Topiramate associated non-glaucomatous visual field defects

Sameen Haque [a,*], Mohamed Shaffi [b], Kong C. Tang [c]

[a] Neurology Department, Canberra Hospital, Yamba Dr, Garran, ACT 2605, Australia
[b] Neurology Department, Nepean Hospital, Derby St, Kingswood, NSW 2747, Australia
[c] Midwest Ophthalmology, Orange, NSW 2800, Australia

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ABSTRACT

We report a 34-years-old woman who presented with bilateral incongruous inferior visual field defects after the commencement of topiramate for management of migraine. Investigations did not reveal any underlying angle closure glaucoma, reported in current literature to be associated commonly with topiramate associated visual field defects. The changes in the peripheral visual fields gradually improved over several months after the medication was withdrawn. There were only minor changes persistent on the left side on a background of pre-existing myopia and keratoconus. Visual field deficits secondary to topiramate are more commonly attributed to angle closure glaucoma due to ciliochoroidal effusion syndrome. In such instance, the visual field defects are associated with considerable pain due to raised intra-ocular pressure. There have also been reports of visual scotomas due to retinal damage and maculopathy in patients taking topiramate. It is worthwhile to obtain a baseline perimetry in patients being considered for topiramate therapy in order to gauge any changes in their peripheral field of vision during the treatment. Changes in visual fields during the course of medication use and after cessation can be easily compared especially if there are other possible confounders such as refractive errors or a history of migraine.

1. Introduction

Topiramate, a sulpha-derivative monosaccharide that was originally approved for use as an anti-epileptic in 1996 by the Food and Drug Administration (FDA) has earned wider indications, including migraine prophylaxis. Visual field defects secondary to topiramate are well described in the literature. The most common underlying mechanism is ciliochoroidal effusion syndrome [1]. This is attributed to swelling of the ciliary body leading to anterior displacement of the iris. The lens is propelled forwards leading to angle closure glaucoma [2]. We describe a case of non-glaucomatous visual field deficits secondary to topiramate.

2. Case report

A 34-years-old woman with pre-existing myopic astigmatism and keratoconus commenced topiramate for migraine prophylaxis. She was maintained on a dose of 100 mg twice a day. No significant visual symptoms were experienced except for an occasional black spot or a floater. An ophthalmologic review for evaluation of her keratoconus 4 months after topiramate commencement showed a subtle decreased sensitivity centrally and inferonasally on the right eye and centrally on the left on perimetry (Fig. 1). Visual acuity was 6/6 on the right and 6/9 on the left with spectacles. Pupillary function, optic discs (on fundoscopy) and colour vision testing were normal. Intraocular pressures were satisfactory at 10 and 14 mmHg, right and left respectively. Gonioscopic examination showed open anterior chamber angles bilaterally. Optical coherence tomography (OCT) demonstrated generalised thinning of the retinal nerve fibre layer (RNFL) with some evidence of early ganglion cell layer (GCL) loss at macula (Cirrus HD-OCT 4000, Carl Zeiss Meditec Inc., Dublin, CA, USA) using Retinal Nerve Fibre Analyser and Ganglion Cell Layer protocols). Topiramate was ceased at this point in time.

MRI of her brain and orbits was unremarkable and a repeat OCT undertaken 5 months after the first showed no progressive changes. A follow-up visual field testing at 9 months after cessation of topiramate had some suggestion of deterioration with more inferior defects bilaterally (Fig. 2). Serial intraocular pressures had remained satisfactory throughout. To evaluate these changes further, she underwent full field and multifocal electroretinography (ERG) and multifocal visual evoked potentials (VEP). Full field ERGs were normal in terms of amplitude and latencies with normal 30 Hz flicker responses. Multifocal ERGs showed good responses across the macular and perimacular regions. On multifocal VEPs, there was mild relative amplitude reduction in the inferior paracentral region bilaterally; more on the left. These changes were mild and did not appear typical of an optic neuropathy. The role of pre-existing myopia and keratoconus in these changes was also considered.

Further evaluation at 15 months after cessation of topiramate showed improvement in her visual fields with only minor left sided changes persistent (Fig. 3). OCT at 18 months post cessation showed stable and non-progressive RNFL and GCL measurements bilaterally.

3. Discussion

In 2003, Foroozan and Buono described a case of right incongruous homonymous hemianopia in a patient with previous surgical resection of a left temporal arteriovenous malformation, while on topiramate for 6 weeks [3]. Topiramate was withdrawn with incomplete resolution of visual field defects. There have been few other case reports to our knowledge [4,5]. The aetiology of such non-glaucomatous visual field defects has remained unclear.

A mechanism similar to vigabatrin induced field defects may be responsible, wherein persistence of GABA neurotransmitter

* Corresponding author. Address: 11 Kidman St, Glenwood, NSW 2768, Australia. Tel.: +61 425 302 643.
E-mail address: sameenhaque@hotmail.com (S. Haque).

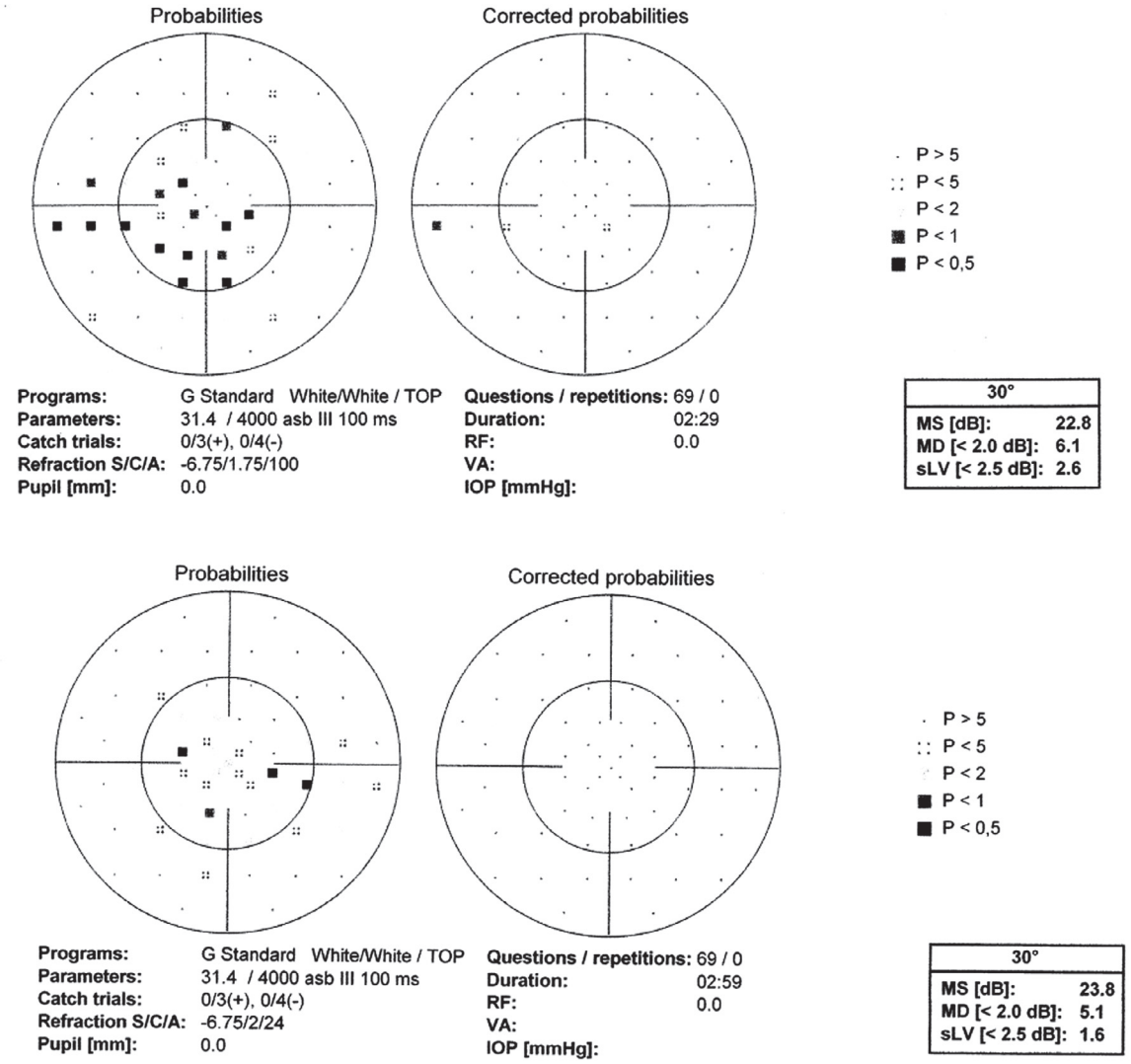

Fig. 1. Visual field examination. Right eye (above), Left eye (below) 4 months after commencement of topiramate. Octopus 300 perimeter; Haag Streit International (Switzerland) using 30° Glaucoma examination, Tendency Orientated Perimetry (TOP) strategy. dB = decibel, IOP = intra ocular pressure, LV = loss of variance, MD = mean defect, MS = mean sensitivity, P = probability, RF = reliability factor, sLV = square root of loss of variance, VA = visual acquity.

in the retina, lateral geniculate nucleus and visual cortex is implicated [6]. A study performed by Kjellstrom et al. evaluated full field ERG and retinal morphology of rabbit retina exposed to topiramate for 8 months. It demonstrated significant reduction in 30 Hz flicker b-wave amplitude. Histopathological review of inner retinal layers exhibited extensive accumulation of GABA [7]. Maculopathy has also been reported as an underlying mechanism in certain cases presenting with visual scotomas [8,9]. Visual field defects resulting from retinopathy and maculopathy are not completely reversible with withdrawal of topiramate.

Our patient did not have a baseline visual field assessment prior to the commencement of topiramate which makes it hard to implicate pre-existing myopia as a sole contributor to mild residual visual field changes. Visual field defects have been reported with migraine and may mimic a pattern similar to that observed in early stages of glaucoma [10]. However, such changes are transient. Our patient had persistent and progressive changes which improved significantly after cessation of topiramate. This temporal relationship favours topiramate as the underlying cause of her presentation. The initial deterioration in perimetry findings after stopping topiramate is not completely understood. There may have been a time lag between cessation of topiramate and expected improvement in the visual fields.

The underlying pathophysiology of non-glaucomatous visual field defects secondary to topiramate is not well understood and is far less common compared to angle closure glaucoma secondary to ciliochoroidal syndrome. This case highlights the possibility of maculopathy and visual field loss secondary to topiramate. Early baseline and regular visual fields may detect this and distinguish it from visual field loss in patients with myopia, glaucoma or migraine.

Conflicts of Interest/Disclosures

The authors declare that they have no financial or other conflicts of interest in relation to this research and its publication.