Role of Anterior Chamber Angle Assessment Techniques in Diagnosis of Angle - Closure Glaucoma

Essay

Submitted by

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(M.B., B.CH.)

In Partial Fulfillment of Master Degree in Ophthalmology

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2010

Abstract

Angle-closure glaucoma is a leading cause of irreversible blindness. Diagnosis and treatment are strongly related to angle assessment techniques

Gonioscopy:

Gonioscopy is the current reference standard for assessing ACA structures and configuration. It requires a subjective assessment by an observer placing a contact lens on the eye of the patient. Definitions of angle findings vary across grading schemes. Gonioscopy is prone to potential measurement errors including artificially opening the angle or closing the angle due to how the lens is placed on the eye. **(Friedman & Mingguang , 2008)**

Key Words:

Outflow Apparatus Anatomy, **Anterior chamber angle assessment techniques, Comparative studies of different techniques of angle assessment**

Acknowledgement

I would like to express my real and deepest gratitude, respect and appreciation to **Professor Dr. Mostafa Mostafa Bahgat, Professor of Ophthalmology, Cairo University**, for his valuable advices, continuous support, scientific additions and sincere help throughout the work.

My profound thanks and deep gratitude to **Professor Dr. Amr Abd EL- latif Osman, Assistant Professor of Ophthalmology, Cairo University,** for his fruitful assistance and valuable suggestions.

My deepest gratitude to **Dr. Amanne Feisal Esmael Lecturer of Ophthalmology, Cairo University,** for her fruitful advices and support.

Special thanks to all my **Professors, colleagues and staff members in the Ophthalmology Department, Faculty of medicine, Cairo University**, for their encouragement and help.

Moataz Hamed

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List of abbreviations

ACA	anterior chamber angle.
ACD	Anterior chamber depth.
ACG	Angle-closure glaucoma.
ACV	Anterior chamber volume.
AOD	Angle opening distance.
ARA	Angle recess area.
AS-OCT	Anterior segment optical coherence tomography.
ATA	Angle-to-angle distance.
CB	Ciliary body.
CBT	Ciliary body thickness.
CCD	Charge coupled device.
CCT	Central corneal thickness.
CRC	Radius of corneal curvature.
CT	Corneal thickness.
HOCT	High-resolution optical coherence tomography.
IAS	Iridocorneal angle size.
ICPD	Iris–ciliary process distance.
ILA	Iris– lens angle.
ILCD	Iris– lens contact distance.
IOLs	Intraocular lenses.
IZD	Iris–zonule distance.
LACD	Limbal Anterior Chamber Depth Measurement.
LOCT	Low-resolution optical coherence tomography.
LPI	Laser peripheral iridotomy.
PACD	Peripheral anterior chamber deph.
PACG	Primary angle closure glaucoma.
PAS	Peripheral anterior synechia.
PCT	Peripheral corneal thickness.
PIC	Plateau iris configuration.
RPB	Relative pupillary block.
SLD	Superluminescent diode.
SL-OCT	Slitlamp optical coherence tomography.
SPAC	Scanning Peripheral Anterior Chamber Depth Analysis.

TCPD	Trabecular–ciliary process distance.
TIA	Trabecular– iris angle.
TICL	Trabeculo-iris contact length.
TISA	Trabeculo-iris space area.
UBM	Ultrasound biomicroscopy.

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Introduction

Angle-closure glaucoma (ACG) is a leading cause of irreversible blindness. Diagnosis and treatment are closely related to angle assessment techniques. Different approaches have been developed to aid in the assessment of the anterior chamber angle (ACA). Those approaches include:

1. Clinical techniques:
   a. Gonioscopy.
   b. Limbal Anterior Chamber Depth Measurement (LACD), (van Herick Technique).
2. Ultrasound biomicroscopy (UBM).
3. Anterior segment optical coherence tomography (AS-OCT).
4. Pentacam and other devices using Scheimpflug photography.
5. Scanning Peripheral Anterior Chamber Depth Analysis (SPAC)

Gonioscopy: is the current reference standard for evaluation of the anterior chamber angle. It has substantial inter-observer variability and relies on subjective assessment of ACA findings**.**

Limbal Anterior Chamber Depth Measurement (LACD) (van Herick Technique): is a quick, easy test that can identify the persons with gonioscopically closed anterior chamber angles and can be used in screening. **(Friedman & Mingguang, 2008)**.

Ultrasound Biomicroscopy (UBM): offers tremendous insight into the anterior chamber angle configuration and allows for detailed imaging of the ciliary body and the posterior chamber. Pathophysiologic changes involving anterior segment architecture can be evaluated qualitatively and quantitatively. **(Ishikawa & Schuman, 2004)**

Anterior Segment Optical CoherenceTomography (AS-OCT): is an alternative cross-sectional imaging modality that has several advantages over other techniques used for objective assessment of the AC angle. It has a higher image resolution than UBM, is totally noncontact, and is easily performed with minimal expertise. **(Radhakrishnan et al., 2005)**

Pentacam: and other device using the rotating Scheimpflug principle can be used in grading of angle width. Although this technique offers a non-contact approach to angle assessment (which is highly appealing for screening purposes), it does not allow detailed visualization of angle structures, compared to UBM. **(Konstantopoulos et al., 2007)**

Scanning Peripheral Anterior Chamber Depth Analysis (SPAC): is a new, non-contact, optical alternative method of ACA assessment. The SPAC does not image the angle directly, and therefore does not give detailed information on angle anatomy. (**Friedman and Mingguang, 2008 and Lavanya et al., 2008)**

Aim of work

This is a review of techniques for assessment of the ACA and their role in diagnosis of angle closure glaucoma. Each technique will be discussed along with its currently used parameters. An assessment of the strengths and limitations of each approach will also be provided. Finally, comparisons of findings using the various techniques will be detailed.

Outflow Apparatus Anatomy

1- Internal scleral sulcus

The Sulcus:

The sulcus is a circular groove on the inner aspect of the corneoscleral limbus, extending from the termination of Descemet's membrane anteriorly (demarcated by Schwalbe's ring) to the scleral spur posteriorly. The sulcus completely accommodates the canal of Schlemm externally, and the corneoscleral portion of the trabecular meshwork internally **Figure** (1)**. (Snell and Lemp, 1998)**

Schwalbe's ring:

Schwalbe's ring is the anterior border ring of the trabecular region**.** The ring marks the transition between the corneal endothelium and the trabecular cells and also the termination of Descemet's membrane**. (Shields et al., 2005)**

Scleral spur:

The scleral spur is a wedge-shaped circular ridge which marks the deep aspect of the sclerolimbal junction. It receives the insertion of the anterior tendons of the longitudinal ciliary muscle on its inner aspect. Its anteromedial base forms the posterior margin of the scleral sulcus and receives the posterior attachment of the corneoscleral meshwork. Contraction of the ciliary muscle pulls the spur posteriorly and opens up the trabecular spaces. **(Bron et al., 1997)**

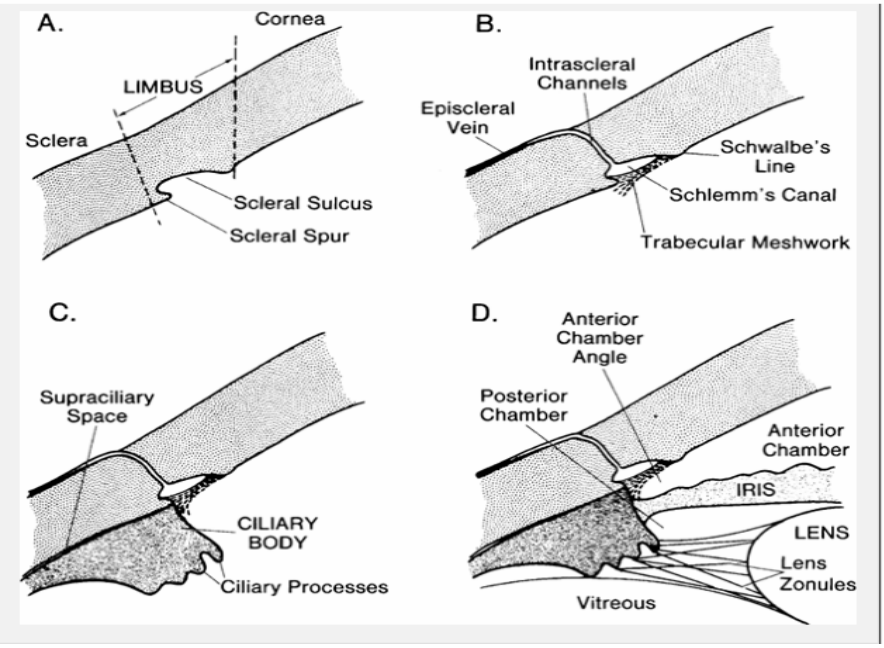

Figure (1): Stepwise construction of a schematic model, depicting the relationship of structures involved in aqueous humor dynamics. A: Limbus. B: Main route of aqueous humor outflow (conventional or trabecular outflow). C: Ciliary body (site of aqueous humor production and other outflow route of the unconventional or uveoscleral outflow). D: Iris and lens. **(Shields et al., 2005)**

2- Trabecular meshwork: Figure (2)

The trabecular meshwork is a sponge work of connective tissue beams which are arranged as superimposed perforated sheets. The beams are arranged circularly in the chamber angle and extend from Schwalbe's ring anteriorly to the scleral spur and junction of iris and ciliary body posteriorly. The inner portion of the trabecular meshwork is referred to as the uveal meshwork and the outer portion, connected to the spur and closer to Schlemm's canal, is the corneoscleral meshwork. The spaces of the trabecular meshwork decrease in size progressively from within outwards. **(Bron et al., 1997).**