Rehabilitation of Balint’s Syndrome: A Single Case Report

Mónica Rosselli
Department of Psychology, Florida Atlantic University, Davie, Florida, USA

Alfredo Ardila
Department of Neuropsychology, Memorial Regional Hospital, Hollywood, Florida, USA

Christopher Beltran
Department of Psychology, Miami Institute of Psychology, Miami, Florida, USA

Very little research has been done in the area of rehabilitation of the visual perceptual deficits observed after Balint’s syndrome. This syndrome is characterized by difficulties with visual scanning, dysmetria secondary to visual perceptual deficits, and an inability to perceive more than 1 object at a time. This article describes the effects of a neuropsychological treatment protocol on a 23-year-old patient who suffered a fat embolism involving the territory of the posterior cerebral arteries. A neuropsychological evaluation carried out 12 months after the brain embolism disclosed Balint’s syndrome, alexia without agraphia, visual agnosia, prosopagnosia, and memory impairments. The rehabilitation protocol included both visuo-perceptual retraining and a functional program designed to provide rehabilitation in contexts that were meaningful to the patient. After 1 year of treatment, a second neuropsychological evaluation was carried out. Significant improvement was demonstrated in terms of both objective testing and the return of an integrated and productive lifestyle.

Key words: Balint’s syndrome, case report, neurorehabilitation

Requests for reprints should be sent to Mónica Rosselli, Florida Atlantic University, Department of Psychology, 2912 College Avenue, Davie, FL 33314-7714, USA. E-mail: mrosell@fau.edu
regions and the prerolandic motor areas (Ayuso-Peralta et al., 1994). The fixed gaze, or ocular apraxia, may be due to the inability to attend to peripheral targets or to the loss of parietal neurons involved in visually guided eye movements (Watson & Rapscak, 1989). Hof, Bouras, Constantinidis, and Morrison (1990) added that ocular apraxia may exist because of damage in Brodmann’s area 7b in the posterior parietal lobe. This cortical area appears to be involved in targeting the gaze on a stimulus and controlling smooth-pursuit oculomotor movements.

Disruption of fronto-parieto-occipital pathways subsequent to parieto-occipital lesions has been implicated in the manifestation of Balint’s syndrome (Girotti et al., 1982; Hof et al., 1990). Patients with this syndrome present with optic ataxia that implies a dysfunctional transferring of information from sensory to motor areas. Damage directly to the fronto-parieto-occipital pathways, however, is not necessary to produce the symptoms of Balint’s syndrome (Girotti et al., 1982).

Lesions in the superior occipital cortex have been implicated in difficulty with constriction of the visual field (Hof et al., 1990), as in simultanagnosia. Watson and Rapscak (1989) added that the restricted visual attention of simultanagnosia may be explained as resulting from bilateral damage to the ambient visual system. It functions to signal peripheral visual stimuli as well as to shift attention from a stimulus being viewed by the peripheral system, with a sparing of the foveal system.

In terms of the specific rehabilitation of visuo-perceptual disorders, such as Balint’s syndrome, the literature is virtually silent. Based on the main characteristics of the syndrome, the rehabilitation training should focus on the improvement of visual scanning, the development of visually guided manual movements, and the improvement of the integration of visual elements. Lopera (1996) and Solhberg and Mateer (1989) recommended exercises that allow practice of spatial analysis and visuomotor skills. Perez, Tunkel, Lachmann, and Nagler (1996) described the individualized rehabilitation of three cases of Balint’s syndrome. The mean age of the three patients was 61. The etiology of two of them was degenerative (posterior cortical atrophy), and one was vascular (bilateral occipito-parietal infarct). Treatment was focused on compensatory strategies to visual impairment and memory deficits and strategies to improve reading and calculations. A significant improvement in visual recognition was reported 6 months after treatment initiation. Humphreys and Riddoch (1994) described the cognitive rehabilitation of two cases with visual memory impairment. Their patients were able to learn new visual–verbal associations, but the generalization of this learning was scarce.

The aim of this article is to analyze the neuropsychological profile and the cognitive rehabilitation protocol in a 23-year-old man diagnosed with Balint’s syndrome.

**Case Report**

**Clinical History**

The patient was a 23-year-old male officer in the Colombian army whose medical history was unremarkable prior to a serious car accident. In this accident, the patient received multiple limb fractures, including that of the left femur; at no time did he experience loss of consciousness. The patient did not show any neuropsychological deficits at admission to the hospital. However, 3 days after the accident, the patient experienced a fat embolism, probably due to the multiple fractures, which produced an occlusion in the posterior cerebral arteries (vertebro-basilar system; Adams, Victor, & Ropper, 1997). This condition initially resulted in the patient experiencing cortical blindness. One week later, the patient was given the diagnosis of Balint’s syndrome, as evidenced by ocular apraxia, optic ataxia, and simultanagnosia. A CT scan was performed and indicated significant bilateral parieto-occipital damage. The patient remained hospitalized for several months.

A neuropsychological assessment was given 12 months after the vascular accident and before any cognitive retraining. Table 1 shows the tests used and the scores obtained by the patient in this first neuropsychological evaluation.

**Neuropsychological Test Results**

The patient was right-handed and was alert and cooperative. He was oriented to person, place, and time. No gross motor deficits were observed. Speech was abundant and contained no articulation, grammatical, or prosodic errors. During conversation, the patient did not establish visual contact. There were no defects in language comprehension, and the patient had preserved judgment and insight. He was aware and concerned about his neurological deficits. Depression was evident in his subjective report of feelings of worthlessness due to his visual problems; however, he did not meet the Diagnostic and Statistical Manual of
No visual field defects were presented, but horizontal diplopia was evident. The patient was able to draw a clock and a map of Colombia adequately but painstakingly. The spontaneous drawing of geometrical figures was found to be relatively well preserved, but his copying of the same figures was deficient and, on occasions, impossible. The copying of the Rey–Osterreith Complex Figure (ROCF) Test (Osterreith, 1944) was defective. He was unable to locate a point in the center of a circle.

In summary, results from the neuropsychological testing led to the conclusion that the patient had Balint’s syndrome characterized by ocular apraxia, optic ataxia, and simultanagnosia. He also had alexia without agraphia, prosopagnosia, visual agnosia for schematized objects, and a diminished memory capacity.

Based on the deficits revealed in the neuropsychological tests (see Table 1), a cognitive rehabilitation protocol was developed, with focus on the improvement of the visuoperceptual symptoms. The rehabilitation protocol was based on the process-specific approach (Solhberg & Mateer, 1989) and attempted to retrain specifically the impaired visual spatial functions (Prigatano, 1986, 1999).

According to the report of the patient’s mother, no noticeable improvement of the symptoms had occurred during the 6 months prior to the initial testing. The effectiveness of the treatment was assessed through a retest neuropsychological evaluation and generalization of treatment to daily life activities.

### Rehabilitation Procedure

The rehabilitation program used visuoperceptual retraining and a functional adaptation program, as described in the following.

#### Visuoperceptual Retraining

During 12 months, the patient attended an outpatient rehabilitation program 2 hr a week. These sessions were devoted to teaching the patient visual exercises to be practiced at home. Some exercises were specially developed to target the patient’s impairments. The participation of the family (mother and sister) was essential within the retraining process. They were periodically interviewed and informed us about the patient’s progress. They also reported on the generalization of the training at home.

### Table 1. Results Obtained in Different Neuropsychological Tests Before and After the Treatment Protocol

<table>
<thead>
<tr>
<th>Test</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAIS: Verbal IQ</td>
<td>115</td>
<td>118</td>
</tr>
<tr>
<td>Wechsler Memory Scale: MQ</td>
<td>90</td>
<td>92</td>
</tr>
<tr>
<td>Rey–Osterreith Complex Figure:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copy</td>
<td>2/36</td>
<td>15/36</td>
</tr>
<tr>
<td>Letter Reading</td>
<td>16/20</td>
<td>20/20</td>
</tr>
<tr>
<td>Word Reading</td>
<td>0/20</td>
<td>18/20</td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phonologic</td>
<td>15</td>
<td>—</td>
</tr>
<tr>
<td>Semantic</td>
<td>18</td>
<td>—</td>
</tr>
<tr>
<td>Recognition of Real Objects</td>
<td>7/7</td>
<td>—</td>
</tr>
<tr>
<td>Recognition of Schematized Figures</td>
<td>0/15</td>
<td>12/15</td>
</tr>
<tr>
<td>Recognition of Overlapped Figures</td>
<td>0/15</td>
<td>9/15</td>
</tr>
<tr>
<td>Recognition of Colors</td>
<td>6/6</td>
<td>—</td>
</tr>
<tr>
<td>Boston Naming Test</td>
<td>42/60</td>
<td>50/60</td>
</tr>
<tr>
<td>Trail-Making Test A</td>
<td>15 min</td>
<td>1 min, 30 secs</td>
</tr>
<tr>
<td>Famous People Photographs</td>
<td>2/10</td>
<td>9/10</td>
</tr>
<tr>
<td>Ideomotor Praxis Praxis</td>
<td>10/10</td>
<td>—</td>
</tr>
</tbody>
</table>

**Note:** WAIS = Wechsler Adult Intelligence Scale.

*Mental Disorders* (4th ed., *DSM–IV*; American Psychiatric Association, 1994) diagnosis criteria for a major depressive episode. His Verbal IQ (Wechsler, 1968) was within normal limits. Mild memory problems were observed. His MQ (Wechsler, 1945) was lower than Verbal IQ, suggesting a mild deficit.

A complete Balint’s syndrome was corroborated. The patient displayed ocular apraxia, optic ataxia, and simultanagnosia. He was unable to scan moving target objects; eye movements under verbal command were very difficult. His inability to reach target objects (misreaching) and his dysmetria secondary to visuoperceptual deficits were interpreted as an optic ataxia. He had very severe difficulty in visual searching and made compensatory head movements. In attempting to describe a complicated figure, he could only describe individual details, with failure to recognize the integrated figure (simultanagnosia). He presented significant difficulties in the identification of photographs of famous people (Ardila & Rosselli, 1990) and in the recognition of schematized objects.

The patient recognized handwritten letters and was able to perform tactile identification of letters correctly. He also recognized words spelled by the examiner but was unable to read them. He was capable of writing spontaneously and to dictation but was unable to copy words or phrases. Given his visuoperceptual difficulties, the distribution of his writing was erratic. No components of apraxic agraphia were observed in his handwriting.
The following exercises were used within the training protocol.

**Eye movements.** The patient first had to visually follow objects moved by the examiner. The aim of this exercise was to improve visual scanning. The patient then had to place the index fingers at a distance of 15 to 20 cm in front of his face and look alternately toward the right index finger, then the left index finger, during a 5-min period. Three centimeters was the initial distance between the index fingers. This distance was progressively increased based on the improvement in visual targeting without head movements. The distance between the fingers was increased up to 50 cm. The aim of this exercise was to increase the self-control of visual scanning.

**Convergence exercises.** From a central point 30 cm away from the face, the patient should bring the right or left index finger gradually closer to the nose, maintaining permanent eye contact on the index finger. This exercise should be done for approximately 30 min each day. The aim of this exercise was to acquire more control of eye movements.

**Word reading.** Single two-syllable words were presented on white index cards. The patient was requested to use the index finger as an aid to find the letters of the words and to spell out loud all the words he was reading. This task was alternated with the reading of two-syllable words that were written in large size (2 cm in height) and in two colors. The vowels were written in red, and the consonants were written in green. The patient was asked to read only the vowels, using the finger as a guide. The letters used in this exercise were progressively smaller in size, whereas words had more syllables. The aim of this exercise was to teach the patient to scan and read words by spelling them out.

**Visuokinetic functioning.** Letters and words were placed in front of the patient. He had to read them aloud and simultaneously reproduce the letter in the air using the index finger. The aim of this exercise was to develop a kinesthetic learning of words.

**Exercises of visual search.** The patient had to look for letters and words in a crossword puzzle. The level of difficulty was progressively increased. The aim of this exercise was to improve visual scanning and recognition of words.

**Trail-making exercises.** Exercises similar to the Trail-Making Test A were developed, using an increasing level of difficulty: The distance between numbers and the amount of numbers increased; the size of the numbers became smaller. Initially, colors were used to increase salience, but later these were eliminated.

**Writing exercises.** The patient had to write letters and words, spontaneously and to dictation, on paper with lines. Large letters were required to facilitate subsequent self-reading.

**Functional Adaptation Program**

The applicability to everyday life of skills learned or relearned during rehabilitation in a laboratory or clinical setting has come into question (Sbordone & Long, 1996). Thus, it was advisable to devise a rehabilitation program that would, at least in a partial fashion, facilitate improvement in ways that are useful in the patient’s world. Bearing this in mind, a functional program, complementary to the visuoperceptual retraining, was developed. The focus of this complementary program was to assign tasks that, although part of everyday life (e.g., reading a newspaper), would address the retraining of the deficits found in Balint’s syndrome. In addition, it would increase independence and self-confidence. With this in mind, the intended goal was for the patient to return to work at his highest capacity. The following activities were recommended:

1. The patient was encouraged to go out with his mother or his sister as frequently as possible and to participate in daily life activities, such as shopping, going to parks, and so on. In addition, social activities were reinforced in an attempt to reduce isolation and to increase self-confidence. This was an initial step, considering that the patient had become socially isolated after the vascular accident.

2. The use of public transportation to come to the rehabilitation sessions was suggested. This required that the patient use visuoperceptual skills and fostered a sense of independence. Initially, the patient was escorted to the sessions, but later he independently used public transportation.

3. It was suggested to the patient to remain active at home: do homework, help with housekeeping, watch television, and try to read the newspaper. During each session, he had to report at least three topics from the previous day’s newspaper that were interesting to him.
4. When the rehabilitation program was advanced enough, it was suggested that the patient look in the newspaper for educational or vocational courses he may be capable of attending. It was further suggested that he go to the corresponding office, initially with a companion and in the following months by himself, to gather information, brochures, and so on. This would maximize the use of visuoperceptual skills and also helped the patient regain confidence.

5. It was recommended to the patient that he attempt to rejoin the military. This was the patient’s desire, and although he may rejoin at a less demanding position, this would represent the optimal recovery scenario.

Table 2 summarizes the changes in community independence before and after the treatment.

After 1 year on this treatment protocol, a follow-up neuropsychological evaluation was performed (see Table 1). A significant improvement was observed, particularly in those tests that are sensitive to scanning deficits, such as word reading and the Trail-Making Test, as well as measures sensitive to simultanagnosia, such as the ROCF: copy, recognition of schematized figures, recognition of overlapping figures, and famous people photographs. No significant improvement was seen in the Wechsler Memory Scale or in Verbal IQ. At this point, the patient reported feeling more confident. He returned to the army and was appointed to an activity not requiring special visuoperceptual abilities (a communication section).

Discussion

This article describes a case report of a 23-year-old man presenting with Balint’s syndrome and analyzes the rehabilitation program that was effective for him. The patient developed the visuoperceptual disorder of Balint’s syndrome, characterized by ocular apraxia, optic ataxia, and simultanagnosia, secondary to a cerebrovascular accident resulting from a fat embolism. The patient also presented with pure alexia (alexia without agraphia), visual agnosia to superimposed and schematized figures, prosopagnosia, and a diminished memory capacity.

The patient began a rehabilitation program 1 year after the embolism. Based on a family report, no spontaneous recovering had occurred in the previous 6 months. Most spontaneous recovery in cases of brain damage occurs during the first 3 months after the injury, with some recovery occurring in the following 6 months (Kertesz, 1979). Thereafter, very little or no recovery is expected. Despite the difficulty of measuring the exact amount of recovery in the months following a brain injury, it is usually accepted that a good amount of spontaneous recovery occurs during the first year. Converging evidence, however, supports that increased functioning can be observed with treatment begun later than 1 year (Prigatano, 1999). Recovery in stroke patients is less pronounced than recovery in posttraumatic brain injury (Kolb & Whishaw, 1996). It is suitable to propose that, in the case described here, most of the spontaneous recovery had occurred at the beginning of the rehabilitation treatment. Most new visual spatial improvements may be attributed to the introduction of the rehabilitation protocol.

Age may affect the recovery from brain damage. Better recovery is expected from younger patients. Our patient was a young adult, which may have contributed to his good recovery. The recovery after brain damage of soldiers in the 21-to-25 age group is greater than in the 26-and-over age group (Kolb & Whishaw, 1996).

The patient described here had a neuropsychological evaluation before the beginning of the treatment protocol. These scores were used as baseline for treatment effectiveness. One year after the introduction of treatment, the same neuropsychological assessment was done. Improvement was observed in all visual tests but was absent in memory and intelligence tests. The rehabilitation program consisted of a visuoperceptual training, however, and no memory retraining was included. Thus, it is reasonable to propose that the rehabilitation protocol used was effective. This case study suggests that a successful rehabilitation program for visuoperceptual disorders should also include a functional component.

There are some limitations to this single case report. There was no control over confounding variables, such as the test–retest effects, that may have affected the neuropsychological test scores. The patient attended the rehabilitation program a limited amount of time

Table 2. Changes in Community Independence Before and After the Treatment

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socially Isolated</td>
<td>Frequent Group Activities: Family, Friends, etc.</td>
</tr>
<tr>
<td>Inability to Use Public</td>
<td>Independent Use of Public</td>
</tr>
<tr>
<td>Transportation</td>
<td>Transportation</td>
</tr>
<tr>
<td>Escorted to Appointments</td>
<td>Attending Appointments by Himself</td>
</tr>
<tr>
<td>Inactive at Home</td>
<td>Reading, Writing, Watching Television</td>
</tr>
<tr>
<td></td>
<td>at Home</td>
</tr>
<tr>
<td>No Attempt to Work</td>
<td>Actively Searching for a Job</td>
</tr>
<tr>
<td>Inability to Work</td>
<td>Returned to Work</td>
</tr>
</tbody>
</table>

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There are some limitations to this single case report. There was no control over confounding variables, such as the test–retest effects, that may have affected the neuropsychological test scores. The patient attended the rehabilitation program a limited amount of time
(2 hr weekly), so there was no control over activities performed by the patient in his own time. There was a significant similarity between some of the testing tasks and some of the rehabilitation exercises. For example, the patient was practicing plenty of times (even hundreds of times) in exercises similar to the Trail-Making Test. At the beginning of the program, the patient was socially isolated and overtly depressed, whereas at the end, depression had cleared, and he was significantly positive and active in his extratreatment environments. All these variables may have affected the final testing results. Nonetheless, using a functional criterion, during the 12 months of the rehabilitation program, a significant improvement was observed. The patient was able to return to the army, securing a limited position that did not require special visuoperceptual abilities.

In summary, significant improvement in objective testing and the return to a productive life can be attained via cognitive rehabilitation, even after the period in which the majority of spontaneous recovery is likely to occur.

References


Original submission December 20, 2000
Accepted June 14, 2001