A comparison between anterior segment OCT & Ultrasound Biomicroscopy in angle closure

P.A.Good,[1] R Siddiqi[1]
Birmingham and Midland Eye Centre,
Birmingham U.K.

Purpose

Ocular Coherence Tomography of the anterior segment (ASOCT) has become a useful tool in the evaluation and biometric analysis of the anterior segment in angle closure.
Iris apposition to the trabecular meshwork is the final common pathway of angle closure / angle closure glaucoma (AC/ACG).[1] This condition can be caused by one or more abnormalities in the relative or absolute sizes or positions of the anterior segment structures or by abnormal forces in the posterior segment that alter the anatomy of the anterior segment. Forces are generated to cause angle closure in four anatomic sites: the iris (pupillary block), the ciliary body (plateau iris), the lens (phacomorphic glaucoma), and behind the iris by a combination of various forces. Differentiating these affected sites is the key to provide effective treatment, and is the principal value of anterior segment imaging. Ultrasound Biomicroscopy (UBM) is extremely useful in establishing the pathophysiological changes involving the anterior segment architecture. [2]
UBM has traditionally been used as the standard for anterior segment imaging [1,2, 3] and, whilst giving excellent quality images, can be difficult to use as it requires the use of a scleral shell (water bath) to provide echographic coupling.[3] However, new generation UBM linear probes (Aviso 50 MHz linear probe, Quantel Medical, France) have made UBM more practical .In that they no longer require a water bath, and require less user expertise. Lateral distortion is also minimised by the linear scan.
This study compares the anterior segment OCT (Heidelberg Engineering, Germany) with the new generation Linear probe. Specificity and Sensitivity was calculated, using the UBM probe as the "standard."

Methods

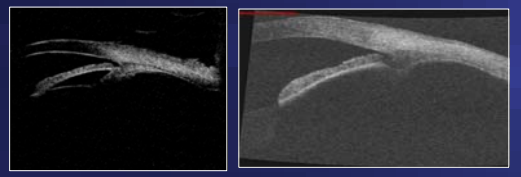
The diagnosis of angle closure is traditionally made with a slit lamp and gonioscope lens.
Twenty five patients (50 eyes) with gonioscopically identified angle closure underwent ASOCT and UBM. Using Gonioscopy all angles were graded using spaeth grading system where angles are graded 0 (closed) – 4(open).AS-OCT and UBM examinations were under both light and dark conditions.[3,4] Measurements of angle, and anterior segment depth were made as well as the position of the iris plane
and ciliary body. Biometric measurement of axial length and lens thickness were also made.

Results

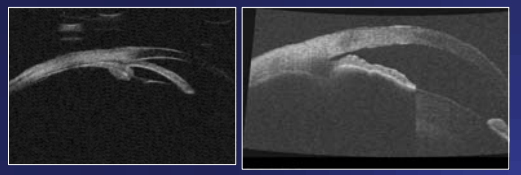
Technique	Pupil block (eyes)	Phaco Morphic (eyes)	Plateau iris (eyes)	Mean Angle (degrees)	Anterior Rotation Ciliary body
ASOCT	22	18	10	13.6	10%
UBM	29	16	5	10.5	48%

Table 1: Table above showing ACG mechanisms are identified by each imaging modality

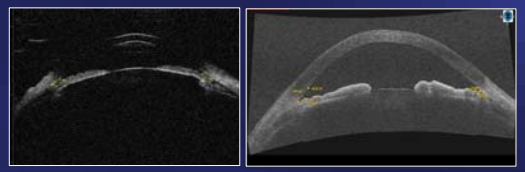
Sensitivity was 100% for both ASOCT and UBM. The Specificity of the ASOCT was 72% (using the UBM as the standard test).



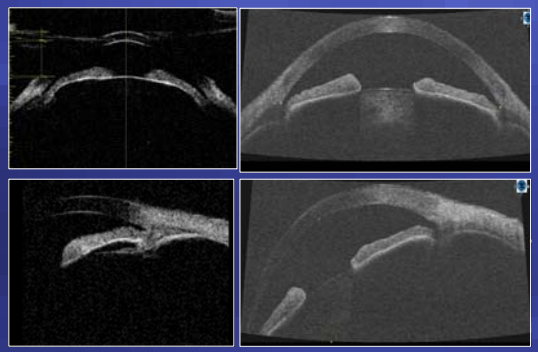
Plateau iris: OCT versus UBM. Iris apposition more clearly seen on UBM Scleral spur and ciliary body indistinct on SL-OCT



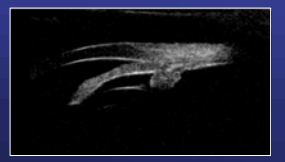
Pupil block: Iris appears more curved and ciliary body clearer with UBM



Pupil block: OCT versus UBM. Angles appear more open on OCT



Phacomorphic angle closure: Flatter iris profile in SL-OCT image, which hides the pupil block co-mechanism of angle closure



UBM of 'zipped-up' angle showing iris profile, ciliary body, irido-lens contact, scleral spur can also be identified.

Conclusions

Both UBM and ASOCT correctly identified the presence of angle closure in all patients. [4]
There was good correlation in biometric measurement of angles and AC depths between the two techniques, [4] although the angles appeared to be slightly wider with ASOCT, and the scleral spur was often indistinct.
The iris plane appeared flatter on ASOCT which made differentiation between pupil block and plateau iris difficult
There was very little view of the ciliary body using ASOCT, whereas the UBM correctly identified the position and size of the ciliary body. This is due to the light absorption of the sclera and iris.
Whilst the ASOCT was easy to use the examination took an average of 35 minutes compared to 15 minutes with UBM. The new generation Linear probe by Quantel can be used without the need of a scleral shell/ water bath, which is a great advantage over other UBM probes in a clinical setting. The ciliary body plays a significant role in the mechanism of angle closure, and not being able to view this using ASOCT is a significant disadvantage. That and the flattening of the iris plane, reduced the specificity of the ASOCT. Nevertheless, the reproducible biometric analysis (3,4), and ease of use of the ASOCT makes it a useful tool in angle closure.

References

1. Pavlin CJ, Harasiewicz K, Foster FS. Ultrasound biomicroscopy of anterior segment structures in normal and glaucomatous eyes. Am J Ophthalmol 1992; 113: 381-9
2. Pavlin CJ, Ritch, R, Foster FS. Ultrasound biomicroscopy in plateau iris syndrome. Am J Ophthalmol 1992; 113: 390-5
3. Ishikawa H, Schuman JS. Anterior segment Imaging: ultrasound biomicroscopy . Ophthalmol Clin North Am. 2004 March; 17(1): 7-20
4. Urbak SF, Pedersen JK, Thorsen TT. Ultrasound biomicroscopy II, Intraobserver & interobserver reproducibility of measurements. Acta Ophthalmol Scand 1998; 76:546-9