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Case report

Chronic chiasmal compression and persistent visual field defect without detectable changes in optical coherence tomography of the macular ganglion cell complex

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ABSTRACT

Purpose: Optical coherence tomography (OCT) of the retinal nerve fiber layer (RNFL) and macular ganglion cell complex (GCC) are important in the ophthalmological evaluation of patients with sellar masses. Changes in OCT of the RNFL and macular GCC often precede visual field changes in patients with chronic chiasmal compression. OCT of the macular GCC has been shown to have better correlation with visual function and allow for even earlier detection of compression of the anterior visual pathways. We present a case of a chronic visual field defect from a pituitary adenoma with largely normal OCT parameters and only subtle changes in OCT of the RNFL and no perceptible changes in OCT of the macular GCC.

Observations: A 32-year-old man presented with a four-month history of decreased vision in his left eye and was found to have a monocular temporal visual field defect from a pituitary adenoma. OCT of the RNFL showed only a subtle change in that the nasal quadrant was mildly reduced and the optic nerve did not follow the ISNT rule. There was no asymmetry, deviation from normal parameters or differences in the nasal and temporal sextants on OCT of the macular GCC. This remained stable after testing two months later and a worsening visual field defect. He was found to have an elevated prolactinoma and after initiation of cabergoline, his visual field defect rapidly resolved within a few days.

Conclusions and Importance: OCT RNFL and macular GCC may have parameters in the normal range in patients with chronic chiasmal compression, emphasizing the importance of both anatomical and psychophysical testing. OCT of the RNFL may show these changes earlier than OCT macular GCC and both should be performed for the pre-treatment evaluation of patients with sellar masses. Preserved RNFL and macular GCC thickness confer a good prognosis as demonstrated in this case with rapid resolution of visual changes after medical treatment.

Optical coherence tomography (OCT) of the retinal nerve fiber layer (RNFL) and macular ganglion cell complex (GCC) are recommended when evaluating patients with sellar masses and visual symptoms.[1] OCT helps with prognostication in patients undergoing surgery and also allows for the early diagnosis of chiasmal compression since it has become well-recognized that OCT changes usually precede early visual field defects in patients with chronic chiasmal compression.[2–4] OCT of the macular GCC is important to include in the evaluation of these patients since it is thought to allow for even earlier detection of anterior visual pathway changes compared to the RNFL.[2,4,5] We present a case of chronic chiasmal compression from a pituitary adenoma with an initial monocular visual field defect that responded promptly to medical treatment. Of greatest significance was the relatively preserved OCT parameters since there was only very mild thinning of the nasal portion of the RNFL without detectable changes in the OCT macular ganglion cell complex.

1. Case presentation

A 32-year-old man presented with a four-month history of decreased color vision and blurred vision in his left eye. He was otherwise healthy and was not taking any medications. On examination, his visual acuity was 20/20 in both eyes, there was a mild left relative afferent pupillary defect and red desaturation in the left eye. Humphrey 24-2 SITA-Fast

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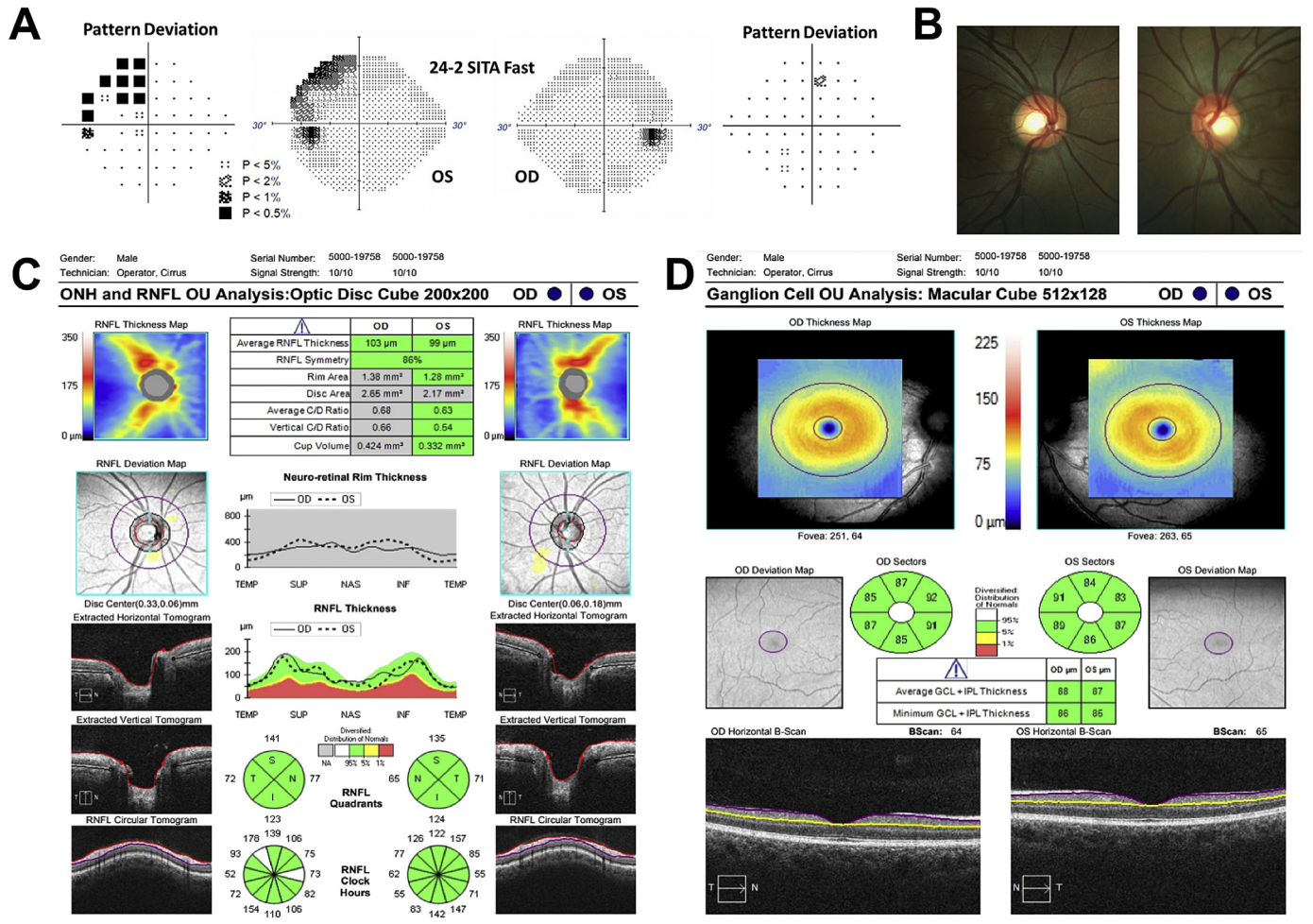

Fig. 1. Visual Fields and OCT Findings on Initial Presentation. A) Humphrey 24-2 SITA-fast automated visual field testing demonstrating a supero-temporal visual field defect in the left eye that respected the vertical meridian and a single depressed point in the right eye. **B)** Fundus photographs showing normal appearing optic nerves. **C)** Optical coherence tomography (OCT) of the retinal nerve fiber layer did not identify thinning in any quadrant. **D)** OCT of the macular ganglion cell complex demonstrating normal thickness in all sextants.

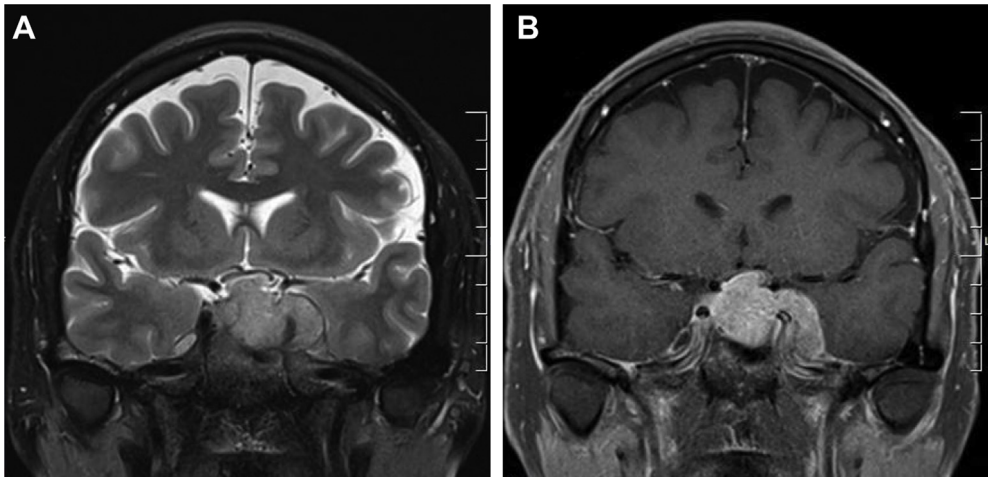

Fig. 2. MRI of the Orbits for Suspected Optic Chiasm Compression. A) Coronal T2-weighted MRI image demonstrating a large pituitary mass extending into the left cavernous sinus and compressing the optic chiasm, primarily on the left side. **B)** Coronal T1-weighted MRI image post-contrast showing enhancement of the tumour with gadolinium.

visual field testing demonstrated a supero-temporal visual field defect respecting the vertical meridian in the left eye with a mean deviation of −3.42dB (Fig. 1A). There was only a single depressed point temporally in the right eye with a mean deviation of −1.25dB. He had normal ocular motility and alignment and pupils were equal sizes. Dilated fundus examination revealed normal appearing optic nerves (Fig. 1B). Optical coherence tomography (OCT) showed subtle thinning of the nasal RNFL and macular GCC was normal without asymmetry between the nasal and temporal sextants (Fig. 1C and D). Due to concern for a chiasmal lesion, MRI of the orbits with gadolinium was performed and revealed a pituitary macroadenoma measuring 40 × 29 × 32 mm. The tumour extended into the left cavernous sinus and compressed the optic chiasm, primarily on the left side (Fig. 2).

Due to the time required to obtain an MRI, additional endocrinology

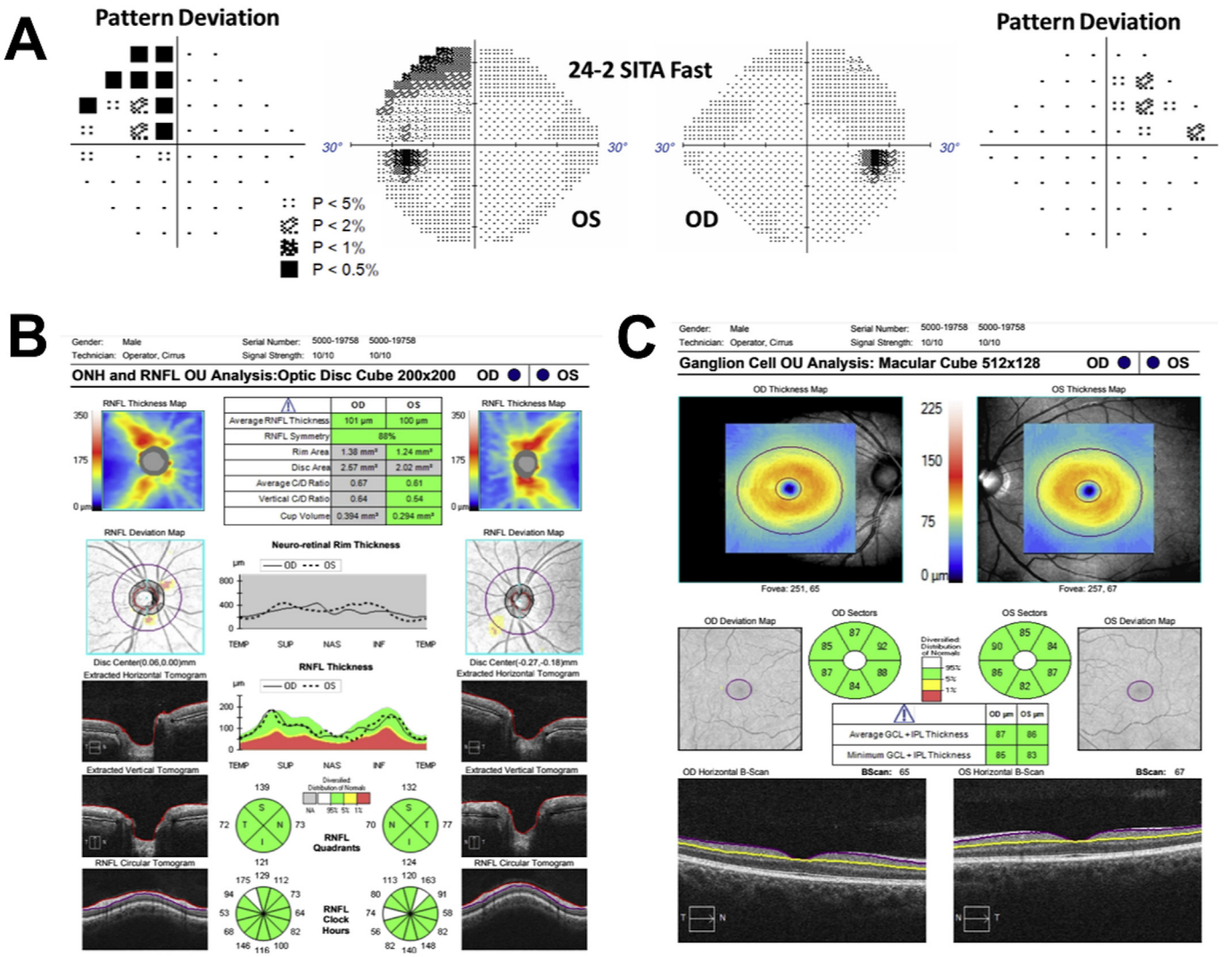

Fig. 3. Repeat Visual Field Testing and OCT 2 Months After Initial Presentation. A) Humphrey 24-2 SITA-fast automated visual field testing demonstrating bitemporal depressed points, slightly worse compared to previous. OCT of the retinal nerve fiber layer **(B)** and macular ganglion cell complex **(C)** did not identify thinning in any quadrant or sextant, respectively.

and neurosurgical consultations, visual field testing and OCT were repeated 2 months (64 days) after the initial visit. The patient had bitemporal depressed points on Humphrey visual field testing, slightly worse compared to previous (Fig. 3A). OCT of the RNFL and macular GCC did not show any significant changes at that time and there was no obvious thinning of the macular GCC (Fig. 3B and C). Despite a negative review of systems, endocrinological workup revealed a significantly elevated prolactin, 6511.7 μg/L (normal 2.6–18.1 μg/L). The patient was started on cabergoline 0.25 mg twice per week and he noticed resolution of his visual symptoms within a few days. Repeat Humphrey visual field testing 1 month after starting treatment demonstrated resolution of the previous visual field defect and OCT of the RNFL and macular GCC remained stable (Fig. 4).

2. Discussion

OCT of the RNFL and macular GCC has become an important aspect of the pre-treatment evaluation of pituitary tumors and is recommended by the Congress of Neurological Surgeons' guidelines.[1] Not only does OCT help in determining prognosis, it also allows for earlier diagnosis since OCT parameters typically precede visual field changes in chronic chiasmal compression.[2] Danesh-Meyer et al. first reported that 15% of patients undergoing resection of parachiasmal tumors had normal visual field testing, but a thin RNFL as detected with OCT.[3] Blanch et al.,[4] reported 7 patients with radiological compression of the optic chiasm without visual field defects where compression of the anterior visual pathways was detected primarily with OCT of the macular GCC.[4] Many of these patients had a normal OCT of the RNFL. Similar cases have been reported by others, which has led to the acceptance that OCT of the macular GCC is important to include when evaluating patients with sellar masses and may allow for even earlier detection of chronic compression of the anterior visual pathways.[5,6] This case is unique in that there were only subtle changes in the nasal RNFL on OCT (the RNFL did not follow the classic ISNT rule[7]) despite a persistent visual field defect and this still remained within the "normal" manufacturer range. More interesting, is that there were no detectable changes in the macular GCC, including no differences between the nasal and temporal sextants in each eye and no differences between the eyes. Chiasmal compression is well-known to cause more thinning of the nasal portion of the macular GCC,[2,4,5] but this was not the case here. This was likely a result of only analyzing the macular GCC rather than elsewhere in the retina and the possibility that a only a mild amount of thinning occurred, which may have been below the level of detection of OCT.[8]

A second interesting aspect of this case was the monocular temporal visual defect resulting from a sellar mass. This has been previously

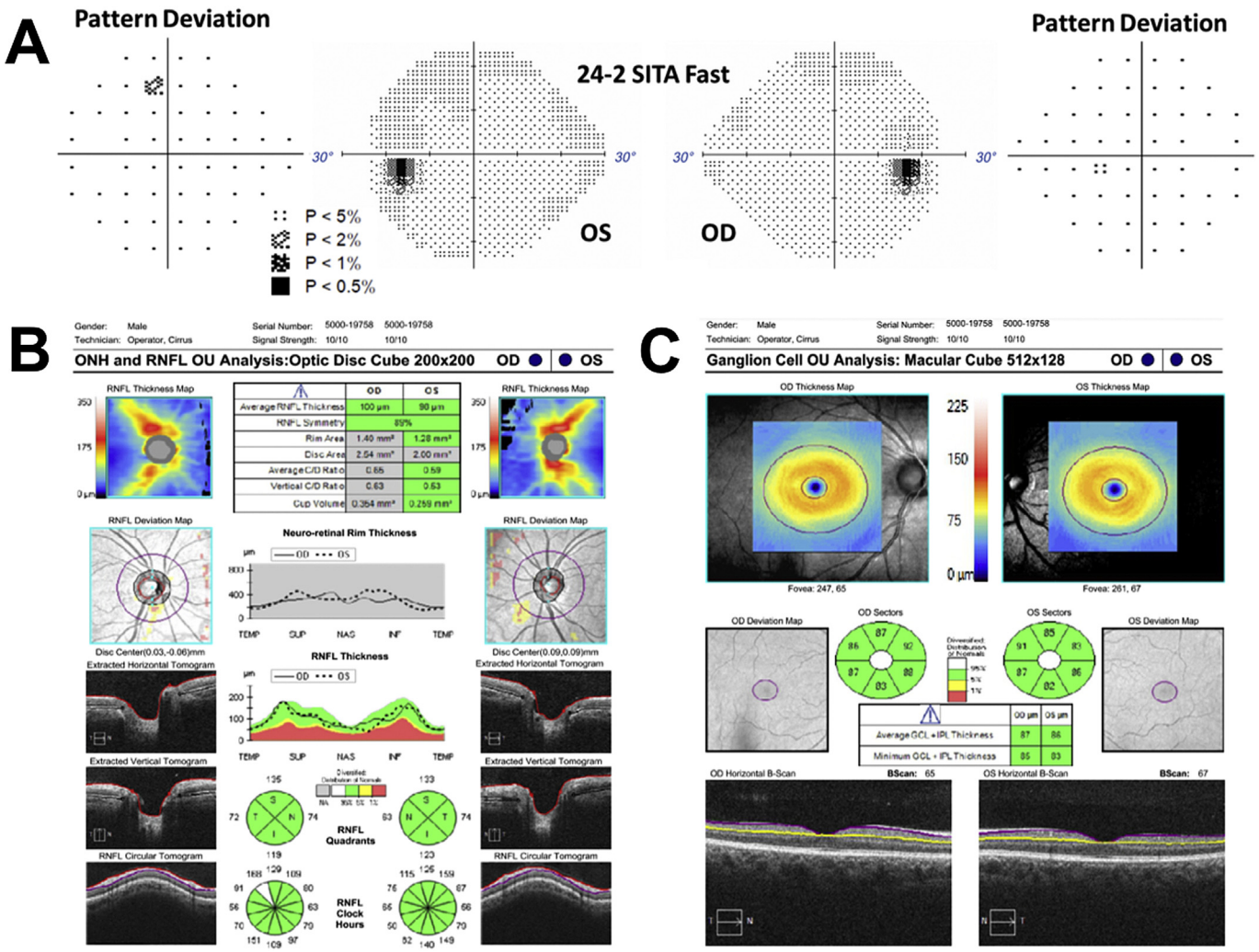

Fig. 4. Visual Field Recovery Following Treatment with Cabergoline. A) The visual field defect was no longer apparent on Humphrey 24-2 SITA-fast automated visual field testing performed 1 month after the initiation of cabergoline. Retinal nerve fiber layer (**B**) and macular ganglion cell (**C**) parameters remained within normal limits as assessed using OCT.

reported and is a result of involvement of crossing nasal fibers prior to entering the optic chiasm.[9] This was radiologically correlated in this case as the compression occurred just anterior to the optic chiasm on the left. It is important to recall that although bitemporal visual field defects are the most common, monocular, junctional and homonymous defects may result from pituitary adenomas. Finally, the patient had a prompt response to medical treatment with cabergoline and his subjective and objective visual parameters returned to normal. Visual recovery after surgical or medical treatment of chiasmal compression occurs in stages with removal of the conduction block, followed by secondary remyelination and restoration of axoplasmic flow over months to years.[2] In this case, chronic chiasmal compression caused conduction block without significant atrophy of retinal ganglion cells since his optic nerve appeared normal and OCT parameters remainder largely normal. This also supports the notion that preserved OCT RNFL and macular GCC thickness confers a good visual prognosis.[2,3]

In conclusion, chronic chiasmal compression may result in a monocular temporal defect and largely preserved OCT parameters. Although OCT of the macular ganglion cell complex typically shows changes before the RNFL, this is not always the case as shown here. Preserved OCT RNFL and macular GCC thickness confers a good visual prognosis and this patient had a subjective and objective return to his normal baseline.

Patient consent

Written consent to publish this case has not been obtained. This report does not contain any personal identifying information.

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Conflicts of interest

The following authors have no financial disclosures: (MKL, JAM).

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

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