**ORA Waveform Analysis of Biomechanical Properties Of The Cornea In Normal Tension Glaucoma**

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**Introduction:**

Normal tension glaucoma (NTG) is unique among glaucomas in that damage to the optic nerve can occur with eye pressure below 21mmHg. Glaucoma progression depends on many parameters but ocular hypertension is the main risk factor. Central corneal thickness (CCT) is also an independent risk factor for glaucoma progression and moreover, it must be considered in analyzing IOP measurements that are performed using Goldmann Applanation.

Recently, it has been shown that corneal viscoelasticity also has an impact on IOP measurements. The Reichert Ocular Response Analyzer® (ORA, Reichert) is the first simple device capable of determining in vivo biomechanical properties of the cornea. It quantifies corneal viscoelasticity by measuring corneal hysteresis (CH). More recently 37 parameters characterizing the ORA Waveform were defined.

The aim of our study was to analyze the Ocular Response Analyzer (ORA) waveform of biomechanical properties of the corneas in normal tension glaucoma (NTG) patients and compare them with those of patients with primary open angle glaucoma (POAG), isolated ocular hypertension (OHT) and normal subjects (N).

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**Methods:**

244 eyes were included and separated in 4 groups:
- NTG: 58 eyes of 29 patients
- POAG: 85 eyes of 53 patients
- OHT: 57 eyes of 29 patients
- N: 44 eyes of 22 subjects.

IOP-GA (Goldmann) and ultrasonic CCT were measured for each eye.

37 parameters characterizing peak 1 and 2 were measured among which: area (p1 and p2 area, p1 and p2 area1), aspect ratio (aspect1, 2, 11 and 21), width (w1 and w2), height (h1 and h2), dive (dive1 and 2). High frequency noise in region between peaks (aplhf) was also quantified (fig.1).

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**Results:**

Age and CCT were not significantly different between the 4 groups.

IOP-GA was not different between NTG and N subjects (13+/-2.63 – 14+/-3.47 p<0.05) and between POAG and OHT subjects (18+/-4.42 - 20+/-3.59 p<0.05).

12 waveform parameters were significantly different between the 4 groups (fig 2.).

NTG had higher aplhf but lower aspect1, aspect11, dslope11 compared to normal subjects.

They were similar to POAG except lower p1area1 and p2area compared to normal subjects.

They had lower w21, p1area1, p2area and p2area1 than OHT subjects.

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**Discussion:**

- NTG and POAG were associated with significant differences on peak1 and higher aplhf than normal subjects.
- NTG had specific characteristics compared to the 3 other groups.
- OHT subjects had ORA waveform similar to normal subjects.

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**Conclusion:**

ORA Waveform analysis could be a useful tool in early diagnosis of NTG.

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**References:**