Complex Visual Hallucinations in the Visually Impaired

A Structured History-Taking Approach

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Objective: To study complex visual hallucinations in visually impaired individuals.

Methods: A prospective comparative study involving structured history taking and cognitive assessment in 48 consecutive visually impaired individuals with best-corrected visual acuity of 20/200 or worse and an age-matched cohort of 48 consecutive patients with visual acuity of 20/40 or better in at least 1 eye.

Results: Thirty visually impaired subjects (63%) experienced hallucinations, unrelated to specific ocular pathology. None volunteered the symptom; 2 admitted hallucinations on nonleading questioning and 28 on direct questioning. All displayed insight into the unreality of their hallucinations, although 18 (60%) achieved this after initial deception. Seventeen (57%) expressed concern; 7 (23%) experienced disturbing images. Nineteen (63%) feared being labeled as insane were they to admit to hallucinations, while 10 (33%) were fearful of impending insanity. Sixteen (94%) of 17 concerned patients derived comfort from sympathetic reassurance that their hallucinations did not represent sinister pathology. In contrast, none of the individuals with normal vision experienced any hallucinations ($P<.001$). Cognition was intact in all groups.

Conclusions: Complex visual hallucinations with insight commonly occur in visually impaired, cognitively intact individuals due to acquired visual impairment and are unrelated to chronological age. Hallucinatory experiences are almost invariably admitted to only on direct questioning, due to fears of being considered insane. Although generally pleasant, hallucinations may cause distress, because of content or implications of the hallucinatory activity. Sympathetic explanation affords significant emotional relief.

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CHARLES BONNET SYNDROME (CBS) was so named by de Morsier,[1,2] recognizing the renowned Genoese philosopher Charles Bonnet (1720-1793), who in 1769 described the visual hallucinatory experiences of his intelligent, articulate, cognitively intact, and visually impaired grandfather Charles Lullin,[3] in the first scientific documentation of a hallucinatory experience.[4] Lullin, an 89-year-old magistrate, described subjective silent visions of men, women, birds, carriages, and buildings, which he fully realized were "fictions" of his brain.[5,6] Ironically, Bonnet later underwent visual deterioration and experienced hallucinations typical of the syndrome to which he lent his name.[4,7]

A hallucination is a subjective sensory experience, occurring without external stimulation of the relevant sensory organ.[8-10] The term *pseudohallucination* signifies a similar phenomenon, in which the subject possesses insight into the unreality of the sensory experience.[10-14] Visual hallucinations may be elementary or complex. The former are characterized by colored or colorless bright lights such as flashes or sparks. Complex visual hallucinations, on the other hand, consist of formed images of objects or persons.[11,15,16]

The visual hallucinations in CBS are widely considered to represent a "release phenomenon"[6,16-24] secondary to deafferentation of the visual association areas of the cerebral cortex,[25] analogous to that seen in the phantom limb syndrome.[22,25-27] Complex visual hallucinations are believed to originate in the visual association areas of the cerebral cortex,[28-30] notably the lateral temporal cortex, corpus striatum, and thalamus.[31] Neuroimaging studies[32-36] suggest that activation of different areas of visual association cortex may result in different specific hallucinatory images.

There is, however, no consensus on the role of visual impairment in the development of CBS. de Morsier[2,4] considered visual impairment etiologically irrelevant to

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An initial **non-leading question** was posed about the existence of symptoms other than visual impairment itself.

Apart from blurred vision, have you noticed anything else unusual about your vision? Have you had any unusual visual experiences?

If a history of hallucinatory experiences was not volunteered on such non-leading questions, a **leading question** was posed along the following lines:

It is well known that some people whose vision is blurred can sometimes see things that they know are not real. Have you experienced anything like this?

If hallucinations were then admitted to, history taking was continued along the following lines:

Content
What did you see? What image did you see?

Movement
Does or did this image move? If yes, describe the movement.

Insight
Do you or did you think the images were real? When did you realize they weren't real?

Noise
Do the images ever make any sound or noise?

Triggering Factors
Is there anything you can do to bring on the images or make them appear?

Relieving Factors
Is there anything you can do to make the images disappear?

Confiding
Have you told anyone about these visions or images? If not, why not?

Distress
Do these images or visions upset you or worry you?

Concerns
Do you have any concerns about these images or visions?

Fear of Insanity
Do you or have you thought you may be going mad?

Fear of Being Labeled Insane
Do you worry or have you worried that if you tell someone they may think you've gone mad?

Figure 1. Structured history taking.

the genesis of visual hallucinations and therefore not obligatory for diagnosis, despite the frequent incidence of ocular pathology in such subjects. Others[22,37] suggest that impaired vision is almost invariable in CBS, some[38] considering it mandatory to the diagnosis of CBS. Others[39,40] concur with de Morsier that visual impairment, although common, is not essential for diagnosis.

Many investigators, however, recognize a strong relationship between CBS and visual impairment,* age-related macular degeneration representing the most commonly associated ocular pathology,[16] although CBS has been reported in the context of visual impairment secondary to pathology anywhere along the visual pathway, from eye to calcarine cortex.[18,30,49-52] Such visual hallucinations occur only in the context of acquired visual loss and never in those who are congenitally blind.[53]

The emergence of hallucinations may relate more to the degree of visual impairment than to any specific underlying ocular pathology.[47] Charles Bonnet syndrome has been reported to occur more commonly in higher degrees of visual impairment[19,42,45,47] and in bilateral rather than unilateral ocular pathology.[45,47,54] It is also well recognized that improvement of visual function,[18,39,52,55] whether spontaneously or by interventional means (such as cataract surgery), often results in cessation of hallucinatory phenomena. Some authors, however, counter that hallucinatory activity bears no relationship to the degree of visual impairment,[27,56,57] a theory supported by the paradoxical cessation of hallucinatory activity on further visual deterioration.[24]

Conflicting figures exist with regard to the sex distribution of CBS. de Morsier[4] originally reported a male preponderance. Other studies[22,40,43,46,56,58,59] suggest a clear preponderance of women, yet others[6,39,47,60] recognize no sex bias. It is, however, widely agreed that CBS is underrecognized,[19,54,61] a phenomenon attributed to patients' natural reluctance to admit to their hallucinatory experiences, for fear of being deemed mentally unstable,[11,23,26,39] and to unfamiliarity of medical personnel with CBS, with a resultant tendency to misdiagnose mental illness.[19,46,54,62]

Previous studies[18,20,45,54,59,61,63] have estimated that the prevalence of complex visual hallucinations among patients with visual impairment is between 11% and 15%. Most information pertaining to this condition is, however, in the psychiatric rather than the ophthalmic literature. This study, therefore, set out to determine the prevalence and characteristics of visual hallucinatory phenomena among visually impaired individuals and to identify any relationship between hallucinations, cognitive function, and relative degree of visual impairment.

METHODS

This prospective cohort study, commenced with approval from the South and West Devon Research Ethics Committee, United Kingdom, involved structured history taking and cognitive assessment in visually impaired subjects, consecutively encountered during normal clinical duties at the Royal Eye Infirmary, from May 1, 2001, to April 30, 2002. An arbitrary cutoff visual acuity of 20/200 was used; individuals with best-corrected visual acuity of 20/200 or worse in the better eye were included in the study.

Forty-eight such visually impaired individuals (22 men and 26 women) were encountered during the study, in outpatient clinics, pre-theater examinations, accident and emergency clinics, and ophthalmic wards. Structured, sensitive, and sympathetic history taking was commenced with nonleading questions about unusual visual symptoms or experiences apart from blurred vision. If a history of hallucinations was not forthcoming, patients were advised that some visually impaired individuals experience visual hallucinations, a well-recognized physiological consequence of visual impairment. Following this, specific and direct inquiry with regard to any complex visual hallucinatory experiences was made. If hallucinations were then admitted to, systematic inquiry was then directed toward elucidating the characteristics of the hallucinatory phenomena, namely, image content, movement, triggering and relieving factors, and any associated hallucinations of other sensory modalities. History taking was continued regarding whether the subject had confided in anyone about his or her hallucinations, harbored any concerns, or had experienced any distress because of the hallucinations (**Figure 1**). Sympathetic explanation with regard to the benign nature of hallucinations in the context of visual impairment was then offered and the patients' reactions recorded. Finally, cognitive function was assessed in all subjects, irrespective of a history or otherwise of hallucinations, with a Mini-Mental State Examination, modified in that 2 of the prescribed tasks that require visual func-

*References 5, 6, 11, 19, 20, 22, 31, 39-48.

tion were omitted. The cognitive score was thus calculated out of a maximum of 28.

The mean ± SD age of the visually impaired cohort was 79.1 ± 10.9 years (age range, 43-96 years). An equal number of consecutive patients older than 65 years, without visual impairment, arbitrarily defined as a visual acuity of 20/40 or better in at least 1 eye along with a full visual field, was then recruited as a control group and subjected to history taking and cognitive assessment along identical lines.

RESULTS

In the visually impaired cohort, no one volunteered a history of hallucinations. Two individuals (who were previously aware of CBS) admitted to hallucinations on nonleading questioning and a further 28 on being directly questioned about any hallucinatory experiences. Thirty subjects (63%) therefore admitted to having experienced complex visual hallucinations. In contrast, none of the subjects in the control group experienced any visual hallucinations. The prevalence of visual hallucinations among the visually impaired cohort was thus significantly greater than that among the non–visually impaired cohort ($\chi^2=40.8$, $P<.001$).

The prevalence of hallucinatory activity appeared unrelated to specific underlying ocular pathology (**Table 1**). Of the 48 patients, only 1 had a neurological diagnosis, a 76-year-old woman with long-standing optic atrophy secondary to multiple sclerosis. Even in this case, visual impairment was secondary to optic atrophy rather than cerebral disease, and neuroimaging was not performed. In effect, therefore, all patients exhibited visual impairment secondary to ocular pathology. Three individuals underwent cataract surgery, with varying degrees of visual improvement; none experienced any further hallucinations.

The mean ± SD age of the visually impaired cohort was 79.1 ± 10.9 years (age range, 43-96 years), while that of the control group (**Table 2**) was 75.0 ± 5.9 years (age range, 66-90 years). There was thus no significant age difference between the 2 cohorts ($t=2.27$, $P=.03$; 2-tailed t test). The mean age of the hallucinators was 79.5 years, and that of the nonhallucinators was 78.3 years. An independent samples t test found no statistically significant age difference between the hallucinating and nonhallucinating groups within the visually impaired cohort ($t=0.37$, $P=.71$).

With regard to sex distribution, the 30 hallucinators comprised 19 women and 11 men. Among the visually impaired cohort, 19 (73%) of 26 women had experienced hallucinations, compared with 11 (50%) of 22 men. This difference between men and women, however, fell short of statistical significance ($\chi^2=1.8$, $P=.18$).

Hallucinatory content was variable, the most commonly observed image being that of a person (adult [14 subjects] or child [6 subjects]). Visions of faces (4 subjects) often with grotesque features, animals (6 subjects) such as cats and dogs, and inanimate objects (12 subjects) were also experienced. Patients also reported that their visions appeared brilliantly clear and detailed, in sharp contrast to their usual blurred images of the real world. The images remained motionless in 6 subjects and manifested en bloc movement (movement of the whole image, without relative movement of its constituent parts) in 5, intrinsic movement (internal movement of the various parts of an image, eg, the hands and feet of a man) in 17, and intrinsic and en bloc movement in 1, while the remaining 1 patient could not remember.

The hallucinatory images were largely independent of volition; triggering and relieving factors were uncommon. Four patients (13%) reported that their hallucinations were sometimes triggered by dim illumination. Six (20%) possessed the ability to voluntarily terminate their hallucinations, 4 by shutting their eyes, 1 by looking directly at the images, and 1 by executing ocular saccades. The hallucinations were invariably silent, unaccompanied by hallucinations of other sensory modalities.

All patients manifested insight into the unreality of their hallucinations. However, 18 (60%) attained such insight only after an initial phase of deception, especially if the hallucinations were realistic and appeared consistent with the surroundings.

Seventeen subjects (57%) expressed concern about their hallucinations; 7 (23%) had experienced disturbing or frightening images. Nineteen (63%) feared being labeled as insane were they to admit to their hallucinations, while 10 (33%) were fearful that they were becoming insane or senile. Ten subjects (33%) had previously admitted the existence of their hallucinations, 7 to family members. Three of these were already aware of CBS, while 4 had been experiencing disturbing images.

Sixteen (94%) of 17 concerned patients admitted to deriving emotional and psychological comfort from sympathetic explanation that their hallucinations represented a release phenomenon in the context of visual impairment, analogous to that of the phantom limb syndrome, and represented neither sinister pathology nor imminent insanity. The remaining 1 patient, although concerned, was not unduly bothered by hallucinations, although the hallucinatory images were frightening.

The cognitive scores of 2 patients, 1 each in the hallucinating and nonhallucinating categories, were excluded, one being dyslexic and the other illiterate. Both individuals, however, appeared well oriented, giving no reason to suspect any cognitive deficit. The mean ± SD cognitive score was higher among hallucinating subjects (mean, 27.2 ± 1.0 [range, 25-28]) than among nonhallucinating subjects (mean, 26.8 ± 1.4 [range, 24-28]). This difference, although not statistically significant ($P=.18$), demonstrates intact cognition among patients with CBS. The control group also demonstrated intact cognition, with a mean ± SD cognitive score of 26.4 ± 1.3 (range, 24-28).

COMMENT

The results of this study demonstrate that acquired visual impairment is responsible for the development of complex visual hallucinations and that the emergence of such hallucinations is independent of age. Moreover, such hallucinations are more common than hitherto believed. The hallucinatory phenomenology is exclusively visual, without noise or hallucinations of other senses.

Table 1. Causes of Visual Impairment

Patient No.	Diagnosis		Visual Acuity			Visual Hallucinations
	Right Eye	Left Eye	Right Eye	Left Eye	Both Eyes	
1	Myopia, POAG	Myopia, POAG	HM	PL	HM	Yes
2	ARMD	ARMD	4/60	2/60	4/60	Yes
3	Rub glaucoma	ARMD	NPL	1/60	1/60	Yes
4	ARMD	ARMD, PBK, PKP	HM	6/60	6/60	Yes
5	HZO, neurotrophic keratopathy	AION, exposure keratopathy	CF	CF	CF	Yes
6	DR Mac	DR Mac	2/60	6/60	6/60	No
7	POAG, aphakia	POAG, aphakia	HM	6/60	6/60	No
8	POAG	POAG	6/60	6/60	6/60	No
9	DR Mac	DR Mac	HM	6/60	6/60	Yes
10	Trauma	POAG	NPL	PL	PL	Yes
11	ARMD, POAG	ARMD, POAG	CF	CF	CF	No
12	ARMD	ARMD	6/60	CF	6/60	Yes
13	Mooren ulcer	Mooren ulcer	CF	CF	CF	No
14	ARMD, POAG	CRVO, ARMD, POAG	CF	NPL	CF	Yes
15	POAG	POAG	HM	HM	HM	No
16	ARMD	ARMD	CF	HM	CF	Yes
17	ARMD	ARMD	CF	CF	CF	Yes
18	AION	AION	6/60	6/60	6/60	Yes
19	PDR	PDR	3/60	5/60	5/60	No
20	Optic atrophy	Optic atrophy	CF	CF	CF	Yes
21	Cataract, ARMD	Cataract, ARMD	CF	HM	CF	Yes
22	RD	RD	NPL	1/60	1/60	Yes
23	Myopic maculopathy	Myopic maculopathy	CF	3/60	3/60	Yes
24	ARMD, POAG	ARMD, POAG	6/60	6/60	6/60	No
25	ARMD, POAG	ARMD, POAG	CF	CF	CF	Yes
26	POAG, PKP	POAG, ARMD, PKP	NPL	6/60	6/60	No
27	ARMD, cataract	DR Mac, cataract	6/60	6/60	6/60	No
28	ARMD, cataract	ARMD, cataract	HM	CF	CF	Yes
29	ARMD, DR Mac	ARMD, DR Mac	6/60	6/60	6/60	No
30	ARMD, POAG	ARMD, POAG	CF	CF	CF	Yes
31	Cataract	Cataract	CF	CF	CF	No
32	Amblyopia	PACG, cataract	3/60	4/60	4/60	Yes
33	Cataract	Cataract	CF	CF	CF	Yes
34	ARMD, POAG	ARMD, POAG	HM	HM	HM	No
35	ARMD	ARMD	3/60	2/60	3/60	Yes
36	Cataract, optic atrophy	Cataract	HM	2/60	2/60	Yes
37	ARMD	ARMD	6/60	6/60	6/60	Yes
38	DR Mac, cataract	DR Mac, cataract	HM	6/60	6/60	Yes
39	ARMD	ARMD	CF	CF	CF	No
40	PDR	PDR	CF	CF	CF	No
41	Eales disease, TRD	Eales disease, TRD	NPL	PL	PL	Yes
42	ARMD	ARMD	HM	CF	CF	Yes
43	Macroaneurysm	ARMD, vitreous hemorrhage	CF	CF	CF	No
44	DR Mac, cataract	DR Mac, cataract	CF	CF	CF	Yes
45	ARMD, cataract	ARMD, POAG, aphakia	CF	2/60	2/60	No
46	ARMD	ARMD	HM	CF	CF	Yes
47	DR Mac	DR Mac	CF	CF	CF	Yes
48	DR Mac	DR Mac	CF	CF	CF	No

Abbreviations: AION, anterior ischemic optic neuropathy; ARMD, age-related macular degeneration; CF, counting fingers; CRVO, central retinal vein occlusion; DR Mac, diabetic retinopathy with maculopathy; HM, hand movements; HZO, herpes zoster ophthalmicus; NPL, no perception of light; PACG, primary angle-closure glaucoma; PBK, pseudophakic bullous keratopathy; PDR, proliferative diabetic retinopathy; PKP, penetrating keratoplasty; PL, perception of light; POAG, primary open-angle glaucoma; RD, retinal detachment; TRD, tractional retinal detachment.

This study also highlights the fact that such patients almost invariably do not admit to their hallucinatory experiences unless specifically asked and draws attention to the need for sensitive and sympathetic history taking, with direct inquiry about visual hallucinations in such subjects. The 2 individuals who admitted to their hallucinations on nonleading questioning were already aware of CBS.

These individuals manifest no cognitive deficits and display accurate insight into the unreality of their hallucinatory experiences, although not always immediately, especially if the perceived images appear real and appropriate to the surroundings. The observed difference between men and women, although falling short of statistical significance, suggests that the condition is commoner in women and merits further study to ascertain whether this is indeed the case.

Table 2. Control Group*

Patient No.	Diagnosis		Visual Acuity	
	Right Eye	Left Eye	Right Eye	Left Eye
1	Cataract	Cataract	20/40	20/30
2	Pseudophakia	Cataract	20/30	20/40
3	Pseudophakia	Cataract	20/17	20/40
4	Cataract	Cataract	20/30	20/30
5	Pseudophakia	Cataract	20/17	20/30
6	BDR	BDR	20/20	20/20
7	Glaucoma suspect	Glaucoma suspect	20/30	20/30
8	BDR	BDR	20/30	20/30
9	Normal	Normal	20/20	20/20
10	Cataract	Pseudophakia	20/30	20/30
11	Cataract	Cataract	20/30	20/30
12	Pseudophakia	Cataract, ERM	20/20	20/200
13	Cataract	Pseudophakia	20/40	20/30
14	Cataract	Cataract	20/30	20/60
15	Cataract	Pseudophakia	CF	20/30
16	Cataract	Pseudophakia	20/40	20/17
17	OHT	ARMD	20/20	CF
18	Pseudophakia	Pseudophakia	20/40	20/40
19	Cataract	Pseudophakia	20/60	20/20
20	Pseudophakia	Cataract	20/40	20/80
21	Cataract	Cataract	20/40	20/40
22	PDR	PDR	20/30	20/60
23	Pseudophakia, POAG	Cataract, OHT	20/30	20/30
24	Normal	Rubeotic glaucoma	20/30	HM
25	Narrow angles	Narrow angles	20/40	20/120
26	Pseudophakia	Pseudophakia	20/20	20/20
27	Pseudophakia	Cataract	20/30	20/30
28	Cataract	Cataract	20/80	20/30
29	Retinal tear	Normal	20/20	20/20
30	Pseudophakia	Cataract	20/30	20/40
31	Cataract, BDR	Cataract, BDR	20/30	20/40
32	Cataract	Cataract	20/30	20/40
33	Cataract, ARMD	Cataract, ARMD	20/60	20/40
34	Cataract, ARMD	Cataract, ARMD	20/30	20/60
35	Cataract	Cataract	20/80	20/20
36	BDR	BDR	20/30	20/40
37	Cataract	Cataract	20/30	20/40
38	Cataract	Cataract	20/60	20/40
39	Cataract	Pseudophakia	HM	20/20
40	Early POAG	OHT	20/20	20/13
41	Normal	Early POAG	20/20	20/30
42	Dry eye	Dry eye	20/40	20/30
43	Normal	Possible early POAG	20/20	20/30
44	Cataract	Cataract	20/40	20/20
45	Normal	Cataract	20/20	20/120
46	Cataract	Pseudophakia	20/120	20/30
47	Cataract	Cataract	20/20	20/120
48	Cataract	Cataract	20/60	20/40

Abbreviations: ARMD, age-related macular degeneration; BDR, background diabetic retinopathy; CF, counting fingers; ERM, epiretinal membrane; HM, hand movements; OHT, ocular hypertension; PDR, proliferative diabetic retinopathy; POAG, primary open-angle glaucoma.
*None had visual hallucinations.

Hallucinatory experiences also appear to be not as "enjoyable" for patients as described in the literature.[5,22,26,39,43,64] The images can be frightening or otherwise disturbing, and patients often experience anxiety with regard to their mental health.

Perhaps most importantly, this study demonstrates the benefits that accrue from providing reassuring and sympathetic explanation of the etiology of visual hallucinations. Apart from improving visual function, which may not always be possible, it is well recognized that sympathetic explanation of the benign nature of such hallucinatory experiences is a source of considerable emotional and psychological relief.[27,65] In this cohort, no patient required any therapy beyond such reassurance. Moreover, the fact that a formal test of cognitive function had been performed afforded patients objective evidence that they were cognitively normal, thus lending credibility to any reassurance that they were not becoming senile or insane.

However, hallucinations that are frequent, nonresolving, distressing, or impairing quality of life may necessitate effective therapy. Unfortunately, a universally effective remedy is still elusive; psychological techniques, including hypnosis and cognitive restructuring, such as that used in therapy for phantom limb pain, have been proposed to minimize the unpleasant effects of persistent, intrusive, and troublesome visual hallucinations.[27]

Pharmacotherapy is disappointing,[11,39] as evidenced by the diverse range of therapeutic agents advocated in this condition, including carbamazepine,[66-70] clonazepam,[71] and valproate sodium,[72] individually and in combination. Other drugs used with some measure of success include low-dose gabapentin,[73] cisapride (a potent 5-hydroxytryptamine-3 antagonist),[74,75] and antipsychotic drugs (neuroleptics),[76] such as thioridazine hydrochloride,[77] haloperidol decanoate,[78] and the atypical neuroleptics risperidone[79] and melperone.[80] A trial of pharmacotherapy may, however, be justified, under the guidance of an expert physician or psychiatrist in the context of persistent disturbing hallucinations in a subject refractory to reassurance.

I suggest that all visually impaired patients should be directly questioned regarding any hallucinatory experiences. In this context, it would appear sensible to advise all visually impaired individuals, even those who do not admit to hallucinatory experiences, of the possible future occurrence of hallucinations, to render them better prepared to deal with such an experience, should it arise.

Because hallucinations may occur in other states, such as psychiatric disease, drug ingestion, sleep-wake transitional states, metabolic and endocrine disorders, epilepsy, cerebral ischemia, and other forms of neurological disease,[16,22,46,81] it would appear prudent to perform a brief but formal assessment of cognitive function, if a history of hallucinations is identified. Further referral is perhaps indicated only in the case of a demonstrable cognitive deficit or suspicion of other neurological or psychiatric pathology. If, as in most cases, cognition is intact, no further measures are indicated save for sensitive and sympathetic explanation and reassurance. In this context, a good performance by a patient on a formal cognitive test lends credibility to any reassurance provided by the ophthalmologist, because patients frequently harbor fears of impending insanity.

Three major groups of investigators, Damas-Mora et al,[5] Podoll et al,[39] and Gold and Rabins,[43] have suggested diagnostic criteria for CBS. All stipulate the occurrence of formed visual hallucinations with insight. However, although the first 2 acknowledge an association with ocular pathology, none specify visual impairment as causative to the emergence of such hallucinations. I therefore suggest the following diagnostic criteria for CBS: (1) acquired visual impairment; (2) complex visual hallucinations that are (a) persistent or recurrent, (b) vivid and clear, (c) pleasant or unpleasant, and (d) stereotyped or variable; (3) no hallucinations of other modalities; (4) insight into the unreality of the hallucinations, which may be delayed; (5) intact cognition; (6) preserved intellectual function; and (7) no neurological or psychiatric disease.

In conclusion, this study demonstrates that visually impaired patients commonly experience hallucinations. It is relevant that Charles Lullin, the first reported case, and later Charles Bonnet, after whom the syndrome was named, were visually impaired. Moreover, ophthalmologists seldom encounter hallucinating patients without pathology of the eyes or visual pathway. I therefore submit that the term *Charles Bonnet syndrome* should be reserved for visual hallucinations in the visually impaired and moreover that visual impairment, prerequisite to the emergence of hallucinatory activity, be therefore considered an essential diagnostic criterion for CBS.

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