Heidelberg Edge Perimetry in optic nerve drusen – a case report

Karolina Czajor1, Marta Misiuk-Hojło1
1. Department and Clinic of Ophthalmology, Wroclaw Medical University

#Corresponding author: Karolina Czajor MD, Department and Clinic of Ophthalmology, Wroclaw Medical University, 213 Borowska Street, 50-556 Wroclaw, Poland. Tel: +48717364300, Fax: +48717364309, email: karolina.czajor@gmail.com

RUNNING TITLE
HEP in optic nerve drusen

KEYWORDS
optic nerve drusen, perimetry, visual field defect

WORD COUNT
908

CONFLICT OF INTERESTS
no conflicts of interest

ABSTRACT

Although often asymptomatic, optic disc drusen may lead to potentially vision-threatening complications. Some researchers suggest effectiveness of pressure-lowering therapy in prevention of visual field defects progression, in particular in patients with drusen and elevated or borderline intraocular pressure. Due to the morphology of the optic disc with drusen, assessment of the neuroretinal rim is very difficult and other diagnostic tools are necessary in taking a decision about treatment initiation. A case of a female patient is presented in whom a new type of perimeter - Heidelberg Edge Perimeter (HEP) with a flicker defined form (FDF) stimulus confirmed functional defect earlier than usual and proved to be useful in reaching a decision about treatment, despite normal intraocular pressure values.

INTRODUCTION

Drusen are non-cellular hyaline deposits located in the prelaminar part of the optic nerve(1). The incidence of drusen in the population is reported to be in the order of 0.34% to 3.7% (2,3). Optic disc drusen most commonly are bilateral and in the majority of patients remain asymptomatic for long periods of time. However, they may potentially lead to complications, some of which are vision-threatening (1). They include: subretinal and intravitreal haemorrhages, subretinal neovascularisation, serous maculopathy, and ischaemic optic neuropathy. The most common complications are: vision field defects and microhaemorrhages in the nerve fibre layer (4). Among the causes of drusen-induced vision field defects, the following are reported: impaired axonal transport and nerve fibre atrophy in the eyes with a small scleral channel, direct pressure of drusen on the prelaminar fibres and ischaemia (4). Optic disc drusen are graded with a 3-point scale: Grade 1 - deep drusen, invisible on fundoscopy; grade 2 - 1 to
6 single superficial drusen are visible; grade 3 - more than 6 single drusen or disc area filled up with drusen (5). In diagnostics of deep drusen, ultrasonography is particularly useful, revealing hyperechogenic structures in the optic disc area (Fig. 1). The size and density of the drusen increase along with advancing age and increasing calcium deposition. Visual field changes and nerve fibre layer damage also progress with time and are more advanced in people with visible drusen, as compared to patients with deep drusen (6).

CASE REPORT

A 32-year-old female patient was seen for a routine ophthalmological examination in the Clinic of Ophthalmology. Best corrected visual acuity 1.0 (Snellen) bilaterally. Intraocular pressure (IOP) of the right eye: 17 mm Hg and the left eye: 18 mm Hg. Optic disc drusen revealed bilaterally on fundoscopy. (Fig. 2a-d) To assess the function of the retinal ganglion cells, visual field examination with use of Heidelberg Edge Perimeter (HEP) was performed. A new type of Flicker Defined Form (FDF) stimulus used in this perimeter is composed of flickering black and white points creating an illusive contour. It stimulates retinal ganglion cells associated with the magnocellular pathway.

Binasal defects were found on visual field examination. In the left eye, where the drusen were located more superficially, the defects involved a larger area and were deeper (the right eye: MD = -3.68dB, PSD = +6.02dB; the left eye: MD = -9.11dB, PSD = +8.25dB) (Fig. 3a-b). In the visual evoked potential test, wave P100 amplitude was lower during stimulation of the left eye (Fig. 4).

The patient returned for a follow-up examination after 8 months. Visual acuity remained unchanged. Progression of defects was found on HEP (the right eye: MD= -6.14dB, PSD =+6.28dB; the left eye: MD= -9.11dB, PSD =+8.59dB) (Fig. 5a-b). No difference was found in the result of the visual evoked potential test, which, when diagnosed early, enable treatment to be initiated and thus the risk of visual disability to be reduced. In patients’ follow-up new types of perimetry may be helpful that confirm functional deficit at an earlier stage.

Anatomically, a defect of the nerve fibre layer was confirmed on the optic coherence tomography (OCT) examination (Fig. 7).

Topical treatment with a carbonic anhydrase inhibitor (dorzolamide BID) was started. IOP values at the level of 14 mm Hg in the right eye and of 15 mm Hg in the left eye were achieved at the follow-up examination. The patient remains in follow-up at our institution.

CONCLUSION

At present, there is no targeted method of optic disc drusen treatment or effective complication prevention. Some investigators recommend the use of IOP-lowering drops in prevention of visual field changes progression, in particular in patients with elevated or borderline IOP values and visual field defects (7,5). Taking into consideration complications related to the topical IOP-lowering treatment, costs incurred by the patient and the effect on the quality of life, the decision about treatment initiation must be clinically justified.

When there are complications in the form of retinal neovascularisation, infrequent reports confirm the efficacy of anti-VEGF (anti-vascular endothelial growth factor) intravitreal therapy. (8)

Besides, the search for new therapeutic options, development of new diagnostic tools seems necessary, that would confirm functional deficit in advance and would allow for earlier decision about treatment. Assessment of morphology of the optic disc and its rim is highly difficult due to the drusen located in it. On standard perimetry, the defects are revealed as late as when about 25-35% of the retinal ganglion cells are lost (9).

Combination of methods confirming anatomical lesion (OCT) and functional deficit (perimetry, electrophysiological tests) may be useful in arriving at the decision about initiation of the therapy with topical IOP-lowering drugs.

Therapeutic options in optic disc drusen include also radial optic neurotomy (RON). Only short series of such cases have been described in the literature and these reports continue to suggest that this surgical method should be reserved for patients with rapidly progressing visual field narrowing (10). The efficacy of this method is probably related to the type of the accumulated material, its hardness and position of the optic disc drusen in relation to the blood vessels (11).

In spite of asymptomatic course of optic disc drusen, with full visual acuity maintained for many years, the patients require ophthalmological follow-up and regular monitoring of vision-threatening complications which, when diagnosed early, enable treatment to be initiated and thus the risk of visual disability to be reduced. In patients’ follow-up new types of perimetry may be helpful that confirm functional deficit at an earlier stage.

FIGURES

Fig.1 US-B scan showing a hyperechogenic structure in the region of the optic disc, corresponding to drusen

Fig.2 Colour (A - the right eye, B - the left eye) and red-free (C - the right eye, D - the left eye) pictures of the optic disc of a patient with drusen.

Fig.3 HEP (FDF 24-2) the left eye (A), the right eye (B)
Fig. 4 Visual evoked potentials of the patient. Wave P100 amplitude lower during stimulation of the left eye.

Fig. 5 Follow-up HEP (FDF 24-2) the left eye (A), the right eye (B)

Fig. 6 Standard automated perimetry in the same patient (Humphrey 24-2) the left eye (A), the right eye (B)

Fig. 7 Optic coherence tomography showing thinning of the nerve fibre layer in the patient, in the lower temporal sector in the right eye and in the upper and lower quadrant of the left eye.

FIG. 1 US-B scan showing a hyperechogenic structure in the region of the optic disc, corresponding to drusen

FIG. 2A The right eye - colour picture of the optic disc of a patient with drusen

FIG. 2B The left eye - colour picture of the optic disc of a patient with drusen

FIG. 3A HEP (FDF 24-2) the left eye

FIG. 3B Standard automated perimetry in the same patient (Humphrey 24-2) the left eye (A), the right eye (B)

FIG. 4 The right eye - red-free picture of the optic disc of a patient with drusen

FIG. 5 Follow-up HEP (FDF 24-2) the left eye (A), the right eye (B)

FIG. 6 Standard automated perimetry in the same patient (Humphrey 24-2) the left eye (A), the right eye (B)

FIG. 7 Optic coherence tomography showing thinning of the nerve fibre layer in the patient, in the lower temporal sector in the right eye and in the upper and lower quadrant of the left eye.
FIG. 3B  HEP (FDF 24-2) the right eye

FIG. 4  Visual evoked potentials of the patient. Wave P100 amplitude lower during stimulation of the left eye

FIG. 5A  Follow-up HEP (FDF 24-2) the left eye

FIG. 5B  Follow-up HEP (FDF 24-2) the right eye

FIG. 6A  Standard automated perimetry in the same patient (Humphrey 24-2) the left eye
FIG. 6B  Standard automated perimetry in the same patient (Humphrey 24-2) the left eye

FIG. 7  Optic coherence tomography showing thinning of the nerve fibre layer in the patient, in the lower temporal sector in the right eye and in the upper and lower quadrant of the left eye

BIBLIOGRAPHY