Comparison of A-scan ultrasound and partial coherence laser interferometry : axial length in idiopathic macular hole

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PURPOSE

• A **macular hole** is a full-thickness defect of the fovea leading to central visual loss due to anterior, posterior, and tangential traction of the posterior vitreous cortex.

• **Applanation A-scan ultrasound** and **partial coherence laser interferometry (IOL Master®)** are commonly used to measure **axial length** (AL).

✓ A-scan (ultrasound) : corneal vertex ~ internal limiting membrane

✓ IOL Master (partial coherence interferometry) : corneal vertex ~ retinal pigment epithelium

• Changes in the macular structure and thickness, such as those caused by macular hole, may generate differences in AL as measured by the IOL Master and A-scan ultrasound, according to the basic measurement principles.

• We examined the measurement of AL by A-scan ultrasound and the IOL Master in patients with idiopathic macular hole and compared the differences between the two techniques and both eyes.

METHODS

• **Study population**

✓ 24 eyes of 24 patients who diagnosed with idiopathic macular hole

✓ From January 2009 to August 2011, Chungnam National University Hospital

✓ Evaluation

slit-lamp and fundus examination, best corrected visual acuity, refraction, AL, and central macular thickness (CMT) in the affected and normal fellow eye

✓ Excluded criteria

- patients with macular holes in both eyes
- high myopia (AL >26mm)
- media opacity (severe posterior capsular opacity, hypermature cataract)
- other retinal diseases such as retinal detachment

• **Measurement of axial length**

✓ A-scan (Ocuscan RXP®, Alcon, USA) and the IOL Master® (Carl Zeiss, Germany)

• **Measurement of central macular thickness**

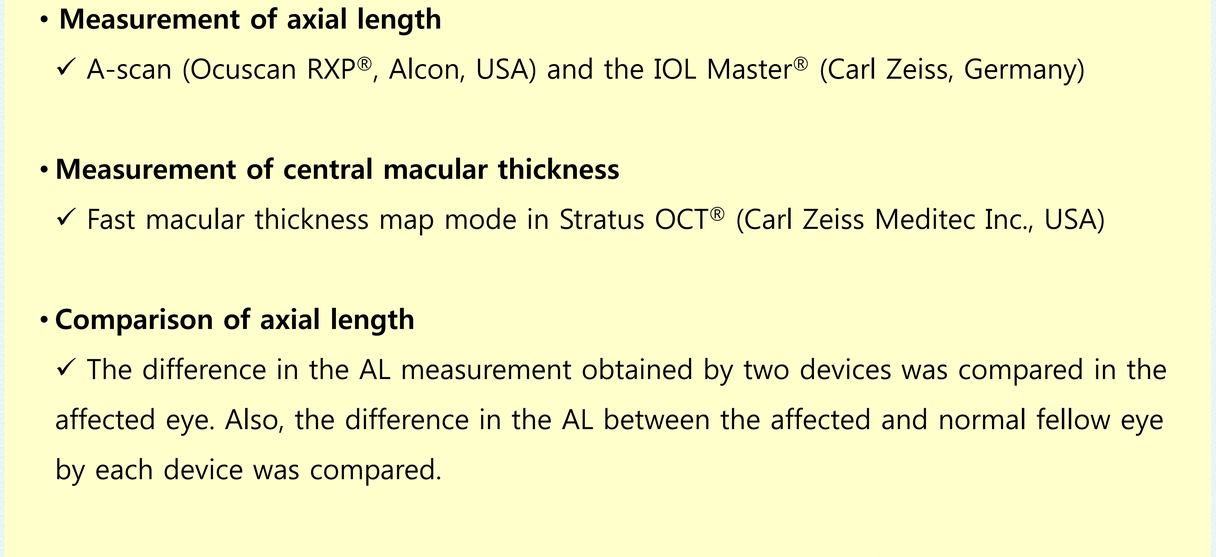
✓ Fast macular thickness map mode in Stratus OCT® (Carl Zeiss Meditec Inc., USA)

• **Comparison of axial length**

✓ The difference in the AL measurement obtained by two devices was compared in the affected eye. Also, the difference in the AL between the affected and normal fellow eye by each device was compared.

✓ Because the boundary around the fovea of the macular hole rises, we hypothesized that A-scan detected the elevated ILM layer and so the AL would be measured as shorter than its actual length

- To correct for this, the difference in the CMT obtained by OCT in the affected eye and normal fellow eye was calculated and then added to the AL of the affected eye as measured by A-scan. This value was then compared with that of the normal fellow eye (Fig 1).



RESULTS

Table 1. Demographics of the subjects

No. of patients (eyes)	24 (24)
Age (years, mean±SD)	65.5±4.7
Gender (male/female)	4/20
Best corrected visual acuity (snellen, mean±SD)	0.15±0.10
Lens status (phakic/pseudophakic)	24/0
Central macular thickness (㎛, mean±SD)	
Affected eye	315.7±63.0
Normal fellow eye	211.5±19.8

Table 2. Comparison of A-scan and IOL Master axial length in patients with macular hole

	A-scan	IOL Master	*p*-value*
Affected eye†	23.29±0.99	23.43±0.99	0.61
Normal fellow eye†	23.31±0.96	23.45±0.95	0.60
p-value*	0.92	0.94	

† mm, mean±SD, * Mann-Whitney U test

Table 3. A-scan measurement of axial length after correction of the affected eye

	A-scan
Affected eye‡	23.40±0.99
Normal fellow eye	23.31±0.96
p-value*	0.74

‡ Corrected axial length (original value plus the difference in the CMT of both eyes)
* Mann-Whitney U test

• **Axial Length of Affected Eyes**

AL was longer with the IOL Master than A-scan. However, the difference was not significant.

• **Axial Length of Fellow Eyes**

AL was also longer with the IOL Master than A-scan. However, no statistically significant difference was found.

• **Comparison of Axial Lengths of Both Eyes**

No significant difference was found in A-scan and the IOL Master. In the case of A-scan, no significant difference between the corrected AL of the affected eye and AL of the normal fellow eye was identified.

CONCLUSION

• No significant difference was found between the ALs measured by two different measurement techniques in one eye and by the each technique in both eyes.

• When the AL of the affected eye corrected by the difference in the CMT of both eyes was compared with that of the normal fellow eye, there was no significant difference.

• The postoperative myopic shift after macular hole combination surgery is not thought to be attributable to the measurement of a short AL.

Figure 1. Schematic image of AL measurement in macular hole. AL could be measured shorter (arrow head) than actual length (asterisk) by A-scan. The dotted line is imaginary line of ILM layer in the normal fellow eye and the double arrow is difference in CMT between the affected and normal fellow eye. AL could be measured consistently by IOL master in both eyes; from the corneal vertex to RPE (long arrow), not the vitreoretinal interface (arrow head).