Department of Ophthalmology

Role of Anterior Segment Optical Coherence Tomography in the Diagnosis of Subclinical Keratoconus in Comparison with the Pentacam

Thesis

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List of Abbreviations

Abb.	Full term
AC	*Anterior chamber*
ARC	*Anterior radius of curvature*
BAD	*Belin / Ambrosio enhanced ectasia display*
BCVA	*Best corrected visual acuity*
BFS	*Best fit sphere*
BFTE	*Best fit toric ellipsoid*
BDVA	*Best distance visual acuity*
CTSP	*Corneal thickness spatial profile*
DLEK	*Deep lamellar endothelial keratoplasty*
DSEK	*Descemet-stripping endothelial keratoplasty*
ECM	*Extracellular matrix*
FD-OCT	*Fourier domain optical coherence topography*
GAG	*Glycosaminoglycan*
ICRS	*Intrastromal corneal rings segments*
KC	*Keratoconus*
LASIK	*Laser in-situ keratomileusis*
MMPs	*Matrix metalloproteinase*
OCT	*Optical coherence tomography*
PKP	*Penetrating keratoplasty*
PRC	*Posterior radius of curvature*
PTI	*Percentage thickness increase*
SD-OCT	*Spectral domain optical coherence topography*
TD-OCT	*Time domain optical coherence topography*
UHR-OCT	*Ultrahigh resolution optical coherence topography*
USB	*Ultrasound biomicroscopy*
VK	*Videokeratoscope*

INTRODUCTION

The most common ectatic disorder is keratoconus which is characterized by bilateral and progressive corneal thinning ***(Ramos, 2009).*** The cornea become conical in shape due to non-inflammatory thinning and protrusion ***(Li, 2009).*** This corneal thinning is focal occurring mostly in the infero-temporal corneal location, and this characteristic pattern of thinning is the clue to diagnose keratoconus ***(Ramos, 2009)***.

Keratoconus in the moderete and severe stages is easily recognized clinically and topographically, while subclinical keratoconus is difficult to distinguish clinically from normal corneas, because patients usually have normal visual acuity, stable topographic patterns and minimal or no clinical signs ***(Ambrosio, 2006).*** In such suspect cases, anterior segment optical coherence tomography (AS-OCT) play major role in producing highly reliable pachymetry maps that can detect keratoconus, ectasia and corneal thinning before LASIK ***(Khurana, 2007).***

Anterior segment OCT provides very comprehensive analysis of numerous anterior segment applications which involve, Angle evaluation (to diagnose narrow angle glaucoma), Anterior chamber biometry (to plan intraocular lens implantation) ***(Ramos, 2009),*** Corneal flap depth measurement following LASIK ***(Konstantopoulos, 2007),*** OCT can also visualize the LASIK flap early postoperative to evaluate the

efficacy of microkeratome or femtosecond laser being used ***(Li, 2007)***, It also can assess the potential safety of lifting the LASIK flap via evaluating the residual stromal bed and flap ***(Randleman, 2003).***

Post-Lasik ectasia is a relatively rare vision-threatening complication. It is important to identify the absolute and relative risk factors of ectasia and their cut-off values following LASIK ***(Giri, 2017)***. The most important risk factors for keratectasia includes, abnormal preoperative corneal topography that is suspicious for keratoconus ***(Randleman, 2003).***

OCT pachymetry maps can accurately detect the characteristic abnormal corneal thinning in patients with keratoconus ***(Li, 2008),*** using four parameters based on the central 5-mm diameter of the pachymetry map ***(Tang, 2005).*** This four parameters are, {I–S: the average inferior octant thickness (I) minus the average superior octant thickness (S)}, {IT–SN: the average inferotemporal octant thickness (IT) minus the average superonasal (SN) octant thickness}, {Minimum: the thinnest corneal thickness}, {Minimum–maximum: the minimum pachymetry minus the maximum pachymetry}.

Using these four parameters asymmetry, global thinning and focal thinning can be detected, and we got diagnostic cut-off points for these parameters. Keratoconus is diagnosed if,

Asymmetry that is more than −45 μm for I–S or IT–SN, or Minimum thickness of less than 470 μm, or a minimum–maximum difference more than −100 μm. One abnormal parameter provides reason to suspect keratoconus. Two or more abnormal parameters provide a definitive diagnosis ***(Li, 2007).*** This method is sensitive and specific as the topographic KISA ***(Li, 2008)*** (keratometry, I-S, astigmatism, and skew percentage) ***(Yaron, 2007).***