Charles Bonnet Syndrome: A Review of the Literature

Lauren O’Farrell, Sandra Lewis, Amy McKenzie, and Lynda Jones

Abstract: Charles Bonnet syndrome (CBS) commonly occurs in older adults with visual impairments, particularly those with age-related macular degeneration. It is characterized by complex visual hallucinations in individuals without mental disorders. The authors explore diagnostic criteria, demographic characteristics, clinical features, theories of pathogenesis, and management options for people who are diagnosed with CBS.

A substantial number of older adults without mental disorders but with age-related visual impairments experience formed visual hallucinations that are due to a condition known as Charles Bonnet syndrome (CBS; Teunisse et al., 1999). CBS is particularly common in people with age-related macular degeneration (AMD) (Kahn, Shahid, Thurlby, Yates, & Moore, 2008; Lannon et al., 2006) and has been reported in persons with diabetic retinopathy (Holroyd, Rabins, Finkelstein, & Lavrishka, 1994; Teunisse et al., 1995) and cataract (Teunisse, Zitman, & Raes, 1994; Teunisse et al., 1995). Historically, visual hallucinations have been associated with the negative stigma of mental disorders. Menon, Rahman, Menon, and Dutton (2003) stated that individuals who grasp the unreality of the visual hallucinations may be disturbed by the possibility of imminent insanity, and because of their fears, they may be reluctant to discuss their experiences with physicians or allied professionals. It is important for clinicians and those in allied professions to be knowledgeable about CBS in order to avoid misdiagnoses and consequent unsuitable therapies or recommendations. It has been suggested that informing a client that the hallucinations are not a result of mental illness may have a therapeutic effect (Lannon et al., 2006; Menon et al., 2003; Nadarajah, 1998).

Origin of CBS

In 1936, Georges de Morsier, a neurologist, coined the eponym Charles Bonnet syndrome in recognition of Charles Bonnet, who was a Swiss naturalist, philosopher, and biologist. Bonnet had documented the experiences with visual hallucinations in 1769 of his 89-year-old grandfather, Charles Lullin, who had cataracts. Lullin was fully aware that the hallucinations were not real because the images of buildings and landscapes would spontaneously appear, disappear, and increase or decrease in size (Hedges, 2007). Lullin was further convinced of the unreal nature of the images because...
they never made noise. He reported seeing people, buildings, carriages, and birds. Bonnet, like his grandfather, experienced visual hallucinations early in his life because of deteriorating vision (Hedges, 2007; Menon et al., 2003).

De Morsier defined CBS as visual hallucinations that occur in older people with otherwise intact mental functioning, but unlike Charles Bonnet, did not emphasize that visual impairment is a possible cause of the visual hallucinations (Hedges, 2007; Menon et al., 2003). The discrepancy regarding the inclusion or not of visual impairment as part of the CBS diagnosis has resulted in a vagueness of diagnostic criteria that has led to the assumption that the condition is rare (Teunisse et al., 1996).

**Diagnostic criteria**

Various criteria exist for diagnosing CBS (Menon et al., 2003; Terao, 2002). Schultz and Melzack (1991) described previously identified core features of CBS hallucinations as (1) a clear state of mind, (2) normal perception, (3) the absence of additional auditory or olfactory hallucinations, (4) the absence of other unusual sensations, (5) the absence of control over hallucinations, and (6) the disappearance of hallucinations upon closing the eyes. They believed that an additional requirement should be the presence of reduced vision. Teunisse et al. (1995) isolated CBS from other psychiatric disorders by requiring the hallucinations to be (1) complex, repetitive, and persistent; (2) with full or partial insight, meaning awareness that the hallucinations are not real; (3) with no additional delusions; and (4) present in the absence of additional hallucinations in the other senses. The criteria used by Gold and Rabins (1989) were similar to those of Teunisse et al. except that Gold and Rabins required the hallucinations to be stereotyped, meaning that the hallucinations are comprised of recurrent themes with little variability experienced by different individuals. Shiraishi, Terao, Ibi, Nakamura, and Tawara (2004) also agreed with the criteria established by Teunisse et al., but did not require full or partial insight into the unreality of the hallucinations.

Menon et al. (2003) highlighted the similarities among the diagnostic criteria used by investigators and found that a diagnosis of CBS involves visual hallucinations that occur in older individuals who (1) have intact mental function; (2) do not have dementia, delirium, psychosis, or neurological diseases; and (3) may or may not have ocular diseases. The majority of criteria require that the person have insight. Collerton, Perry, and McKEith (2005) found that there are no validated tools to assess or classify visual hallucinatory experiences subjectively or objectively. They also found it difficult to distinguish among visual hallucinations, illusions, and misrepresentations. Overall, there is a lack of agreement as to which criteria should be used to diagnose CBS (Menon et al, 2003; Rovner, 2002; Terao, 2002).

**Prevalence of CBS**

Although visual hallucinations may occur in the absence of ocular disease, a high correlation exists between ocular pathology and visual hallucinations in older adults (Berrios & Brook, 1984). Lannon et al.’s (2006) study of the prevalence of visual hallucinations among persons with AMD found that visual hallucinations were
indeed common among these persons; 21% of those with AMD experienced visual hallucinations monthly or more frequently. These findings supported the claim that there is strong relationship between ocular pathology and CBS.

Shiraishi et al. (2004) noted that CBS is rare among optometric and ophthalmologic patients who do not have severely impaired vision. Other studies have found that the prevalence of complex visual hallucinations in people with visual impairments is between 11% and 15% (Menon et al., 2003). Kahn et al. (2008), using the criteria established by Teunisse et al. (1995), reported that the prevalence of CBS hallucinations in persons with end-stage AMD was as high as 27%. Scott, Schein, Feuer, and Folstein’s (2001) study on visual hallucinations in persons with retinal disease found that hallucinations were common among those with retinal disease; were underdiagnosed; and were not related to abnormal personality traits, cognitive deficits, or histories of personal or familial psychiatric morbidity. An interesting finding was that persons with better vision and visual hallucinations experienced more distress and a decreased quality of life.

**Demographic characteristics of CBS**

**Visual acuity**

Teunisse et al. (1995) and Lannon et al. (2006) reported findings that supported a strong relationship between decreased visual acuity and CBS hallucinations. Scott et al. (2001) also found a significant relationship among bilateral visual impairment, diminished acuity, and CBS visual hallucinations in persons with retinal disease. Lannon et al. (2006) noted that people with AMD were more likely to experience hallucinations when the visual acuity of the better eye fell from a mean of 6/36 to 6/60, although Holroyd et al. (1992) reported that those with a bilateral acuity of 20/60 or worse were more likely to experience hallucinations. The findings of Kahn et al.’s (2008) study differed from those of other studies in that the study found that better visual acuity (between 6/12 and 6/36) among individuals with end-stage AMD (in which choroidal neovascularization or geographic atrophy had occurred) was the most important risk factor for developing CBS. In contrast, Abbot, Connor, Artes, and Abadi’s (2007) study reported that decreased visual acuity or visual field loss or both did not predict which persons with AMD would develop CBS hallucinations. The results of a study by Jackson, Bassett, Nirmalan, and Sayre (2007) were similar.

**Contrast sensitivity**

In a study of 225 persons who were receiving vision rehabilitation services, Jackson et al. (2007) examined the association among visual acuity, contrast sensitivity, and the participants’ reports of visual hallucinations. Visual hallucinations were reported by 35% of these participants. After adjusting for visual acuity and controlling for age, sex, depression, and level of independence, Jackson et al. found that those with the lowest measures of contrast sensitivity were the most likely to report hallucinations.

**Gender distribution**

The majority of the studies found that CBS is more prevalent among women.
(Gold & Rabins, 1989; Holroyd et al., 1994; Schultz & Melzack, 1991; Scott et al., 2001). Other studies found no difference in gender distribution (Fernandez, Lichtschein, Vieweg, & Victor, 1997; Lannon et al., 2006; Tan et al., 2004; Teunisse et al., 1995).

**AGE DISTRIBUTION**

The majority of the studies examined CBS in older adults (Abbot et al., 2007; Cohen, Bulik, Tadayoni, & Quentel, 2003; Holroyd et al., 1992; Holroyd & Rabins, 1996; Lannon et al., 2006; Scott et al., 2001; Tan et al., 2004; Teunisse et al., 1995; Teunisse et al., 1996). The high prevalence of CBS among the elderly population may reflect the higher incidence of visual impairment among this population as a whole. Abbot et al. (2007) found a higher prevalence of visual hallucinations in the younger participants in their study. However, the participants were younger only by a median difference of 4 years, and the mean age of all the participants was 81.2 years. Abbot et al. theorized that the older participants may have had trouble recalling their visual hallucinations and therefore that it appeared that the younger participants were more likely to experience visual hallucinations. Tan et al. (2004) found that the participants with CBS had a mean age of 76.3 years, compared to the other participants without CBS, who had a mean age of 67.9 years. Others did not find age to be a predictor of CBS (Lannon et al., 2006). Although age may not be a predictor of CBS, a strong association has been found between CBS and advanced age (Teunisse et al., 1995).

**LIVING CONDITIONS**

Some studies have shown that CBS is connected with living alone and solitary conditions (Abbot et al., 2007; Holroyd et al., 1992). Teunisse et al. (1995, 1999) noted in two separate studies that even though CBS occurred more frequently in people who lived alone, the relationship did not reach statistical significance. In contrast, Kahn et al. (2008) found a higher percentage of individuals with CBS living with someone than in those living alone. Teunisse et al. (1999) reported that there appeared to be a significant relationship between low-quality social contact and incidences of CBS. In both the control and test groups, the number and frequency of social contacts were similar, but the group with CBS reported missing significant interpersonal relationships.

**COGNITIVE DEFICITS**

Scott et al. (2001), unlike Holroyd et al. (1992), found no relationship between lower cognitive scores and visual hallucinations. Abbot et al. (2007) noted that cognitive factors, such as the level of arousal, may play a role in the development of visual hallucinations when vision loss has reached a critical threshold. Collerton et al. (2005) cited intellectual impairments as one of the risk factors for recurrent visual hallucinations.

Pliskin et al. (1996) conducted a battery of neuropsychological tests on 15 persons with ocular pathology who presented with visual hallucinations and met Gold and Rabins’s (1989) criteria for CBS. They compared these persons’ results with the performance of 11 paid control participants who had not reported neurological or psychiatric illness. The CBS participants showed evidence of a decline in global cognitive function, as measured by...
the Dementia Rating Scale, the Wechsler Memory Scale with Russell Revision, and a test of verbal learning capacity, even though they demonstrated no behavioral manifestations of such a decline. Pliskin et al. concluded that these neuropsychological changes were similar to those associated with the early onset of dementia. Their study, however, was confounded by the inclusion of 8 participants who were unaware that the hallucinations were not real. As we noted earlier, insight into the unreality of hallucinations is one of the criteria for the majority of definitions of CBS (Menon et al., 2003).

Clinical features of CBS

Definitions and content of hallucinations

Visual hallucinations are sensory perceptions that occur without external stimuli and are not controlled by the persons who are experiencing the hallucination (Rabins, 1994). Hallucinations are often described as simple or unformed and complex or formed. Simple hallucinations include seeing spots, flashes, floaters, and shapes, such as circles or squares (Lannon et al., 2006). Complex visual hallucinations include seeing people, faces, plants, animals, objects, and sometimes complete scenes (Beck & Harris, 1994; Holroyd et al., 1992; Lannon et al., 2006).

Complex visual hallucinations that persist are referred to as recurrent complex visual hallucinations, or RCVH, which Collerton et al. (2005) defined as “repetitive involuntary images of people, animals, or objects that are experienced as real during the waking state but for which there is no objective reality” (p. 736). Burke (2005) suggested that extensive vision loss may be associated with RCVH, whereas mild vision loss may be associated with simple visual hallucinations.

When studying visual hallucinations, some researchers (Abbot et al., 2007) distinguish between true hallucinations and those that are caused by entopic phenomena and visual inference. Entopic phenomena are sensations that arise from the eyes and include photopsias, characterized by seeing lights, colors, sparks, and moving blobs or lines. Visual inferences are the result of the person erroneously attributing meaning to ill-defined perceptions of external stimuli using prior knowledge. In some studies, entopic phenomena have been classified as simple visual hallucinations and visual inferences have been classified as complex visual hallucinations (Cohen et al., 2003; Holroyd et al., 1992; Holroyd & Rabins, 1996; Lannon et al., 2006; Scott et al., 2001; Tan et al., 2004; Teunisse et al., 1995, 1996, 1999). Abbot et al. (2007) differed from previous researchers by defining visual hallucination as not being of entopic origin or visually inferred.

The specific content of CBS visual hallucinations varies greatly among individuals. Common themes include people, animals, and patterns (Abbot et al., 2007; Cohen et al., 2003; Holroyd et al., 1992; Kahn et al., 2008; Scott et al., 2001; Tan et al., 2004; Teunisse et al., 1995). Some studies have reported a high frequency of colorful hallucinations in individuals with AMD (Kahn et al., 2008; Santhouse, Howard, & ffytche, 2000).

There is some disagreement over whether the hallucinations that are related to CBS are stereotyped or comprised of common themes. Gold and Rabins (1989) based their requirement of stereotyped
visual hallucinations on the work of Wilder Penfield, M.D., a neurosurgeon who found that repeated stimulation of the visual cortex resulted in complex sensory experiences that included recurrent themes and little variation among different individuals (Rabins, 1994). Teunisse et al. (1995), however, found that the images were not stereotyped and recommended that this criterion be abandoned.

ANATOMY OF VISUAL HALLUCINATIONS

In 1998, ffytche et al. conducted a functional magnetic resonance imaging, or fMRI, study of individuals with CBS who were then experiencing visual hallucinations. They used two strategies in their study. In the first strategy, the participants were asked to signal the beginning and ending of each visual hallucination during a five-minute fMRI scan, and the timing of hallucinations was compared with the time span of the scan. The second strategy was indirect and was not dependent on capturing a hallucination during a scan. Instead, ffytche et al. showed the participants a nonspecific visual stimulus while simultaneously conducting a scan. They then compared the scans of individuals who had experienced visual hallucinations in the past with a control group of individuals who had never experienced hallucinations. As a result of both experiments, they were able to connect specific types of hallucinations with documented activities in different areas of the brain, with the primary location being in the ventral occipital lobe within or around the fusiform gyrus. For example, a spontaneous colored hallucination corresponded with activity in the posterior fusiform gyrus, and a hallucination in black and white was associated with activity behind and above the previously mentioned area.

ffytche et al. were also able to identify the locations of brain activity that corresponded to hallucinations of faces, textures, and objects.

Another interesting finding of ffytche et al.’s (1998) study was that there was a rise in the fMRI signal before the experience of a visual hallucination, which is the opposite of what has been found in fMRI studies of people who do not have visual hallucinations and instead show a delayed response to visual stimulation. ffytche et al. concluded that the results of their study suggested that visual consciousness is a product of complex neuronal sequences that are influenced by top-down processing and that the top-down processes may be located in specialized areas of the brain instead of being distributed across the brain. Typically, sensory processing is bottom-up and starts with the stimulation of sensory receptors that then transmit the information to the brain. In contrast, top-down processing is a higher-level nervous system process that starts in the brain and influences the lower sensory pathways.

TRIGGERS AND RELIEF

Hallucinations have been reported to last from seconds to hours and have occurred with the eyes open and closed (Menon et al., 2003). No one factor is responsible for triggering visual hallucinations, but a number of conditions seem to coincide with the onset of a hallucination. Social isolation, living alone, stress, fatigue, low or bright lighting, inactivity, and sensory reduction have been reported to be conducive to hallucinations (Abbot et al., 2007; Holroyd et al., 1992; Kahn et al., 2008; Teunisse et al., 1996).
Just as there is no uniform prompt for a hallucination, there is no standard procedure to stop the hallucination. Some persons have reported stopping the hallucinations by blinking; closing their eyes; approaching, talking to, or fixating on the hallucinations; focusing attention elsewhere; and even trying to swing their fists at the hallucination (Teunisse et al., 1996). Kahn et al. (2008) found that in some cases, the visual hallucinations occurred even with the eyes closed. However, the majority of persons have no control over when the hallucinations begin or end (Abbot et al., 2007; Schultz & Melzack, 1991; Tan et al., 2004).

Theories of pathogenesis
Collerton et al. (2005) proposed that a general model should be developed to explain the mechanisms that cause visual hallucinations that would include who hallucinates, what is seen during the hallucinatory experience, and the location of the hallucination. The model would be applied not only to eye diseases, but to pathological states of dementia, delirium, and schizophrenia. According to Collerton et al., the general model should (1) “account for the initiation and treatment of RCVH by pharmacological manipulations; (2) predict why nonpathological hallucinations occur on the borders of sleep; (3) explain the associations within disorders with poor vision, disturbed alertness, and intellectual impairment; [and] (4) account for the phenomenology of RCVH, for the frequency of hallucinations of people and animals, for the abrupt onset and offset of hallucinations and their movement, for temporal and situational regularities where they exist, and last, for their extinction with eye closure” (p. 745). They stated that existing models that are used to explain the occurrence of visual hallucinations fall short because they fail to include these criteria. They also found that there is a large degree of overlap among the different explanations that have been proposed, which include phantom-limb syndrome and release hallucinations, sensory deprivation, creating consistency, perceptual release, irritative hallucinations, and senescence.

PHANTOM-LIMB SYNDROME AND RELEASE HALLUCINATIONS
The visual hallucinations of CBS have been compared to phantom-limb syndrome (Berrios & Brook, 1984; Menon et al., 2003; Schultz & Melzack, 1991), which is known to be experienced by individuals who have had a body part amputated. Phantom-limb syndrome is characterized by the experience of sensations, or tactile hallucinations, and pain and discomfort at the site of the amputated body part (Rabins, 1994). Rabins identified the similarities between phantom-limb syndrome and CBS. In both conditions, the loss of sensory receptors or the sensory receptive organs predisposes an individual to hallucinations, and, in both cases, the individual recognizes the hallucinatory or unreal nature of the experience.

On the basis of the similarities, Rabins (1994) hypothesized that CBS and phantom-limb syndrome share a common mechanism that results in “de-enervation hallucinations.” De-enervation is defined as the loss of neural connections. Rabins cited a number of studies of animals that found that the interruption of sensory afferent cells, the receptor cells, was immediately followed by an expansion or
movement of the cortical receptive field to neighboring cells. For example, a study of macaques with retinal lesions found a broadening of the receptive field in the visual cortex following the retinal damage. Rabins suggested that the de-enervation hallucinations resulted from the spontaneous discharge of cells in the altered cortical receptive fields. The spontaneous cellular discharges could originate from the area of sensory loss or from the cells where the sensory receptive field had migrated.

Rabins (1994) believed that the most likely source were the cells of the new sensory receptive field. Hypothetically, the site of the new sensory receptive field would be receiving messages from both damaged sensory receptors and the intact sensory receptors from the surrounding area. Therefore, when the intact neural pathways are stimulated, the messages may be perceived as coming from the injured receptors. In the case of the macaques, in which the damaged retinal sensory cells recovered activity within several months, Rabins supposed that it was possible that the damaged sensory cells could regain activity and produce spontaneous discharges that resulted in hallucinations.

Regardless of the source, Rabins (1994) believed that the cellular mechanism was related to a hypersensitivity of the receptive cells in the original area of the brain, altered thresholds of the neighboring receptive areas, and a loss of the normal inhibitory system. Santhouse et al.’s (2000) study supported Rabin’s line of reasoning when it found a significant association between color hallucinations and AMD in individuals with CBS. Santhouse et al. contended that the color hallucinations were a result of selective deafferentation, the elimination or interruption of sensory nerve fibers in the macula, and localized hyperexcitability of the color area in the ventral pathway of the brain. They stated that they had found further evidence to support their findings in an fMRI study that they conducted in 1998 that found that the color area of the brain was chronically overactive in CBS patients with AMD. Another study of older adults with end-stage AMD and CBS found that the majority of the hallucination images were colored, further supporting the aforementioned theories (Kahn et al., 2008).

Rabins (1994) acknowledged that hallucinations do not occur in all individuals who experience amputations or retinal lesions. He proposed that individuals who do experience hallucinations may have receptive fields that have been previously altered by preexisting damage or environmental factors, such as social isolation. Rabins found the environmental condition of social isolation to be intriguing because he theorized that the lack of environmental stimulation could cause an alteration in the receptive field that could, in turn, predispose an individual to experience hallucinations in the event of a peripheral or central injury.

**SENSORY DEPRIVATION**

The findings of a sensory deprivation study by Merabet et al. (2004) confirmed a strong connection between visual hallucinations and the lack of sensory input. Merabet et al. blindfolded 10 adults in their early to late 20s, the majority of whom experienced visual hallucinations after the first day of being blindfolded.
One woman reported that she could actually see her arm and hand as she was pouring a glass of water from a pitcher. Many studies have supported the theory of sensory deprivation (Holroyd et al., 1992).

**Theory of Creating Consistency**

Elbers, Geraerts, and van Heerden (2007) suggested that hallucinations serve a functional and beneficial purpose by creating perceptual consistency. Although most people inherently view hallucinations as negative, Elbers et al. pointed out that normal, healthy people experience hallucinations without even realizing that they do. Their theory emphasizes the important role that top-down processing plays in influencing visual perceptions. Two different forms of top-down processing that Elbers et al. identified are heuristics and gap filling. Heuristics involves using Gestalt principles to organize small parts into wholes in the fastest, most efficient way possible, such as perceiving objects that are near each other as a group. Gap filling is a top-down process that involves sensory systems filling in gaps in perception, such as the visual gap filled in the blind spot where the optic nerve connects to the retina. Despite the lack of receptor cells in this location, the process of gap filling imposes coherence, and vision is not disturbed. In both top-down processes, visual perception is influenced in an effort to maintain consistency. Elbers et al. concluded that visual hallucinations result from such top-down processes attempting to generate consistency in unstructured sensory input.

**Theory of Perceptual Release**

The theory of perpetual release proposes that the brain has a built-in censorship mechanism that is constantly eliminating irrelevant sensory impulses from conscious perception. For this censorship mechanism to work, there must be a normal amount of incoming sensory input. If the quantity of sensory input decreases below a certain level, the brain may then permit subconscious perceptions that were previously not registered to surface into consciousness, which produces visual hallucinations (Menon et al., 2003).

**Irritative Hallucinations**

Irritative hallucinations are thought to be the result of abnormal electrical overactivity in areas of the brain that contain specific memories of images or representations (Collerton et al., 2005). Holroyd and Rabins (1996) reported evidence that irritative hallucinations may be a potential cause of visual hallucinations. Their follow-up study on persons with AMD and CBS found that visual hallucinations had subsided in two persons who had received laser eye treatments. They suggested that retinal ganglion cells may have been discharging spontaneously because of a decrease in sensory input caused by AMD and theorized that the brain misunderstood the discharges because they mimicked normal sensory input, resulting in a hallucinatory experience. The laser eye treatment may have silenced the abnormal discharges, which caused the hallucinations to end.

**Senescence**

In addition to the theories just mentioned, the aging process may play an important role in visual hallucinations (Menon
et al., 2003; Teunisse et al., 1995). Andermann and Manford (1998) proposed that changes in the central nervous system that occur with aging may predispose individuals with impaired vision to experience visual hallucinations.

Parkinson’s disease, another disease that is frequently associated with aging, is one of the most common neurological conditions that are associated with visual hallucinations (Barnes & David, 2001). It is a chronic and slowly progressive disorder of the central nervous system that results in motor and cognitive impairment. Matsui et al.’s (2006) study found that impaired visual acuity was a risk factor for developing visual hallucinations in Parkinson’s disease.

The visual hallucinations experienced by individuals with Parkinson’s disease share many similarities with the visual hallucinations experienced by persons with CBS (Barnes & David, 2001). One of the striking similarities that Barnes and David described was that the majority of individuals are aware that the visual hallucinations are not real. The visual hallucinations of Parkinson’s disease and CBS have both been found to occur while individuals are alert with eyes open and in dim lighting. Like CBS, the hallucinations of Parkinson’s disease are involuntary. The differences between the hallucinations of the two conditions are related to color, duration, motion, and eye opening, with the visual hallucinations experienced with Parkinson’s disease often described as blurry and moving. Barnes and David concluded, however, that the similarities far outweighed the differences.

Kitayama, Wada-Isoe, Nakaso, Irizawa, and Nakashima (2007) examined the associations between aging and visual hallucinations in individuals with Parkinson’s disease with dementia and found that aging was an important factor in the development of dementia in Parkinson’s disease. They also found that the presence of visual hallucinations may predict the development of dementia in individuals with Parkinson’s disease. Barnes and David (2001) found that the visual hallucinations from other sources of dementia differed from the visual hallucinations found in CBS and Parkinson’s disease because they often occurred in conjunction with hallucinations in other sensory modalities and with less insight into the hallucinatory experience. On the basis of these findings, it is important that older adults with AMD be thoroughly screened for other conditions, like Parkinson’s disease, that could be the cause of visual hallucinations.

The need for careful screening for neurological impairment is underscored by the results reported by Pliskin et al. (1996), who found that their small sample of participants with CBS and visual impairment exhibited neuropsychological changes similar to those of individuals with the early stages of dementia. Because CBS is a diagnosis of exclusion, and one of the exclusion criteria is the lack of dementia, it can be argued that these participants were misdiagnosed with CBS. Before making the diagnosis of CBS, physicians need to be satisfied that processes that lead to cognitive degeneration are not present.

**Management of CBS**

There is no cure or standard treatment for CBS. A crucial component in the management of CBS involves educating
persons about the syndrome and assuring those who do not have Parkinson’s or other brain diseases that they are not mentally ill or developing dementia (Abbot et al., 2007; Lannon et al., 2006; Scott et al., 2001; Teunisse et al., 1995). Abbot et al. advocated for clinicians and those in allied professions to be more knowledgeable about CBS and screen their patients for visual hallucinations. Lannon et al. (2006) recommended that ophthalmologists administer the General Health Questionnaire to patients to identify individuals with visual hallucinations who may benefit from referral for counseling or support groups.

Mosimann et al. (2008) criticized existing interviews that are used to assess visual hallucinations because they do not take individuals with cognitive impairments into consideration. In response to this need, they developed a comprehensive interview called the North-East Visual Hallucinations Interview (NEVHI) to be used to assess visual hallucinations in older adults, individuals with visual impairments, and individuals with cognitive impairments. The interview was designed to (1) focus on the phenomenology of visual hallucinations, separating simple and complex hallucinations; (2) evaluate the course of visual hallucinations preceding the assessment; and (3) evaluate cognitions, emotions, and behaviors in individuals who are experiencing recurrent visual hallucinations. NEVHI was found to be promising on the basis of preliminary measures of validity and reliability. Mosimann et al. found that although the participants did not voluntarily disclose their experiences of visual hallucinations, leading questions elicited positive responses from the majority of them. Questions such as “Do your eyes play tricks on you?” and “Do you see things others can’t see?” were found to be the most effective in screening for visual hallucinations.

Medications, such as antipsychotics, anticonvulsants, and selective serotonin reuptake inhibitors, have been used to treat CBS (Lang et al., 2007; Menon et al., 2003; Mocellin, Walterfang, & Velakoulis, 2006). On the basis of the results of case studies they described, Batra, Bartels, and Wormstall (1997) argued that treating CBS with medications should not be dismissed and suggested that antipsychotic medications with low side effects may be useful, especially in older adults. Clearly, pharmacotherapy should be used only when individuals find the visual hallucinations to be chronic and distressing (Menon et al., 2003).

One study found that low vision rehabilitation decreased the frequency of CBS hallucinations in 3 of 11 individuals with CBS (Crumbliss, Taussig, & Jay, 2008). It recommended that vision rehabilitation strategies include direct questioning to identify individuals with CBS, education about CBS hallucinations, and the provision of low vision devices to improve visual function. However, the study did not find a significant correlation between an improvement in visual acuity and the decreased occurrence of visual hallucinations. Additional rehabilitation strategies may include support groups in an effort to provide individuals with good-quality social interactions and to decrease social isolation.

**Conclusion**

In conclusion, there appears to be a strong relationship between visual impairment and CBS. An even higher prevalence of
CBS was found in older adults with AMD. There is no agreement on the specific cause of CBS, but the majority of theories emphasize an interruption in normal sensory input, an overactivity of sensory cells, and the role that top-down processing plays in the occurrence of visual hallucinations. Furthermore, visual hallucinations may be the result of the brain attempting to generate perceptual consistency. The high prevalence of CBS among adults aged 65 and older suggests that the natural age-related brain changes of the body may cause changes in the central nervous system that could contribute to visual hallucinations. Although most of the studies screened their participants for such conditions as dementia, Parkinson’s disease, Alzheimer’s disease, and other diseases that cause brain damage that could cause visual hallucinations, only a small number used fMRI’s, positron emission tomography scans, electroencephalographs, and computed axial tomography scans in their studies to confirm the absence of these potential causes (Berrios & Brook, 1984; ffytche et al., 1998). Imaging studies, such as the fMRI study conducted by Santhouse et al. (2000), are vital to the study of CBS because they can provide a link to processes in the brain and the experience of visual hallucinations. These studies are also important because they may be able to detect disorders of the central nervous system that are causing visual hallucinations that are misdiagnosed as CBS.

Until the cause of CBS is discovered, it is important for professionals in the medical and allied fields to develop a greater awareness of CBS. It is especially important for professionals in the field of vision rehabilitation to be knowledgeable about CBS, to be able to screen clients for the syndrome, and to be able to provide high-quality education to clients who are experiencing this condition.

References


Lauren O’Farrell, M.S., COMS, CVRT, blind rehabilitation specialist, Charlie Norwood VA Medical Center, One Freedom Way, Augusta, GA 30904; e-mail: <lauren.ofarrell@va.gov>.

Sandra Lewis, Ed.D., associate professor, School of Teacher Education, Florida State University, 2205 Stone Building, Tallahassee, FL 32306-4459; e-mail: <slewis@fsu.edu>.

Amy McKenzie, Ed.D., assistant professor, School of Teacher Education, Florida State University; e-mail: <armckenzie@coe.fsu.edu>.

Lynda Jones, M.A., private consultant, Tallahassee, FL; e-mail: <lyndajones2414@embarqmail.com>.