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A clinical case report of left homonymous hemianopia

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Introduction: Homonymous hemianopia (HH), which refers to defects in the same half of the visual field in each eye, results from lesions that are posterior to the optic chiasm. Homonymous hemianopia may be classified as complete or incomplete depending on the characteristics of the visual field defect.

Patient presentation: A 40-year-old woman was referred to the eye clinic. Her chief complaint was visual field loss, where she was unable to see objects to the left when looking straight ahead. The ocular examination revealed left complete HH without macular sparing.

Management and outcome: The patient was fitted and trained with peripheral prism spectacles for distance viewing according to the method proposed by Peli. In the follow-up examinations, the patient subjectively reported improved awareness of objects on the left and better functional vision with the peripheral prism spectacles. Furthermore, the Humphrey Visual Field Analyser findings showed that the patient had some level of awareness of the test stimuli in the left field when wearing the peripheral prism spectacles.

Conclusion: The presence of HH affects functional vision and quality of life, and may be managed using peripheral prism spectacles to improve awareness of objects on the affected side of the visual field.

Contribution: This case report demonstrates the potential of rehabilitation efforts using peripheral prism spectacles and training, at this university-based low vision eye clinic, to improve functional vision and quality of life in individuals with HH.

Keywords: homonymous hemianopia; peripheral prism spectacles; Fresnel prisms; visual field; peripheral awareness.

Introduction

Lesions in the visual pathway typically result in visual field defects and the characteristics of these defects help to determine the location of the lesion. Homonymous hemianopia (HH), which refers to defects in the same half of the visual field in each eye, results from lesions that are posterior to the optic chiasm.[1] These visual field defects can be classified as complete when the entire hemifield is affected or incomplete when some part of the field is intact on the affected side.[2] Some of the common causes of HH in adults include stroke, trauma, tumours and brain surgery.[1,3] Zhang et al.[2] reviewed 904 clinical cases of HH and reported a mean age of ~50 years, almost equal gender distribution (52% male), higher number of left-side HH (55%) and more cases (62.4%) of incomplete HH in their sample. Furthermore, HH was noted as an isolated finding in 47% of patients while motor and/or cognitive changes were noted in the remaining 53% of patients.[2] The presence of HH affects quality of life as it impacts navigation and reading tasks because of the inability to detect objects, undertake independent mobility and perform leisure activities.[1,2] Spontaneous recovery does not happen in all cases, and therefore rehabilitation efforts aimed at identifying and managing activity restrictions can improve participation and quality of life. Some of the management options that optometrists can provide include prescribing prism spectacles, performing training (compensatory eye movements or vision restoration) and advising on task modifications aimed at specific visual problems related to object identification, mobility and reading.[1,4] Sometimes the management of HH may involve a combination of prism spectacles, compensatory training and/or task modifications to help the patient make better use of their residual vision.

Ethical considerations

Ethics exemption was obtained from the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (BREC reference number: EXM001/2025). The patient also provided written informed consent for publication of this case report and use of the clinical details and images obtained during the examination, and anonymity was maintained.

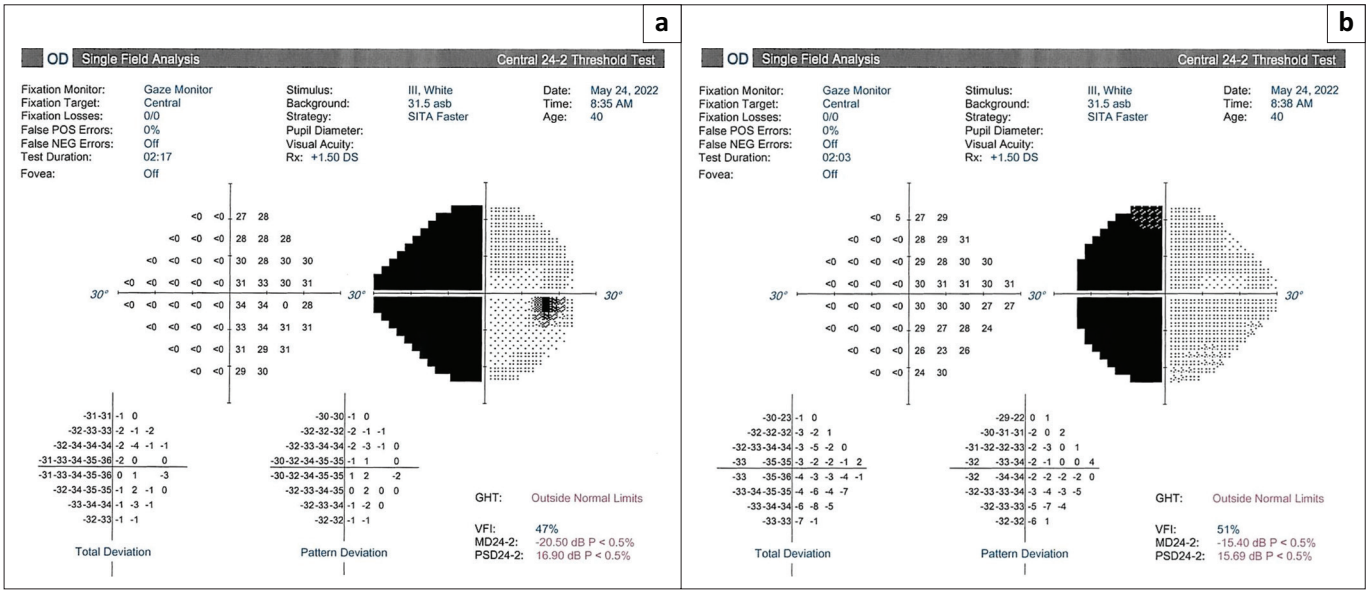
Patient presentation

A 40-year-old woman presented to the university-based low vision eye clinic. The patient was unaccompanied, walked independently but cautiously and had no abnormal head turn or tilt. She was referred from the neurologist in a central hospital facility where she was receiving medical care for a cerebrovascular accident (stroke) that was experienced 10 months ago. Her chief complaint was visual field loss that was noted after the stroke where she complained of not being able to see objects to the left when looking straight ahead. There was a positive history of hypertension (2-year duration), and the patient was currently on medication and reported the condition as stable. She was not receiving any rehabilitative (occupational therapy or physiotherapy) or psychological care. She reported negative for any head injuries and did not smoke or consume alcohol. Her ocular history was unremarkable with no previous ocular examination, surgeries or injuries, and she did not wear any refractive correction. She did not experience blurred vision at distance, headaches, photophobia or glare. She reported positive for blurred vision at near when reading small print in the newspaper and on digital devices. She also complained of mobility problems as she was unaware of objects on the left when looking straight ahead and would often bump into unseen objects. In terms of lighting and activities of daily living, she preferred bright light but wore dark sunglasses outdoors on sunny days and experienced no problems with activities of daily living.

The unaided distance visual acuity (VA), which was assessed using a low vision resource centre chart and recorded in logarithm of the minimum angle of resolution (logMAR) notation, was 0.20 logMAR (Snellen equivalent of 6/9) and 0.6 logMAR (Snellen equivalent of 6/24) for the right and left eyes, respectively, and showed no change with the use of a pinhole. The VA was measured using normal room illumination, and the patient did not skip or consistently miss any optotypes but adopted a head turn to the left when assessing the VA for the left eye. Her unaided binocular VA was 0.1 logMAR (Snellen equivalent of 6/7.5) and slightly better than the monocular visual acuities. The unaided binocular near VA, which was assessed using a continuous text reading chart, was 1.2M at 40 centimetres (cm) with normal room illumination and improved to 1.0M at 40 cm with the use of an overhead lamp. Cover test findings showed orthophoria (distance and near), and ocular motilities were full without any restrictions although she experienced discomfort when the target was on the left. The pupils were equal, round and reactive to light and accommodation with no afferent pupillary defect. The refraction findings were unremarkable except for near where a reading addition lens of +1.00 D was accepted resulting in a near binocular VA of 1.0M at 40 cm in normal room illumination. The patient showed normal binocular contrast sensitivity (no loss of contrast at high or low spatial frequencies) when assessed using the Lea Low Contrast 10M flip chart. The intraocular pressure measurements, assessed with a noncontact tonometer, for the right and left eyes were 13 mmHg and 11 mmHg, respectively, at 11:30 am. A slit lamp and fundus examination showed no anterior and posterior segment abnormalities, respectively. The visual field was assessed using subjective and objective tests including confrontation, tangent screen and automated static perimetry. Results from the Humphrey Visual Field Analyser, which was used to perform a central 24-2 threshold test with the SITA faster testing strategy, confirmed left complete HH without macular sparing (Figure 1).

Management and outcome

The patient was fitted with peripheral prism spectacles for distance viewing according to the method proposed by Peli[3]



POS, positive; NEG, negative; asb, apostilbs; Rx, prescription; DS, dioptre sphere; SITA, Swedish interactive thresholding algorithm; GHT, glaucoma hemifield test; VFI, visual field index; MD, mean deviation; PSD, pattern standard deviation.

FIGURE 1: Central 24-2 threshold test report for the right (a) and left (b) eyes showing left complete homonymous hemianopia without macular sparing.

using temporary press-on Fresnel prisms obtained from an ophthalmic company used in South Africa (Genop Healthcare, Midrand, South Africa). As the patient's distance refraction was unremarkable and she reported no distance vision problems, a spectacle frame that had two plano powered lenses with a minimum B-size of 40 mm was selected to ensure that the dimensions needed for the prism segments could be accommodated. Using the method proposed by Peli, two 40 base-out prism segments of dimensions 8 mm × 22 mm were fitted above and below the patient's pupil on the left spectacle lens (Figure 2). As these prism segments were not placed in the line of sight and had an interprism separation of 12 mm, the patient did not experience diplopia or confusion in primary gaze. Instead, she perceived a prism-shifted 'ghost image' of objects located in the left visual field, which she would normally not be aware of, superimposed over objects in her peripheral right visual field.

Training and education were critical to help the patient understand how to effectively use the peripheral prism spectacles. This involved training the patient to look through the central portion of the peripheral prism spectacles, when walking and stationary, and to avoid looking through the prism segments to prevent central diplopia.[3] This was important as Fresnel prisms induce glare and reduce VA as well as contrast sensitivity because of their optical quality.[5] When wearing the peripheral prism spectacles, the patient was now aware of objects in the left visual field that she would normally not detect when fixating in primary gaze. This observation and subjective report of the patient implied that she was able to appreciate the field expansion, because of the peripheral visual confusion, being created by the peripheral prism spectacles. The training also involved demonstrating to the patient that the prism-shifted 'ghost image', which appeared blurry, improved her awareness of objects in the left visual field when fixating in primary gaze. The patient was advised that she could thereafter take the necessary steps to either fixate the object by making a compensatory head turn or avoid the object. Furthermore, the patient was observed and trained while wearing the peripheral prism spectacles and walking in an uncluttered environment, cluttered environment and when navigating stairs. No adjustments were made to the peripheral prism spectacles based on observation of the patient and specifically her head movements while navigating the uncluttered and cluttered environments. The patient was advised on care of the peripheral prism spectacles and asked to return for a follow-up examination in 4 weeks or sooner if she experienced any symptoms or difficulties with the peripheral prism spectacles. Lastly, the patient was also advised to use additional illumination, especially when viewing small print in paper format and on appropriate settings (font size, screen brightness and contrast) for small print in digital format. This was considered appropriate given the complaint of blurry near vision and the improvement in near VA with the use of an overhead lamp.

FIGURE 2: The peripheral prism spectacles with the two horizontal Fresnel prism segments on the left lens.

The patient returned to the eye clinic after 1 month and did not report any specific complaints. She did not experience dizziness, vertigo or nausea in the initial 4-week adaptation period. However, she indicated that she initially experienced confusion because of the 'ghost image' in the first 2 weeks but has since adapted to the spectacles. She reported using the peripheral prism spectacles even when undertaking activities of daily living and experienced no difficulties. Furthermore, she indicated that the peripheral prism spectacles improved her awareness of objects on the left and reduced how often she bumped into objects when walking. She reported being comfortable and satisfied with the peripheral prism spectacles as they allowed her to undertake navigation activities, and she was again confident to travel independently in familiar and unfamiliar environments.

Observation of the spectacles revealed that the prism segments were still attached to the lens and in good condition, but the spectacles were sitting slightly lower on the patient's nose bridge. When probed, she reported that the frame fitted slightly loose, and, therefore, minor frame adjustments were made for a more appropriate fit. There were no changes in the VA, refraction and ocular health findings. Assessment of the visual field with the peripheral prism spectacles, using automated static perimetry, revealed that the patient had increased awareness of objects in the left visual field during primary gaze corroborating her subjective reports. Figure 3 shows results for the Humphrey visual field analyser central 24-2 threshold test report with the patient wearing the peripheral prism spectacles. Specifically, the results for the left eye were different (from the visual field findings in the initial visit) and showed that the patient had some level of awareness of the test stimuli in the left field when wearing the peripheral prism spectacles. Observation of the patient revealed that she was able to safely navigate through uncluttered and cluttered environments within and outside the eye clinic. The patient was reminded on use and care of the peripheral prism spectacles and advised to return for a follow-up visit in 12 months or sooner if she experienced any symptoms or difficulties.

The patient failed to return to the eye clinic after 1 year and was therefore contacted telephonically. When probed, she reported no specific complaints with or without the peripheral prism spectacles. Furthermore, she reported that the spectacles were still in good condition and she was using them as they improved her awareness of objects on the left. The patient was readvised on use and care of the peripheral prism spectacles and to return to the eye clinic for a follow-up visit in 12 months or sooner if she encountered any symptoms or difficulties.

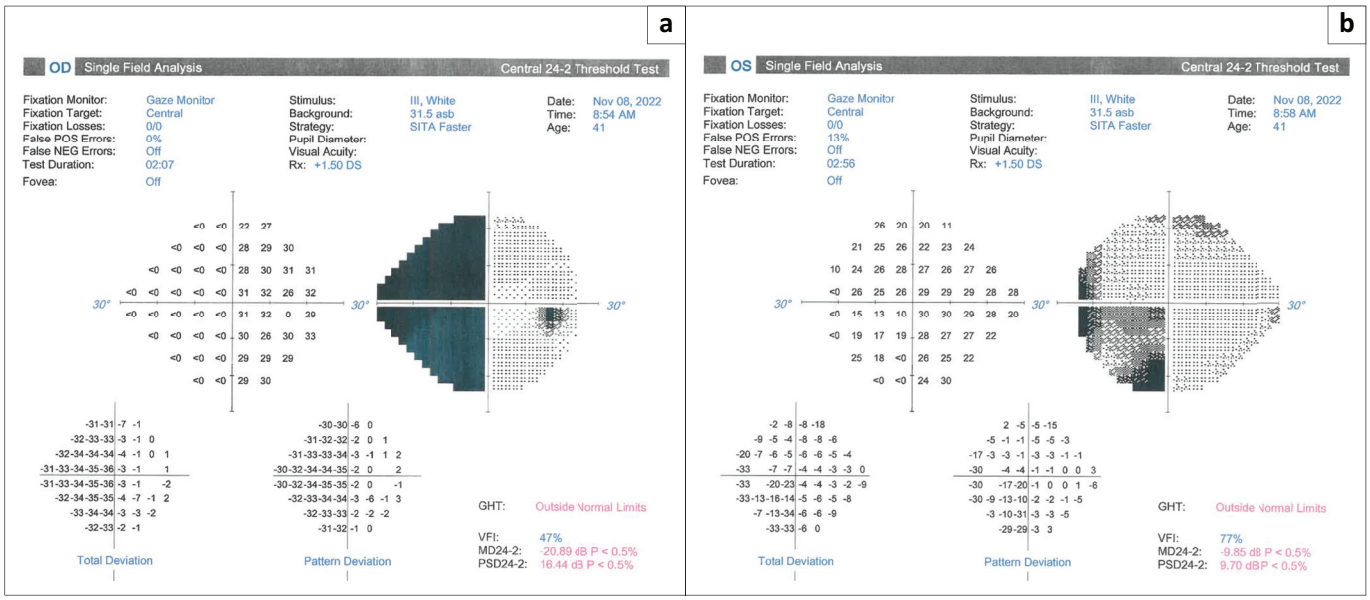


FIGURE 3: Central 24-2 threshold test report for the right (a) and left (b) eyes with the patient wearing the peripheral prism spectacles.

Discussion

Many optical devices such as mirrors, beam splitters, dichroic mirrors, reverse telescopes and prisms have been considered and used in the optical management of HH.[3,6] Of these, prism spectacles are the most commonly used, and several methods of prescribing prisms have been proposed including binocular full prisms, yoked prisms and sector prisms.[4,7] Prism spectacles are useful in the management of HH as they shift the image falling on the hemianopic retina onto the unaffected retina.[1] In 2000, Peli described a novel method of fitting monocular sector prisms that addressed some of the limitations associated with other optical devices and prism methods for the optical management of HH.[3,6,8] Since then, there has been extensive work on the use of peripheral prism spectacles for management of HH in clinical and laboratory studies as well as clinical trials.[4,5,8,9]

Peli[3] asserted that true expansion of the visual field in HH occurs when prisms are fitted monocularly to create peripheral visual confusion, whereby two objects are perceived in the same visual direction.[3,6] In this fitting method, the prism segments are placed with the base orientated towards the direction of the visual field loss.[3,6,9] The prism segments are placed on a single vision lens, and a bifocal lens may also be used with the prism segments placed above the near segment to ensure that reading is not affected.[9] The use of a multifocal lens as a carrier for the prism segments is challenging as the peripheral aberrations in these lenses may also be shifted with the prisms.[9] Moreover, the lack of distinct demarcation between the different portions (distance, intermediate and near) within these lenses could provide further challenges for its use as a carrier lens.[9] In the initial fitting, 40 prism segments are used in the prism spectacles and provide ~20° visual field expansion.[3,6,7] Higher powered prism segments of 57 are also available as a permanent prism and provide ~30° visual field expansion.[4] As the prism segments are placed in the periphery of the spectacle lens, the peripheral visual confusion that is created may be better tolerated than foveal visual confusion.[7,8] Peli[3,4] proposed that this may be the case because physiological diplopia is present and commonly experienced in the peripheral visual field. The prism-shifted 'ghost image' of objects on the hemianopic (nonseeing) side of the visual field is projected onto the unaffected (seeing) side of the visual field so that the patient has increased awareness of these objects because of the peripheral visual confusion. As a result of the increased awareness, patients can be taught to make more compensatory head scans towards the side of the visual field loss to improve their visual search abilities.[1] These head scans can help to easier detect and react to objects that may not be ordinarily detected without the use of the peripheral prism spectacles.

The prism-shifted 'ghost image' is constantly present in the patient's superior and inferior peripheral visual field on the unaffected seeing side.[7] Even though peripheral visual confusion may be less disturbing than foveal visual confusion,[5] it still may be disorientating and often requires considerable patient education, support and follow-up. Other challenges with prism spectacles include glare, difficulties when navigating stairs and the sudden appearance of objects in the visual field.[5] Consequently, patient education, demonstration of the prism-shifted 'ghost image' and training in uncluttered and cluttered visual environments are essential when considering and prescribing peripheral prism spectacles.[9] Some of the measures of clinical success with peripheral prism spectacles include their continued use, patient subjective reports of benefit, objective measures of visual field expansion and impact on quality of life.[5,8]

This case report presents a clinical case of left HH that was evaluated and managed using peripheral prism spectacles

fitted using the method proposed by Peli.[3] Peripheral prism spectacles was considered appropriate for this patient as the HH visual field loss was experienced for more than 6 months at the time of presentation, which is longer than the commonly accepted time period for spontaneous recovery of the field loss.[10] Furthermore, this time period possibly allowed the patient to better assess her functional vision and challenges with specific tasks allowing for a more goal-oriented low vision evaluation. To manage this patient, we opted for the use of temporary Fresnel press-on prisms in the peripheral prism spectacle despite their reduced optical quality. However, this was considered necessary so that the patient could experience use of the peripheral prism spectacles and permanent prisms will be considered for long-term use based on patient adjustment and feedback. The visual field impairment in HH can be debilitating and severely impact functional vision[4] highlighting the importance of comanagement and rehabilitation in affected patients. Specifically for this patient, the aim at the university-based low vision eye clinic is to provide continued rehabilitative care to address any challenges and/or symptoms with the peripheral prism spectacles and assess the condition of the peripheral prism spectacles. The latter is important as the Fresnel prism segments may need to be replaced as the optical quality of press-on prisms deteriorates over time.[4,6] As neuroimaging (CT and MRI) reports were not available for this patient, we are unable to comment on the exact location of the lesion that resulted in the left HH. Nevertheless, the purpose of this case report was to demonstrate the potential of rehabilitation efforts using peripheral prism spectacles and training to improve functionality and quality of life in individuals with HH. The continued use of the peripheral prism spectacles and the patient's subjective reports were considered as measures of its usefulness for improving functional vision. Therefore, it is recommended that patients with HH be evaluated and considered for rehabilitation by eye care personnel that prescribe prism spectacles. This could help to improve the functional vision and quality of life of patients with HH. The application of peripheral prism spectacles for patients with HH is an exciting possibility at the university-based low vision eye clinic where we are also looking to add fitting of oblique base direction prisms that are now the current recommendation.[4]

Conclusion

Optometrists and neurologists should work together to provide rehabilitative care for patients with HH. Spectacles with peripheral prisms are useful for patients with HH as they can improve their awareness of objects on the affected side of the visual field, thereby improving functional vision and quality of life. Appropriate training and patient education are imperative for the successful management of HH with peripheral prism spectacles.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

A.B. and S.A.S examined the patient and collected the data with N.R. as the supervisor. A.B., S.A.S., S.N. and N.R. conceived the idea. S.N. and N.R. wrote the case report.

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Data availability

Data that support the findings of this case report are available from the corresponding author, N.R., upon reasonable request.

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