# Electrical optic nerve stimulation in normal tension glaucoma

P-303

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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

Seven 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 (Eyetronic®, Neuromodtronic GmbH, Germany). Ten daily stimulation sessions within 2 weeks lasted about 80 min each.

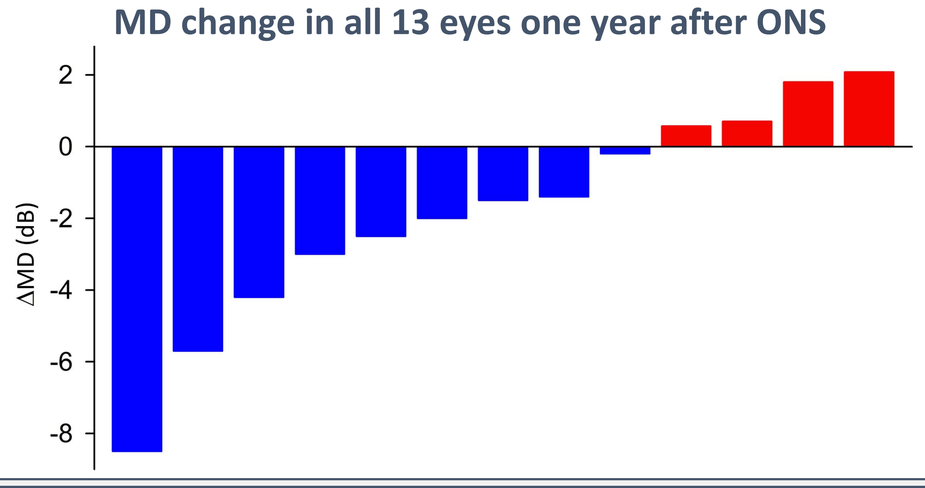
Mean defect (MD) as measured by perimetry was defined as primary outcome parameter.

## Results

Clinical data from 13 eyes in 7 patients (4 f, 3 m) fulfilled the inclusion criteria. Patients were 62.0±13.7 years old ranging from 46 to 80 years.

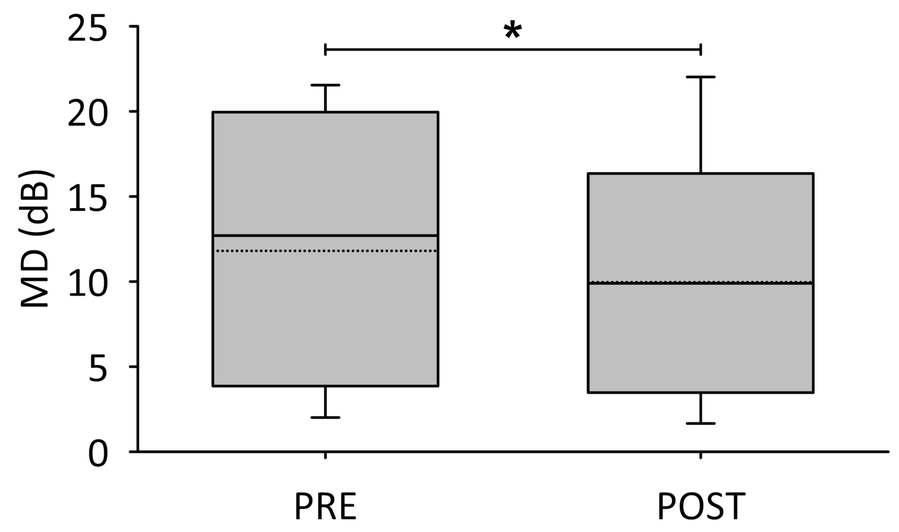
MD significantly decreased from PRE 11.8±7.5 dB (mean±SD) to POST 10.0±7.3 dB one year after ONS (paired t-test, $t=2.2$, $p<0.05$) corresponding to an average improvement of visual field. Nine eyes in 5 patients showed a reduction of MD by 3.2±2.6 dB (range 0.2 to 8.5 dB). Thus, 69% of eyes in the present case series were responders.

**MD change in all 13 eyes one year after ONS**

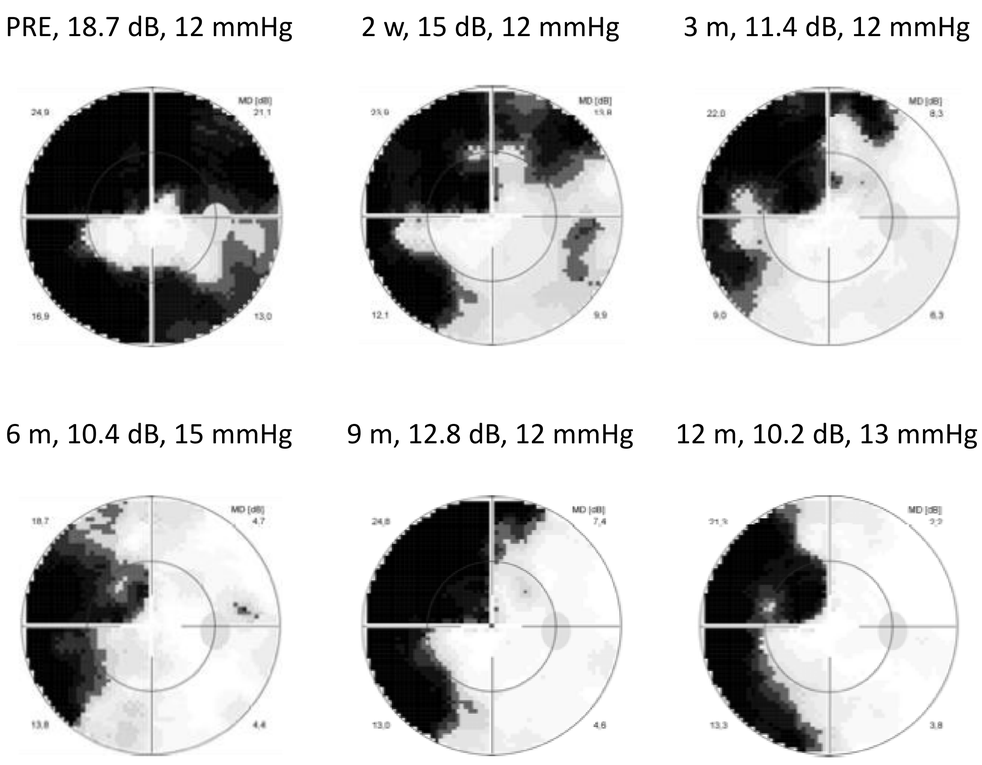



## Results

**Significant reduction of average PRE MD 11.8 dB down to 10.0 dB one year after ONS**




**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 69% of affected eyes after ONS and, thus, extend existing evidence from clinical trials.

## References

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