

Long-term follow-up of visual field loss after electrical optic nerve stimulation in normal tension glaucoma

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Introduction

Normal tension glaucoma (NTG) is characterized by optic nerve degeneration and loss of retinal ganglion cells causing visual field impairment without elevated intraocular pressure (IOP) (1, 2). The current standard approach in NTG therapy is further reduction of the IOP. Despite effective medications leading to IOP-lowering, glaucoma exacerbation and progressive vision loss among patients is common. Electrical stimulation of the optic nerve (ONS) facilitates axonal regeneration and survival of retinal ganglion cells (3). The case series provides real-world evidence for long-term clinical efficacy of ONS in NTG.

Patients and Methods

Ten NTG patients were included in the study.

Inclusion criteria:

- Diagnosis of NTG with progressive vision loss despite appropriate IOP-lowering therapy.
- Assessment of visual receptive field by static threshold perimetry in the central 30° with a reliability factor (RF) of max. 20% before ONS treatment (PRE).
- Full ONS treatment cycle with 10 daily sessions.
- Perimetry assessment approximately one year after ONS therapy (POST) identical to PRE condition.

Patients could only opt for ONS treatment, if they were under appropriate IOP-lowering medication as monitored by Goldmann applanation tonometry.

ONS: Closed eyes were separately stimulated by bipolar rectangular pulses (duration 14-20 ms, frequency 5-34 Hz) with stimulus intensities up to 1.2 mA sufficient to provoke phosphenes (Eyetric®; Neuromodtronic GmbH, Germany). Ten daily stimulation sessions within 2 weeks lasted about 80 min each.

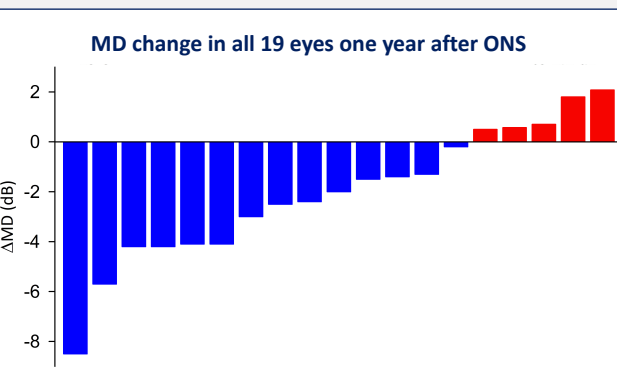
Mean defect (MD) as measured by perimetry was defined as primary outcome parameter.

Results

Clinical data from 19 eyes in 10 patients (6 f, 4 m) fulfilled the inclusion criteria. Patients were 64.8±13.5 years old ranging from 46 to 80 years. IOP was 13.4±1.2 mmHg ranging from 12 to 15 mmHg.

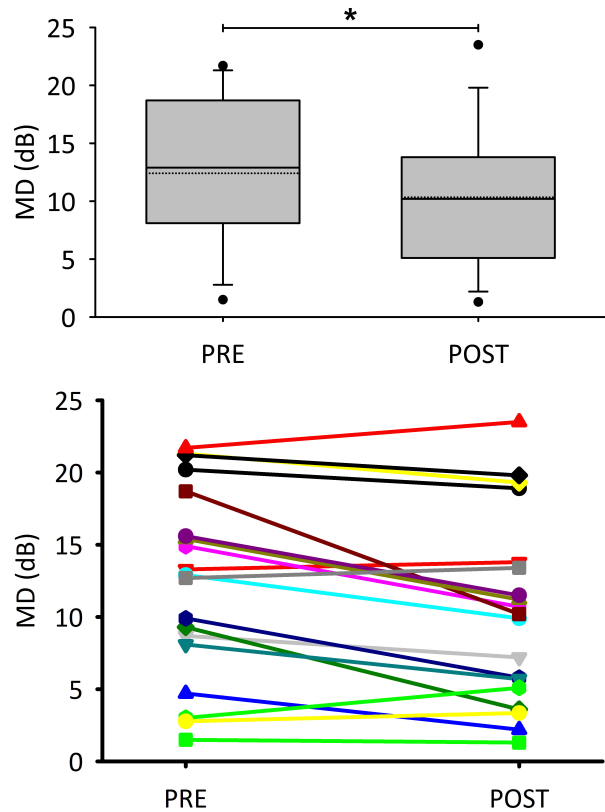
MD significantly decreased from PRE 12.4±6.6 dB (mean±SD) to POST 10.3±6.5 dB by -2.1±2.7 dB one year after ONS (paired t-test, t=3.4, p<0.01) corresponding to an average improvement of visual fields.

14 eyes in 8 patients showed a reduction of MD by 3.2±2.1 dB ranging from 0.2 to 8.5 dB. Thus, 73.7% of eyes in the present case series were responders.

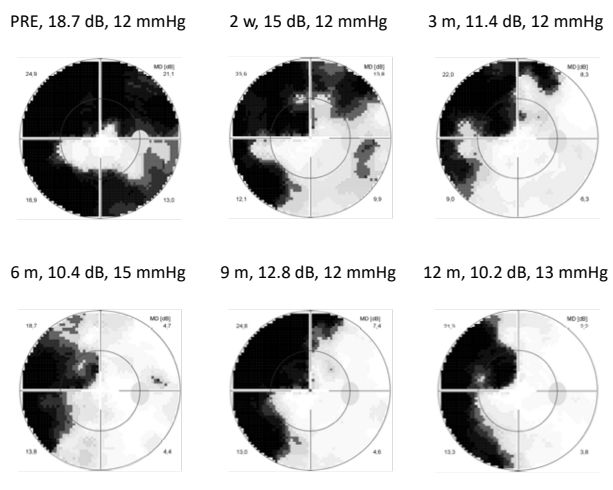


Results

Significant reduction of average PRE MD 12.4 dB down to 10.3 dB one year after ONS in 19 eyes



Visual field progress of the right eye in one patient with normal tension glaucoma over 12 months



Conclusion

Innovative treatments that preserve visual function through mechanisms other than lowering IOP are required for NTG with progressive vision loss. The present long-term data document progression halt or even improvement of visual fields in more than 73% of affected eyes after ONS and, thus, extend existing evidence from clinical trials.

References

1. Shen WC, Huang BQ, Yang J. Regulatory mechanisms of retinal ganglion cell death in normal tension glaucoma and potential therapies. *Neural Regen Res* 18: 87-93, 2023
2. Leung DY, Tham CC. Normal-tension glaucoma: Current concepts and approaches - A review. *Clin Exp Ophthalmol* 50: 247-59, 2022
3. Fu L, Lo AC, Lai JS, Shih KC. The role of electrical stimulation therapy in ophthalmic diseases. *Graefes Arch Clin Exp Ophthalmol* 253: 171-6, 2015