

# Refractive and Campimetric Changes after Trabeculectomy, a Case Report

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## Abstract

We present the case of a 52-year-old patient with a diagnosis of pigmentary glaucoma whose topical treatment was not sufficient to reach her target IOP with progression of damage in the nerve fiber layer and computerized visual field, showing extensive worsening in her right eye with central remnant. Therefore, he underwent trabeculectomy, resulting in a broad improvement in visual acuity through his central remnant.

Performing a review of the topic, we found that improvement in both visual acuity, visual field (VF) and the nerve fiber layer is common, and would be due to the intervention of factors such as the position of the anterior portion of the optic nerve, the elasticity of the cribriform plate and its composition, a factor determined by age, and the role of the position of the vasculature as a determinant of the irrigation flow of the axons of the optic nerve. However, this should not be used as an objective in reducing intraocular pressure, since the importance lies in the non-progression of damage.

**Keywords:** Trabeculectomy, Visual Acuity, Computerized Visual Field

## Introduction

Within glaucoma filtering surgeries, trabeculectomy in patients, whether phakic or pseudophakic, may experience changes in their visual acuity (VA) and in the Computerized Visual Field (CVF).

Among the post-trabeculectomy side effects, cataracts are very common, as well as the sudden loss of VA, a phenomenon called snuff out or wipe out, in patients with advanced glaucoma with central remnant, varying in an incidence of 7.7%, in which several of the risk factors for its manifestation are hypotonic maculopathy, uncontrolled elevated IOP or inflammatory reaction [1-8].

However, there are patients who recover their VA and field defects, in addition to improving the topography of the optic nerves [9]. In these cases, it is likely that the decompression and stability of the cribriform plate are one of the factors that intervene in the beneficial changes in the decrease in IOP after filtering surgery, in our particular case, after a trabeculectomy [9].

## Clinical Case

A 52-year-old patient who consulted our service for the first time due to a progressive decrease in visual acuity that corrected to 20/20 in both eyes. When performing the rest of the ophthalmological examination, an intraocular pressure was found to be 21 mmHg in the RE and 35 mmHg in the LE, with a lens with signs of pseudoexfoliation in the AO and an open-angle gonioscopy with pigmentary and pseudoexfoliative material on a compatible Schwalbe line with the Sampaolesi both eyes line. In the fundus of the eyes, both papillae with clear edges are observed with a cup-disc ratio in RE of 0.3 and in LE of 0.9 with a CFN OCT where preservation of fibers is evident in RE, while in the LE there is a severe depletion of them at the temporal, superior and inferior levels with borderline alterations at the nasal level.

Latanoprost + dorzolamide/timolol combination is indicated, responding with a decrease in IOP to 14 mmHg RE and 15 mmHg LE.

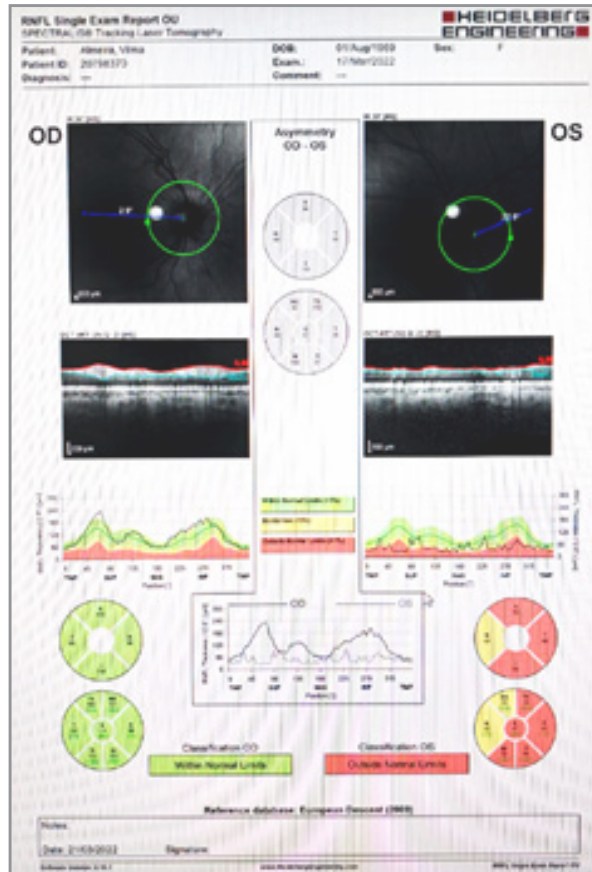


Figure 1: First OCT CFNL

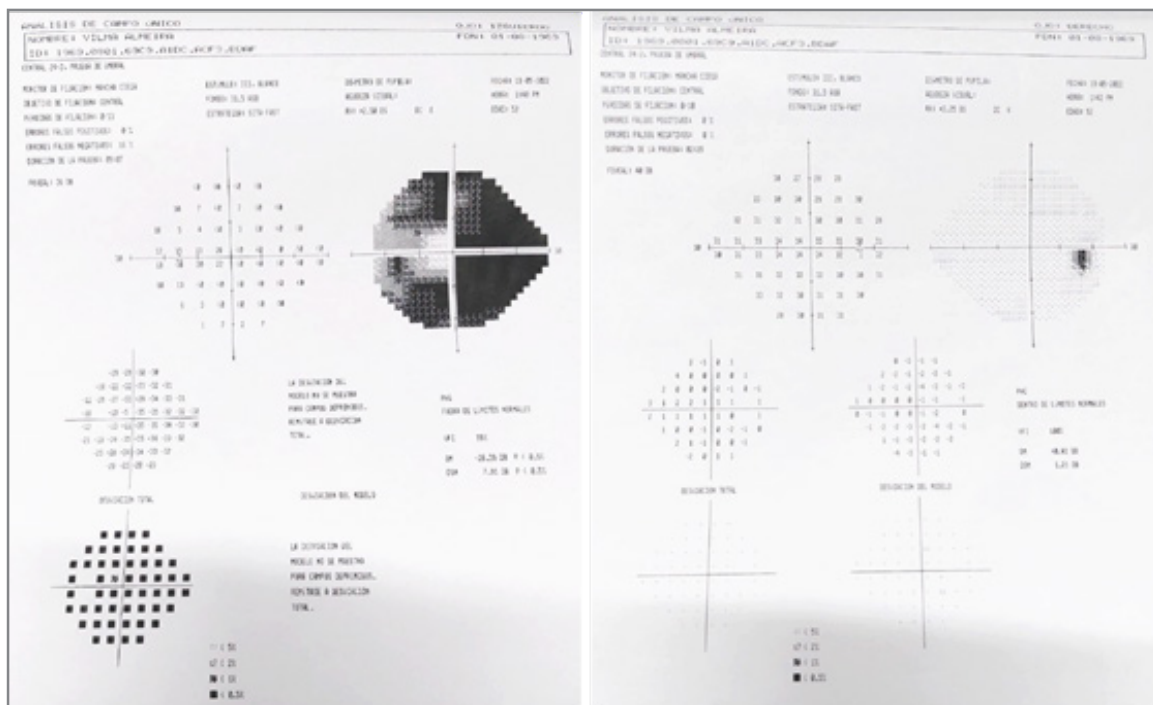


Figure 2: First CVF.

One year later, the patient attended a follow-up visit and admitted abandoning treatment, so when Goldmann tonometry was performed, the RE was 33 mmHg and LE 42mmHg. A regimen

with latanoprost + dorzolamide/timolol was again indicated and new studies were requested in which great progress of damage was evident, with an BCVA RE 20/20 and LE FCV 1 meter.

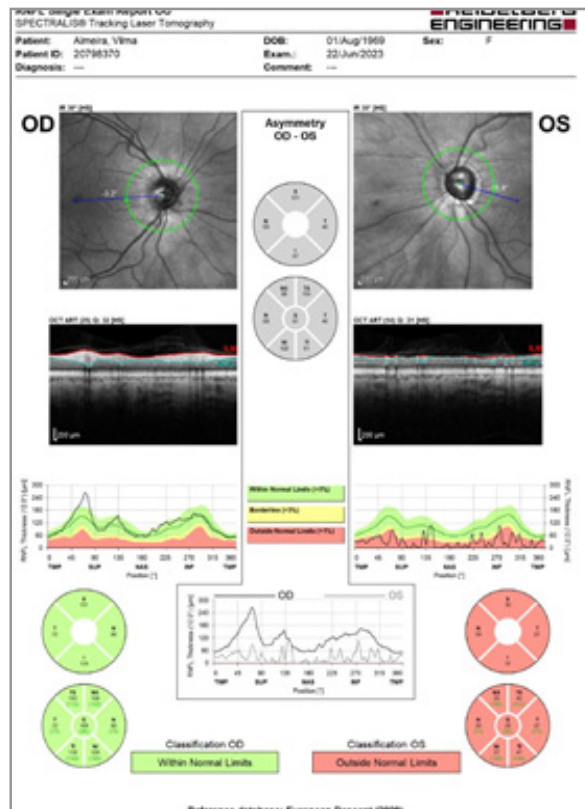


Figure 3: Second CFNL OCT where worsening is evident

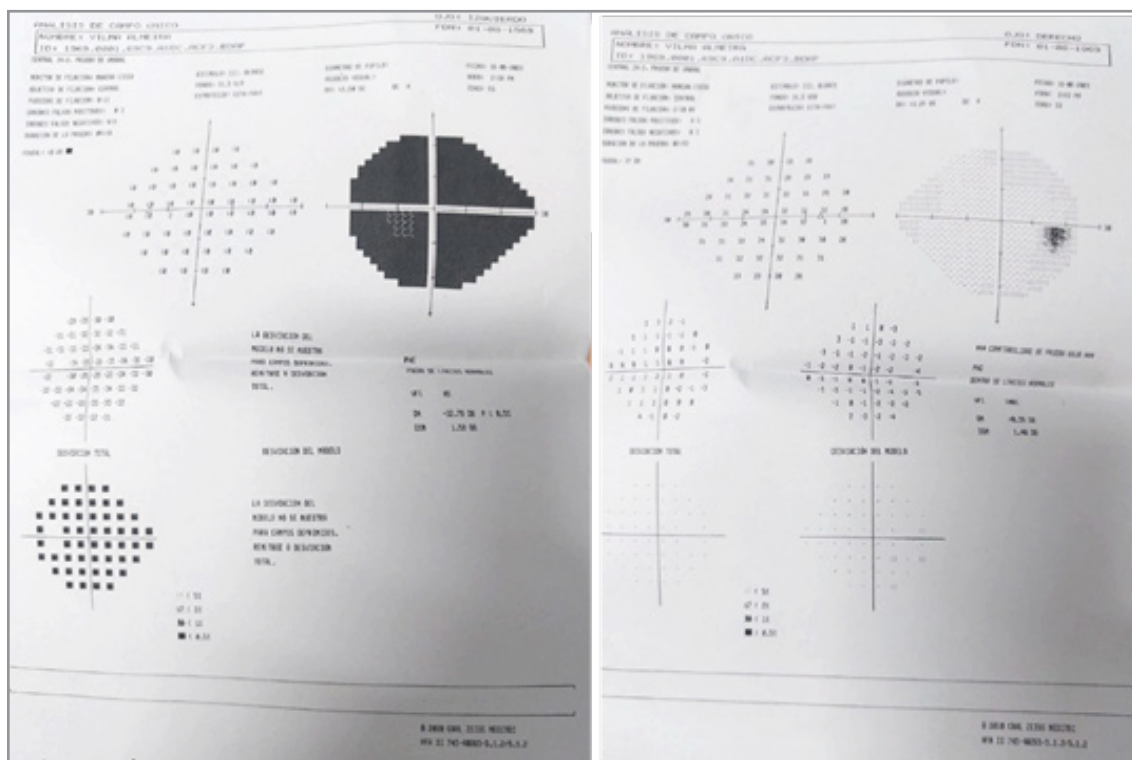
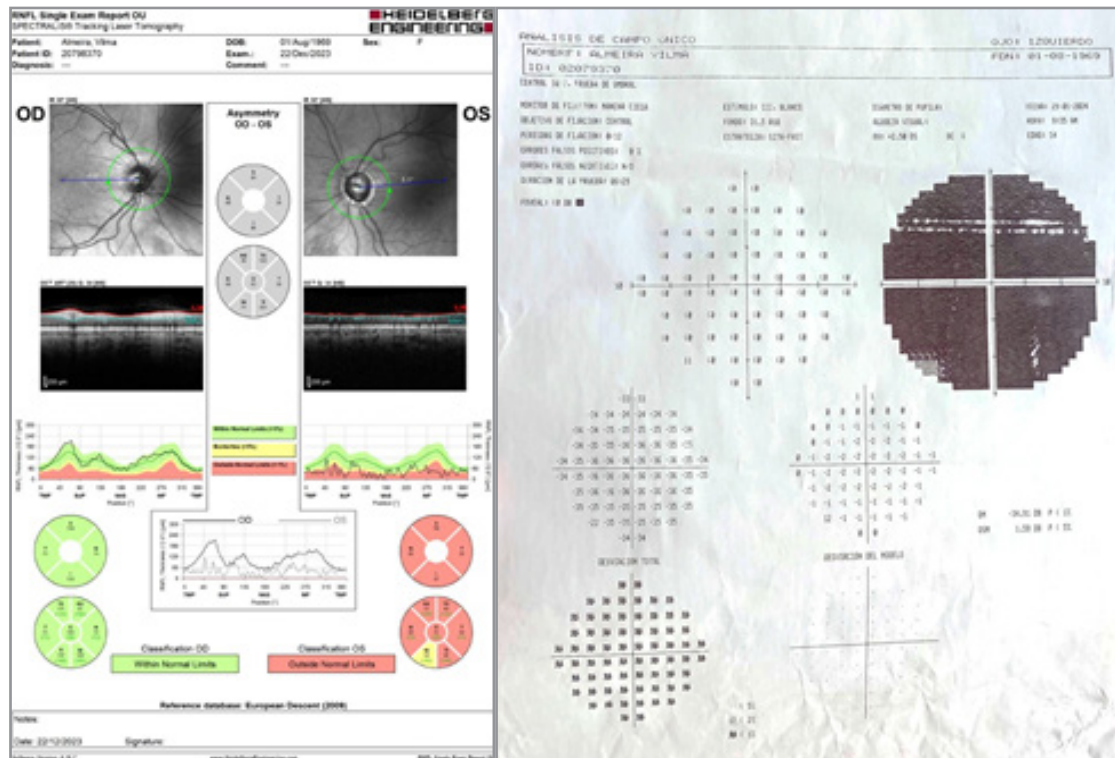


Figure 4: CVF 24.2 where worsening is evident compared to the first

It is monitored 3 weeks after treatment and good adherence with an IOP RE 20 mmHg and LE 35 mmHg.

Given the lack of response, filtering surgery was performed using trabeculectomy in the LE. The response evidenced was fa-

vorable with a marked decrease in IOP RE 10 mmHg (travoprost + triple combination dorzolamide/timolol/brimonidine) and LE 9 mmHg (without topical treatment) and a marked improvement in their BCVA OD 20/20 and LE 20/20 over its central remnant at the third postoperative month.



**Figure 5:** OCT CFNL and CVF 24.2 post trabeculectomy. An improvement is observed in lower nasal CFNL with a slight improvement in the remaining sensitivity present.

## Discussion

As we have previously mentioned, it is not uncommon for the snuff-out phenomenon to occur as a secondary effect of decompression after a trabeculectomy in advanced glaucoma.

In the case of our patient, with advanced glaucoma with central remnant, after the surgical intervention there was a large improvement in her visual acuity, despite no evidence of changes in the visual field.

Reviewing the topic, there are cases in which decompression of the optic nerve favors its topography as well as the VA and CVF. Among the factors that intervene in this is the role of the cribriform plate. Both the position of the anterior portion of the optic nerve, which involves pressure inside the eye anterior to the lamina cribrosa, pressure posterior to the lamina cribrosa, and compliance of the lamina cribrosa play important roles. The disc is a plastic structure, related to the presence of elastin in the lamina. With age the amount of elastin decreases. Additionally, the nature of collagen changes with age and perhaps with the presence of glaucoma. In an enucleated eye, it has been subjected to changes of 5 to 50 mmHg in IOP, displacing the head of the optic nerve posteriorly and traumatizing the neurons, not only by traction, but by arterial ischemia and venous stasis [10]. The influencing factors are the relationship between the IOP level before and after the lamina, and the ability of the lamina to deform due to its compliance characteristics (composition of elastin and changes to collagen with age and its resistance to deformation). Furthermore, laminar deformation may also have effects on vessels passing through tissues, and a restoration of the normal position of the lamina may be associated with improved vascular hemodynamics [11-14].

Acute edema can cause an immediate decrease in excavation after a decrease in IOP. While this tends to be more prominent in eyes with lesser degrees of disc shift, it can occur in eyes with advanced optic nerve damage [15-27].

One study, which reviewed stereophotographs and visual fields, demonstrated that of patients who had at least a 30% reduction in IOP, 30% had improved disc appearance and 40% had improved visual fields [23, 16].

Improvement in all optic disc parameters was found in 8 of 13 eyes that had a mean IOP reduction of 48% with an increase in neuroretinal rim area in 44% of patients undergoing trabeculectomy [17]. Furthermore, Raitta and colleagues demonstrated, using the Heidelberg retinal tomograph (HRT) to study changes in optic disc topography after glaucoma surgery in 9 patients, there was a reduction in the volume of the optic disc cup in all eyes except one that had less than a 30% reduction in IOP [17, 24, 25].

However, the correlation between the amount of IOP drop and the presence of disc improvement is not significant, consistent with the results of Lesk and colleagues and Irak and colleagues [18-20].

The reduction in IOP has been associated with an increase in the thickness of the nerve fiber layer, a sign of a greater number of ganglion cells [17].

Many authors noted improvements in visual field in association with IOP reduction (9,16). This can occur in response to acute changes, either with topical or oral treatment with acetazolamide (18), in addition to occurring changes chronically. The relation-



ship between the amount of IOP reduction and the amount of visual field improvement was demonstrated [21]. However, whether these apparent improvements are real, it is difficult to know due to the variability of the images, the test results, the learning curve, the psychological changes and the difficulties in interpretation.

Movement of the anterior surface of the optic nerve, whether anterior or posterior, can stretch blood vessels, causing the release of vasoactive endothelial factors and subsequent localized vasospasm becoming the damaging mechanism. But the cause of vasospasm is the change in position of blood vessels caused by IOP [18]. Therefore, when IOP is reduced, arterial flow will increase [11, 26].

Based on this research, Spaeth suggests using visual field improvement as a glaucoma control measure more appropriately than using the concept of target pressure [22]. The problem with this is that efforts may be focused on deeply reducing IOP in search of improvements, which sometimes will not occur.

## Conclusion

Anatomical changes determined by the position of the anterior portion of the optic nerve, such as the role of the lamina cribrosa and changes in the position of the vasculature of the optic nerve, are factors that determine that a decrease in intraocular pressure compared to a trabeculectomy produces an improvement in both visual acuity, computed visual field and optic nerve topography both acutely and chronically, and could be determined by the amount of IOP decrease, although it has not yet been concluded in a significant way.

However, just as there may be such an improvement in the aforementioned parameters, as in the case of our patient, they should not be taken into account as glaucoma control measures, since, in cases of advanced glaucoma with central remnant, it could also occur. the snuff out phenomenon, due to significant drops in intraocular pressure in said filtering surgery.

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