



Applications of anterior segment Optical Coherence Tomography

(AS-OCT)

Essay

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Table of content

Title	Page No.
Introduction	1
Development of Anterior Segment Optical Coherence Tomography Technology	6
Applications of AS-OCT in corneal surgery	30
Applications of AS-OCT in corneal diseases	45
Applications of AS-OCT in phakic IOLs	61
Applications of AS-OCT in Glaucoma	72
Applications of AS-OCT in uveal assessment	91
Applications of AS-OCT in conjunctival diseases	101
Summary	104
References	108
Arabic Summary	1

Table of Figures

Figure No.	Title	Page No.
1	Illustration of the principle of reflectometry.	7
2	Formation of OCT image through series of axial scans.	8
3	Schematics of the basic fiber-optic OCT system.	9
4	Schematics of a time domain OCT system.	11
5	Schematics of a generalized FD-OCT system.	11
6	Schematics of a spectrometer-based FD-OCT system.	12
7	An OCT cross section of a normal live human cornea	13
8	Illustration comparing the single-pass ocular transmissions of 1310-nm and 830-nm light.	14
9	A comparison of the anterior chamber angle imaged with the 830-nm wavelength OCT and the 1310-nm.	15
10	Three possible scan geometries for anterior segment OCT.	16
11	OCT image of a post-LASIK cornea.	17
12	Schematics of the grating-based RSOD scanning mechanism used in the reference arm of high-speed OCT systems.	19

13	Corneal scar imaged with an 830-nm spectral OCT system.	21
14	The anterior chamber angle imaged with an 830-nm spectral OCT system.	21
15	Image of acanthamoeba suspended in agar scanned by an 830-nm spectral OCT system.	22
16	OCT images of the anterior chamber angle.	24
17	Horizontal OCT cross-sectional scans of the anterior chamber.	25
18	High-definition OCT image of a post-LASIK cornea.	26
19	Illustration of three types of reflecting structures.	28
20	Typical normal pachymetry map obtained by the Visante OCT.	31
21	Moria C-B microkeratome flap 1 day postop.	32
22	Amadeus II microkeratome flap.	33
23	IntraLase flap.	33
24	High magnification shows the typical sharp 70-degree edge of an IntraLase flap.	34
25	Schematics of a pair of Intacs implants.	35
26	(A) Slit lamp photograph of cornea with implanted Intacs. (B) Slit lamp image of cornea with implanted Intacs.	35
27	Visante "High Res Corneal Quad" scan pattern.	36

28	Four meridional OCT cross-sections acquired using the Visante "High Res Corneal Quad" scan pattern.	37
29	Use Visante flap caliper tool to measure Intacs depth.	38
30	(A) Visante contrast/brightness adjustment. Intacs image without contrast/brightness adjustment. (B) Intacs image after manual contrast/brightness adjustment.	39
31	Anterior segment noncontact optical coherence tomography for corneal scarring depth evaluation reveals the depth of the lesion-scarring	41
32	Femtosecond laser–assisted sutureless anterior lamellar keratoplasty.	42
33	Optical coherence tomograph of two-planed clear corneal incision in human globe.	44
34	The Visante pachymetry map of a keratoconic eye with inferior thinning.	47
35	High-resolution corneal optical coherence tomography scan visualizing the stromal demarcation line 1 month after corneal cross-linking	49
36	Preoperative evaluation of an eye with corneal scarring due to bacterial ulcer.	52
37	The same eye as in Figure 36, 3 months after PTK.	52
38	Images demonstrating microbial keratitis in a patient with trichiasis and lagophthalmos.	54

39	Images demonstrating fungal keratitis in a contact lens wearer.	56
40	Images showing corneal dystrophy of Bowman's layer type 2.	58
41	Images showing spheroidal degeneration	59
42	Images showing granular dystrophy.	60
43	(A) Clinical photograph of a pigment dispersion syndrome following Artisan implant. (B) OCT of same eye showing high CLR.	63
44	Safety distances from the endothelium.	66
45	OCT images showing 300 μm forward shift of the anterior pole of the crystalline len with 10 D of accommodation in a young adult.	67
46	The "free zone"	69
47	(A) Measure of the CLR in a patient with a Nuvita (B) Another eye photographed 10 years after implantation of a ZB5M implant	70
48	Low resolution angle scan.	75
49	High resolution angle scan.	75
50	A. Identification of the scleral spur. B. Angle opening distance C. Trabecular iris angle. D. Trabecular iris space area. E. Trabecular iris contact length.	76 77 77 78 78

51	Slit-lamp appearance of a bleb and corresponding images obtained by 3-dimensional cornea and anterior segment optical coherence tomography	80
52	Standard bleb color monophotograph & Standardized anterior segment optical coherence tomography scans.	82
53	Cystic bleb.	84
54	Failed bleb.	86
55	Standardized AS-OCT scans of blebs.	88
56	AS-OCT image and photograph of a bleb after trabeculectomy.	89
57	AS-OCT image and photograph of the same bleb 11 days after laser suture lysis.	89
58	Diffuse iris melanocytosis.	92
59	Amelanotic iris nevus with iris pigment epithelial cyst.	93
60	Benign iris nevus.	94
61	Wall of iris cyst.	94
62	Ciliary body cyst.	95
63	Melanotic iris nevus.	96
64	Melanotic iris nevus.	96
65	Amelanotic iris melanoma.	97
66	Melanotic iris melanoma.	98

67	Slit lamp photo and angle scans of iridoschisis patient.	99
68	Melanotic ciliary body melanoma.	100
69	Clinical, AS-OCT, and histopathology of cystic conjunctival nevi.	103

Table of Tables

Table No.	Title	PAGE NO.
1	Characteristic Reflectance of Tissue at Perpendicular and Oblique Incidence Angles.	27

List of Abbreviations

- **OCT** : Optical coherence tomography
- **AS-OCT** : Anterior segment OCT
- **SD-OCT** : Spectral-domain OCT
- **TD-OCT** : Time Domain OCT
- **FD-OCT** : Fourier Domain OCT
- **OFDI** : Optical Fourier domain imaging
- **SS-OCT** : Swept-source OCT
- **UHR OCT** : Ultra High-Resolution Anterior Segment OCT
- **3-D CAS OCT** : 3-D cornea and anterior segment OCT
- **AC-OCT** : High-speed anterior segment OCT prototype
- **UBM** : Ultrasound biomicroscopy
- **LASIK** : Laser-assisted in situ keratomileusis
- **PTK** : Phototherapeutic keratectomy
- **DSEK** : Descemet's stripping endothelial keratoplasty
- **L K** : Lamellar Keratoplasty
- **FDA** : Food and Drug Administration
- **IOP** : Intraocular pressure

➤ ONH	: Optic nerve head
➤ GON	: Glaucomatous optic neuropathy
➤ POAG	: Primary open-angle glaucoma
➤ ACA	: Anterior chamber angle
➤ ACD	: Anterior chamber depth
➤ PD	: Pupil diameter
➤ IP	: Iris profile
➤ IR	: Iris rotation
➤ SS	: Scleral spur
➤ CB	: Ciliary body
➤ SC	: Schlemm's canal
➤ TM	: Trabecular meshwork
➤ AOD	: Angle opening distance
➤ TIA	: Trabecular iris angle
➤ TISA	: Trabecular iris space area
➤ TICL	: Trabecular iris contact length
➤ TH	: Total bleb height
➤ PAS	: Peripheral anterior synechiae
➤ RADAR	: RAdio Detection And Ranging
➤ SLD	: Superluminescent diode

- **ANSI** : American National Standards Institute
- **RSOD** : Rapid scanning optical delay
- **UVA** : Ultraviolet A
- **LoA** : Limits of agreement
- **CT** : Corneal thickness
- **CCT** : Central corneal thickness
- **IT** : Infiltration thickness
- **PMMA** : Polymethylmethacrylate lens
- **CLR** : Crystalline lens rise
- **LSL** : Laser Suture Lysis

Introduction

Optical coherence tomography (OCT), which was introduced in the early 1990s, is a noncontact imaging method that provides detailed cross-sectional images of biological tissues by measuring their optical reflections. OCT has been widely used clinically in ophthalmologic practice for a number of years. It has been a significant advance in diagnosis and monitoring treatment of vitreoretinal diseases such as age-related macular degeneration and macular edema, as well as glaucoma.¹⁻²

In recent years, OCT technology has evaluated the incorporation of spectral-domain (SD) imaging that offers significant advantages over the traditional time-domain (TD) OCT techniques, which include faster imaging speed, higher resolution, and better visualization. Simultaneously with these improvements, the utility of OCT in the ophthalmic practice has become more extended. For example, anterior segment OCT (AS-OCT), which provides high-resolution cross-sectional images of anterior segment structures, including anterior chamber angle, cornea, conjunctiva, and tear meniscus, has recently gained popularity.³⁻⁵

In comparison to ultrasound biomicroscopy (UBM), AS-OCT is more user-friendly and allows for non-contact acquisition of images with near-infrared light vs. water immersion image acquisition with sound waves. The axial resolution of the AS-OCT is 18 μ m, compared to 50 μ m for the UBM.⁶⁻⁷

In corneal surgery, Corneal surgery and associated technology has changed a lot over the past 10 years, Descemet's stripping endothelial keratoplasty (DSEK), deep anterior lamellar keratoplasty, femtosecond laser used for keratoplasty and collagen cross linking were not available for patients before 1999.⁸

AS-OCT has dual applications in refractive surgery. Visante OCT, for example, provides global corneal thickness measurements for preoperative planning and offers a difference map feature that illustrates changes in postoperative corneal thickness, which can be used to confirm or deny expected laser ablation results as well as diagnose post-LASIK edema. Secondly, AS-OCT indicates flap architecture and thickness as well as residual bed thickness, which is particularly helpful in considering re-treatments for patients who were clinically assessed as borderline for LASIK enhancement preoperatively and in diagnosing unexpected postoperative cases of ectasia secondary to thicker-than-expected flaps.⁹

In Corneal diseases, AS-OCT is very useful for assessing corneal pathologies. It can be used in diagnosis of Keratoconus, studying corneal changes after collagen cross linking, assessment of corneal opacities, in determining the exact depth of foreign body penetration or the existence of a residual defect following removal. Additionally, AS-OCT can be used to diagnose and follow up corneal infiltrate, ulcer or dellen healing, as well as to document the extent of Fuchs' dystrophy.¹⁰