

Ocular Applications Of Pentacam

Essay

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Abbreviations

3D	Three Dimensional
ACD	Anterior Chamber Depth
AC M	AC Master Apparatus
BFS	Best-Fit-Sphere
C	Cortical cataract
CBDS	Capsular Bag Distension Syndrome
CCT	Central Corneal Thickness
CD	Cell Density
CM 3910	Double-Scheimpflug Camera
CR	Coefficient of Repeatability
CT	Corneal Thickness
D	Diopters
ER	Endoplasmic Reticulum
HR	High Resolution
ICL	Implantable Contact Lens
IOL	Intraocular Lens
IOP	Intraocular Pressure
LASEK	laser-Assisted Sub Epithelial Keratectomy
LASIK	Laser in Situ Keratomileusis
LOCS III	Lens Opacities Classification System III
LPI	Laser Peripheral Iridotomy
NC	Nuclear Color
Nd: YAG	Neodymium-doped Yttrium Aluminium Garnet
NO	Nuclear Opalescence
OCT	Optical Coherence Tomography
OD	Right
OLCR	OLCR pachymeter
OS	Left
P	Posterior subcapsular cataract
PAC	Primary Angle Closure
PACD	Peripheral Anterior Chamber Depth
PACG	Primary Angle-Closure Glaucoma
PAR	Posterior Apical Radius
PAR CTS	PAR Corneal Topography System

PAS	Periodic Acid –Schiff
PCO	<i>Posterior Capsule Opacification</i>
PEA	<i>Phacoemulsification aspiration</i>
PIOL	<i>Phakic Intraocular Lenses</i>
PMD	<i>Pellucid Marginal Degeneration</i>
PMMA	Polymethyl Methacrylate
PMN	Poly Morph Nuclear leukocyte
PKP	Penetrating Keratoplasty
PRK	Photorefractive Keratectomy
RK	Radial Keratotomy
SE	<i>Spherical Equivalent</i>
S/PLaser	Self-Pulsating Laser
TMS	<i>Topographic Modeling System</i>
UBM	Ultrasound Biomicroscope
US	<i>Ultrasound</i>
WTW	<i>White-to-white distance</i>

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Introduction

Pentacam is a multipurpose instrument that is capable of external ocular photography, corneal pachymetry, corneal topography, densitometry and anterior chamber analysis.

The Pentacam imaging device has been operational in ophthalmic practice since it was approved for use in the United States in 2004. The Pentacam is considered as a multifunctional imaging device by the manufacturer. The reliability of Pentacam in measuring central corneal thickness (CCT) and anterior chamber depth (ACD) have been rigorously tested (Barakana et al, 2005). Several studies report that the Pentacam has excellent reliability in measuring CCT and ACD in normal and keratoconus populations. The repeatability of posterior corneal elevation was also reported in a recent publication (Chen and Lam, 2007).

The Pentacam allows fast, noncontact examination of the anterior eye segment while the patient is sitting in front of the camera, thus providing good patient comfort and preventing application of local anesthetics and corneal erosions. However, patients have to be able to fixate while the measurement is being made, which can be a problem for children, older patients or patients with nystagmus. (Rufer et al, 2005).

The Pentacam (Oculus, Inc., Lynnwood, Wash., USA) utilizes Scheimpflug imaging. It is a rotating Scheimpflug camera that provides 50 Scheimpflug images during one scan in less than 2 seconds with 500 true elevation points per image. The Pentacam has two integrated cameras. One is located in the center for the purposes of detection of the size and orientation of the pupil, and to control fixation. The second is mounted on the rotating wheel to capture images of the anterior segment. The Scheimpflug image is a complete picture from the anterior surface of the cornea to the posterior surface of the lens.

The slit images are photographed on an angle from 0 to 180 degrees to avoid shadows from the nose. It generates 25,000 true elevation points for each surface, including the center of the cornea. Possible eye movements are captured and corrected internally (Gerste, 2004).

The Pentacam rotating Scheimpflug camera is useful for screening patients because important parameters, especially chamber angle in different positions, ACD, pachymetry, corneal radii and diameter and lens position can be evaluated in examination within a very short period with good reliability (Devereux et al, 2000).

Aim of the work

This study reviews the Pentacam corneal topography system, which is considered the gold standard for evaluating the anterior segment of the eye by a rotating scheimpflug camera.

Anatomy of the cornea

Macroscopic anatomy:

The transparent cornea forms the anterior one sixth of the eyeball. (Bron et al, 1997).

Because its curvature is greater than the rest of the eye-ball, a slight sulcus, the sulcus sclera, marks the junction of the cornea with the sclera. Anteriorly, the cornea is convex but somewhat elliptical in shape, although the dimensions of the cornea vary considerably from one person to another, the approximate measurements are about 10.6 mm vertically but about 11.7 mm horizontally. (Rufer et al, 2005).

Posteriorly the cornea is concave, measuring about 11.7 mm in diameter. (Bron et al, 1997).

The cornea is thinnest at its center, measuring about 0.5-0.6mm and thicker at the periphery measuring about 0.7 mm. (Bron et al, 1997).

The radius of curvature of the anterior surface of the cornea is about 7.7mm; that of the posterior surface, 6.9mm. (Bron et al, 1997).

The anterior surface is frequently more curved in the vertical than in the horizontal planes.

The cornea is the main structure responsible for the refraction of light entering the eye. It separates the air, with a refractive index of 1.00, from the aqueous humor, the refractive index of 1.33. (Bron et al, 1997).

The Anterior Segment

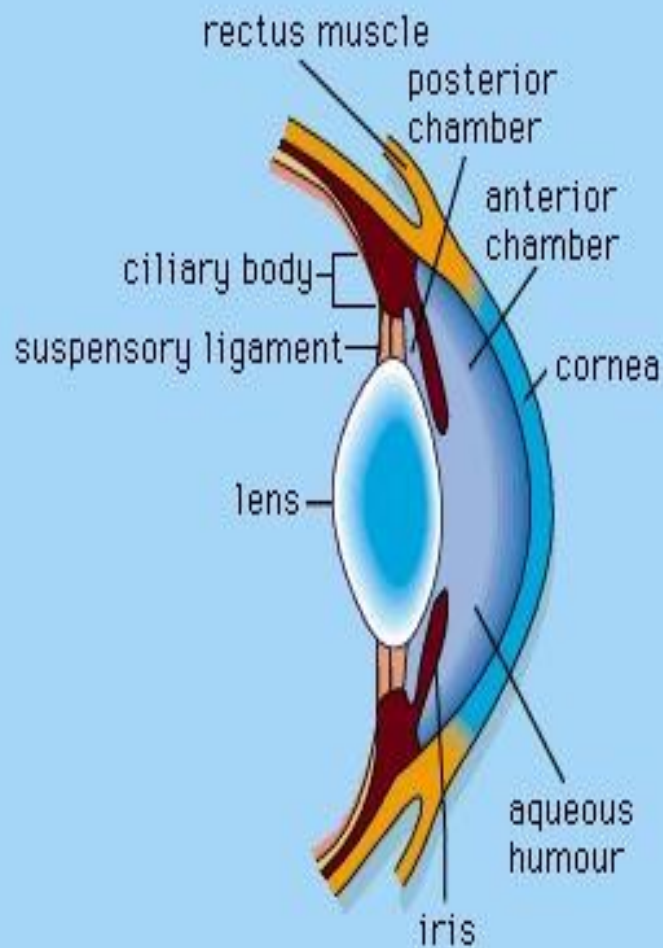


Figure 1. Anterior segment anatomy.
(Rufer et al, 2005)