Supplement 1. Method

Oscillopsia measurements

For measure of far oscillopsia a 0.5 cm dot that was drawn on a paper sheet was posted at eye level on a wall at 5 m from the patient. The patient was seated and asked to fixate the dot and then to estimate the maximum deviation of the seen dot with the use of a laser light (with the help of a first examiner). A second examiner marked the position of the laser on the sheet. The deviation of the laser mark and dot was used to calculate oscillopsia in horizontal and/or vertical degrees. For measure of near oscillopsia, the patient sat 57 cm from a computer screen. We used a geometry software (geogebra®) to draw two lines: one vertical, one horizontal. The patient was asked to fixate a specific part of one line and to mark with the use of mouse the maximum deviation of the seen line. Vertical line was used to measure horizontal deviation and horizontal line for vertical deviation. The deviation of the patient mark relative to the line was used to calculate oscillopsia in degrees. For each test, we performed 5 measures and the final result was a mean of these measures.

Eye movements recording

Beside the recorded eye, the patient was in scotopic condition, seated with the head stabilized by an occipital support and was instructed to fixate straight ahead at a target located 2 meters from him. The eye movements were recorded during 30 sec for each eye. For the horizontal and vertical components, the online analysis software extracts from the video images the position and velocity of the pupil's center (0.1 deg precision). For the torsional component, the analysis method was based on a neural network that allows tracking grey level gradients of the iris (0.3 deg precision). Calibration is not needed for torsional eye movement since the software calculates the change of torsional eye position relative to 360 deg. Horizontal ocular motor paralysis in the OPT group and nystagmus in both groups prevented the use of a calibration based on fixations of different spatial targets. Therefore, for horizontal and vertical components,

we used the software's automatic calibration based on an adjustment relative to the pupil size (0.1 deg precision). The resulting horizontal and vertical error was estimated to be less than 20% for 95% of subjects. Eye movements in the three dimensions were displayed online and stored in a database for off line analysis.