

# Compensatory Prism for Strabismus Secondary to Stroke

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Janice, a 74- year-old white female, was referred by her physical therapist for a comprehensive neuro-optometric evaluation. Three weeks prior to being seen in my office, she experienced a myocardial infarction and three ischemic strokes in a single day. The primary visual complaint was constant horizontal and vertical double vision present in all gazes. Other complaints included blurred vision at distance and near, nausea when doing visual tasks or riding in the car, eyestrain, words moving on the page when reading, decreased reading comprehension, light sensitivity, and loss of depth perception. Janice felt that it was necessary to close one eye in order to view distant and near objects.

The ocular history also included previous cataract extraction in both eyes with positive outcome. Medical history was positive for non-insulin dependent diabetes mellitus and hypertension, both of which the patient reported as adequately controlled with medication. Table 1 shows the data taken at the initial examination.

Slit lamp examination was performed, and anterior segment health was unremarkable. Goldman applanation tonometry measured 11 mmHg OD, OS. Dilated fundus examination was performed, and posterior segment health was unremarkable.

The patient was diagnosed with

1. Cranial Nerve III Palsy with absence of adduction OD
2. Diplopia

**Table 1. Examination Data from the Initial Examination**

<b>Habitual correction</b>	OD: plano/ +2.50 Add OS: -1.00-0.25x152/ +2.50 Add
<b>VA distance (with habitual correction)</b>	OD: 20/30-1, OS: 20/30-1
<b>VA near (with habitual correction)</b>	OD: 20/30, OS: 20/30
<b>Pupils</b>	PERRL (-)APD
<b>EOMs</b>	(-) adduction OD (+ diplopia all gazes) Full range of motion OS
<b>Confrontation fields</b>	Full to finger count OD, OS
<b>Humphrey VF (Central 24-2 Threshold test)</b>	GHT within normal limits but low test reliability OD, OS
<b>Cover test (distance &amp; near)</b>	25 prism diopter exotropia OD 12 prism diopter hypertropia OS
<b>Manifest refraction</b>	OD: -0.75 sphere 20/30 (PHNI) OS: -0.50-0.25x150 20/30 (PHNI) Add: +2.50, 20/30 OU

Compensatory prism and occlusion were discussed in-depth with the patient. She wanted to attempt Fresnel prism first before deciding to proceed with ground-in prism. It was recommended that prism be trialed with distance and near prescriptions separately. The patient opted to have a new distance-only pair of glasses made at a nearby one-hour lab and then return to the office the same day to have Fresnel prism applied. Translucent occlusion was applied to the entire right lens of both her FT-28 bifocals and her prescription sunglasses so that she could continue to wear them until the compensatory prism amount was finalized for both the distance and near spectacles. The translucent occlusion was achieved by stippling the right lens with a combination of pearl-colored and clear fingernail polish.

Prism was the recommended treatment option in this case, with occlusion as a secondary option. To determine the amount of prism required for fusion, round prisms were trial framed for the patient starting with the horizontal/vertical amounts determined during the examination. Patient observations were noted both in the exam room and by having the patient view distant objects outside of the office, such as vehicles in the parking lot, signs on adjacent buildings, and street signs. Prism amounts, either horizontal or vertical, were

decreased in 1-2 diopter increments to determine if the patient maintained fusion or if intermittent diplopia was reported. The goal was to determine the least amount of horizontal and vertical prism required to eliminate diplopia.

The patient returned to the office four months later for follow-up (Table 2). She stated that she did not experience any double vision while wearing the Fresnel prisms, but she was greatly disturbed by the blur when viewing through them. She was interested in the possibility of ground-in prism.

Prism was trialed at distance and near using the same method previously described. The patient exhibited no diplopia at distance or near, and she was able to perform basic near tasks such as pouring a glass of water without any difficulty or blur. The total prism amounts of 25 diopters horizontal and 12 diopters vertical were split between the eyes. Previously, the prism was placed over the right eye only because of the blur experienced with a Fresnel. However, lens thickness and weight is more evenly distributed when the total prism can be split between the two eyes.

Ground-in prism was discussed in great detail with the patient, A call was placed to the lab to get more information regarding the thickness of the lenses as this was patient's primary concern.

**Table 2. Examination Data from the First Follow-Up**

<b>Habitual Correction</b>	OD: -0.76 sph/+2.50 Add OS: -0.50-0.25X150/+2.50 Add
<b>VA distance (with habitual correction)</b>	OD: 20/30-1, OS: 20/30-1
<b>VAR near (with habitual correction)</b>	OD: 20/30, OS: 20/30
<b>Pupils</b>	PERRL (-)APD
<b>EOMs</b>	(-) adduction OD (+ diplopia all gazes) FROM OS
<b>Confrontation fields</b>	Full to finger count OD, OS
<b>Cover test (distance and near)</b>	25 prism diopter exotropia OD 12 prism diopter hypertropia OS
<b>Prism trial</b>	OD: 15 prism diopters BI, 6 prism diopters BU OS: 10 prism diopters BI, 6 prism diopters BD

The following week, she saw her cardiologist, and he asked her about the Fresnel prisms she was wearing. He suggested that she see a different eye doctor with whom he was personally familiar.

The patient followed through with his suggestion and had an examination with the other optometrist. This doctor told her that ground-in prisms would not be effective for her and showed her prisms from the trial lens set as an example of how thick her new glasses would be. He referred her for surgical consultation. When she contacted the ophthalmology office about a possible consultation, she was told that the doctor would not consider surgical correction as long as she was still taking Coumadin. She called my office immediately afterward because she was afraid of surgery and was not interested in it unless absolutely necessary.

The patient's main concern about prism glasses was the thickness of the lenses. I offered to contact the lab directly to get specific calculations on lens thickness before proceeding. Measurements were provided for the patient's frame. (zyl) and the lab's recommended frame (metal). Using a slightly oblique orientation of the prism in both lenses, the technician quoted the thickest point of the lens in the zyl frame to be approximately 17.5mm OD, 17mm OS. The thickest point of the lens in the suggested metal frame was less at approximately 13.5mm OD, 14mm OS because there was vertex adjustment ability with that particular frame. It was suggested that the patient begin with CR-39 to minimize cost, with a consideration of changing to high-index plastic with AR coating once it was determined that the ground-in prism was effective.

The patient was very pleased with her options and chose to get the lab's suggested metal frame. She returned to the office approximately two weeks later for dispensing. There was no diplopia

at distance or near with the new glasses, and the patient was ecstatic with the outcome. After adjusting to the new glasses for a few weeks, she ordered a near-only pair as well.

Within a month of receiving her new glasses, the patient traveled across the country and experienced no diplopia at any time. She followed-up with the cardiologist to let him know that prisms were in fact an option for her and that she was able to achieve complete resolution of diplopia with her distance and near glasses. The patient was instructed to return to the office in approximately six months to monitor stability, or sooner if she experienced any changes.

This case ended up being straightforward with regard to my ability to determine the required amount of compensatory prism and the patient's ability to achieve stable fusion with this prism. One difference in how I approach more complicated cases is by using horizontal and vertical Maddox rod testing in addition to cover test. Maddox rod is performed in all fields of gaze to determine comitancy and to determine a bracket of maximum/minimum prism amounts to begin trialing. It is always important to observe the patient's response to prism in a setting beyond the exam room. Examples include having the patient view distance objects outside of the office or perform basic activities such as eating or pouring a drink. If responses are inconsistent, consider bringing the patient back for 1-2 additional visits at various times of day. Repeat the sensorimotor evaluation and determine how much variation there is in the angle of deviation. This tends to be most helpful in determining what amount to prescribe for a patient with unstable findings, and the patients are typically very open to the idea of returning for multiple visits because they know you are being thorough.