follow-up, none of the eyes required enucleation or relapsed. These cases were less advanced, without diffuse retrolental cyclitic membranes, which may explain our rate of tumor control. Because the tumors were small, the change in height is also small. A biopsy was not performed, so it is impossible to comment on the presence of malignant cells. However, the rationale for brachytherapy is to neutralize any malignant components. It is likely that this has been achieved because there were no cases of local or systemic relapse. With longer follow-up, there is the possibility of recurrence or complications, such as cataract progression or neovascularization that require further intervention.

Our results suggest that ruthenium-106 plaque brachytherapy achieved excellent tumor control, avoiding enucleation and sparing vision. The long-term implications of plaque brachytherapy are currently unknown, but because metastasis is relatively uncommon, we believe that plaque brachytherapy coupled with careful surveillance is appropriate in the initial management of a small, localized medulloepithelioma.

Daniel S. Poon, MB, BS[1]
Ehud Reich, MD[1,2,3]
Victoria M. Smith, BM Sci[1]
Judith Kingston, FRCP, FRCPCH[4]
M. Ashwin Reddy, MD, FRCOphth[1,2]
John L. Hungerford, FRCS, FRCOphth[2]
Mandeep S. Sagoo, MB, PhD[1,2,3,5]

[1]*Royal London Hospital, London, UK;* [2]*Moorfields Eye Hospital, London, UK;* [3]*St. Bartholomew's Hospital, London, UK;* [4]*Great Ormond Street Hospital, London, UK;* [5]*UCL Institute of Ophthalmology, London, UK*

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Author Contributions:
Conception and design: Poon, Reich, Sagoo
Analysis and interpretation: Poon, Reich, Smith, Kingston, Reddy, Hungerford, Sagoo
Data collection: Poon, Reich, Smith, Sagoo
Overall responsibility: Poon, Reich, Smith, Kingston, Reddy, Hungerford, Sagoo

Correspondence:
Mandeep S. Sagoo, MB, PhD, Moorfields Eye Hospital, City Road, London, EC1V 2PD, UK. E-mail: mandeep.sagoo@moorfields.nhs.uk.

References

1. Canning CR, McCartney AC, Hungerford J. Medulloepithelioma (diktyoma). Br J Ophthalmol 1988;72:764–7.
2. Shields JA, Eagle RC Jr, Shields CL, Potter PD. Congenital neoplasms of the nonpigmented ciliary epithelium (medulloepithelioma). Ophthalmology 1996;103:1998–2006.
3. Cassoux N, Charlotte F, Sastre X, et al. Conservative surgical treatment of medulloepithelioma of the ciliary body. Arch Ophthalmol 2010;128:380–1.
4. Davidorf FH, Craig E, Birnbaum L, Wakely P Jr. Management of medulloepithelioma of the ciliary body with brachytherapy. Am J Ophthalmol 2002;133:841–3.
5. Kaliki S, Shields CL, Eagle RC Jr, et al. Ciliary body medulloepithelioma: analysis of 41 cases. Ophthalmology 2013;120:2552–9.

Charles Bonnet Syndrome in Advanced Retinitis Pigmentosa

Chronic visual hallucinations associated with vision loss, known as the Charles Bonnet syndrome (CBS), are a well-recognized clinical entity. Charles Bonnet syndrome is characterized by recurrent visual images that vary in nature from basic imagery of lights to more complex images of objects, people, or animals.[1,2] Charles Bonnet syndrome can be associated with negative emotional consequences, and is often not reported to health practitioners.[3–5]

A number of novel interventions are being studied for people with advanced retinal degeneration, such as retinal prostheses and gene therapy, with the hope of restoring vision. However, with the return of visual function to these individuals, it is possible that there may be unintended consequences, such as changes in the nature or frequency of visual hallucinations. Therefore, we were interested in the occurrence of CBS in the most common population for these vision restoration treatments, patients with advanced retinitis pigmentosa (RP).

The prevalence of CBS among persons with eye diseases who might be candidates for vision restorative treatment trials is unclear. Although the prevalence among those with age-related macular degeneration has been reported as 20% to 40%,[2] the prevalence has not yet been established for those with RP, which is the condition targeted in most current vision restoration clinical trials.

As part of a larger natural history study of RP, which forms part of our work related to the Bionic Vision Australia's research program, 72 participants with severe vision impairment (acuity $<$20/200 in the better eye and/or a visual field restriction to $<10^{\circ}$) were identified to be eligible for this substudy. We excluded participants taking medications known to cause visual hallucinations, those who reported a history of recreational drug use or any psychological condition (including cognitive dysfunction), and those who failed a cognitive screening test or did not have sufficient English to complete the survey. All subjects had completed a recent full ophthalmological examination, which included confirmation of the diagnosis of RP and visual function measures. A telephone interview was conducted, which included the CBS questionnaire developed by Vukicevic and Fitzmaurice.[5] The CBS questionnaire comprised 10 multiple choice questions on presence, type of visual hallucinations, onset, frequency, duration, triggers, suppressors, associated stress, and number of persons told.[5] Type of hallucination was classified as either simple (basic inanimate imagery, e.g., lights and colors) or complex (animate imagery, e.g., people and objects). The main outcome—presence of visual hallucinations and hence CBS—was determined by an affirmative response to the question: "Some people with certain types of vision loss have difficulty seeing certain things and may even see things that are not really there. They may see things such as colorful patterns, animals, buildings, people or plants, and trees. Have you ever seen anything similar to this?"

Table 1. Characteristics of Charles Bonnet Syndrome (CBS; n = 27)

CBS Characteristics	Frequency (/27)	%
Type of image seen		
Inanimate light patterns	13	48.2
Animals	1	3.7
People	2	7.3
Formless blobs	6	22.2
Other (combination of above)	5	18.6
Frequency of hallucinations		
Daily	8	29.8
Weekly	7	25.9
Monthly	3	11.0
1-3 episodes a year	7	25.9
Infrequent	2	7.4
Length of hallucinations		
Seconds	20	74.1
Minutes	7	25.9
Triggers		
Tiredness	11	40.7
Relaxed	2	7.4
Doing an activity or concentrating on a task	3	11.0
Waking up	1	9.2
None, occur at random	10	31.7
Suppressors		
Close eyes	6	22.2
Do nothing, they disappear on their own	21	77.8
Light intensity during episodes		
Dim light	3	11.0
Bright light	6	22.2
Darkness	3	11.0
Both light and dark	3	11.0
Not light dependent	12	44.7
Stress levels as a result of the hallucinations		
None	18	66.7
Mild	5	18.5
Moderate	2	7.4
Severe	2	7.4
Persons informed about hallucinations		
No one	8	29.6
Spouse, family member, or friend	11	40.7
Eye care professional	8	29.6

The cohort included 37 males and 35 females, with a mean age of 55.7±14.5 years. Sixty-five (90%) had rod−cone RP, 4 had cone−rod dystrophy, 2 had Lebers congenital amaurosis, and 1 had choroideraemia. The best-corrected visual acuity (BCVA) in the better eye ranged from 0.3 logarithm of the minimum angle of resolution (logMAR) to no perception of light. Ten participants had light perception and 5 had no light perception; the remaining 57 participants had mean BCVA of 1.3±1.1 logMAR (Snellen 6/120). Twenty participants (28%) had no measurable visual field and the remainder had an average functional field score (FFS) of 34.1±25.5, indicating severe vision impairment on the FFS scale of 0 to 110 (where lower scores indicated greater impairment).

Twenty-seven of the 72 participants (37.5%; 95% CI, 26.3−48.6%) reported experiencing visual hallucinations typical of CBS. Characteristics of the visual hallucinations are presented in Table 1.

We found approximately 1 in 3 individuals with advanced RP experienced visual hallucinations typical of CBS. This is similar to the prevalence reported in a recent survey of 1254 adults with "macular disease," which found 39% had CBS symptoms.[3]

The majority of RP participants with CBS experienced simple hallucinations (70.4%) comprising inanimate light patterns that usually lasted seconds (74%). One-third of those with CBS reported that episodes manifested at random, with no noted temporal patterns or known triggers. In those that were aware of the exacerbating circumstances (n = 17), 41% reported the hallucinations occurred when tired and 11% when concentrating on an activity or task. In addition, 22% reported episodes ceased upon intentionally closing their eyes.

One-third of participants reporting CBS experienced emotional distress from their experience of visual hallucinations. Careful screening, education, and reassurance would be beneficial in reducing the unnecessary negative impact.[2,3,5] In this study, 29% of participants reported that they had not informed anyone about their visual hallucinations. The reasons for not reporting were not established in this cohort; however, it has been suggested previously that the main reason for not reporting CBS is for fear of experiencing the stigma associated with a psychiatric disorder.[2] Greater awareness and inquiry about CBS may encourage more patients to report their symptoms, thereby facilitating delivery of appropriate care (reassurance, advice, and support), and alleviating emotional distress. It will be of considerable interest to monitor for symptoms of CBS and determine whether there are significant alterations in the symptomatology in individuals who undergo vision restoration interventions in the future.

These findings suggest that as many as 1 in 3 adults with advanced RP may experience CBS. A significant proportion of patients may not report their symptoms and, thus, are undiagnosed. This has important implications both for routine ophthalmologic care and clinical treatment trials. Not only should we ensure that CBS is diagnosed and managed actively, but it should be monitored during intervention studies and in treatments that restore some form of visual function in advanced eye disease.

Fleur O'Hare, MPhil[1]
Sharon A. Bentley, PhD[1,2]
Zhichao Wu, PhD[1]
Robyn H. Guymer, PhD[1]
Chi D. Luu, PhD[1]
Lauren N. Ayton, PhD[1]

[1]*Centre for Eye Research Australia, University of Melbourne, Royal Victorian Eye and Ear Hospital, Melbourne, Australia;* [2]*Australian College of Optometry, University of Melbourne, National Vision Research Institute, Carlton, Australia*

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Author Contributions:
Conception and design: Ayton, O'Hare, Luu, Bentley
Analysis and interpretation: Ayton, O'Hare, Wu, Guymer, Luu, Bentley

Data collection: O'Hare
Obtained funding: Ayton, Guymer, Luu
Overall responsibility: Ayton, O'Hare, Wu, Guymer, Luu, Bentley

Correspondence:
Lauren N. Ayton, PhD, Centre for Eye Research Australia, Department of Ophthalmology, University of Melbourne, Royal Victorian Eye and Ear Hospital, Level 1, 32 Gisborne Street, East Melbourne, Victoria 3002, Australia. E-mail: lnayton@unimelb.edu.au.

References

1. Gold K, Rabins PV. Isolated visual hallucinations and the Charles Bonnet syndrome: a review of the literature and presentation of six cases. Compr Psychiatr 1989;30:90–8.
2. Menon GJ, Rahman I, Menon SJ, Dutton GN. Complex visual hallucinations in the visually impaired: the Charles Bonnet Syndrome. Surv Ophthalmol 2003;48:58–72.
3. Cox TM, Ffytche DH. Negative outcome Charles Bonnet syndrome. Br J Ophthalmol 2014;98:1236–9.
4. Teunisse RJ, Cruysberg JR, Verbeek A, Zitman FG. The Charles Bonnet syndrome: a large prospective study in The Netherlands. Br J Psychiatr 1995;166:254–7.
5. Vukicevic M, Fitzmaurice K. Butterflies and black lacy patterns: the prevalence and characteristics of Charles Bonnet hallucinations in an Australian population. Clin Experiment Ophthalmol 2008;36:659–65.

Resident and Fellow Glaucoma Surgical Experience Following the Tube Versus Trabeculectomy Study

Trabeculectomy has traditionally been considered the gold standard glaucoma surgery for treatment of uncontrolled intraocular pressure, whereas glaucoma drainage implant (GDI) surgery has been reserved for cases at high risk for filtration failure. Recently, there has been a shift in the practice patterns of glaucoma specialists, with fewer trabeculectomies and more GDIs being performed.[1,2] The Tube Versus Trabeculectomy Study (TVTS) results, first published in 2007, evaluated trabeculectomy versus the Baerveldt 350 mm^2 GDI for intraocular pressure reduction, long-term success, and safety and efficacy. The study concluded that GDI surgery achieved comparable intraocular pressure reduction, less probability of failure, and lower rates of early postoperative complications compared with trabeculectomy.[3]

Although trends in practitioner surgical preferences have been evaluated, to the best of our knowledge, no studies have evaluated trends in trainee surgical experience. The goal of this study was to evaluate the glaucoma surgical experience of ophthalmology residents and glaucoma fellows around the publication of the TVTS results.

All of the publically available ophthalmology resident and glaucoma fellow case log reports published by the Accreditation Council for Graduate Medical Education (ACGME; 2010−2014) and the Association of University Professors of Ophthalmology (AUPO; 2009−2013) were analyzed.[4,5] Numbers of "filtering procedures" and "shunting procedures" in the ACGME reports and "trabeculectomy or express shunts" and "aqueous shunt" in the AUPO reports were reviewed for total, average, and median number of cases. The IRB/Ethics Committee ruled that institutional review board approval was not required for this study because it did not involve human subjects.

From 2010 through 2014, the total number of resident "filtering procedures" performed as primary surgeon over 5 consecutive academic years was 2695, 2303, 2133, 1995, and 1945 cases, with an average of 6.0, 4.9, 4.5, 4.2, and 4.2 cases per resident (Table 1). Conversely, the total number of resident "shunting procedures" as primary surgeon over the same time period was 1993, 2397, 2702, 2850, and 3149 cases, with an average of 4.5, 5.1, 5.7, 6.0, and 6.8 cases per resident (Table 1). This equates to a 30% decrease in average filtering procedures, with a concomitant 51.1% increase in average shunting procedures over a 5-year period.

The median values for each type of surgery demonstrated the same trend over the 5-year period. From 2010 to 2014, median number of filtering procedures decreased from 5 to 3 cases per resident, and the median number of shunting procedures increased from 3 to 6 cases per resident.

The total number of primary fellow performed "trabeculectomy or express shunts" over 5 academic years from 2009 to 2013 was 1415, 1802, 1040, 1607, and 1704 cases, with an average of 30.1, 26.9, 28.9, 28.7, and 28.4 cases per fellow (Table 1). For "aqueous shunt" procedures performed as primary surgeon over the same time period, the total numbers were 1419, 2486, 1267, 2066, and 2334 cases, with an average of 30.2, 37.1, 35.2, 36.9, and 38.9 cases per fellow (Table 1).

In 2009, the average number of fellow-performed trabeculectomy/express shunt and GDI procedures were approximately the same at 30.1 and 30.2 cases. Over the next 5 years, while the average number of trabeculectomies declined by 5.6%, from 30.1 to 28.4 cases, the average number of GDIs increased by 28.8%, from 30.2 to 38.9 cases.

Unlike for residents, which demonstrated a linear trend from year to year, the glaucoma fellow average values in both categories fluctuated over 5 years, although the overall trend for trabeculectomy was a decrease and for GDI was an increase.

In reviewing resident glaucoma surgical experience from 2010 to 2014 and fellow experience from 2009 to 2013, there was a steady decline in the average number of filtering procedures and a concurrent increase in GDI surgeries. These surgical trends mirror previously published trends in practitioner surgical practice patterns. A survey of the American Glaucoma Society members' practice patterns in 2008 found that, in comparison with a similar survey from 1996, GDI use increased from 17.5% to 50.8% and average trabeculectomy use decreased from 80.8% to 45.5%.[1] This shift in practice patterns is also consistent with Medicare claims data, which demonstrated a 43% decrease in trabeculectomies and a 184% increase in tube shunt surgeries from 1995 to 2004.[2] The outcomes of the TVTS, which were first published in 2007, supported these trends, and may have further affected them. The parallel between attending and trainee experience suggests that practitioner preferences are influencing trainee surgical experience because they serve as trainee educators.

We must be cognizant of how practitioner trends may affect trainees. Residents and fellows will encounter post-trabeculectomy patients in their future careers and will need to understand the nuances of the surgery to manage these patients optimally. Furthermore, a GDI may not be an appropriate choice in all glaucoma cases, just as a trabeculectomy may not be. To possess the knowledge and skills in various operative interventions is