

# General shape of the optic nerve head in one high myopic glaucomatous patient before and after trabeculectomy

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Received: 2019-03-09 Accepted: 2020-08-12

**DOI:10.18240/ijo.2020.11.24**

**Citation:** Ehongo A, Dugauquier A, Alaloui Mhammedi Y. General shape of the optic nerve head in one high myopic glaucomatous patient before and after trabeculectomy. *Int J Ophthalmol* 2020;13(11):1836-1838

## Dear Editor,

I am Adèle Ehongo, Head of the Glaucoma Clinic at Erasme Hospital, Brussels, Belgium. Along with Artémise Dugauquier and Yassir Alaoui, I am writing to you to present the case of one glaucomatous myopic patient with change in the general shape of the optic nerve head (ONH) after trabeculectomy.

Glaucoma is a progressive optic neuropathy affecting the structure and the function of the eye. Its treatment aims to stabilize the disease. Therefore, a reliable baseline examination is crucial for an efficient follow up.

After a drop of the intraocular pressure (IOP) induced by surgical treatment of glaucoma, it is possible to observe a range of structural changes of the ONH, called reversal. Presently, reversal is well known both in children<sup>[1]</sup> and adults<sup>[2]</sup> and is believed to be related to the degree of IOP reduction<sup>[3-4]</sup>. The most commonly accepted mechanism of reversal is the one including the posterior bowing of the lamina cribrosa as it is submitted to mechanical strains resulting from high IOP, being released when the IOP returns to a normal range<sup>[4-6]</sup>.

Less described is the change of the general shape of the ONH, which can be followed by fundus photography. Due to its qualitative nature, only few researchers used it as main examination technique in their studies<sup>[6-7]</sup>. Nevertheless, it is with this method that we noticed remarkable changes in one patient who presented sustainable modifications in the overall shape of the ONH in addition to the reversal

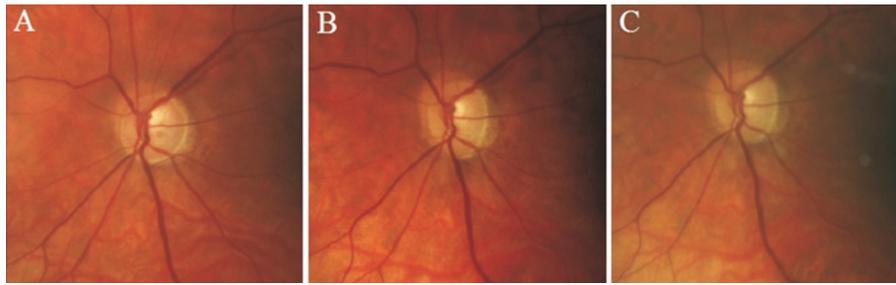
phenomenon postoperatively. This has already been reported by a previous team<sup>[7]</sup>. As their study was limited to five months post-trabeculectomy, we would like to share longer-term observations. This retrospective observational case report complies with the Declaration of Helsinki. The review of the patient's medical record was approved by the Ethics Committee and by the institutional board of the hospital. The patient provided a written consent.

Our patient is a 55-year-old high myopic (spherical equivalent of -13 D in both eyes) woman with primary open angle glaucoma whose treatment was complicated by severe drop intolerance. Without any treatment, her IOP was 36 mm Hg for a central corneal thickness of 538  $\mu\text{m}$ , bilaterally. Her best-corrected visual acuity was 0.7 at right eye (RE) and 1.0 at left eye (LE). After bilateral trabeculectomy, her IOP dropped to 9 mm Hg in both eyes and this value is still maintained seven years after surgery. We present here the clinical observations of the LE which underwent the most obvious changes (Figures 1-3).

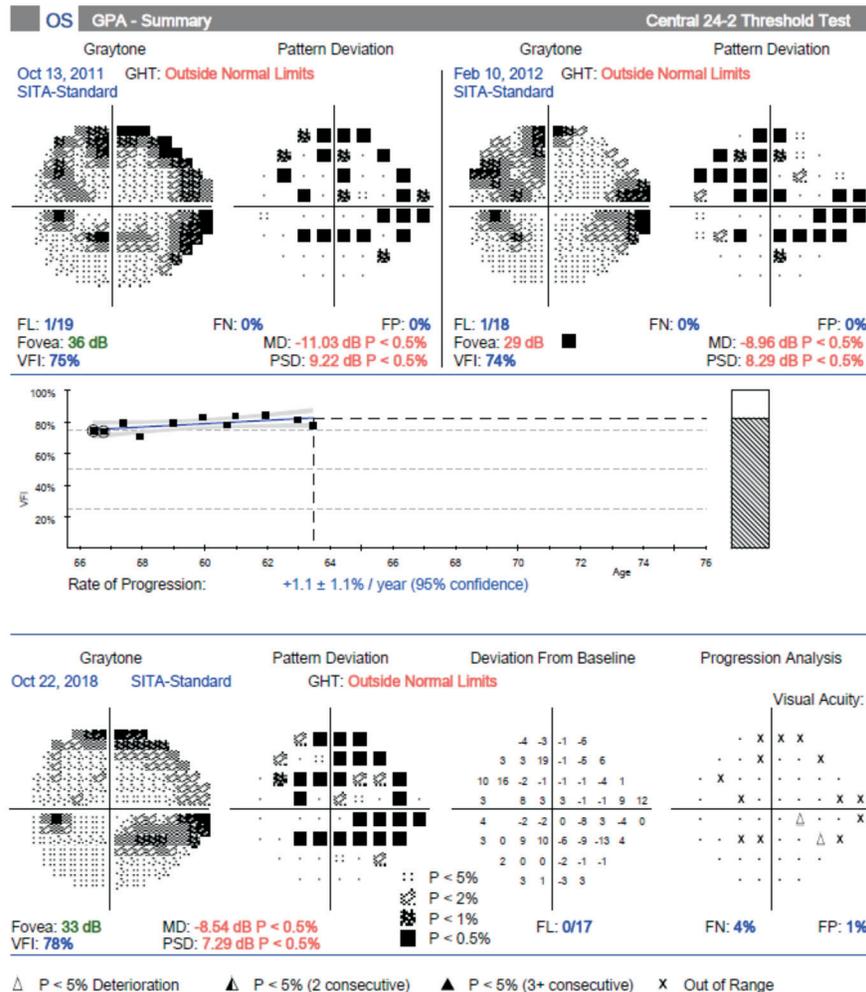
Before surgery, the shape of the ONH is round. There is a disc haemorrhage and the vertical C/D ratio is 0.8 (Figure 1A). After trabeculectomy, the disc has a pronounced vertical orientation and a thicker neuroretinal rim (Figure 1C).

In the overall, we notice that the disc of our patient experienced a decrease of its horizontal component. This finding is consistent with those from a previous work we already mentioned<sup>[7]</sup>. This report was related to the first five postoperative months. We recorded the same changes in our patient's ONH postoperatively, and the main axis is no more horizontal even several years after the surgery.

Our patient possesses some specific characteristics: she is young, suffers from high myopia and an advanced stage of glaucoma for which a low postoperative target pressure was needed. This low IOP was reached and is still present. All these parameters may play a role in our findings. We also think that the ONH did not recover a main horizontal axis because of a sustainable reduced IOP over years with subsequent changes in the strains interacting at the level of the lamina cribrosa. Indeed, a report suggests that highly myopic eyes, especially if the postoperative IOP is low, are more susceptible to fundus changes associated with OCT changes<sup>[8]</sup>. According to a recent



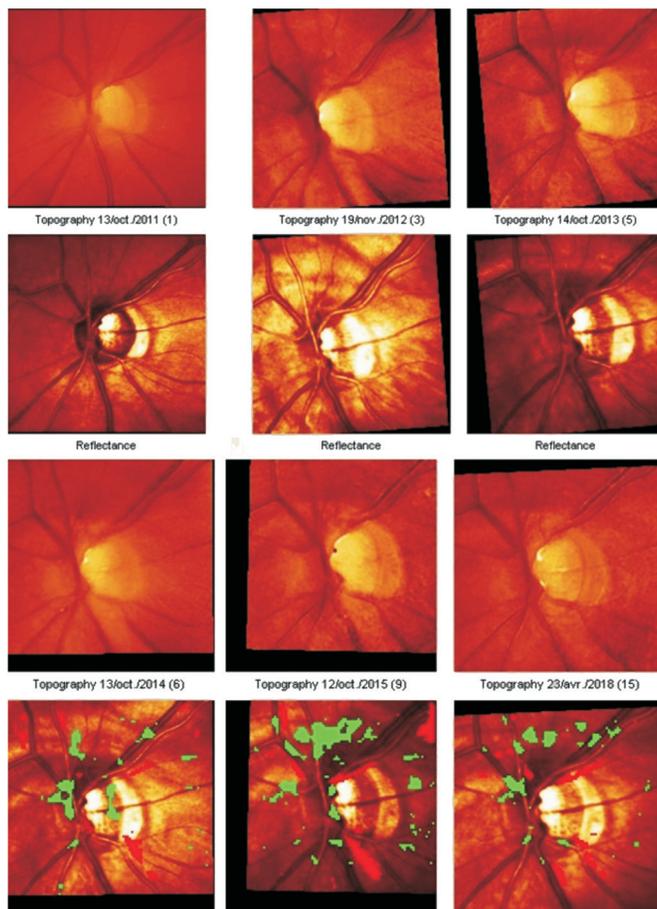
**Figure 1 Fundus pictures** A: Before the surgery; B: Right after the surgery; C: Last good quality image of the follow-up. Time elapsed between A and C: 7y.



**Figure 2 Progression analysis of the left eye.**

study<sup>[9]</sup>, the tensile strength of the sclera during myopic shift induces stretching in the opposite side of the ONH, resulting in the tilting of the ONH and the parapapillary atrophy. It is as if the high IOP is counteracting this apparent ovalization of the ONH. Therefore, reduction of the IOP then favors the oval shape by modifying the balance of forces acting on the ONH. Interestingly, our patient experienced an improvement of her visual field indices. As she was used to do visual fields, this cannot be related to a “learning curve effect”. While it is a divisive issue, some studies show that effective IOP reduction in a context of glaucoma can lead to an improvement of the visual function, contradicting the popular belief that

glaucomatous damages are irreversible<sup>[10-12]</sup>. The clinical relevance of ONH changes is still unclear, but some recent reports suggest that it could also be a predictor of visual function improvement<sup>[13-14]</sup>. Our work compiles only one clinical case and, as it is a retrospective analysis, we lack some preoperative parameters like axial length. Despite these limitations, it raises awareness to the fact that fundus examination and disc images, already considered crucial to detect papillary hemorrhages in glaucoma follow-up, may change drastically after surgery and though, brings arguments to set a new baseline for photographs or disc imaging after trabeculectomy.



**Figure 3** HRT scans of the left eye The first scan was made before surgery; all the others have been taken after trabeculectomy. The decrease of the disc’s horizontal component is also observable.

To conclude, we observe a decrease of the horizontal component of the ONH of this high myopic glaucomatous patient, even several years after trabeculectomy. These modifications following IOP reduction give arguments to the fact that the IOP acts actively beside other parameters in the shape of the ONH of myopic patients. The shape of the optic disc could then represent an important biomarker of the forces acting on the eye of high myopic patients.

We thus suggest considering the shape of the optic disc as another parameter to look at, among other classical signs of glaucomatous reversal, during the postoperative follow-up of myopic patients. We also advocate to set a new baseline imaging of the optic disc in these cases. Further prospective-designed studies are needed to specify how the shape of the ONH changes, the clinical correlations and relevance.

**ACKNOWLEDGEMENTS**

**Conflicts of Interest:** Ehongo A, None; Dugauquier A, None; Alaloui Mhammedi Y, None.

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