Rehabilitation of Left Homonymous Hemianopia with Adjacent Palomar Prism Technique and Visual Therapy on Line

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Abstract: We present a case of a female who suffered a right cerebral infarction, which caused a left Homonymous hemianopia. He couldn’t walk alone or do tasks of near vision, as reading. For his rehabilitation, we used Palomar’s prisms and visual therapy on line with stimulation exercises and spatial localization. The patient was able to totally recover the central visual field in one year of treatment, being able to walk alone with the visual far aid.

Keywords: Hemianopia, low vision, prism adaptation, rehabilitation, visual field, Palomar Prisms.

Homonymous hemianopia (HH) can be defined as the complete or partial loss of vision in the right or left halves of the field of vision of both eyes [1, 2]. It occurs as a result of structural pathological processes that affect retrochiasmatic visual pathways, and it can be caused by a variety of lesions such as a stroke of the posterior cerebral artery, a traumatic brain injury, tumors and surgery [3, 4].

The prevalence of HH is of approximately 0.8% in the general population older than 49 years, [5] with about 2 million stroke survivors in rehabilitation suffering from either HH or hemineglect in the United States annually [6, 7].

Patients who suffer from a complete homonymous hemianopic defect have a lot of difficulties in their everyday lives.

HH are a result of structural pathological processes which affect the retrochiasmatic visual pathways, the primary location being the occipital bone (55%) and the vascular the most frequent etiology (76.5%). Recuperation only occurred in 1/3 of the cases, and was optimum in 10% of them.

These pathological processes sometimes affect the cognitive level of the patient (speech, understanding), causing in some cases a decrease in his intellectual level. The recovery of the lost visual field facilitates neuro-sensorial recovery processes, helping in the recovery process of his disability in intelligence. Consequently, a key question that needs to be addressed by the visual sciences concerns the extent to which some degree of rehabilitation or partial recovery of the lost field of vision (FoV) can be achieved [8, 9]. Specialists in visual rehabilitation for hemianopia are also interested in whether or not the acquisition of compensatory oculomotor strategies by these patients could lead to improved performance in their everyday activities [10].

Given the prevalence of hemianopia resulting from stroke and the increasing longevity of the population, research on the treatment of hemianopia must be regarded as a priority. A number of studies [11-14] have reported that the use of prisms (usually Fresnel prisms) can be an effective treatment for HH. Palomar-Petit described how the central field could be restored by placing small prism strips on to the spectacle lenses (on the side with hemianopia) of patients [15].

We present the case of a 58-year-old female who suffered a Ischemic stroke in the territory of the right posterior cerebral artery, which caused a left HH (Figure 1).

Although postoperative recovery was generally satisfactory, HH failed to resolve. The patient attended our ophthalmology practice complaining of severe limitations in such habitual tasks as house care, reading, or watching television, associated which with a left visual field loss, impeded her from being able to walk without assistance.

For her rehabilitation, we used the adjacent Palomar prism technique, which consists of the binocular adaptation of prism bands. These are 15mm-wide strips, moved 2mm towards the heminopsic side (Figure 2). The patient did not have central diplopia and was able to totally recover the central visual field,
without needing to do any ocular movements to see both sides of the field, being able to walk without assistance.

The patient presented with normal extrinsic and intrinsic ocular motility and neither latent nor constant ocular deviations were discovered. Slit-lamp and ophthalmoscope examinations were unremarkable.

Rehabilitation with ground-in sectorial prisms and training was considered as the best treatment option for this patient.

The adaptation of the prisms was carried out over his refraction:

RE.: +1.75, with a visual acuity of 20/20 and LE.: 165° - 0.50 +1.75 with a visual acuity of 20/20.

Prismatic lens power was obtained by calculation based on the empirical formula [16].

\[ PT = PD + \frac{2}{5} PN \]

where PT is total prism power and PD and PN are required prism power for distance and near vision, respectively.

Prism power for distance and near vision where determined with the aid of our trial case prisms (Figure 3), putting the prisms on top of his glasses with adhesive removable putty. We determined a prismatic power of 14 diopters (Figure 4).

Figure 1: Dicon computerised visual field (Paradigm Medical) in this case; we can observe left HH.
Figure 2: Glasses with the adjacent Palomar prisms for left HH.

Figure 3: Reduced trial case Palomar prisms with prisms of 10, 15, 25 and 30 prism dioptres.

The patient with the binocular Palomar prisms receives images from the FoV of the left and right eyes, projected onto the functional hemiretinas. Images corresponding to the FoV of the non-functional hemiretina are captured through the prisms. The visual system must perform a reconstruction of the visual space subtended for each eye, combining (merging) both reconstructed spaces. Thus, using the computerized perimeter it is possible to assess the restored central FoV by comparing the spatial localization accuracy under both conditions that is, executed with or without the aid of the attached prisms (Figure 5).

Figure 4: a. Detail of the Palomar prisms on her glasses with adhesive removable putty, to determine the necessary prismatic power by trial and error, in this case of left HH. b. Diagram illustrating the functioning of the attached prisms in the case of a patient with left CHH.

With the prism attached to the patient’s glasses, two overlapping images are projected onto the subject’s retina. One of them corresponds to the individual’s usual field of registration, while the other overlaps the first, due to the displacement of the image caused by the prisms and the corresponding visual field damage. This is why, when starting treatment, the patient reported experiencing spatial displacement in the restored half-field, but did not report any diplopia or confusion as other authors indicate [17, 18].

He was prescribed exercises with games of small pieces, such as exercises of locating objects, to help the adaptation.

Further improvement in quality of life was described by the patient during the third visit. Indeed, she was
walking completely unassisted and she reported being able to watch television and perform near-vision tasks with less difficulty, as well as to successfully interact with various daily life objects. Follow-up visits were scheduled at every 6 months. Two years later, the patient has a relatively satisfactory quality of life with no complications with her visual aid.

Patients suffering from a complete homonymous hemianopsic defect have demonstrated to have great difficulty with spatial orientation. Therefore, although most of the time they have good visual acuity, in both far distance and near distance, they have a lot of difficulties in their everyday lives. The results obtained with the adjacent Palomar prisms are very encouraging [19]. This could be due to the fact that they provide an image of good optical quality, which allows the patient to adapt more easily.

On the other hand, we defend the point that the exact determination of prismatic power by means of trial lens sets, allows us to obtain more precise and individualised values.

Complete lateral HH create a very disabling visual incapacity, especially in people who conserve good visual acuity and only have this neurological defect. These campimetric losses notably decrease the patient’s quality of life.

The present case describes the successful rehabilitation of a young patient with left HH with binocular ground-in sectorial prisms, achieved through precise adjustment of prism power and location. Indeed, prism power was determined by calculation based on an empirical formula that takes into account distance and near prism requirements.

The results from this calculation, which was derived from previous clinical experience with similar cases, [20] were later further refined with the aid of trial case prisms and a trial spectacle frame, which also allowed for accurate determination of prism location. Prism location is critical to avoid diplopia in primary gaze while allowing objects that would normally fall in the hemianopic field to be relocated to the residual field, thus becoming visible in primary gaze [21, 22].

During this time, patients are also instructed to follow a program of daily exercises on-line to facilitate their acceptance of the new optical device and improve spatial localization.

By means of adaptation of adjacent prisms in hemianopic patients, their quality of life is significantly improved [23].
DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

REFERENCES


