UNUSUAL POSTNEURITIC DISTURBANCES AND THEIR REDUCTION BY A COLOR FILTER

Doris Safra and Fritz Steiner

ABSTRACT

After a third episode of multiple sclerosis with retrobulbar neuritis, a female patient showed abnormal postneuritic symptoms, which to our knowledge have never been previously described:

1. Extremely impaired black/white sensitivity, which bothers her mostly when reading.
2. Having the impression that the floor is moving; this hinders her enormously when walking.

Unusually and surprisingly these disturbances were corrected with a special blue color filter. The cause of these symptoms was assumed to be the hyperexcitability of the magnocellular system; this as a result of a weakening of the parvocellular system due to the neuritis, although signs of partial postneuritic optic nerve atrophy could not be found at the examination. The positive effect of the color filter was interpreted as a fortification of the parvocellular system and its depressant effect on the magnocellular system. Furthermore, a standard variant of the patient's retinal sensory apparatus was discussed, which may be responsible for these abnormal postneuritic disturbances and their correction with a color filter.

INTRODUCTION

Retrobulbar neuritis is typically described as a sudden, profound vision loss due to a central scotoma along with decreased visual acuity and color blindness; first for red and green and later for other colors as well. Visual acuity will sometimes spontaneously improve on its own to such a degree that "normal" acuity returns. However, more often than not, a relative central scotoma remains, as evidenced by lingering damage to the central optic fibers with temporal pallor of the optic disk. This paper concerns a case of recurring retrobulbar neuritis due to multiple sclerosis. This case shows unusual postneuritic symptoms although there where no clear pathological findings. Equally unusual and surprising is the fact that these symptoms can be reduced to a large extent by means of a color filter.

ABNORMAL AFTER-EFFECTS OF RETROBULBAR NEURITIS

The now 49-year-old patient suffered her first retrobulbar neuritis episode thirteen years ago, which resulted in a severe loss of vision in her left eye. Visual acuity returned 2-3 weeks later. This episode was followed by a second similar episode in her left eye eleven years ago. She had a third retrobulbar neuritis episode two years ago, this time in her right eye with moderate loss of vision. This third episode, however, was also accompanied by other symptoms such as difficulty walking, dizziness, glare and difficulty speaking or understanding speech. This time the diagnosis of multiple sclerosis was backed up by MRI and cerebrospinal fluid analysis. Once again visual acuity eventually returned to normal but several symptoms remained, two of which severely impede the patient's everyday life:

1. She has great difficulty reading. The text flickers in front of her eyes and appears too bright and out of focus. “It’s as if the black letters and the white in between were fighting for power,” she describes.
2. She walks unsteadily. Elements of the floor, especially regular patters, e.g. cobblestones, compound stone or the grooves of a road ramp appear to move ceaselessly in all directions. “I would rather just close my eyes when I walk!” she explains.
Besides these two symptoms she also complains about glare, especially with florescent light, which makes a visit to a shopping center unbearable: “All the lights, all the people, all the goods, the noise, everything is moving around … I just can’t take it anymore!” she describes. Furthermore, she feels physically weak, her short-term memory is diminishing and she still finds it difficult to speak, although she claims her ability to speak is mutch better than it was at the beginning. The examination showed a normal distance acuity in both eyes, the near acuity of the left eye was reduced to (0,9) and the right eye had a normal near acuity. In the fundus of both eyes were no special findings, both papillea were temporal light, but still within the normal range. The accommodation range of 3dpi of the right eye corresponds to the age-appropriate rated value. For the left eye the value was reduced by 1 dpt to 2 dpt). The visual field (Octopus G1) of both eyes was normal; the color test (Farnsworth-Munsell) showed a minimal anomaly in the blue-violet part. The motility test showed a slightly reduced elevation in the left eye, the 30-Prisms Test showed a slight esophoria and depression of the left eye. Fixation of the finger is maintained for a very short time. A slight compound myopic astigmatism, an exophoria and a slight hypertropia of the right eye were corrected by glasses with addition of +1.5 for near vision. The glasses enabled the patient to read more easily, but did not substantially improve her symptoms, especially those she had when walking.

ELIMINATING THE SYMPTOMS WITH A COLOR FILTER
Mostly because of the patient’s difficulties with reading, Fritz Steiner continued the systematic examination; first with colored transparencies then with color filter glasses. A blue transparency made reading substantially easier. A light blue filter glass led to sudden improvements in reading as well as in walking. The individual letters in the reading texts became settled and distinct and the grooves of a road ramp, “stopped dancing around”. With the filter she was able to hold the fixation as long as she wanted. Without the filter she could only do this fleetingly.

AN ATTEMPT AT AN EXPLANATION
We felt we had to explain these unusual postneuritic symptoms and their elimination with a color filter became necessary. The explanation could only be speculative because we were not able to find satisfactory references either in literature nor on the Internet nor during a consultation with Greg Robinson, Special Education Centre, University of Newcastle, NSW, Australia, a color filter therapy expert.

Our explanation of the 4 factors,

- postneuritic retrobulbate
- hypersensitivity to light/dark contrast
- apparent movement, particularly on the floor
- eliminating the symptoms with a color filter

reduced to a common denominator is the following:

A dysfunctional coordination of the parvocellular and magnocellular systems.

IMPORTANCE AND FUNCTION OF THE PARVOCELLULAR AND MAGNOCELLULAR SYSTEMS

These two systems have been known for about 20 years. According to the neuroscience textbook (1) the parvocellular system or 'What' System responds to subtle contours, subtle differences in depth and color contrasts. It relays information about the properties of an object's shape and color by channeling parvocellular neurons through two channels relatively slow and sustained from the retina via the lateral geniculate nucleus to the primary visual cortex and finally to the lower part of the temporal lobe. The 'What' System allows objects to be recognized in detail and then identified.

Also according to the neuroscience textbook, the magnocellular or 'Where' System channels quickly and transient information about the locations of objects and movement from the retina via the lateral geniculate nucleus to the primary visual cortex and finally to the posterior parietal lobe via large cell neurons. It is sensitive to brightness contrast and movement, depth perception and structures next to the fixated object, e.g. when reading it is sensitive to the next group of letters. According to ***Stein*** (2) it also regulates binocular vision. The domain of the parvosystem is the cone-rich and the rod-poor center of the retina, that means the macula. The domain of the magnosystem is the rod-rich and cone-poor periphery of the retina. According to the textbook, the parvosystem perceives almost no motion and the magnosystem perceives almost no color. Thus the latter is unable to see an image with equally luminescent colors. For example, when we look at a flag, the parvosystem tells us which country it belongs to and the magnosystem tells us

Fig. 1: The parvocellular system ('What' System) conducts information about an object's shape and color through small cell neurons from the retina to the cerebral cortex in a slow and sustained manner. Its domain is the cone-rich and the rod-poor center of the retina. It is especially sensitive to color contrasts and small contours.
The magnocellular system ('Where' System) quickly conducts information about an object's location and movement through large cell neurons from the retina to the cerebral cortex. Its domain is the rod-rich and cone-poor periphery of the retina. It is especially sensitive to light-dark contrasts and movement.

WHAT DOES A DYSFUNCTIONAL COORDINATION OF BOTH SYSTEMS MEAN?

Coordination means that the two systems do not interfere with each other during their activities. There is indeed, as ***Goldmann*** (3) established 40 years ago, a certain mutual inhibition between the macula and the periphery of the retina, but nevertheless only so far that no interference in visual perception occurs. Perhaps it can be owed to the impeding influence of the parvosystem on the magnosystem that we are not usually blinded by normal daylight. However, if the parvosystem were excessively active, there would be no further motion on the neighboring fixed upon object, which would be very disturbing when reading, for example. Drastic somatic and visual symptoms have been described by ***Wilkins*** (4), who concerned himself with 'Visual Stress' research. These symptoms result from a hypersensitivity to black and white contrasts in regular, repetitive patterns like lines on a white ground – a specific stimulus of the magnocellular system. Looking at such stimuli can lead to visual illusions such as simulated movements, according to this author and others.

In the case of our patient we suspect a hyperexcitability of the magnocellular system, which overreacts to specific stimuli such as the black-white contrast of the reading text and the elements of the repetitive patterns of the train station ramp grooves, and leads to illusions of movement.

How can this hyperexcitability of the magnocellular system be explained? The ophthalmologic examination did not result in a clear reference point for postneuritic permanent damage of the optic nerve, for instance a central scotoma, a deficit of color distinction or of accommodation, with which a weakening of the parvosystem and thereby a reduction of its absorbing influence on the magnocellular system can be explained.

But we consider a weakening of the parvosystem due to a moderate neuron loss in the retina center due to the neuritic process probable. This loss, however, is unverifiable with the available standard research methods.

A correlation can also be found in the normal visual system between black-white contrast stimulation and the illusion of movement, as seen in Fig. 2

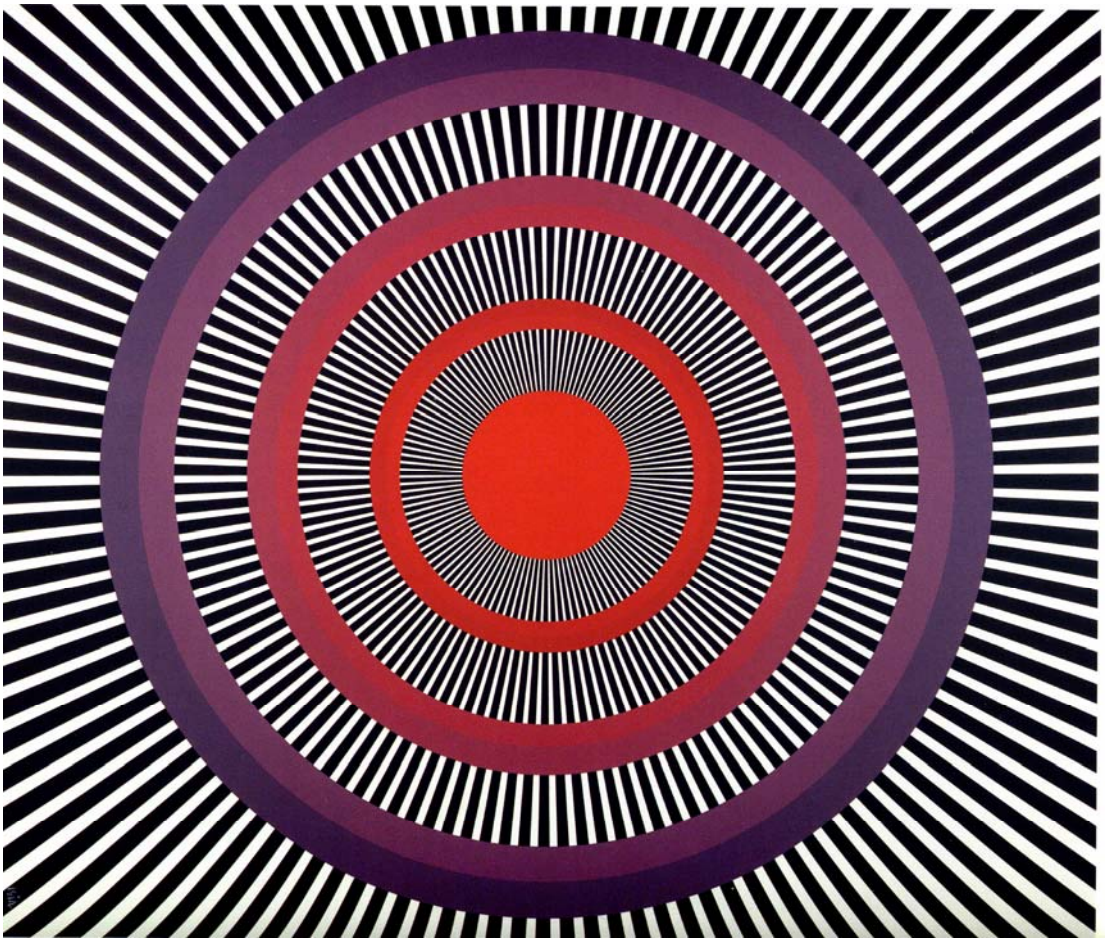
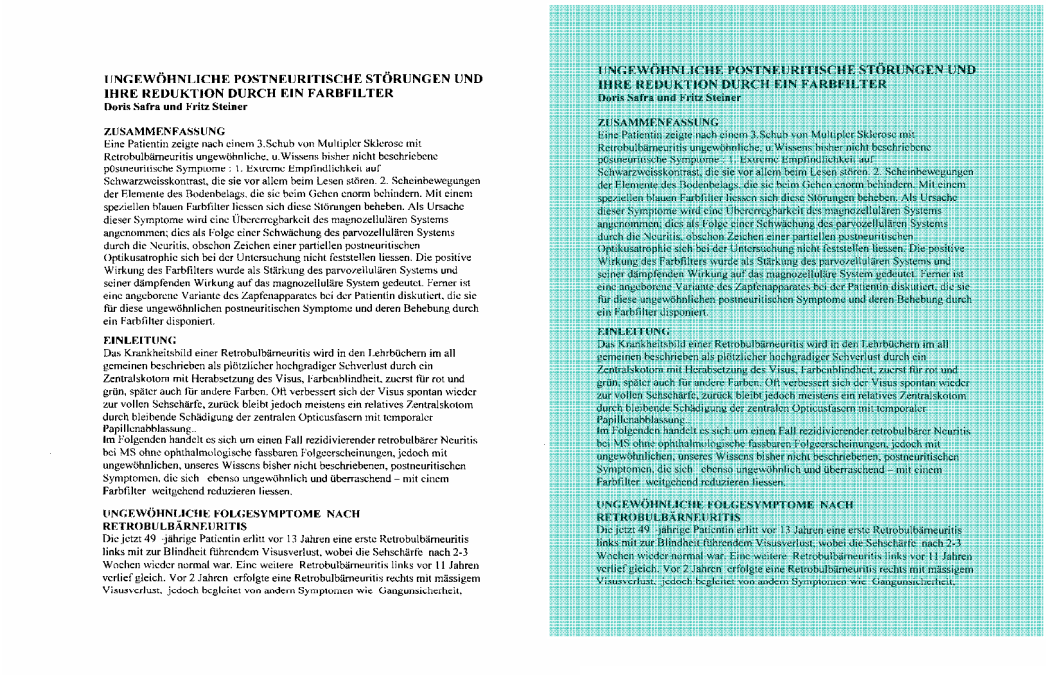


Fig. 2: If you look at the center of this equally luminescent, colored, concentrically arranged circle for a short period of time, the circles appear to spin. The black and white pattern between the circles is a strong stimulus for the magnosystem and causes apparent movement in the normal visual system as well. (from Vision and Art by Margaret Livingstone 5)

HOW DOES THE COLOR TRANSPARENCY WORK?

Does it strengthen the weakened parvosystem or does it push the hyperexcited magnosystem to its limits or both?
Our explanation is given in Fig. 3. By laying a transparency over the reading text we can "color" the paper blue in order to give the color-sensitive parvosystem an adequate stimulus. In addition, the luminance contrast and with it the stimulus for the magnosystem are alleviated.



UNGEWÖHNLICHE POSTNEURITISCHE STÖRUNGEN UND IHRE REDUKTION DURCH EIN FARBFILTER
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ZUSAMMENFASSUNG
Eine Patientin zeigte nach einem 3.Schub von Multipler Sklerose mit Retrobulbärneuritis ungewöhnliche, u.Wissens bisher nicht beschriebene pösneuritische Symptome : 1. Extreme Empfindlichkeit auf Schwarzweisskontrast, die sie vor allem beim Lesen stören. 2. Scheinbewegungen der Elemente des Bodenbelags, die sie beim Gehen enorm behindern. Mit einem speziellen blauen Farbfilter liessen sich diese Störungen beheben. Als Ursache dieser Symptome wird eine Übererregbarkeit des magnozellulären Systems angenommen; dies als Folge einer Schwächung des parvozellulären Systems durch die Neuritis, obschon Zeichen einer partiellen postneuritischen Optikusatrophie sich bei der Untersuchung nicht feststellen liessen. Die positive Wirkung des Farbfilters wurde als Stärkung des parvozellulären Systems und seiner dämpfenden Wirkung auf das magnozelluläre System gedeutet. Ferner ist eine angeborene Variante des Zapfenapparates bei der Patientin diskutiert, die sie für diese ungewöhnlichen postneuritischen Symptome und deren Behebung durch ein Farbfilter disponiert.

EINLEITUNG
Das Krankheitsbild einer Retrobulbärneuritis wird in den Lehrbüchern im all gemeinen beschrieben als plötzlicher hochgradiger Sehverlust durch ein Zentralskotom mit Herabsetzung des Visus, Farbenblindheit, zuerst für rot und grün, später auch für andere Farben. Oft verbessert sich der Visus spontan wieder zur vollen Sehschärfe, zurück bleibt jedoch meistens ein relatives Zentralskotom durch bleibende Schädigung der zentralen Opticusfasern mit temporaler Papillenabblassung.
Im Folgenden handelt es sich um einen Fall rezidivierender retrobulbärer Neuritis bei MS ohne ophthalmologische fassbaren Folgeerscheinungen, jedoch mit ungewöhnlichen, unseres Wissens bisher nicht beschriebenen, postneuritischen Symptomen, die sich ebenso ungewöhnlich und überraschend – mit einem Farbfilter weitgehend reduzieren liessen.

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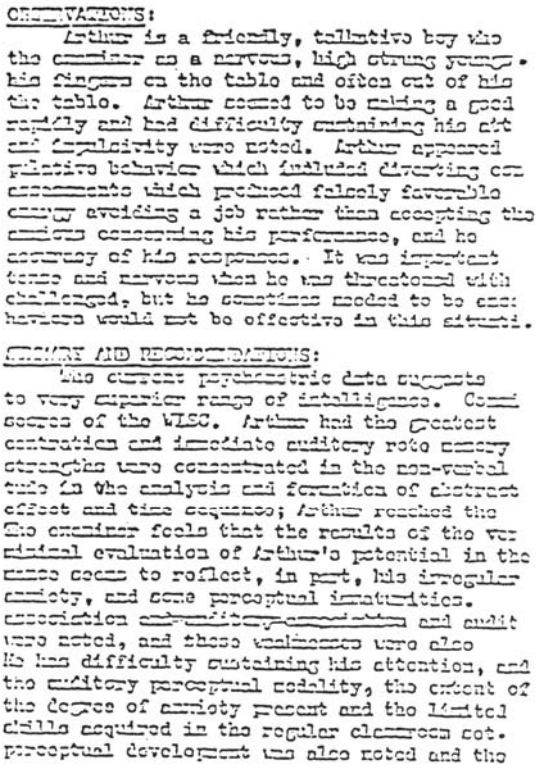
Fig. 3: By laying the blue transparency, which the patient has chosen as the best one for her, on top of the reading text we can turn the white background blue and the black letters a light grayish color. By doing so the stimulus for the color-sensitive parvosystem is strengthened so that the activity magnosystem can be lessened. In addition, the luminance contrast, to which the magnosystem overreacts, is lessened.

Similarly, the rotation of the colored circles in Fig. 2 is reduced for most people when a red transparency, for example, is placed over it. By using such colored transparencies it is possible to strengthen the parvocellular system and reduce the stimulus for the magnocellular system.



OBSERVATIONS:

Arthur is a friendly, talkative boy who the examiner as a nervous, high strung young. his fingers on the table and often out of his the table. Arthur seemed to be eating a good rapidly and had difficulty sustaining his att and impulsivity were noted. Arthur appeared positive behavior which included directing com statements which produced falsely favorable easily avoiding a job rather than accepting the errors concerning his performance, and he accuracy of his responses. It was important tense and nervous when he was threatened with challenged, but he sometimes needed to be enc: however would not be effective in this situati.

SUMMARY AND RECOMMENDATIONS:

His current psychometric data suggests to very superior range of intelligence. Comm scores of the WISC. Arthur had the greatest contration and immediate auditory recall memory strengths were concentrated in the non-verbal tuis in the analysis and formation of abstract effect and time sequence; Arthur reached the The examiner feels that the results of the ver clinical evaluation of Arthur's potential in the tests seem to reflect, in part, his irregular anxiety, and some perceptual immaturities. association auditory-vocal and audit were noted, and these weaknesses were also He has difficulty sustaining his attention, and the auditory perceptual modality, the extent of the degree of anxiety present and the limited skills acquired in the regular classroom set. perceptual development was also noted and the

Fig.4: A possible representation of how the reading text might appear to the patient according to her description. (Irlen 1997 p. 60)

We learn something similar in Figures 5 and 6. The black and white pattern in Figure 5 comes across as fidgety and unsettled while the same pattern in color in Fig. 6 shows no movement.

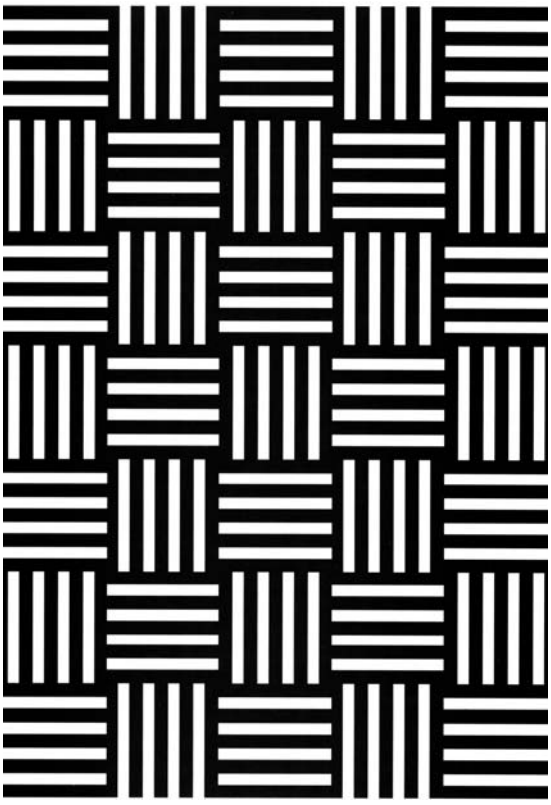


Fig. 5: The black lines on the white background, arranged as a repetitive pattern, appeal to the magnocelluar system. When looked upon it, this pattern appears to move in an unsettled manner. (Livingstone 2002, p. 203)

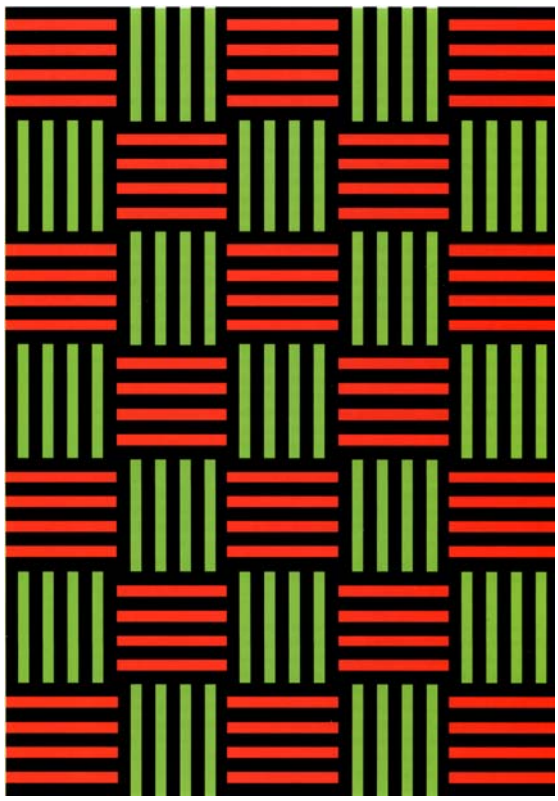


Fig. 6: The same pattern in color stimulates the parvocellular system and stays calm. (Livingstone 2002, p.202)

But why light blue of all colors?
Why, of all colors, did the patient pick a light blue transparency? The same effect of going from a black-white contrast to a black-color one could have been done with any color.

We currently do not have a clear answer. A possible explanation would be that a standard variant of the cones exists concerning their frequency, distribution and quality, whereby even minimal damage to the parvosystem is able to cause such a symptomatology. That means that the colors have to be determined using a special, individual procedure. The selected filters differ in color, intensity and grey portion.

According to ***Wilkins*** (4) there are strong variations in the effect of the color filter from person to person. But a blue filter, with the result of a reduction of the long-wave red, produces a calming effect on the symptoms of people who are photosensitive. This calming effect is attributed to the effect on the magnosystem.

WHY HAVE THESE SYMPTOMS NOT BEEN DESCRIBED IN OTHER CASES OF POSTNEURITIS?

This question, similar to "why light blue of all colors", can only be answered with the assumption that there is a standard variant of the cone apparatus, which disposed the patient to this unusual pattern of Postneuritis optica.

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