ABSTRACTS

Neuro-ophthalmic literature review

David Bellows, Noel Chan, John Chen, Hui-Chen Cheng, Peter MacIntosh, and Michael Vaphiades

You may jump through hoops, but it's worth testing for MOG

Hamid SHM, Whittam D, Mutch K, Linaker S, Solomon T, Das K, Bhojak M, Jacob A. What proportion of AQP4 IgG negative NMO spectrum disorder patients are MOG IgG positive? *J Neurol.* 2017;264:2088–2094.

This study is a valuable addition to our armamentarium when we are forced to “jump through hoops” in order to obtain testing for anti-myelin oligodendrocyte glycoprotein (MOG) antibodies. A high positive yield is demonstrated if testing is appropriately targeted. This tertiary neurology hospital in Liverpool, UK looked at 132 patients who met the neuromyelitis optica spectrum disorder (NMOSD) 2015 criteria. 73% of these patients were Aquaporin 4-IgG (AQP4-IgG) positive and 27% were AQP4-IgG negative.

42% of the seronegative patients were found to be MOG-IgG positive. 33% of the seropositive group were tested for MOG-IgG antibodies and all were found to be negative. Also of interest is that 20% of patients who had atypical demyelinating disease (those not satisfying the NMOSD criteria) were found to be MOG-IgG positive. Of the patients who were MOG-IgG positive, 86% of them suffered relapsing disease. This, however, may be biased sampling as the study was performed at a tertiary institution where many patients are referred because they have a relapsing disease.

David Bellows

Optic disk haemorrhage in health and disease

Razeghinejad MR, Nowroozadeh MH. Optic disk hemorrhage in health and disease. *Survey Ophthalmol.* 62;6:784–802.

Did you know that there is an increased risk of optic disk haemorrhages in migraineurs (even those without glaucoma)? Were you aware that a “blot” shaped haemorrhage located in the central part of the optic disk is more likely to occur in otherwise healthy individuals? How many of us ever noticed that that larger and longer haemorrhages are more characteristic of normal-tension glaucoma as opposed to primary open angle glaucoma (OAG)?

As neuro-ophthalmologists we frequently encounter haemorrhages on or adjacent to the optic nerve. These haemorrhages will occur most commonly in patients with glaucoma. However, we are often challenged with differentiating healthy individuals from those with glaucoma or those who may have a wide variety of optic neuropathies and/or systemic diseases.

This review article details the incidence of disk haemorrhages in both health and disease. It provides a comprehensive differential of the causes of disk haemorrhages and describes some of the characteristics of these haemorrhages that is valuable for us to review from time to time.

David Bellows

What can the cornea tell you about multiple sclerosis?

Petropoulos IN, Kamran S, Li Y, Khan A, Ponirakis G, Akhtar N, Deleu D, Shuaib A, Malik RA. Corneal confocal microscopy: an imaging endpoint for axonal degeneration in multiple sclerosis. *Invest Ophthalmol Vis Sci.* July 2017;58:3677–3681.

Previous studies have demonstrated correlation between retinal nerve fibre layer thickness (RNFLT) and functional disability scores in

multiple sclerosis (MS). Thus, RNFLT has started to become one of the biomarkers or co-endpoint in some of the clinical trials in MS. However, RNFLT has its limitations as its thickness may not increase upon visual recovery. This study tried to investigate if corneal confocal microscopy (CCM) can detect axonal degeneration and whether it is associated with clinical disability in MS patients. Like optical coherence tomography (OCT), CCM is a rapid non-invasive imaging modality which takes about ten minutes to complete. This imaging technique has been proven to objectively quantify axonal degeneration and regeneration in patients with diabetic neuropathy and other central neurodegenerative diseases.

Besides CCM parameters, OCT and neurological disability assessment using the expanded disability scale score (EDSS) and the MS spasticity scale (MSSS) were compared between 25 MS patients and 25 healthy controls. They showed that corneal nerve fibre density, branch density (CNBD), and length (CNFL) were all significantly reduced in MS patients. There was no significant difference in CCM parameters between relapsing remitting MS and secondary-progressive MS. This is a possible indicator that subclinical axonal loss occurs early before the development of significant neurological disability. The reduced corneal nerve density was present regardless of optic neuritis history, MS duration, or stage and was not associated with retinal nerve fibre layer (RNFL) thickness. The quantification of corneal nerve density may act as a more objective measure of axonal loss in MS patients independent of inflammation or trans-synaptic retrograde axonal degeneration, which can affect RNFL. In terms of functional disability, EDSS and MSSS showed significant inverse correlation with CNBD and nasal inferior RNFL thickness which supports the potential use of corneal sub-basal innervation as a useful biomarker for the detection of neuro-axonal injury in MS. However, the study has small sample size and involves mainly mild MS patients. Larger studies are required to investigate the future role of CCM in the management of MS.

Noel Chan

Myelin oligodendrocyte glycoprotein antibodies: A marker for NMOSD?

Hyun JW, Woodhall MR, Kim SH, Jeong IH, Kong B, Kim G, Kim Y, Park MS, Irani SR, Waters P, Kim HJ. Longitudinal analysis of myelin oligodendrocyte glycoprotein antibodies in CNS inflammatory diseases. *J Neurol Neurosurg Psychiatry* 2017;88(10):811–817.

The authors reviewed 505 patients with CNS inflammatory disease and found 22 (4.4%) had serum positive for myelin oligodendrocyte glycoprotein-IgG (MOG-IgG) using a cell-based assay for MOG-IgG. The majority of MOG-positive patients were NMOSD ($n = 10$); four had recurrent optic neuritis, four had transverse myelitis, three had other demyelinating syndrome, and one had MS. This study confirms that NMOSD is the most common phenotype seen with MOG-IgG at a tertiary centre and that MS is rarely positive for MOG-IgG. However, it is important to note that there was an unintentional selection bias towards patients with a relapsing clinical course because the patients were seen at a single referral centre and inclusion was dependent on available serum for analysis. Interestingly, no relapses were seen in patients when they became seronegative for MOG-IgG, although there was follow-up serum available in only 10 patients (only one with recurrent optic neuritis). The verdict is still out, but this study suggests the MOG-IgG phenotype is most commonly NMOSD and that persistent MOG-IgG positivity may predict relapse.

John Chen

MS remains the most common cause of optic neuritis

Deschamps R, Lecler A, Lamirel C, Aboab J, Gueguen A, Bensa C, Vignal C, Gout O. 2017. Etiologies of acute demyelinating optic neuritis: an observational study of 110 patients. *Eur J Neurol*. 2017;24(6):875–879.

With the discovery of new antibodies associated with optic neuritis (MOG-IgG and AQP4-IgG), the authors evaluated their patients with optic

neuritis to determine the relative frequency of these antibodies in relationship to MS. The authors reviewed 110 consecutive patients with optic neuritis seen at a tertiary centre. 78 (70.9%) of patients with optic neuritis had MS as defined by the 2010 McDonald criteria. 11 (10%) had MOG-IgG, 5 (4.5%) had AQP4-IgG, and 16 (14.5%) were considered idiopathic. None of the patients with idiopathic optic neuritis had relapse or any other CNS demyelinating events during their follow-up period. In their study, MOG-IgG was twice as common as optic neuritis-related AQP4, while MS remained by far the most common cause of optic neuritis. Interesting, a past history of optic neuritis or bilateral optic neuritis was not statistically significant between the different groups. Other studies have found that MOG-IgG is associated with bilateral or recurrent optic neuritis, but many of these studies used recurrent optic neuritis as an inclusion criteria, which can introduce bias in characterizing the phenotype of MOG-IgG-related optic neuritis. Future population-based studies will be required to determine the true incidence of the relative causes of optic neuritis and the phenotypes of these conditions.

John Chen

OCT angiography, AION, and glaucoma

Liu CH, Wu WC, Sun MH, Kao LY, Lee YS, Chen HS. Comparison of the retinal microvascular density between open angle glaucoma and nonarteritic anterior ischemic optic neuropathy. *Invest Ophthalmol Vis Sci.* 2017;58:3350–3356.

Ischemic optic neuropathy in nonacute phase may sometimes be confused with glaucoma. Using Optical coherence tomography angiography (OCT-A), Liu *et al.* compared peripapillary and parafoveal superficial retinal microvasculature between 10 nonarteritic anterior ischemic optic neuropathy (NAION) eyes, 16 OAG eyes with altitudinal hemifield defects and 27 normal eyes. They found that the NAION group demonstrated marked decrease in average circumpapillary vessel density, while the OAG group demonstrated significant decreased macular and

perifoveal vessel density. The authors proposed that the attenuation of peripapillary retinal vasculature was less severe in glaucomatous eyes because the retinal ganglion cells may still be in the stage of reversible dysfunction. On the other hand, marked decrease in macular retinal vasculature in OAG group may indicate early involvement of macular vessel density in glaucoma. The major limitation in this study is the small sample size. Further large-scale studies are needed to confirm the structure–perfusion relationships and offer a better understanding of the pathophysiology of these two diseases.

Hui-Chen Cheng

A novel oculomotor prosthetic for acquired nystagmus

Nachev P, Rose GE, Verity DH, et al. Magnetic oculomotor prosthetics for acquired nystagmus. *Ophthalmology* 2017;124:1556–1564.

Acquired nystagmus is usually associated with oscillopsia, which lead to disability and reduced visual acuity. It also has variable response to pharmacotherapy. Nachev *et al.* tried to establish a physical method to damp the oscillation at the point of fixation, allowing unhindered gaze shifts at other times. They designed a pair of interacting magnetic elements, which composed of an orbital part fixed to the orbital wall (orbital floor for vertical nystagmus and lateral wall for horizontal nystagmus) and an ocular part tethered to an extraocular muscle. They proposed that the magnetic force will damp ocular oscillation, while leaves a full range of motion and essentially saccadic gaze shifts. A 49-year-old male with medication-resistant upbeat nystagmus received the implantation of this new device. After the operation, the patient reported improved visual acuity. Reductions in the amplitude, drift velocity, frequency and intensity of the nystagmus were also measured objectively. The improvements sustained during a 4 years follow-up and enable the patient to return to employment. We expect more clinical results from this new magnetic oculomotor prosthetics, which might improve the quality of life in

patients with acquired nystagmus refractory to all other interventions.

Hui-Chen Cheng

Cholangiocarcinoma and the eye

Rico G, Smith SV, Siddiqui Y, Whyte A, Gombos D, Lee AG. Neuro-ophthalmologic manifestations of cholangiocarcinoma: a case series. *Eye (Lond)*. 2017;31(8):1245–1248.

Cholangiocarcinoma is a rare cancer of the biliary tract epithelium. In this case series, the authors report neuro-ophthalmic manifestations in five patients with cholangiocarcinoma that metastasized to the brain or orbits. This series is unique in that the neuro-ophthalmic manifestations were the presenting features in two cases: (1) a 72 year-old man who had homonymous hemianopia caused by left occipital infarcts. Stroke and systemic assessments revealed a hypercoagulable state, multiple cerebral infarcts, and locally advanced cholangiocarcinoma. (2) The other case was a 41 year-old female who presented with diplopia caused by metastasis to the clivus compressing the right 6th nerve. The other three cases presented 2–4 years after diagnosis with cholangiocarcinoma. A 57 year-old woman who had diplopia because of metastasis to the left medial rectus muscle that was associated with gradual loss of vision because of extension to the orbital apex with optic nerve compression and two cases (53 year-old man and 71 year-old woman) who had right homonymous hemianopia because of occipital metastasis. Metastasis from cholangiocarcinoma was confirmed in four patients after biopsy and histopathological examination. Although rare, the incidence of this cancer and its systemic complications is rising due to the increasing prevalence of its risk factors diabetes and obesity.

Omar Solyman & Peter MacIntosh

OCT angiography, AION, (but no glaucoma)

Sharma S, Ang M, Najjar RP, Sng C, Cheung CY, Rukmini AV, Schmetterer L, Milea D.

Optical coherence tomography angiography in acute non-arteritic anterior ischaemic optic neuropathy. *Br J Ophthalmol*. 2017;101(8):1045–1051.

In this observational study, the authors used OCT-A (RTVue XR 100 OCT-A Optovue, Fremont, California, USA) to quantify flow in peripapillary choroidal and retinal blood vessels in six eyes of five patients with confirmed diagnosis of acute NAION (within 1 week of visual loss) and compared the results with those of the opposite normal eyes and with results from 19 eyes of 19 age matched normal controls. Flow density was rendered using RTVue XR beta version software within 750 μm wide elliptical annulus extending from the optic disc boundary. Flow was studied for both the retina and choroid combined and for choroidal circulation alone. For the retina and choroid, a segment between the outer aspect of the internal limiting membrane as an inner border and a line 180 μm below the Bruch membrane as an outer border was studied. To study the peripapillary choroidal flow alone a layer was delineated using a semi-automated chorioretinal algorithm between the Bruch's membrane and the line situated 180 μm below.

OCT-A images evaluated separately by two independent investigators revealed global reduction of the mean peripapillary flow density in eyes with NAION ($53.5 \pm 3.7\%$) compared with normal eyes ($64.3 \pm 2.4\%$) ($p < 0.001$). The mean vascular flow density was also reduced in the peripapillary choroid layer of eyes with NAION ($53.2 \pm 7.8\%$) compared with controls ($69.5 \pm 3.0\%$) ($p < 0.001$). Follow-up OCT-A in three patients showed a spontaneous partial recovery of the peripapillary flow densities after resolution of the optic disc oedema accompanied with partial improvement of visual function. The authors concluded that OCT-A is useful for evaluating the peripapillary microvasculature in acute NAION and for follow-up, however further studies are needed to validate these preliminary findings.

Omar Solyman & Peter MacIntosh

Optic disc haemorrhages in pseudotumour cerebri

Wall M, Thurtell MJ. NORDIC idiopathic intracranial hypertension study group. optic disc haemorrhages at baseline as a risk factor for poor outcome in the idiopathic intracranial hypertension treatment trial. *Br J Ophthalmol*. 2017;101(9):1256–1260.

In this study, the authors from the neuro-ophthalmology research disease investigator consortium (NORDIC) who conducted the idiopathic intracranial hypertension treatment trial (IIHTT) investigated the type, frequency and significance of optic disc haemorrhages in subjects enrolled in IIHTT. IIHTT involved 165 patients with IIH, bilateral papilledema, and mild visual field loss defined as perimetric MD between -2 and -7 dB. It was conducted at 38 neuro-ophthalmology centres in the US and Canada over 3-year period and patients were randomized to receive low sodium diet either with acetazolamide or with placebo. Of a total of 165 subjects of IIHTT, 133 who had data at baseline and 6 months (69 from the acetazolamide group and 57 from the placebo group in addition to seven patients who reached the end-point criteria of treatment failure) were included. Treatment failure was defined by the study protocol as when a subject with baseline MD up to -3.5 dB develops visual function worsening by more than 2 dB MD from baseline in either eye, or when a subject with baseline MD between -3.5 and -7 dB develops visual function worsening by more than 3 dB MD from baseline in either eye on a follow up perimetric examination.

Optic disc haemorrhages were found in 31.6% of study subjects in at least one eye, most were nerve fibre layer haemorrhages (27.2%) while subretinal haemorrhages were less common (4.4%). Haemorrhages were noted to be most frequent where the nerve fibre layer is thickest at the superior and inferior poles of the optic disc. Significant correlation was noted between the presence of nerve fibre layer haemorrhages and the high baseline Frisén grade of papilledema and with higher baseline intracranial pressure on lumbar puncture; however correlation with perimetric mean deviation (PMD) at baseline and PMD change at six

months was poor. Also, nerve fibre layer haemorrhages were present in five out of seven (71%) of the subjects who met the criteria of IIHTT protocol-defined treatment failure. The authors concluded that nerve fibre layer haemorrhages in the context of IIH with mild visual loss may indicate poorer visual outcome. Hence, more aggressive control of intracranial pressure and related optic disc oedema in addition to timely initial follow-up examinations are recommended in patients of IIH with nerve fibre layer haemorrhages.

Omar Solyman & Peter MacIntosh

Oscillopsia suppression

Ahmad H, Roberts RE, Patel M, Lobo R, Seemungal B, Arshad Q, Bronstein A. Downregulation of early visual cortex excitability mediates oscillopsia suppression. *Neurology* 2017;89(11):1179–1185.

The authors designed and implemented a prospective study of 12 patients who presented with bilateral vestibular failure and normal hearing. They investigated V1/V2 excitability using transcranial magnetic stimulation (TMS) in these patients and 12 healthy controls. They assessed TMS-induced phosphene thresholds at baseline and cortical excitability changes while performing a visual motion adaptation paradigm during the following conditions: baseline measures (i.e. static), during visual motion (i.e. motion before adaptation), and during visual motion after 5 minutes of unidirectional visual motion adaptation (i.e. motion adapted). Patients had significantly higher baseline phosphene thresholds, reflecting an underlying adaptive mechanism. Individual thresholds were correlated with oscillopsia symptom load. During the visual motion adaptation condition, no differences in excitability at baseline were observed, but during both the motion before adaptation and motion adapted conditions, we observed significantly attenuated cortical excitability in patients. Again, this attenuation in excitability was stronger in less symptomatic patients. The authors findings provide neurophysiologic evidence that cortically mediated adaptive mechanisms in V1/V2 play a

critical role in suppressing oscillopsia in patients with bilateral vestibular failure.

Michael Vaphiades

White matter disease and stroke

Wardlaw JM, Chappell FM, Valdés Hernández MDC, Makin SDJ, Staals J, Shuler K, Thrippleton MJ, Armitage PA, Muñoz-Maniega S, Heye AK, Sakka E, Dennis MS. White matter hyperintensity reduction and outcomes after minor stroke. *Neurology* 2017;89(10):1003–1010.

This prospective study of 190 patients who presented within 4 weeks of minor ischemic stroke or lacunar or cortical subtype underwent neuroimaging. At 1 year, they assessed recurrent cerebrovascular events and dependency and repeated the MRI. They assessed change in white matter hyperintensity (WMH) volume from baseline to 1 year. Among 190 participants, WMH decreased in 71 participants by 1 year. At baseline, participants whose WMH decreased had similar WMH volumes but higher blood pressure ($p = 0.0064$) compared with participants whose WMH increased. Patients with WMH increase experienced more recurrent cerebrovascular events. Study limitations include the complexities of differentiating WMH volume from infarcts. WMH pathogenesis is poorly understood and multiple mechanisms may contribute to WMD.

Michael Vaphiades

Imaging pituitary tumours

Ryu WHA, Starreveld Y, Burton JM, Liu J, Costello F. PITNET Study Group. The utility of magnetic resonance imaging in assessing patients with pituitary tumours compressing the anterior visual pathway. *J Neuroophthalmol.* 2017 Sep;37(3):230–238.

The purpose of this study was to evaluate the various MRI-based structural analyses and to explore the relationship between measures of structure and function in the afferent visual pathway of patients with pituitary tumours. The authors performed a critical review of literature on MRI-based structural analyses of pituitary

adenomas from October 2010 to January 2014. They reviewed a total of 443 citations, eight of these studies met inclusion/exclusion criteria and were retrieved for critical review and only two studies examined the relationship between MRI-based structural measurements and postoperative visual recovery. MRI analysis of chiasm elevation, severity of optic nerve compression, chiasm position, height of chiasm, tumour height, and tumour volume failed to differentiate patients with postoperative visual dysfunction vs. those with visual recovery. Although MRI-based structural analysis is an important and useful tool for managing patients with pituitary tumours, there are limited objective measures shown to be predictive of postoperative visual recovery.

Michael Vaphiades

The quantiferon assay

Little LM, Rigi M, Suleiman A, Smith SV, Graviss EA, Foroozan R, Lee AG. The QuantiFERON-TB gold in-tube assay in neuro-ophthalmology. *J Neuroophthalmol.* 2017;37(3):242–246.

Ninety-nine patients from 2 neuro-ophthalmology centres were identified as having undergone QFT-GIT testing between January 2012 and February 2016. Patients were divided into groups of negative, indeterminate, and positive QFT-GIT results. Records of patients with positive QFT-GIT results were reviewed for development of latent or active TB. Of the 99 cases reviewed, 18 patients had positive QFT-GIT tests. Of these 18 cases, 12 had documentation of chest radiographs or computed tomography which showed no evidence for either active TB or pulmonary latent TB infection (LTBI). Four had chest imaging which was indicative of possible LTBI. None of these 18 patients had symptoms of active TB and none developed active TB within the follow-up period. Based on our results, we conclude that routine testing with QFT-GIT in a low-risk cohort did not diagnose active TB infection. We do not recommend routine QFT-GIT testing for TB low-risk individuals, as discerned through patient and exposure history, ocular

examination, and clinical judgment, in neuro-ophthalmology practice.

Michael Vaphiades

Pupils in dorsal midbrain syndrome

Kelbsch CB, Maeda F, Strasser T, Peters TM, Wilhelm BJC, Wilhelm HM. Color pupillography in dorsal midbrain syndrome. *J Neuroophthalmol.* 2017 Sep;37(3):247–252.

Colour pupillography was performed in five patients with DMS and in 20 controls using full-field red stimuli that primarily address the rod/cone system and blue stimuli that preferentially activate intrinsically photosensitive retinal ganglion cells (ipRGCs) directly. The pupillary light reflex in patients with DMS was reduced, differed in shape, and showed a prolonged latency time compared to normal subjects. Limitations include a small sample size and one patient had disc pallor which may have altered pupil responses. In DMS, the melanopsin-mediated ipRGC pathway appears relatively preserved.

Michael Vaphiades

The forced eyelid closure test

Apinyawasisuk S, Zhou X, Tian JJ, Garcia GA, Karanjia R, Sadun AA. Validity of forced eyelid closure test: a novel clinical screening test for ocular myasthenia gravis. *J Neuroophthalmol.* 2017 Sep;37(3):253–257.

A retrospective chart review of 48 patients that presented with ptosis and/or diplopia who had a forced eyelid closure test (FECT). To perform FECT, the patient was asked to squeeze his or her eyelids shut for 5–10 seconds then open quickly and fixate in primary position. The excessive upward overshoot of eyelids movement indicated a positive test and assisting in the diagnosis of ocular myasthenia gravis (OMG). Of the 48 patients studied, 18 patients had positive FECT; 15 of whom had a final diagnosis of OMG (83.3%). Of the 30 patients with negative FECT, 1 had OMG (3.3%). Sensitivity and specificity of FECT were 94% and 91%. Limitations include a small sample size and the examiner was not completely

masked to the patient symptoms. FECT is a simple clinical screening test with good sensitivity and specificity for OMG.

Michael Vaphiades

Age and ischemic optic neuropathy

Sun MH, Liao YJ. Structure-function analysis of nonarteritic anterior ischemic optic neuropathy and age-related differences in outcome. *J Neuroophthalmol.* 2017 Sep;37(3):258–264.

In this retrospective study of 55 nonarteritic anterior ischemic optic neuropathy (NAION) eyes in 34 patients to assess clinical outcome and perform structure-function correlations. Sixty-seven percent of patients presented with their first event between the ages of 40 and 60 years, and 32% presented at ≤ 50 years. Those with NAION onset at age ≤ 50 years did not have significantly better visual outcome per visual acuity, automated PMD or OCT measurements. Patients with age > 50 years at NAION onset was associated with greater risk of second eye involvement. Older age at onset was significantly correlated with greater thinning of the ganglion cell complex (GCC) but not with visual acuity, PMD, or thinning of RNFL. Limitations include the retrospective nature, small sample size and the arbitrary nature of choosing age > 50 as the cutoff for data analysis. The authors showed that NAION onset at age > 50 years had a greater risk of second eye involvement. Patients with OCT mean RNFL thickness $> 65 \mu\text{m}$ and mean macular GCC thickness $> 55 \mu\text{m}$ had better visual outcomes.

Michael Vaphiades

Sleep-induced apraxia of eyelid opening

Reggie, SN, Chen, JJ, Lee MS, Chung SM. Sleep-induced apraxia of eyelid opening. *J Neuroophthalmol.* 2017 Dec;37(4):390–392.

The authors reported 11 patients age range 35–80 years who experienced apraxia of eyelid opening (AEO) on awakening from sleep thought to occur in isolation and as an idiopathic phenomenon, unassociated with a

neurodegenerative disease. After initial manual elevation, all patients reported normal function and position of the eyelids for the remainder of the day. The authors concluded that AEO occurring only upon waking from sleep is a rare entity. Neuroimaging and extensive laboratory testing are not indicated without associated neurologic or ocular findings. There may be a Caucasian female preponderance and autoimmune link in patients with AEO, but further studies are required.

Michael Vaphiades

MS and intraocular pressure

Lincoff NS, Buccilli A, Weinstock-Guttman B, Sieminski S, Gandhi S. Is multiple sclerosis

associated with a lower intraocular pressure? *J Neuroophthalmol.* 2017 Sep;37(3):265–267.

In this retrospective study of 30 patients with clinically definite multiple sclerosis (MS) underwent IOP recording by a single investigator using kinetic applanation tonometry. The average intraocular pressure (IOP) in MS group was 12.3 mm Hg and in the control group was 17 mm Hg. There was a significant effect of presence of MS on IOP accounting for 53% variability in mean IOP when compared with the control group. Limitations include the retrospective nature and small sample size. This study demonstrated that IOP was significantly lower in patients with MS compared with controls.

Michael Vaphiades