ABSTRACTS

Neuro-Ophthalmic Literature Review

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VISUAL ACUITY AND COLOUR VISION IN OPTIC NEUROPATHIES VS. OTHER CAUSES OF VISUAL LOSS

Almog Y, Nemet A. The correlation between visual acuity and color vision as an indicator of the cause of visual loss. *Am J Ophthalmol* 2010;149:1000–1004.

It is commonly known that optic neuropathies affect colour vision disproportionately more than visual acuity, compared to other causes of visual loss. However, as the authors put it, it is surprising that this assumption has never been proven. In this retrospective study, the authors measured the best-corrected visual acuities (Snellen) and colour vision (Ishihara Test 14 Plate Book) of 259 eyes of 259 patients who had visual loss due to one of the following causes: (1) optic neuropathies; (2) maculopathy; (3) media opacity and (4) amblyopia. Optic neuropathies included optic neuritis, anterior ischaemic optic neuropathy and compressive optic neuropathies. Patients with congenital colour deficiency were excluded. It was found that colour vision was correlated to visual acuity in all four groups. However for the same degree of visual loss, colour vision was worst in the optic neuropathy group, followed by maculopathy and media opacity. Colour vision was least affected in the amblyopia group. Particularly in patients with mild visual loss (VA 20/100 or better), the colour vision was significantly affected (0–9.5/15 correct Ishihara plates) in 38% of patients with optic neuropathy, but almost none in the other three groups. This study therefore confirmed that disproportionate loss of colour vision was an indicator of visual loss from optic neuropathies.

Carmen Chan

GENETICALLY VERIFIED MITOCHONDRIAL DISEASES: OPHTHALMIC FINDINGS

Grönlund MA, Honarvar AK, Andersson S, Moslemi AR, Oldfors A, Holme E, Tulinius M, Darin N. Ophthalmological findings in children and young adults with genetically verified mitochondrial disease. *Br J Ophthalmol* 2010;94:121–127.

The eyes are frequently affected in mitochondrial disorders, but how frequent and in what ways? In this retrospective study, the authors reviewed the findings of the detailed eye examination performed in 57 of 59 consecutive patients, diagnosed with a mitochondrial disease (by DNA analysis), between 1984 and 2006 at the Queen Silvia Children's Hospital, Gothenburg, Sweden. These patients had a mean age of 12.1 years and included diseases like Alpers, Leigh, Pearson, infantile mitochondrial myopathy, leukoencephalopathy, Kearns-Sayre, chronic progressive external ophthalmoplegia; mitochondrial encephalopathy, lactic acidosis and stroke-like episodes (MELAS), myoclonus epilepsy with red ragged fibres (MERRF), Leber's hereditary optic neuropathy and mitochondrial myopathy. The ophthalmic findings of individual patients were listed in tables. Excluding patients with refractive errors alone, 42/57 (74%) had eye findings e.g. ptosis (n=16), reduced eye motility (n=22), strabismus (n=4), nystagmus (n=9), low vision (n=21), optic atrophy (n=25), and pigmentary retinopathy (n=16). 27 patients had a full field ERG performed: 10 were abnormal, including 2 without clinical pigmentary retinopathy. Due to the high prevalence of abnormal ophthalmic findings, the authors recommended a full eye examination, including ERG for all patients suspected of having a mitochondrial disease.

Carmen Chan

ASSESSMENT OF OPTIC DISC MORPHOLOGY AND RETINAL NERVE FIBRE LAYER THICKNESS AFTER OPTIC NEURITIS—WHAT IS THE BEST TOOL?

Bertuzzi F, Suzani M, Tagliabue E, Cavaletti G, Angeli R, Balgera R, Rulli E, Ferrarese C, Miglior S. Diagnostic validity of optic disc and retinal nerve fiber layer evaluations in detecting structural changes after optic neuritis. *Ophthalmology* 2010;117:1256–1264.e1.

Patients with demyelinating optic neuritis (ON; isolated or associated with multiple sclerosis) usually regain good visual acuity. However, many of them are left with functional deficits, e.g. colour vision (CV), contrast sensitivity (CS) and visual field (VF). What is the most reliable tool which can objectively quantify the post-ON deficits? In this study, the authors performed a series of functional visual tests (including best-corrected visual acuity, CV, CS, VF, visual evoked potential, VEP) and correlated the findings with anatomical parameters, in 25 patients with unilateral retrobulbar optic neuritis of at least 1 year's duration. They then compared the changes in the optic neuritis eyes with the non-affected fellow eyes and 29 disease-free controls. The anatomical parameters assessed included optic disc evaluation by confocal scanning laser ophthalmoscopy (Heidelberg Retinal Tomograph [HRT III]), retinal nerve fibre layer thickness (RNFLT) by HRT III, scanning laser polarimetry (GDx with enhanced corneal compensation, ECC) and optical coherence tomography (OCT, StratusOCT). All the visual function parameters and RNFL (OCT and GDx) were significantly different between the optic neuritis and fellow or normal eyes. However, there were no significant differences in any of the HRT parameters between the three groups. Using receiver operating characteristics (ROC) curve analysis, the parameters with the greatest diagnostic validity that differentiated between optic neuritis eyes and normal eyes were GDx nerve fibre indicator (NFI), OCT temporal thickness, OCT average thickness and GDx temporal-superior-nasal-inferior-temporal average (TSNIT) thickness. OCT temporal thickness significantly correlated with visual acuity. VEP P-100 latency did not correlate with RNFLT, but P-100 amplitude correlated with all OCT RNFL parameters and GDx NFI/TSNIT. The authors concluded OCT and GDx, but not HRT, were useful tools in the assessment of permanent damage after ON. In any case, the technology for objective assessment of RNFLT is rapidly evolving, so watch this space.

Carmen Chan

FRACTIONATED RADIOTHERAPY FOR OPTIC NERVE SHEATH MENINGIOMA: GENERALLY SAFE IN THE LONG TERM

Lesser RL, Knisely JP, Wang SL, Yu JB, Kupersmith MJ. Long-term response to fractionated radiotherapy of presumed optic nerve sheath meningioma. *Br J Ophthalmol* 2010;94:559–563.

Surgery for optic nerve sheath meningioma (ONSM) is usually associated with visual loss. Therefore, the current usual approach to ONSM is observation; if there is documented progressive loss of visual function, then conformal radiotherapy (RT) may be given. But just how safe is conformal RT in the long term? In this retrospective case series, the long-term outcomes of 11 patients with clinically diagnosed and radiologically confirmed primary ONSM were reviewed. This group of patients had relatively good baseline vision: the mean pre-treatment visual acuity (VA) was 0.2 logMar units (~20/32) and 6 eyes had VA equal or better than 20/20. They all underwent fractionated conformal RT (techniques included 3D conformal RT, stereotatic RT and intensity modulated RT). The mean follow up period was 89.6 months (range 61–156 months). The final VA improved by a mean of 0.08 logMar units and the visual field mean deviation improved by a mean of 4.63 dB. The MRI appearance of the ONSM remained stable in size in 9 patients and decreased in 2. There were no major RT-related complications. The authors also summarised the existing literature on the outcomes of ONSM treatment with conformal RT, in particular there were 7 reported cases of radiation retinopathy after conformal RT to date. The authors concluded that although the long term outcomes of ONSM treatment with conformal RT, even in patients with good VA, were favourable in this series, the decision to treat had to be balanced against the low but non-zero potential for retinal or optic nerve toxicity.

Carmen Chan

ANTON SYNDROME

Kartsounis LD, James-Galton M, Plant GT. Anton syndrome, with vivid visual hallucinations, associated with radiation induced leucoencephalopathy. *J Neurol Neurosurg Psychiatry* 2009;80:937–938.

Anton syndrome is one of those neurological curiosities that is difficult to understand. Why would someone who is blind deny that they are blind? It is a form of anosognosia. The authors present their findings in a 69-year-old cortically blind woman, with relatively well preserved cognitive skills, who was anosognosic for blindness and reported perception of a frequently changing visual experience. Two years previously, she had undergone radiotherapy for a large (15 cm diameter) squamous cell carcinoma at the occiput. She presented with progressive visual loss but reported seeing non-existent animals, cars and people. She also was said to have looked out of a window and described a new village that, to her surprise, had been built there. She firmly denied any impairment in her vision and, when explicitly challenged about visual difficulties, she attributed them to reduced lighting conditions. She was asked to say whether she saw a “circle” or a “cross” (presented randomly on individual cards): she scored 10/22 over two sessions. When shown either a red or yellow token and asked to make a forced choice between the two colours, she scored 5/10. On a test of imagery, referring to tail length of 20 animals she scored above chance level (70% correct). The question that the authors discuss is whether she was experiencing hallucinations or was confabulating to make up for the lack of visual input. They include a review on the mechanisms that might underlie visual hallucinations.

Simon Hickman

OCT IN MS

Costello F, Hodge W, Pan YI, Freedman M, Demeulemeester C. Differences in retinal nerve fiber layer atrophy between multiple sclerosis subtypes. *J Neurol Sci* 2009;281:74–79.

Whenever a new investigative technique comes along there is an initial lead-in period where a few papers are produced describing the technique and demonstrating its ability in small-scale pilot studies. What then follows is an explosion of papers as different research groups take up the technique and use it to investigate different aspects of the disease in question. Over time, the technique gets refined with higher resolution and serial studies get performed, before there is a tailing off of interest as it is thought of as old hat. This has been the pattern in investigating multiple sclerosis (MS) with evoked potentials in the 1970s and early 1980s, magnetic resonance imaging in the 1980s to the present day and now optical coherence tomography (OCT). In this study, Costello et al. followed Stratus 3 OCT-measured retinal nerve fibre layer (RNFL) values over 2 years in 35 patients (70 eyes) with optic neuritis (ON) as a clinically isolated syndrome; 39 patients (78 eyes) with relapsing remitting MS; and 7 patients (14 eyes) with secondary progressive MS. They found that RNFL comparisons involving eyes without ON yielded greater differences between MS subtypes than ON-affected eyes; however, RNFL values did not change significantly for any MS subtype during the 2-year duration of the study. They concluded that RNFL thickness may represent a structural marker, which can help distinguish MS subtypes, because the extent of atrophy is commensurate with disease progression; however, this is best seen in eyes that have not had previous ON. Although these changes were detectable at entry to the study, the lack of significant change over time suggests that the currently available OCT machines are not sensitive enough to detect meaningful change over the sort of time periods that would be useful in a clinical trial. So, onward to serial MS studies in MS using Fourier domain OCT!

Simon Hickman

OCT IN NMO AND MS

Naismith RT, Tutlam NT, Xu J, Klawiter EC, Shepherd J, Trinkaus K, Song SK, Cross AH. Optical coherence tomography differs in neuromyelitis optica compared with multiple sclerosis. *Neurology* 2009;72:1077–1082.

Neuromyelitis optica (NMO) is thought to be more destructive than multiple sclerosis (MS) with the more extensive lesions causing necrosis. Optical coherence tomography (OCT) can provide a surrogate marker for retinal ganglion cell loss by providing a measure of the retinal nerve fibre layer (RNFL) thickness. In this study, Naismith *et al.* performed Stratus 3 OCT measures on 22 subjects with NMO and 47 subjects with MS. They found that an attack of optic neuritis as part of NMO resulted in a thinner mean RNFL compared with optic neuritis associated with MS. This was found when controlling for both visual acuity and contrast sensitivity. The superior and inferior quadrants were more severely affected in NMO than MS. The authors propose that NMO is associated with more widespread axonal injury in the affected optic nerves. At each level of visual function, however, there was considerable overlap in OCT measures, limiting the role of OCT to differentiate the two conditions on an individual basis. Therefore, OCT alone is not useful as a diagnostic test to differentiate between the two conditions, although it remains a powerful research tool to measure axonal integrity.

Simon Hickman

RETINOPATHY AND STROKE

Doubal FN, Dhillon B, Dennis MS, Wardlaw JM. Retinopathy in ischemic stroke subtypes. *Stroke* 2009;40:389–393.

It has been shown that retinopathy is a risk factor for subsequent stroke. In this study, Doubal *et al.* have tried to test the hypothesis that retinopathy would be more likely to be associated with lacunar infarcts than cortical infarcts. This is because both retinopathy and lacunar infarcts are thought to be due to pathology in small arterioles with increases in vascular permeability. They prospectively recruited 220 patients who had had either a lacunar or cortical stroke and performed dilated digital retinal photography of each eye in all patients. A trained physician, blinded to stroke type, graded the photographs as to the presence or absence of retinopathy, including the presence of hard or soft exudates, microaneurysms or haemorrhages. Similar proportions of each group had diabetes (17% lacunar versus 10% cortical) and hypertension (56% lacunar and 66% cortical). Eighteen percent of lacunar and 19% of cortical patients had any retinopathy. After adjusting for baseline differences in age, hypertension, and diabetes, retinopathy was not associated with the stroke subtype. Therefore, retinopathy may just be a non-specific marker for cerebrovascular disease.

Simon Hickman

THE PATHOLOGY OF CAR

Matsuo S, Ohguro H, Ohguro I, Nakazawa M. Clinicopathological roles of aberrantly expressed recoverin in malignant tumor cells. *Ophthalmic Res* 2010;43:139–144.

Cancer-associated retinopathy (CAR) is a paraneoplastic disorder produced by an immunological reaction against recoverin and other retinal antigens. It produces retinal photoreceptor cell degeneration mimicking retinitis pigmentosa. This paraneoplastic syndrome is frequently found in patients with lung small cell carcinoma and other malignancies. Malignant tumour cells may aberrantly express recoverin and other retinal proteins, which serve as a shared antigen between tumour and retinal cells. When anti-recoverin antibodies penetrate the blood-retina barrier, they block visual transduction pathway and cause photoreceptor cell death. The present study analyzes the pathological role of the aberrantly expressed recoverin. The recoverin expression levels of different malignant tumours were determined by immunohistochemistry, as well the effects of this expression on the sensitivity to anti-cancer drugs. Ten percent to 40% of the malignant tumour tissues studied aberrantly expressed recoverin. Moreover, tumours expressing recoverin showed increased sensitivity to anti-tumour agents. The authors suggest that the specific binding of recoverin to caveolin and G proteins would induce higher anti-cancer treatment sensitivities in this group of tumours. These results sustain the favourable prognosis of malignant tumours that cause CAR.

ENDOTHELIN-1 AND GIANT CELL ARTERITIS: SEARCHING FOR NEW TREATMENTS

Dimitrijevic I, Andersson C, Rissler P, Edvinsson L. Increased tissue endothelin-1 and endothelin-B receptor expression in temporal arteries from patients with giant cell arteritis. *Ophthalmology* 2010;117:628–636.

Endothelin-1 (ET-1) is a vasoactive peptide implicated in atherosclerosis and inflammatory disorders. Some similarities between the development of giant cell arteritis (GCA) and atherosclerosis have been detected. The use of endothelin antagonists is under investigation to treat cardiovascular disorders, so the authors raise the question about the utility of anti-endothelin agents in GCA. A retrospective and experimental study was conducted to determine the role of ET-1 and the expression of its receptors in GCA. There were 10 temporal artery biopsies positive for GCA and 10 samples from negative controls. Quantification of ET-1 and its receptors ETA and ETB was done with immunohistochemistry techniques. The results detected an increased immunoreactivity for ET-1 and ETB in the media layer and the endothelial cells in the GCA biopsies. Moreover, there was a correlation between the inflammatory degree in the arterial wall and ET-1 and ETB expression. This evidence that the endothelin pathway is activated in the GCA may offer a new therapeutic alternative with anti-ET-1 drugs instead high-dose corticosteroids.

Silvia Muñoz

OCT IN SPANISH OPTIC NEURITIS

Oreja-Guevara C, Noval S, Manzano, Diez-Tejedor E. Neuritis óptica asociada o no a esclerosis múltiple: estudio estructural y funcional. [Optic neuritis; multiple sclerosis-related or not: structural and functional study]. *Neurología* 2010;25:78–82.

MS, an inflammatory and demyelinating disease of the CNS, also causes axonal damage from early stages of the disease. Optic neuritis (ON) is a common manifestation of this disorder and the optic nerve head is an optimum place to study axonal damage independently of myelin state. Damage of the retinal nerve fibre layer (RNFL) at this point could be an accessible biomarker of axonal integrity in the brain as a whole. The aim of the study is to measure RNFL thickness in MS patients with or without ON, and to correlate structural damage with functional disturbances (visual acuity and visual field impairment). The authors studied 49 patients, distributed into three groups: the first with isolated unilateral ON, the second with ON in MS, and the third with MS and no documented episodes of optic neuritis. They found decreased measurements of RNFL in all patients with MS, which was more pronounced in those eyes with optic neuritis. There was significant difference in RNFL thickness in the unaffected eyes in the group of only ON, which was thicker than in the eyes of the other two groups. There also was significant difference in visual function between the contralateral eye of the ON group and the affected eyes. These results support the idea that OCT is an available non-invasive technique to quantify axonal integrity in MS, although no correlation was found between RNFL thickness and neurologic disability measured with the EDSS.

Silvia Muñoz

WHEN WE LEARNED TO (AB)USE TOBACCO

Grzybowski A, Holder GE. Tobacco optic neuropathy (TON)—the historical and present concept of the disease. *Acta Ophthalmol* 2010 [Epub ahead of print] DOI 10.1111/j.1755-3768.2009.01853.x

This is a very interesting historical review of both the discovery of tobacco leaves and its toxic effects. Tobacco optic neuropathy has to be differentiated from the nutritional optic neuropathy. It causes an optic neuropathy less commonly than the pure nutritional optic neuropathy. One proposed mechanism of toxicity is cyanide intoxication in genetically susceptible patients. It affects pipe smokers, tobacco chewers and snuff users. The clinical presentation

is with bilateral central scotomas and colour vision disturbances. Surprisingly, the reported incidence in the 19th century was much higher despite the more widespread use of tobacco products in the following century. The author proposes several misdiagnoses as Leber's hereditary optic neuropathy, syphilis, ischaemic optic neuropathy, and a worse nutritional status 100–150 years ago for this decreasing incidence.

Silvia Muñoz

HUMAN VISUAL TILT: EVOLUTIONARY PERSPECTIVES

Brodsky MC. The evolutionary dichotomy of human visual tilt. *Arch Ophthalmol* 2010;128:496–498.

In this invigorating editorial, Brodsky reviews recent findings concerning the detection of visual tilt in humans and formulates hypotheses in order to understand how the ocular torsion system evolved from the lower lateral-eyed animals to the human. In lateral-eyed animals, both utricular inputs from the two labyrinths and luminance inputs from the two eyes summate to determine postural orientation in the roll plane. As light comes from the sky, equal luminance inputs mean head verticality, whereas unequal luminance determines a compensatory body tilt towards the brighter side, called the dorsal light reflex. Surviving subcortical luminance reflexes does actually exist in humans: dissociated vertical divergence is one of those. It is determined by unequal luminance inputs and is visually driven. It is clinically obvious in some children with infantile strabismus, but has been shown to be detectable, though negligible, in normal subjects. Surviving subcortical labyrinth reflexes also persist in humans, namely the static ocular counterroll and the physiologic skew deviation. Both subcortical reflexes are, however, vestigial in humans. Not only do humans rely on visual cues in order to appreciate vertical position, but also to control torsional eye position. We knew that a portion of dynamic ocular counterroll was modulated by visual inputs in humans (dynamic ocular counterroll diminishes by looking at a visual target tilted along with the head). The same fact has now been demonstrated for static ocular counterroll in humans. Visual orientational cues (vertical trees, horizontal lakes, etc.) replace primitive luminance reflexes in frontal-eyed animals. Brodsky then explains why visual tilt rather than stereopsis may be implicated in the down-modulation of ocular torsion in humans. He discusses the role of the eye centering reflexes among the "antivestibular forces" that suppress the primitive reflexes implicated in ocular counterroll. He concludes: "our torsional control system has evolved in a dialectical fashion to meet the conflicting needs of positional orientation, binocular alignment and stereoscopic vision."

Matthieu Robert

SPONTANEOUS INTRACRANIAL HYPOTENSION AND DURAL SINUS THROMBOSIS

Ivanidze J, Zimmzeman RD, Sanelli PC. Spontaneous intracranial hypotension followed by dural sinus thrombosis: a case report. *Clin Neurol Neurosurg* 2010;112:498–500.

Ivanidze et al. report a case of spontaneous intracranial hypotension (SIH), with typical clinical and imaging features in a 33-year-old woman. The patient improved after a week of conservative treatment. One week after discharge, she was admitted again because of a typical symptomatic dural sinus thrombosis (DST). Further work-up only revealed Protein S deficiency. The case was well documented on both occasions, so that the time sequence of the SIH and the DST is clear. SIH syndrome and pseudotumor cerebri syndrome share several clinical characteristics. SIH may lead to DST, probably due to secondary engorgement of the dural sinuses. DST, in turn, usually increases the intracranial pressure and is a common cause of a pseudotumor cerebri-like presentation. This case suggests that SIH patients are at risk for DST.

Matthieu Robert

MIGRAINE AURA: THE MICROEMBOLIC HYPOTHESIS

Dalkara T, Nozari A, Moskowitz MA. Migraine aura pathophysiology: the role of blood vessels and microembolisation. *Lancet Neurol* 2010;9:309–317.

In this personal view, Dalkara et al. summarise the many recent studies that suggest a central role for microembolisation in the genesis of the migrainous aura. Migraine with aura and stroke are both probably associated with some similar comorbid disorders, such as right-to-left shunts, which facilitate the transit of fibrin-rich, soft, red-type venous thrombi. Such thrombi, unlike platelet-rich, calcified, white-type thrombi, may transiently occlude the microcirculation and so cause small ischaemic or hypoxic foci. As recent experimental studies and clinical observations have shown that microembolism could trigger cortical spreading depression (CSD), it is hypothesised that these occlusions may induce either CSD, resulting in migraine, or transient ischaemic attacks or strokes, according to the duration of the hypoxia. This would account for the controversial association between patent foramen ovale and migraine with aura. Such transient occlusions in the microcirculation are proposed as a cause of migraine with aura in CADASIL, but also in primary Sjögren's syndrome and in Raynaud's phenomenon, possibly through endothelial dysfunction, amongst other primary factors. A lot is still to be discovered and this article is an invigorating token for ongoing research in this field.

Matthieu Robert

GABAPENTIN VERSUS MEMANTINE IN ACQUIRED NYSTAGMUS

Thurtell MJ, Joshi AC, Leone AC, Tomsak RL, Kosmorsky GS, Stahl JS, Leigh RJ. Crossover trial of gabapentin and memantine as treatment for acquired nystagmus. *Ann Neurol* 2010;67:676–680.

Thurtell et al. conducted a double-masked crossover treatment trial to assess gabapentin (1200 mg/day) and memantine (40 mg/day) in 10 patients with acquired nystagmus (3 multiple sclerosis, 6 post-stroke and 1 post-traumatic). The clinical expression were as follows: 6 pendular including 4 oculopalatal tremors, 1 jerk upbeat, 1 hemi-seesaw, 1 torsional and 1 upbeat-diagonal. The results are encouraging: both drugs significantly reduced median eye speed (32.8% on average with gabapentin and 27.8% on average with memantine) and both significantly improved visual acuity (0.084 log MAR on average for either drug), irrespective of the cause and nature of the nystagmus. Jerk nystagmus showed improvement with both drugs; upbeat, upbeat-diagonal and hemi-seesaw improved most with memantine, and torsional with gabapentin. It will be interesting to see in further larger studies whether such trends are confirmed and may be of clinical use. Both drugs were generally well tolerated. Eight out of the 10 patients chose to carry on their preferred drug after the end of the trial.

Matthieu Robert

BURDEN AND DISTRIBUTION OF LISCH NODULES

Boley S, Sloan JL, Pemov A, Stewart DR. A quantitative assessment of the burden and distribution of Lisch nodules in adults with neurofibromatosis type 1. *Invest Ophthalmol Vis Sci* 2009;50:5035–5043.

Lisch nodules are pigmented iris nodules and are amongst the diagnostic criteria for neurofibromatosis type 1 (NF1). They appear as well-circumscribed elevations on the iris surface and are not generally found in patients lacking NF1. The authors of this study hypothesised a priori that Lisch nodule burden would be higher in the inferior iris and that this is likely related to lid and brow shielding of the upper iris from UV light exposure. They assessed Lisch nodule burden and distribution in 77 adults with NF1 and explored potential relationships between these findings and iris colour, estimates of UV radiation exposure, systemic skin lesion burden of café-au-lait macules and neurofibromas, and NF1 genotypes. Lisch nodules were, in fact, found to be primarily located in the inferior half of the iris and light eyes had a higher Lisch nodule burden than dark eyes; however there was no correlation with lifetime sunlight exposure or the burden of systemic skin lesions. The authors propose that “benign tumor of the iris” may be a better descriptor of Lisch nodules than the classically

used descriptor, “hamartoma”, given a presumed role of UV radiation and secondary DNA damage in the pathogenesis of Lisch nodules.

Janet Rucker

THE PREVALENCE OF NYSTAGMUS

Sarvananthan N, Surendran M, Roberts EO, Jain S, Thomas S, Shah N, Proudlock FA, Thompson JR, McLean RJ, Degg C, Woodruff G, Gottlob I. The prevalence of nystagmus: the Leicestershire nystagmus survey. *Invest Ophthalmol Vis Sci* 2009;50:5201–5206.

Nystagmus includes infantile-onset types and acquired, adult-onset types with many different waveforms and etiologies. While some prior studies have attempted to determine the prevalence of infantile nystagmus in different populations of children, the prevalence of acquired nystagmus in the general population is unknown. The goal of the study authors was to determine the prevalence of all nystagmus types in a United Kingdom subpopulation of approximately 1 million people via a county-wide survey. All identified nystagmus patients were invited for clinical examination. Two-hundred and thirty-eight patients were identified by a hospital-based survey and 198 of these underwent video and eye movement recordings. Infantile nystagmus was the most common nystagmus type in this cohort, present in 50 patients. Additional patient sources included review of records of registered partially sighted or blind patients (414 additional patients) and of individuals receiving educational services for the visually impaired (193 additional patients). The overall prevalence of nystagmus was determined to be 24 per 10,000 persons. In all patients combined, nystagmus due to neurologic disease was most common, with a prevalence of 6.8 per 10,000 (mostly attributed to multiple sclerosis and stroke). Nystagmus associated with low vision due to diseases such as congenital cataracts and achromatopsia was also prominent. Nystagmus was more prevalent in whites than in other ethnicities. The authors conclude that nystagmus is likely more prevalent than previously thought.

Janet Rucker

OPHTHALMOPLEGIC MIGRAINE

Pareja JA, Churrua J, de la Casa Fages B, de Silanes CL, Sánchez C, Barriga FJ. Ophthalmoplegic migraine. Two patients with an absolute response to indomethacin. *Cephalalgia* 2010;30:757–760.

Friedman DI. The ophthalmoplegic migraines: A proposed classification. *Cephalalgia* 2010;30:646–647.

Ophthalmoplegic migraine (OM) is a controversial diagnosis, especially in adults in whom painful microvascular cranial mononeuropathies that spontaneously resolve are common. Recurrent episodes of spontaneously resolving cranial mononeuropathy in the presence of a headache with migrainous features often lead to a clinician to ascribe the ocular motor deficits to OM. The hallmark radiographic finding associated with the diagnosis of OM is enhancement of the cisternal portion of the affected cranial nerve as it exits the brainstem. This is generally seen when the oculomotor nerve is affected, but often absent when the abducens nerve is the clinically affected nerve. The pathologic mechanism is unknown, but as of 2004, this entity is classified as a cranial neuralgia in the International Headache Society headache classification and the pathophysiologic mechanism is presumed to be demyelinating or inflammatory. In this case report, 2 patients with recurrent episodes of oculomotor palsy accompanied by headache and enhancement of the cisternal portion of the affected nerve on MRI had complete resolution of pain with indomethacin treatment, after treatment failure with other medications, including other non-steroid anti-inflammatory medications. The oculomotor nerve palsy in each case resolved over the following 2 weeks. The authors report that the patients met the diagnostic criteria for OM and discuss the potential mechanisms of pain production in OM and potential relationship with other indomethacin-responsive headache disorders. The accompanying editorial discusses the entity of OM, emphasises the fundamental lack of understanding surrounding the underlying physiology and appropriate treatment of the condition, and proposes a new classification system of primary versus secondary OM.

Janet Rucker

VISUAL PROCESSING AND HALLUCINATIONS IN PARKINSON'S DISEASE

Meppelink AM, de Jong BM, Renken R, Leenders KL, Cornelissen FW, van Laar T. Impaired visual processing preceding image recognition in Parkinson's disease patients with visual hallucinations. *Brain* 2009;132:2980–2993.

Visual hallucinations (VH) are common in Parkinson's disease (PD) and have been attributed to the iatrogenic effects of levodopa, as well as to the primary disease process itself. They are most commonly non-threatening, complex, formed hallucinations of animals, people, or objects. In the current study, functional MRI was performed as subjects processed recognition of revealed images. PD patients with (n=9) and without (n=14) VH and a healthy control group (n=13) were included to assess brain regions involved in visual perception (most specifically regions involved in visual processing prior to image recognition). The a priori hypothesis was that increased activation in the basal ganglia and frontal lobes in PD patients with VH may contribute to internal generation of the hallucinations, in concert with simultaneous decreased activation in primary visual processing areas. The latter was, in fact, the result, as manifested by decreased activation of the lateral occipital and extrastriate temporal visual cortices prior to image recognition in PD patients with VH; however, no increased basal ganglia or frontal lobe activation was identified.

Janet Rucker

INCIDENCE, OCULAR MANIFESTATIONS, AND SURVIVAL IN CHILDREN WITH NEUROBLASTOMA: A POPULATION-BASED STUDY

Smith SJ, Diehl NN, Smith BD, Mohnney BG. Incidence, ocular manifestations, and survival in children with neuroblastoma: a population-based study. *Am J Ophthalmol* 2010;149:677–682.

This study is a retrospective chart review of all pediatric patients (<19 years old) diagnosed with neuroblastoma in Olmstead County, Minnesota, during the 40-year period (January 1, 1969, through December 31, 2008). Fourteen children were identified. Six of the 14 (43%) had ocular manifestations, including orbital metastasis in 6 (100%), proptosis and ecchymosis in 4 (67%), ptosis in 2 (33%), and strabismus in 1 (17%). The survival for all 14 children was 57% at 1 year and 50% at 5 years. Orbital metastasis in the 6 children in this cohort was associated with poor prognosis (survival rate of 17% at 9 months).

Michael Vaphiades

HERPES ZOSTER OPHTHALMICUS AND THE RISK OF STROKE: A POPULATION-BASED FOLLOW-UP STUDY

Lin HC, Chien CW, Ho JD. Herpes zoster ophthalmicus and the risk of stroke: a population-based follow-up study. *Neurology* 2010;74:788–789.

The authors performed an age and gender matched retrospective study of the risk of stroke in patients after an episode of herpes zoster ophthalmicus. Patients were tracked from their index visits for 1 year. Herpes zoster ophthalmicus patients were found to have a 4.52-fold higher risk of stroke than the age and gender matched. The authors concluded that herpes zoster ophthalmicus may represent a marker of increased risk of stroke development during the 1-year follow-up period.

Michael Vaphiades

VISUAL FIELD PROFILE OF OPTIC NEURITIS: A FINAL FOLLOW-UP REPORT FROM THE OPTIC NEURITIS TREATMENT TRIAL FROM BASELINE THROUGH 15 YEARS

Keltner JL, Johnson CA, Cello KE, Dontchev M, Gal RL, Beck RW; Optic Neuritis Study Group. Visual field profile of optic neuritis: a final follow-up report from the optic neuritis treatment trial from baseline through 15 years. *Arch Ophthalmol* 2010;128:330–337.

The authors evaluated 10,443 visual fields from 454 participants in the Optic Neuritis Treatment Trial for years 1 through 15 after an episode of optic neuritis. At baseline, diffuse loss accounted for 66.2% of the abnormalities in the affected eyes but only 6.2% of the abnormalities in the fellow eyes. During years 1 through 15, the affected and fellow eyes exhibited predominantly localized loss in the nerve fibre bundle region (partial arcuate, paracentral, and arcuate defects). The authors concluded that diffuse and central loss were more predominant in the affected eye at baseline, and nerve fibre bundle defects were the most predominant localized abnormalities in both the affected and fellow eyes during the study.

Michael Vaphiades

EVALUATION OF ON-ROAD DRIVING IN PEOPLE WITH HEMIANOPIA AND QUADRANTANOPIA

Elgin J, McGwin G, Wood JM, Vaphiades MS, Braswell RA, DeCarlo DK, Kline LB, Owsley C. Evaluation of on-road driving in people with hemianopia and quadrantanopia. *Am J Occup Ther* 2010;64:268–278.

The authors examined 22 patients with hemianopia, 8 with quadrantanopia (with no lateral spatial neglect), compared them to 30 normal controls and assessed driving skills on an on-road evaluation under natural traffic conditions. Of drivers with normal vision, >90% drove flawlessly or had minor errors. Although drivers with hemianopia were more likely to receive poorer ratings for all skills, 59.1–81.8% performed with no or minor errors. Of 8 drivers with quadrantanopia, 7 (87.5%) exhibited no or minor errors. This study highlights the need to provide individual opportunities for on-road driving evaluation in these patients.

Michael Vaphiades

GIANT CELL ARTERITIS OF THE BASAL CEREBRAL ARTERIES: CORRELATION OF MRI, DSA, AND HISTOPATHOLOGY

Pfefferkorn T, Schüller U, Cyran C, Hüfner K, Fesl G, Seelos K, Dichgans M, Pfister HW, Nikolaou K, Kretzschmar H, Saam T. Giant cell arteritis of the basal cerebral arteries: correlation of MRI, DSA, and histopathology. *Neurology* 2010;74:1651–1653.

The authors present a 59-year-old woman without apparent vascular risk factors who presented with right-sided hemiparesis and a small acute left frontal brain infarction. An ESR was normal. High-resolution black-blood T1-weighted MRI demonstrated marked contrast enhancement in the terminal segment of the left ICA and the left posterior communicating artery. This was correlated with DSA. The patient expired and histology of the basal cerebral arteries revealed severe vasculitic alterations and multinucleated giant cells. The absence of extracranial artery involvement and a normal ESR argue against a diagnosis of typical giant cell arteritis. The authors concluded that the case may represent a distinct manifestation of giant cell arteritis with predilection of the basal cerebral arteries and that black-blood T1-weighted MRI may be valuable in the diagnosis of diseases in which vessel wall inflammation may play a role.

Michael Vaphiades

A VISUAL MIGRAINE AURA LOCUS MAPS TO 9Q21-Q22

Tikka-Kleemola P, Artto V, Vepsäläinen S, Sobel EM, Rätty S, Kaunisto MA, Anttila V, Hämäläinen E, Sumelahti ML, Ilmavirta M, Färkkilä M, Kallela M, Palotie A, Wessman M. A visual migraine aura locus maps to 9q21-q22. *Neurology* 2010;74:1171–1177.

The authors sought to identify susceptibility loci for visual migraine aura in families primarily with scintillating scotoma. Thirty-six families containing 351 individuals were included, 185 of whom have visual aura and 159 have scintillating scotoma. A novel locus on chromosome 9q22-q31 was identified which has previously been linked to occipitotemporal lobe epilepsy with prominent visual symptoms. The authors' findings support a shared genetic

background in migraine and epilepsy and suggests that susceptibility variants to visual aura for both of these traits are located in the 9q21-q22 locus.

Michael Vaphiades

DIAGNOSTIC ACCURACY OF CONFRONTATION VISUAL FIELD TESTS

Kerr NM, Chew SS, Eady EK, Gamble GD, Danesh-Meyer HV. Diagnostic accuracy of confrontation visual field tests. *Neurology* 2010;74:1184–1190.

The authors sought to determine the diagnostic accuracy of seven common confrontation visual field tests. All 172 patients underwent SITA-standard 24-2 Humphrey visual field analysis. The authors concluded that confrontation visual field tests are insensitive at detecting visual field loss when performed individually, however, combining improves the sensitivity. Kinetic testing with a red target provided the highest sensitivity of 74.4% and specificity of 93.0% of any individual test and when combined with static finger wiggle testing achieved a sensitivity of 78.3% while retaining a specificity of 90.1%.

Michael Vaphiades

A COMPARISON OF MRI CRITERIA FOR DIAGNOSING PEDIATRIC ADEM AND MS

Ketelslegers IA, Neuteboom RF, Boon M, Catsman-Berrevoets CE, Hintzen RQ, Dutch Pediatric MS Study Group. A comparison of MRI criteria for diagnosing pediatric ADEM and MS. *Neurology* 2010;74:1412–1415.

The authors compared four MRI criteria (Barkhof criteria, KIDMUS criteria, Callen MS-ADEM criteria, and Callen diagnostic MS criteria) to distinguish acute disseminated encephalomyelitis (ADEM) from multiple sclerosis (MS) in 49 children who had had a demyelinating event and an MRI scan within 2 months of their first clinical attack. Twenty-one patients had ADEM and 28 patients had MS. They noted that the Callen MS-ADEM criteria had the best combination of sensitivity (75%) and specificity (95%). The authors concluded that the new Callen criteria for multiple sclerosis-acute disseminated encephalomyelitis (MS-ADEM) are the most useful for differentiating a first attack of MS from monophasic ADEM.

Michael Vaphiades