Optical Coherence Tomography Guided Corneal Surgeries

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Abstract

It helps screen out patients with formefruste keratoconus and is helpful in calculating the expected residual stromal bed thickness It is also beneficial for detecting post LASIK complications early and accurately as: post LASIK ectasia, diffuse lamellar keratitis, epithelial ingrowth, interface fluid syndrome and macrostriae.

Key word: Tomography , Coherence , Ophthalmology

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List of Abbreviations

µm	Micrometer
ACI 7000	Acu Focus Corneal Inlay 7000
A-mode	Amplitude mode
AS - OCT	Anterior segment optical coherence tomography
BCVA	Best corrected visual acuity
BESSt	Borasio, Edmondo, smith and Stevens
B-mode	Brightness mode
C/P ratio	Corneal central thickness over peripheral thickness
CA USA	California united states of America
CAM	Corneal adaptor module
CCT	Central corneal thickness
CET	Central epithelial thickness
D	Diopters
DESEK	Descmet's stripping endothelial keratoplasty
DLEK	Deep lamellar endothelial keratoplasty
DLK	Deep lamellar keratoplasty
DSAEK	Descemet's stripping automated endothelial keratoplasty
EK	Endothelial keratoplasty
FD-OCT	Fourier domain optical coherence tomography
FFK	Formefruste keratoconus

I	Inferior
ICO	International council of ophthalmology
ICR	Intracorneal rings
ICRS	Intracorneal ring segment
IFS	Interface fluid syndrome
IOL	Intraocular lens
IT-SN	Inferotemporal-superonasal
K value	Keratometric value
KCI	Keratoconus index
KHz	Kilo Hertz (One thousand cycle per second)
KPI	Keratoconus prediction index
LASIK	Laser insitu keratomeleusis
mm	Millimeters
MR	Manifest refraction
nm	Nanometers
OCP	Online corneal pachymetry
OCT	Optical coherence tomography
UBM	Ultrasound biomicroscopy
PKP	Penetrating keratoplasty
PRK	Photorefractive keratectomy
PTK	Phototherapeutic keratectomy
RK	Radial keratotomy

S	Superior
SD OCT	Spectral domain optical coherence tomography
S-I	Superior-inferior
Sim-K	Simulated Keratometric readings
SL OCT	Slit lamp optical coherence tomography
SN-IT	Superonasal-inferotemporal
SRAX	Skewed radial axis
TD-OCT	Time domain optical coherence tomography
UBM	Ultrasound biomicroscopy
UCVA	Uncorrected visual acuity
UP	Ultrasound pachymetry
US	Ultrasound
USP	Ultrasound pachymetry
Vs	Versus

INTRODUCTION

Anterior segment optical coherence tomography (AS-OCT) can be used to assess corneal thickness andanterior chamber biometry. It is also used to image phakic intraocular lenses and intra-corneal ring segments[1]. Because it is a noncontact technique, it can be used intra-operatively, which could be useful after flap corneal surgeries to detect abnormalities in the cornea and in the interface[2].

Current OCT technology is divided into Time domain OCT and Fourier Domain OCT Fourier-domain OCT devices, which have faster image acquisition and higher resolution, are currently more preferred for preoperative and postoperative assessment of corneal surgeries[3].

When assessing corneal thickness, advantages of OCT over ultrasound biomicroscopy include noncontact methodology, with consequent reduction of patient discomfort and risk of corneal injury, higher resolution and the ability to image the eye in the sitting position[1]. AS-OCT is simpler to use,requires much less operator skill, and provides noncontact scanning of the anterior segment[1].

Slit scanning imaging as the Orbscan is an alternative noncontact optical system that has primarily been used to view the cornea, although it may also have applications in angle estimation[3].

In comparison with orbscan, anterior segment OCT allows corneal mapping in 8 meridians (8x1019A-scans) in 0.31 seconds[2].

Rapid acquisition during the pachymetry scan ensure an accurate and repeatable pachymetry map result for application in determining the safety of a refractive surgery. OCT measurements show a high degree of repeatability and reproducibility. Thus, OCT is emerging as a reliable tool for evaluation of central corneal thickness (CCT) in the clinical setting. With the pachymetric mapping protocol of AS-OCT, the results suggest that central and peripheral corneal thickness measurements in healthy subjects and in eyes with keratoconus are repeatable and reproducible[2]. Optical coherence tomography measurements of central corneal thickness agreed well with ultrasound (US) pachymetry measurements while Orbscan significantly underestimated corneal thickness[2].

The Visante OCT is the first non-contact device to image, measure and document both corneal flap thickness and residual stromal thickness immediately following LASIK surgery[3]. It allows measurements of flap and residual stromal thickness at