoma
(2015; Updated December 2021) UptoDate an UpToDate review on "Angle-closure glaucoma" by Weizer and colleagues, states that "Gonioscopy is the gold-standard method of diagnosing angle-closure …. High-definition anterior segment optical coherence tomography is being used as a modality to image the drainage angle and detect eyes at risk for angle-closure. Findings suggest that eyes prone to developing angle-closure do not merely differ anatomically from normal eyes but may also respond differently to light stimuli". (*Accessed January 2022*)

(2010) Mansouri and colleagues published a study that compared the accuracy in measurement of the anterior chamber (AC) angle by anterior segment OCT and UBM in European patients with suspected primary angle closure (PACS), primary angle closure (PAC), or primary angle-closure glaucoma (PACG) (Mansouri, 2010). In this study, 55 eyes of 33 consecutive patients presenting with PACS, PAC, or PACG were examined with OCT, followed by UBM. The trabecular-iris angle (TIA) was measured in all 4 quadrants. The angle-opening distance (AOD) was measured at 500 microns from the scleral spur. In this comparative study, the authors concluded that OCT measurements were significantly correlated with UBM measurements but showed poor agreement with each other. The authors do not believe that anterior segment OCT can replace UBM for the quantitative assessment of the anterior chamber angle.

(2010) Narayanaswamy et al conducted a community-based cross-sectional study of glaucoma screening. The study population consisted of individuals 50 years or older who underwent anterior segment OCT by a single ophthalmologist and gonioscopy by an ophthalmologist who was masked to the OCT findings. Individuals were excluded if they had a history of intraocular surgery, any evidence of aphakia/pseudophakia, or penetrating trauma in the eye; previous anterior segment laser treatment; a history of glaucoma; or corneal disorders such as corneal endothelial dystrophy, corneal opacity, or pterygium, all of which could influence the quality of angle imaging by OCT. The angle opening distance (AOD) was calculated at 250, 500, and 750 microns from the scleral spur. Of 2,047 individuals examined, 28% were excluded due to inability to locate the scleral spur (n=515), poor image quality (n=28), or software delineation errors (n=39). Of the remaining 1,465 participants, 315 (21.5%) had narrow angles on gonioscopy, defined as having a narrow angle if the posterior pigmented trabecular meshwork was not visible for at least 180 degrees on nonindentation gonioscopy with the eye in the primary position. Out of those who had an acceptable image, the area under the receiver operating characteristic curve was highest at 750 microns from the scleral spur in the nasal (0.90) and temporal (0.91) quadrants. A noted limitation of this quantitative technique for screening of angle closure glaucoma was the inability to define the scleral spur in 25% of the study population.

Pekmezci et al (2009) examined the sensitivity and specificity of the Visante optical coherence tomography using different cutoff values for the angle opening distance measured at 250, 500, and 750 μm from the scleral spur. Optical coherence tomography and gonioscopy records were available for 303 eyes of 155 patients seen at a glaucoma clinic. Blinded analysis showed sensitivity and specificity between 70% and 80% (vs. gonioscopy), depending on the angle opening distance and the cutoff value. Correlation coefficients between the qualitative gonioscopy grade and quantitative optical coherence tomography measurement ranged from 0.75 (angle opening distance=250 μm) to 0.88 (angle opening distance=750 μm). As noted by these investigators, "a truer measure of occludable angles is whether an eye develops angle-closure glaucoma in the future."

(2007) Nolan et al assessed the ability of a prototype of the Visante OCT to detect primary angle closure in 203 Asian patients. The patients, recruited from glaucoma clinics, had been diagnosed with primary angle closure, primary open-angle glaucoma, ocular hypertension, and cataracts; some had previously been treated with iridotomy. Images were assessed by 2 glaucoma experts, and the results compared to an independently obtained reference standard (gonioscopy). Data were reported from 342 eyes of 200 individuals. A closed angle was identified in 152 eyes with gonioscopy and 228 eyes with OCT; agreement was obtained between the 2 methods in 143 eyes. Although these results suggest low specificity for OCT, it is noted that gonioscopy is not considered to be a gold standard. The authors suggest 3 possible reasons for the increase in identification of closed angles with OCT: lighting is known to affect angle closure, and the lighting conditions were different for the 2 methods (gonioscopy requires some light); placement of the gonioscopy lens on the globe may have caused distortion of the anterior segment; and landmarks are not the same with the 2 methods. The authors noted that longitudinal studies will be required to determine whether eyes classified as closed by OCT, but not by gonioscopy, are at risk of developing primary angle closure glaucoma.

Tumors

(2016) Janssens et al completed a systematic review, analyzed corneal and conjunctival tumor thickness and internal characteristics and extension in depth and size and shape measured by 2 non-invasive techniques: AS-OCT, and UBM. AS-OCT, and UBM.

This review was based on a comprehensive search of 4 databases (Medline, Embase, Web of Science, and Cochrane Library). Articles published between January 1, 1999, and December 31, 2015, were included. These investigators searched for articles using the following search terms in various combinations: "optical coherence tomography", "ultrasound biomicroscopy", "corneal neoplasm", "conjunctival neoplasm", "eye", "tumor" and "anterior segment tumors". Inclusion criteria were as follows: UBM and/or AS-OCT was used; the study included corneal or conjunctival tumors; and the article was published in English, French, Dutch, or German. A total of 14 sources were selected. The authors noted that several studies on the quality of AS-OCT and UBM showed that these imaging techniques provided useful information about the internal features, extension, size, and shape of tumors. Yet there is no enough evidence on the advantages and disadvantages of UBM and AS-OCT in certain tumor types. They concluded that due to their different measuring technique, AS-OCT and UBM have different advantages and disadvantages. The disadvantage of AS-OCT is that it cannot penetrate deeper than 1 to 3 mm and cannot penetrate through pigmented lesions. But for smaller lesions AS-OCT is a more accurate technique that can give detailed images of the remaining healthy cornea, can identify cysts, or might be useful in detecting tumor recurrence. For larger or pigmented lesions UBM can better delineate tumor margins and tumor thickness. They stated that more comparative studies are needed to determine which imaging technique is most suitable for a certain tumor type. The main drawback of this review was that the sample size of most studies was small, often leading to the conclusion that further research is needed. Also, only a limited amount of tumor types was examined, which made it impossible to extrapolate these findings to all corneal and conjunctival tumors.

(2014) Thomas et al noted that noninvasive methods of diagnosing ocular surface squamous neoplasia would be increasingly important as treatment moves toward medical therapy, although future studies would have to evaluate the diagnostic accuracy for this indication. Additional studies are needed to further evaluate anterior segment optical coherence tomography for anterior segment disease or pathology and to demonstrate the clinical utility of using optical coherence tomography for these indications.

(2011) Bianciotto et al reported a retrospective analysis of 200 consecutive patients who underwent both anterior segment OCT and ultrasound biomicroscopy (UBM) for anterior segment tumors. When comparing the image resolution for the two techniques, UBM was found to have better overall tumor visualization.

Wilson Disease

(2017) Sridhar et al completed a retrospective, case-series study, presented AS-OCT as an alternative method of evaluating Kayser-Fleischer (KF) ring in Wilson disease (WD) not only by ophthalmologists but also by other clinicians dealing with WD. This study included 6 WD patients with KF ring. Evaluation of KF ring was done by naked eye examination using torch light, slit lamp biomicroscopy (SL), and AS-OCT. SL examination was done using a narrow slit of the superior cornea; AS-OCT was performed using the Optovue RTvue PremierTM device (Fremont, CA). AS-OCT revealed KF ring as an intense hyper-reflective band at the level of Descemet membrane (DM). Color scale of AS-OCT showed KF ring as greenish/greenish yellow/orange yellow/yellowish/red band. Validation of AS-OCT findings was carried out by a 2nd ophthalmologist, medical gastroenterologist, surgical gastroenterologist, and neurophysician. After seeing the first observation, they could identify the AS-OCT features in all pictures with ease. The authors concluded that this was the first observation of KF ring in WD on AS-OCT. On AS-OCT, KF ring was visualized as intense hyper-reflectivity at the level of DM in the peripheral cornea. Moreover, they stated that further studies are needed to evaluate the usefulness of AS-OCT in WD management. In summary, available evidence for AS-OCT is primarily comparison studies between this imaging tool and established methods for measuring anterior segment ocular structures. Currently, there are no data that demonstrate improved outcomes using this technology. Thus, AS-OCT is a promising technology; but its clinical value remains to be ascertained by well-designed studies that show improved outcomes.

Other Conditions

(2018) Kokubun et al examined if AS-OCT can be used to predict post-trabeculectomy bleb outcomes. These researchers divided 58 eyes of 47 trabeculectomy patients into success or failure groups based on their status at 12 months after surgery. They then compared various AS-OCT measurement parameters between the 2 groups at 1 and 2 weeks and 1, 3, 6, and 12 months. They also analyzed the early post-trabeculectomy bleb parameters with multiple logistic regression, stepwise multiple regression, and the receiver operating characteristic (ROC) curve, to evaluate the power of these parameters to predict long-term outcomes; IOP 3 or more months after trabeculectomy was significantly lower in the success group than the failure group (all: $p < 0.0016$). Cleft volume was significantly higher 6 or more months after trabeculectomy in the success group than the failure group ($p = 0.0027$ and < 0.0016). Reflectivity of the bleb wall was significantly higher in the failure group than the success group at 2 weeks and all later time points (all: $p < 0.0016$). Reflectivity of the bleb wall at 2 weeks after trabeculectomy was a risk factor for failure, with an odds ratio (OR) for failure of 2.48 (95 % CI: 1.31 to 4.68, increasing per 10 AU). The area under the ROC curve for reflectivity of the bleb wall at 2 weeks after trabeculectomy was 0.775 when the cut-off value was set at 122.8, with sensitivity, specificity, and OR of 78.3 %, 80.0 %, and 14.4, respectively. A stepwise multiple regression analysis showed that reflectivity of the bleb wall at 2 weeks was an independent factor indicating post-operative bleb survival period ($\beta = -0.39$, $p = 0.007$). The authors concluded that reflectivity of the bleb wall, measured by AS-OCT, may be an early post-trabeculectomy predictor of bleb outcome. These findings need to be validated by well-designed studies.

(2017) Rose et al completed an observational, cross-sectional study quantified normal corneal transparency by AS-OCT by measuring the average pixel intensity. These researchers analyzed the variation in the average pixel intensity in mild and severe grades of corneal opacities. This trial included 38 eyes from 19 patients with mild or severe grades of corneal opacities greater than 3 mm and a normal contralateral cornea; AS-OCT was performed centered on the opacity with a 3-mm cruciate protocol. A similar image was taken of the contralateral clear cornea in the same quadrant. The average pixel intensity was calculated in a standardized manner using MATLAB software. The average pixel intensity of the normal cornea was 99.6 ± 10.9 [standard deviation (SD)]. The average pixel intensity of the mild and severe corneal opacities was 115.5 ± 9.1 and 141.1 ± 10.3, respectively. The differences were statistically significant. The authors concluded that the findings of this study provided proof of principle evidence to estimate corneal opacification on a nominal scale. They stated that a follow-up study with a larger sample size is underway to prove this principle in a larger population including leucoma scars. The authors stated that the drawbacks of this study included the small sample size (n = 19 subjects), no correlation with any specific etiological diagnosis, analysis of only 2 directional scans for a given image, and the lack of comparisons with any other instruments that could measure corneal transparency.

(2017) Venincasa et al reported on combining grayscale and color images captured using anterior segment optical coherence tomography to prepare for eye surgery. Viewing an image in different colors provides different perspectives. The authors of this retrospective study determined that while grayscale is good for mapping extraocular muscle structures, the addition of color can improve the accuracy in finding the ideal point of insertion. Accuracy was measured as being within 1.00 mm of the intraoperative caliper measurement. One hundred thirty-nine anterior segment optical coherence tomography images were collected from 74 patients. When using grayscale and color imaging, anterior segment optical coherence tomography accuracy increased from 77% to 87%. Accuracy was lower (i.e., falling outside the 1.00-mm range) when applying this practice to reoperations. The authors concluded that, especially for first-time surgeries, use of combination imaging could be clinically useful.

(2016) Kitahata and associates reported the use of AS-OCT for characterization of late-onset tunnel fungal infections with endophthalmitis after cataract surgery. A 77-year-old female (case 1) and a 76-year-old male (case 2) who received cataract surgery 15 and 1 year before their initial visits, respectively, were treated with topical steroids based on a diagnosis of uveitis, because they showed growing white lesions on the upper iris and beneath the cataract scleral wound. Irrigation of the anterior chambers and removal of the white lesions were performed in each case, and microbiological tests were positive for fungi (case 1, a positive culture of Fusarium sp.; case 2, a filamentous fungus present in a direct smear) in the white lesions. Both cases were diagnosed as late-onset fungal endophthalmitis after cataract surgery and were treated with topical and systemic anti-fungal agents. However, the white lesions re-appeared, and the inflammation in the anterior chambers worsened. Anterior segment optical coherence tomography showed the spread of the white lesions into the scleral incisions from cataract surgery. De-roofing of the tunnel and sclera-corneal patch grafts were performed in both cases to treat the fungal tunnel infections. After these treatments, inflammation of both corneas and anterior chambers subsided. The authors concluded that AS-OCT can be used to identify late-onset fungal tunnel infections with endophthalmitis after cataract surgery. These preliminary findings need to be validated by well-designed studies.

(2009) In a study from India, Agarwal et al evaluated the anterior chamber inflammatory reaction by anterior segment high-speed OCT. This was a prospective, nonrandomized, observational case series of 62 eyes of 45 patients. Hyper-reflective spots suggesting the presence of cells in the anterior chamber from the OCT images were counted manually and by a custom-made automated software package and correlated with clinical grading using Standardization of Uveitis Nomenclature criteria. Of 62 eyes, grade 4 aqueous flare was detected by OCT imaging in 7 eyes and clinically in 5 eyes. The authors concluded that anterior segment (AS)-OCT can be used as an imaging modality in detecting inflammatory reaction in uveitis and also in eyes with decreased corneal clarity. Additional studies are needed to further evaluate these results and to demonstrate the clinical utility of using OCT in this situation.

(2008) Garcia and Rosen evaluated the diagnostic performance of AC Cornea OCT (Ophthalmic Technologies Inc.) by comparing image results with ultrasound biomicroscopy (UBM) in patients with conditions of the anterior segment. The patients were recruited from various specialty clinics, and imaging with OCT and ultrasound was performed sequentially after obtaining informed consent. Eighty eyes with pathologic conditions involving the anterior ocular segment were included in the study; 6 cases were reported in detail to demonstrate the imaging capabilities of OCT and UBM. Comparison of OCT and UBM images shows that while the AC Cornea OCT has high resolution for the cornea, conjunctiva, iris, and anterior angle, ultrasound biomicroscopic images are also clear for these areas. In addition, ultrasound biomicroscopy was found to be superior at detecting cataracts, anterior tumors, ciliary bodies, haptics, and posterior chamber intraocular lenses. OCT was found to be superior at detecting a glaucoma tube and a metallic foreign body in the cornea when imaging was performed in the coronal plane.

Summary of Evidence

Ideally, a diagnostic test would be evaluated based on its technical performance, diagnostic performance (sensitivity, specificity, and predictive value), and clinical utility (effect on health outcomes). Current literature consists primarily of assessments of qualitative and quantitative imaging and detection capabilities. Technically, the anterior segment optical coherence tomography (OCT) can create high-resolution images of the anterior eye segment. In addition, studies indicate that the anterior segment OCT detects more narrow or closed angles in the eyes than gonioscopy, suggesting that the sensitivity of OCT is higher than gonioscopy. However, because of the lack of a true gold standard, it is not clear to what degree these additional cases are true-positives versus false-positives, and therefore the specificity and predictive values cannot be determined. OCT imaging may be less sensitive in comparison with ultrasound biomicroscopy for other pathologic conditions of the anterior segment, such as cataracts, anterior tumors, ciliary bodies, haptics, and posterior chamber intraocular lenses. There are promising results the high-resolution images provided by anterior segment optical coherence tomography (AS OCT) are superior to results from slit-lamp examination or gonioscopy for some indications. Evaluation of the clinical utility of anterior segment OCT depends on demonstration of an improvement in clinical outcomes. Based on the review of the current evidenced based peer reviewed literature the evidence is insufficient to determine the technology improves net health outcomes. Further randomized controlled trials with long term outcomes need to be completed.

Practice Guidelines and Position Statements

American Academy of Ophthalmology (AAO)

(2020) The AAO published a preferred practice pattern on primary angle closure disease. The Academy stated that gonioscopy of both eyes should be performed on all patients in whom primary angle closure disease is suspected to evaluate the angle anatomy, including the presence of iridotrabecular contact and/or peripheral anterior synechiae, and plateau iris configuration. Anterior segment imaging may be a useful adjunct to gonioscopy and is particularly helpful when the ability to perform gonioscopy is precluded by corneal disease or poor patient cooperation. Although anterior segment optical coherence tomography can be very useful, it has limitations in evaluating the angle. Neither the posterior aspect of the iris nor the ciliary body are well imaged with anterior segment optical coherence tomography, reducing the utility of this approach in evaluating plateau iris configuration or ciliary body abnormalities. Isolated peripheral anterior synechiae or small tufts of neovascularization may be missed if not in the plane imaged by anterior segment optical coherence tomography. (*Accessed January 2022*)

Regulatory Status

Several devices have received clearance for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. The table below includes some FDA approved devices. *Please note this is not intended to be an all-inclusive list.*

Optical Coherence Tomography			
Device	**Manufacturer**	**Clearance Year**	**Indication**
Amico DH-W35 Ophthalmoscope Series	Amico Diagnostic Inc.	2014	Anterior segment optical coherence tomography. 510 (k) Number: K131939
ARGOS	Santec Corporation	2015	Anterior segment optical coherence tomography. 510 (k) Number: K150754
Avanti	Optovue Inc.	2018	Anterior segment optical coherence tomography. 510 (k) Number: K180660
CenterVue Macular Integrity Assessment	CenterVue SpA	2014	Anterior segment optical coherence tomography. 510 (k) Number: K133758
Cirrus AngioPlex OCT Angiograph	Carl Zeiss Meditec	2015	Designed to visualize and measure various optical structures. 510 (k) Number: K181534

Cirrus HD OCT™	Carl Zeiss Meditec	2016	Designed to visualize and measure various optical structures. 510 (k) Number: K150977
EnFocus 2300 EnFocus 4400	Bioptigen Inc.	2015	Anterior segment optical coherence tomography. 510 (k) Number: K150722
iVue	Optovue Inc.	2017	Anterior segment optical coherence tomography. 510 (k) Number: K163475
IVUE 500	Optovue, Inc.	2014	Anterior segment optical coherence tomography. 510 (k) Number: K133892
LSFG-NAVI	Softcare Co. Ltd	2016	Anterior segment optical coherence tomography. 510 (k) Number: K153239
OCT-Camera	OptoMedical Technologies GmbH	2015	Anterior segment optical coherence tomography. 510 (k) Number: K142953
Pentacam AXL	Oculus Optikgerate GmbH	2016	Anterior segment optical coherence tomography. 510 (k) Number:K152311
Propper Insight Binocular Indirect Ophthalmosope	Propper Manufacturing Co. Inc.	2014	Anterior segment optical coherence tomography. 510 (k) Number: K141638
RTVue® XR OCT Avanti with AngioVue Software	Optovue, Inc.	2016	Anterior segment optical coherence tomography. 510 (k) Number: K153080
The Stratus OCT™	Carl Zeiss Meditec	2008	Designed to visualize and measure various optical structures. 510 (k) Number: K030433
Visante™ OCT	Carl Zeiss Meditec	2005	measures corneal flap thickness and residual stroma thickness in patients who have had LASIK procedures. 510 (k) Number: K051789
VX130 Ophthalmic Diagnostic Device	Luneau SAS	2017	Anterior segment optical coherence tomography. 510 (k) Number: K162067
Xephilio OCT-A1	Canon	2019	Anterior segment optical coherence tomography. 510 (k) Number: K182942

The anterior chamber cornea optical coherence tomography (Ophthalmic Technologies) is not cleared for marketing in the United States.

PRIOR APPROVAL

Not applicable.

POLICY

See related medical policies:

- 09.03.01 Corneal Topography

Optical coherence tomography (OCT) of the anterior eye segment is considered **investigational** for all indications as the evidence is insufficient to determine the effects of the technology on net health outcomes.

PROCEDURE CODES AND BILLING GUIDELINES

To report provider services, use appropriate CPT* codes, Alpha Numeric (HCPCS level 2) codes, Revenue codes, and/or ICD diagnosis codes.

- 92132 Scanning computerized ophthalmic diagnostic imaging, anterior segment, with interpretation and report, unilateral or bilateral

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POLICY HISTORY

Date	Reason	Action
January 2022	Annual review	Policy Revision, New Policy Created

New information or technology that would be relevant for Wellmark to consider when this policy is next reviewed may be submitted to:

Wellmark Blue Cross and Blue Shield
Medical Policy Analyst
PO Box 9232
Des Moines, IA 50306-9232

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