



Programme and Abstracts



Welcome

Dear Friends,

We are very pleased to be able to welcome you to Aylesbury, the County Town of Buckinghamshire and home to the Aylesbury duck, noted for its pure white colour, large size and (allegedly) delicious flavour. The BriSCEV 2006 logo is the figure of John Hampden (1596-1643) who was a local nobleman, and a famous Parliamentarian. Hampden was famous for resisting an unjust tax imposed by King Charles I and eventually fought on the side of Parliament in the Civil War. Stoke Mandeville Hospital is best known as the home to the world's first Spinal Injuries Unit, founded by Sir Ludwig Guttmann and championed in recent years by Sir Jimmy Savile. The Guttmann Centre and the Olympic Lodge play host every year to an international competition for athletes with disabilities.

Although Stoke Mandeville Hospital is not a university teaching hospital, it has a long tradition of clinical research and teaching. We hope that you will enjoy the facilities, the academic programme and the social programme. Those of you who have travelled by car or who have brought cycles may also be able to enjoy the surrounding areas which include the Chiltern Hills, stately homes such as Waddesdon Manor and picturesque villages with thatched houses. Bird watchers may be able to catch sight of the Red Kite (common on the Chiltern escarpment) or the more elusive Firecrest (Wendover Woods).

Many of you will have to hurry away at the end of the meeting, but perhaps you should consider returning to the area for a short break to recharge your batteries on another occasion.

Richard Smith
David Sculfor
Conference Organisers



Sponsors

We are indebted to our generous sponsors for this meeting. Please take the time to meet them on the exhibition stands during refreshment breaks, or whenever you have a spare moment. They help to keep the cost of your meeting down!

The logo for Diagnosys, consisting of a blue square containing a white circular icon with a dot in the center, followed by the word "diagnosys" in a white, lowercase, sans-serif font.The logo for Roland Instruments, featuring a stylized blue starburst icon to the left of the word "ROLAND" in a bold, black, uppercase, sans-serif font, with the word "INSTRUMENTS" in a smaller, black, uppercase, sans-serif font below it.



Programme

Monday 4th September 2006

- 10.30 Registration opens
- 10.45 Officers' meeting
- 12.00 Clinical cases session with buffet lunch
- 13.15 Welcome
- 13.30 Keynote Lecture 1: "Melanopsin, mice and men"
Professor Russell Foster (University of Oxford)
- 14.30 Tea and commercial exhibition
- 15.00 Oral presentations
(Chair: Miss Chea Lim)
- 16.30 BRISCEV membership meeting
- 18.00 Coach departs from Olympic Lodge for Oxford
- Midnight Coach returns to Olympic Lodge



Programme

Tuesday 5th September 2006

- 9.15 Keynote Lecture 2: "A plethora of processes – the ERG since Granit"
Professor John Robson FRS (Cambridge, Houston)
- 10.15 Coffee and commercial exhibition
- 10.45 Poster parade
- 12.15 Lunch and commercial exhibition
- 13.15 Oral presentations 2
(Chair: Dr Lawrence Brown)
- 14.30 Tea
- 15.00 Nitty-gritty session
(Chair: Professor Colin Barber)
- 16.30 Meeting ends



Monday 4th September 2006

Keynote Lecture 1

Melanopsin, mice and men

Professor Russell Foster
University of Oxford

Notes



Monday 4th September 2006

Oral Presentations

**15.00 Oral presentations
(Chair, Miss Chea Lim)**

- 15.00 Atypical fundus phenotypes in X-Linked Retinoschisis (XLRS):
Robson AG, Tsang H, Vaclavik V et al
- 15.15 A retrospective case-note analysis of the utility of chromatest and pattern reversal VEP in the management of dysthyroid eye disease:
Fox M, Lakshmanan A, Lim C, Barber C.
- 15.30 Dynamic random dot stereograms: useful stimuli for assessing stereopsis?
Shahani U, Manahilov V, Mihaylov P et al.
- 15.45 Contrast sensitivity using sweep VEP in bilateral pseudophakic children:
Cunningham I, Chandna A, Chen S.
- 16.00 Retest variability in a group of normal subjects:
Hogg C.
- 16.15 Clinical utility of the multifocal VEP:
Barber C.



4th BriSCEV Meeting
Stoke Mandeville Hospital
4-5th September 2006

Monday 4th September 2006

Oral Presentations

ATYPICAL FUNDUS PHENOTYPES IN X-LINKED RETINOSCHISIS (XLRS)

Anthony G. Robson¹, Stephen H. Tsang^{1,2}, Veronika Vaclavik,³ Anthony T Moore,^{1,3} Alan C. Bird,³
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Purpose: To characterize atypical manifestations of X-linked retinoschisis.

Methods: Nine patients, without typical fundus features of XLRS, were referred for the evaluation of reduced visual acuity. Ages ranged from 4 to 50 years. All patients underwent full-field electroretinography (ERG) and 8 cases underwent pattern ERG (PERG) testing. Optical coherence tomography (OCT) and fundus autofluorescence (AF) imaging were performed in selected cases. All patients' genomic DNAs were subjected to molecular genetic analysis.

Results: Full-field ERG revealed abnormalities that included an electronegative dark adapted maximal ERG (8 cases) or a low b:a ration (1 case), consistent with generalized dysfunction that is post-phototransduction or inner retinal in origin. Pattern ERGs were undetectable or subnormal in all eight cases tested, indicating macular dysfunction. The nature of the full-field ERG abnormality directed mutational screening and all patients were found to have mutations in *RS1*. Visual acuities ranged from 6/9 to hand movements. Fundus findings included fine, intraretinal white dots that were sometimes associated with localized retinal pigment epithelium (RPE) pigmentation abnormalities within the macula (6 cases). Other fundus phenotypes included widespread inner retinal reflex (1 case), unilateral retinal fold (1 case) and an isolated parafoveal pinpoint lesion (1 case). Fundus AF of the macula revealed abnormalities in all 3 patients tested. A para-foveal ring of high density AF was present in three eyes; one patient showed foci of high density that corresponded with the white dots. OCT failed to show foveal schisis in five of the eight eyes examined.

Conclusions: Fundus phenotypes in XLRS are variable. Multiple fine white dots at the macula or a widespread metallic sheen may be the presenting fundus feature. Electrophysiology is important as it suggests dysfunction that is post-phototransduction and enables focused mutational screening. Autofluorescence imaging suggests early RPE involvement; a para-foveal ring of high density AF has not previously been described in this disorder.



Monday 4th September 2006

Oral Presentations

A RETROSPECTIVE CASE-NOTE ANALYSIS OF THE UTILITY OF CHROMATEST AND PATTERN REVERSAL VISUAL EVOKED POTENTIALS IN THE MANAGEMENT OF DYSTHYROID EYE DISEASE

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Purpose: To assess whether test outcomes for Chromatest (ChrT) and pattern reversal visual evoked potentials (PRVEP) aid the management of patients with dysthyroid eye disease.

Method: All patients referred with dysthyroid eye disease to the Evoked Potentials (EP) Clinic at Queen's Medical Centre undergo either PRVEP only or PRVEP and ChrT. Patients referred with dysthyroid eye disease since February 2003 were included in this analysis, with tests occurring between June 1995 and March 2006. Test outcomes were recorded from the medical physicist's report. Hospital notes for each patient were scrutinized to determine patient management after each EP Clinic visit, when the test results were available to the clinician. The visual acuity (VA) and presence or absence of relative afferent pupillary defect (RAPD) was also recorded on the proforma.

A Physicist specialising in visual EPs judged the utility of test results on their effect on management:

- | | | |
|-------------|---|--|
| Essential | - | treatment followed as a direct result of testing |
| Helpful | - | treatment was supported by the test results |
| Unnecessary | - | the test results did not appear to be consulted. |

The outcomes of different tests were compared to one another.

Results: 32 patients with dysthyroid eye disease have been referred for EP testing since February 2003. 4 were excluded due to ophthalmic co-pathology and 4 sets of hospital notes were not available. Of the 24 remaining patients 6 were male. The average age at the first EP clinic visit was 53 ± 20 years, range 33-72 years. There was a total of 52 EP clinic visits with 9 visits comprising PRVEP testing only. No association was found between VA and PRVEP results. In 75% of visits treatment did not change after the clinician had the test results. After 23% of visits, treatment was initiated. In 10% of visits, the tests were essential to patient management. 77% were helpful. 12% were unnecessary. 4% were not used in the clinical decision making process as they did not agree with the clinical picture, despite being consistent with optic nerve compression. Of the 18 visits resulting in an abnormal ChrT, only one had a normal PRVEP and that patient was colour blind. Of the 24 visits resulting in an abnormal PRVEP, 13 (51%) had abnormal ChrT and 6 (33%) had RAPD. Of the 8 visits resulting in RAPD, none had normal PRVEP. 38% of tests with abnormal PRVEP had subsequent surgery and 21% were in the process of receiving or were referred for pulsed steroids.



Monday 4th September 2006

Oral Presentations

**A RETROSPECTIVE CASE-NOTE ANALYSIS OF THE UTILITY OF CHROMATEST AND
PATTERN REVERSAL VISUAL EVOKED POTENTIALS IN THE MANAGEMENT OF DYSTHYROID
EYE DISEASE**

Conclusions: PRVEP testing is very useful in the management of thyroid eye disease both to detect optic nerve compression and monitor response to interventions. ChrT is less sensitive. Other than RAPD, PRVEP is the only widely accessible objective functional test and is more sensitive than RAPD to optic nerve compression. The PRVEP is quick, non-invasive and does not involve radiation. The limitations of the study were that it was sometimes difficult to assess the utility of the tests using the notes and the small sample size.

Acknowledgements: L Hall², S Waites²



Monday 4th September 2006

Oral Presentations

DYNAMIC RANDON DOT STEROGRAMS. USEFUL STIMULI FOR ASSESSING STEREOPSIS?

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Purpose: Stereopsis is the ability of the visual system to perceive three-dimensionality from the 2-dimensional images formed on each retina (Hirsch, 1996). It is achieved by cortical neurons that respond to binocular input and varying levels of horizontal disparity. The purpose of our study was to use dynamic random-dot anaglyphic stereograms to follow the stereoscopically induced VEP in normal children and adults.

Methods: The stimulus consisted of sine waves appearing every one-second from a dynamic random red-green dot background. The stimulus lasted for 500ms. Subjects viewed the stimulus using red green glasses. Electrophysiological recordings were collected using 32 electrodes and a modified template of the international 10/20 system. Electro-oculograms (EOG) were also recorded to monitor blinks (BioSemi Active II flat-type and pin type electrodes). Data were analysed offline using MATLAB.

Results: Preliminary data from subjects with normal binocular vision indicated that the first positivity linked to the appearance of the sine wave in the dynamic stimulus appeared at between 300 and 400 milliseconds over occipito-parietal and temporal regions. Morlet waveform analysis showed induced temporal frequencies around 40Hz over temporal and parietal locations. Evoked time-frequency spectra showed a similar pattern.

Discussion: Dynamic random dot stereograms may prove to be a useful way of assessing the development of stereopsis.



Monday 4th September 2006

Oral Presentations

CONTRAST SENSITIVITY USING SWEEP VEP IN BILATERAL PSEUDOPHAKIC CHILDREN

Ian Cunningham, Arvind Chandna, Sean Chen
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Purpose: The disruptive effects of partial cataracts to the visual system are unknown. Objective clinical decisions are made regarding surgery on the appearance of the cataract and any sensory changes i.e. strabismus and/or nystagmus. We present here data collected in older verbal children, using sweep VEP parameters, that had their cataracts removed later during childhood.

Methods: Contrast sensitivity was tested in six children with bilateral cataracts and compared to six normal young adults. The children in the cataract group were pseudophakic. Cataracts had initially been diagnosed as partial and were not interfering with visual development. The swept parameter VEP was used to estimate contrast thresholds by extrapolating the response functions to zero amplitude. Contrast stimuli were swept between 2 (low-contrast) and 80% (high contrast) using pattern-reversal modulation. Temporal frequency ranged from 3.76 to 7.51Hz with fixed spatial frequency at 2cpd.

Results: Mean age for cataract extraction was 5.47 ± 2.2 yrs. The mean age at time of test was 9.6 ± 1.7 yrs with an average time of 3.8 ± 1 yrs since the cataract was removed. Mean contrast sensitivity in the pseudophakic group was reduced compared to the control group; however the cataract children showed greater intra-group variability (cataract: $8.96 \pm 4.05\%$; control: $3.80 \pm 0.89\%$, $p=0.10$).

Conclusions: There was a trend for contrast sensitivity in pseudophakic children that had bilateral partial cataracts to be lower than in a normally developed visual system. The disruptive effects of dense cataracts are predictable but it is likely that other visual functions maybe disrupted for children even with partial cataracts. We have found the sweep VEP useful to determine contrast sensitivity thresholds in older verbal children and hope to extend the usefulness of this clinical tool by examining visual functions for babies and young children with cataracts.



Tuesday 5th September 2006

Oral Presentations

RETEST VARIABILITY IN A GROUP OF NORMAL SUBJECTS

Chris Hogg
Moorfields Eye Hospital, London

Purpose: To investigate the test - retest variability of commonly used electrophysiological tests.

Methods: Healthy male volunteers aged 18 to 40 were screened for systemic and ophthalmic disease. Twenty four normal volunteers were selected, and tested in 3 groups of 8 subjects. Each group was examined using a battery of standardised test procedures, including pattern and ganzfeld ERGs, and VEPs, visual acuity, colour contrast sensitivity and dark adaptation, on 4 visits at 2 week intervals. The degree of inter-visit variability in the routinely measured parameters was examined.

Results: Substantial variation was found in the repeatability many parameters.

Conclusion: Possible explanations for this variability and the means of reducing it are discussed. The interpretation of variation in test results over time should be viewed with caution.

Funding: The data used in this study was recorded as part of a phase one pharmaceutical trial funded by Organon.



Monday 4th September 2006

Oral Presentations

CLINICAL UTILITY OF THE MULTIFOCAL VEP

Professor Colin Barber
Queens Medical Centre, Nottingham

Purpose: This talk will give some practical examples of situations where the multifocal VEP has made a contribution to diagnosis or patient management.



Social Programme

Monday 4th September 2006

- 18.00 Coaches Depart from Olympic Lodge for Oxford
- 20.00 Dinner at Cherwell Boat House
- 23.00 Coaches Depart for Olympic Lodge, Aylesbury



Tuesday 5th September 2006

Keynote Lecture 2

A plethora of processes – the ERG since Granit

Professor John Robson FRS
Cambridge, Houston

Notes



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Tuesday 5th September 2006

Poster Parade

OBJECTIVE AND SUBJECTIVE ASSESSMENT OF THE EFFECT OF INTRAVITREAL TRIAMCINOLONE ACETONIDE IN IDIOPATHIC JUXTAFOVEAL RETINAL TELANGIECTASIS TYPE 2A PATIENTS

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Purpose: To monitor the effect of intravitreal triamcinolone acetonide in patients with idiopathic juxtafoveal retinal telangiectasis (IJRT) type 2A by measuring the mfERG, visual acuity, contrast sensitivity and foveal thickness.

Methods: In this prospective case series, patients were identified who had IJRT type 2A who had received a single intravitreal triamcinolone acetonide (4mg) and had reached 12 months of follow up. Patients received logMAR visual acuity (VA), contrast sensitivity (CS), central foveal thickness (by OCT) measurements and mfERG recordings before and at 1, 3, 6, 9 and 12 months after injection.

Results: Seven eyes of 5 patients were included. Macular OCT examination at baseline revealed sub-retinal fluid and retinal thickening in only 2 eyes, which showed a dramatic improvement of central foveal thickness at 1 month post injection. This effect was maintained until 6 months, after which there was a slow increase, but it had still not returned to baseline at 12 months. Patients without retinal thickening did not show significant change in foveal thickness with time. Patients with retinal thickening did not show improvement in VA, whereas those without retinal thickening did. The median change VA for patients without retinal thickening showed an improvement at 1 month with a slow return to baseline between 6 and 12 months. However, the CS of patients with retinal thickening showed an improvement, whereas those without retinal thickening did not. The first order kernel mfERG responses were analysed and local responses were grouped into central (0-7.5°) and peripheral (7.5°-30°) two concentric groups. P1 (peak to peak) amplitudes of the central response of patients without retinal thickening were increased at 1 month with return to baseline in about 3 months, whereas those with foveal thickening were increased 3 months after injection and retained this improvement until at least 9 months. There were no significant changes in P1 amplitude of responses from the peripheral group for patients with or without retinal thickening. There were no significant changes in P1 latency of responses from both the central and peripheral groups in all patients.

Conclusion: Patients without retinal thickening showed improvements in the mfERG and VA at 1 month and gradually return to baseline, while it did not show any improvement in CS. On the other hand, patients with retinal thickening showed improvements in central foveal thickness and CS at 1 month, and in the mfERG at about 3 months after injection, but did not show any significant change in VA over the 12 months follow up period.

Both subjective and objective assessments demonstrate that intravitreal triamcinolone acetonide may be an effective short-term treatment for improving the symptoms of IJRT type 2A in patients with and without central foveal thickening.



Tuesday 5th September 2006

Poster Parade

RELATIONSHIP BETWEEN OPTICAL COHERENCE TOMOGRAPHY FEATURES AND MULTIFOCAL ELECTRORETINOGRAPHY IN PATIENTS WITH SUBFOVEAL CHOROIDAL NEOVASCULARISATION

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Purpose: To investigate the relationship between optical coherence tomography (OCT) and multifocal electroretinography (mfERG) in subfoveal predominantly classic choroidal neovascularisation (CNV) secondary to age-related macular degeneration (AMD).

Methods: Patients with subfoveal CNV secondary to AMD were prospectively recruited. All patients had: refraction protocol log MAR visual acuity (VA), fluorescein angiography, mfERG and Stratus OCT (OCT3). 19 segment mfERGs (Roland Consult Retiscan system) stimulating the central 40° diameter field were recorded and summarised by the P1 amplitude density and latency of three concentric rings. 5mm horizontal line and fast macular OCT3 scans passing through the fovea were obtained. Measurements on OCT3 were: neuro-retinal foveal thickness (NFT), bilaminar foveal thickness (BFT), outer high reflectivity band thickness (OHRBT) and intra retinal fluid (IRF). As the OCT measurements were made at the fovea, only central ring measurements were used for the analysis. Linear correlation between variables was analysed using Pearson correlation coefficient. P values of ≤ 0.05 were taken to be significant.

Results: 28 eyes of 28 patients were recruited. The OHRBT was significantly thicker in eyes with reduced P1 amplitude density in the central mfERG ring ($p=0.002$). There was no correlation between P1 amplitude density of the rings and VA, NFT nor BFT. There was also no correlation between P1 latency and OCT3 measurements (i.e. NFT, BFT, OHRBT) ($p>0.05$). There were trend associations between OHRBT, VA and P1 amplitude density/ latency. There was no difference in the mfERG parameters between eyes with and without IRF.

Conclusion: Our results suggest that increased OHRBT and associated RPE dysfunction may render neuroretinal dysfunction detectable on mfERG. MfERG responses appear not to be associated with increased retinal thickness.



Tuesday 5th September 2006

Poster Parade

SENSORY PROCESSING IN A CHILD WITH ALOBAR HOLOPROSENCEPHALY

Alki Liasis^{1,2}, Sam Hayton^{1,2}, Goran Hildebrand¹, Dorothy Thompson^{1,2}, David Taylor^{1,2}

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Purpose: Holoprosencephaly (HPC) is a disorder caused by the failure of the prosencephalon to divide into the double lobes of the cerebral hemispheres, an event which is normally complete by embryonic day 35 and has an incidence of 1:16000. There are four major categories of HPC: Alobar is the most severe when the brain is not divided; Semi-Lobar is when the brain is partially divided onto two hemispheres; Lobar when the brain is divided, but there are some mild abnormalities and the Middle Interhemispheric Variant where the posterior frontal and parietal lobes are not well separated.

We report a 4 year old child with a severe form of alobar HPC who was not expected to survive after birth and remained in hospital for the first 20 days of life. Magnetic resonance imaging at 1 month and at 4 years of age revealed agenesis of the corpus callosum, absent third ventricle and fused thalami and basal ganglia.

At assessment the child did not have any meaningful sounds or words, but she did seem to respond visually and smile in response to facial gestures. Due to her inability to verbally communicate a number of electrophysiological investigations were carried out to provide further information regarding her sensory processing.

Methods: Visual auditory and somatosensory investigations were carried out. Pattern reversal visual evoked potentials were recorded in response to a range of high contrast check sizes (400-12.5') presented in a 28 degree test field. Long latency auditory evoked potentials to tone bursts with a 5ms rise and fall time were recorded during binaural stimulation to a range of frequencies (1-3KHz). Somatosensory evoked potentials were recorded over the left hemisphere in response to right median nerve stimulation at the wrist (during stimulation a thumb twitch was observed).

Results: Evoked potentials were recorded to all sensory modalities. Pattern reversal VEPs during binocular stimulation were evident to all tested checksizes, recorded maximally over Pz. Responses consisted of two positive peaks at 85ms and 120ms. The first peak was better defined for the larger test checks. Auditory evoked potentials recorded maximally over Fz with positive peaks at 130 and 185ms. Increases in stimulus frequency resulted in a decrease in amplitude of the two components. Somatosensory evoked potentials although degraded evoked reproducible responses with a negative component at 25ms over TP7.

Conclusion: The prognosis for alobar HPC is generally poor with most infants dying shortly after birth with survivors having marked developmental delay. The HPC diagnosis is based on structural investigations. This case shows that electrophysiological measures are able to identify and quantify the extent of sensory processing present in the small number of surviving children with alobar HPC.



Tuesday 5th September 2006

Poster Parade

COMPLETE CONGENITAL STATIONARY NIGHT BLINDNESS (CSNB1) WITH KERATOCONUS

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Purpose: To present the clinical and electrophysiological characteristics of a gentleman with keratoconus associated with X-linked complete congenital stationary night blindness (CSNB1).

Design: Case Report

Methods: The authors describe the clinical history and ophthalmic examination including refraction, corneal topography and electrophysiological tests of a 35 year old gentleman with keratoconus associated with CSNB1.

Results: Examination of his right cornea showed a central corneal scar with central thinning. Both right and left corneas were ectatic. Corneal topography revealed bilateral steep central corneas with thinning characteristic of keratoconus. Electroretinography (ERG) demonstrated a "negative" ERG to an ISCEV (International society for Clinical Electrophysiology of Vision) standard flash in scotopic conditions. Responses in photopic conditions were greatly attenuated with a near absence of B-wave.

Conclusion: An association between keratoconus and CSNB1 has not been previously reported. The nyctalopin (NYX) gene, encoding a leucine rich repeat proteoglycan may play a role in the maintenance of corneal integrity and is involved in the expression of the keratoconus phenotype. Further studies are necessary to identify and provide further insight into the genetic basis of keratoconus.

Key words: Congenital stationary night blindness, Genetics, Keratoconus, Nyctalopin



Tuesday 5th September 2006

Poster Parade

ASSESSMENT OF CHIASM FORMATION IN WAARDENBURG SYNDROME USING VISUAL EVOKED POTENTIALS

^{1,2}MM Neveu, ²G Jeffery, ³M Bitner-Glindzicz, ^{1,2,3}AT Moore, ¹GE Holder
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Purpose: Ocular hypopigmentation, foveal hypoplasia and misrouting of the visual pathways in albinism are a result of a mutation of the Tyrosinase gene. Waardenburg Syndrome is also associated with ocular hypopigmentation, affecting the irides and the fundus. This is most commonly due to a mutation of Pax3 or MITF (microphthalmia transcription factor). The aim of this study is to determine if hypopigmentation in Waardenburg Syndrome also results in a misrouting of the visual pathways, similar to that found in albinism.

Methods: Two patients (female, aged 6 years and 11 years) with Waardenburg Syndrome underwent full clinical and electrophysiological examination. Visual evoked potentials (VEP), electroretinography (ERG), fundus photography and ophthalmoscopy were performed on these patients. VEPs were recorded using a horizontal array of 5 active electrodes situated over the occipital cortex, referred to Fz. Binocular and monocular stimulation was used for both flash and pattern stimuli.

Results: Both patients were asymptomatic visually and had 6/6 Snellen visual acuity in both eyes. The first patient was of English origin and the second from Pakistan. Ophthalmoscopy revealed heterochromia in the first patient, where the right eye had a blue iris and the left eye had a lightly pigmented brown iris. Both fundi were showed mild peripheral hypopigmentation, with a normal foveal reflex and normal retinal blood vessel patterns. The second patient had lightly pigmented striking blue eyes, which is unusual for an individual of Pakistani origin. Both fundi were hypopigmented, with a normal foveal reflex and retinal blood vessel patterns. The ERG from both eyes of both patients was normal. There was no significant inter-hemispheric amplitude or latency difference in either the pattern appearance or flash VEP from both eyes of both patients. The VEP distribution in both patients was similar to that found in age-matched normal subjects.

Conclusion: Ocular hypopigmentation appears to have no effect on chiasm formation in Waardenburg Syndrome. In addition, development of the fovea and retinal blood vessels is normal in these patients. This would suggest that the underlying mechanisms associated with hypopigmentation and visual abnormalities in albinism are different to those in Waardenburg Syndrome.



4th BriSCEV Meeting
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Poster Parade

HYPOTRICHOSIS WITH JUVENILE MACULAR DYSTROPHY

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Purpose: Two unrelated boys of Turkish descent presented at aged 2 and 5 years of age complaining of poor vision and some colour vision deficits. They each were noted to have sparse scalp hair. This poster reports the visual electrophysiological findings in these two boys.

Methods: Serial visual electrodiagnostic recordings were carried out in both patients. Patient 1 was seen at age 9, 10 & 13 years, and patient 2 at age 11, 12, 13 & 15 years. Pattern VEPs, pattern and flash ERGs and EOGs were recorded according to ISCEV and GOS published recommendations. In detail, pattern reversal VEPs and PERG were recorded to a range of high contrast checksizes (200'-6.25') presented in a 28 & 14 degree test field. ERGs to an intensity series were recorded employing Grass strobe and skin ERGs and Ganzfeld DTL ERGs.

Results: PVEPs were increased in latency to all checksizes in both patients indicating macula pathway dysfunction. PERG P50 & N95 amplitudes were reduced confirming retinal macula dysfunction. Ganzfeld ERGs Dark adapted a-wave and b-wave amplitudes were abnormally small (50% of lower limit) to all intensities indicating rod photoreceptor dysfunction. b-wave amplitudes were markedly small such that a:b amplitude ratios were subnormal suggesting additional inner retinal dysfunction. Latencies were normal except for high flash intensity a-waves, which were increased.

Cone mediated responses were markedly abnormal: a-wave amplitude 30% of lower limit and b-wave amplitude 20% of lower limit again suggesting additional inner retinal dysfunction.

These findings confirmed earlier Grass ERG recording when the mixed rod cone and cone mediated ERG a:b ratio were noted to be subnormal.

The EOG amplitude (Patient 2) were small and ratios mildly abnormal indicating RPE/photoreceptor abnormality, though formal dark adaptation testing fell within normal limits.

Conclusions: These 2 boys were found to have (different) mutations in CDH3 gene (16q22.1), which encodes P-cadherin and is the gene defect responsible for hypotrichosis with juvenile macular dystrophy (HJMD). Although fundal changes in HJMD are confined to the macula, ERGs in these 2 boys show global retinal dysfunction. P-cadherin is expressed in the retinal pigment epithelium (RPE), as well as the skin and follicular epithelium, where it is believed to be involved in cell-cell adhesion. Our EOG data indicate mild RPE/receptor dysfunction, which would be consistent with the expression of abnormal P-cadherin. Our data, in agreement with previous reports, show photoreceptor dysfunction in HJMD patients, but also suggest inner retinal layer dysfunction. It is unclear how exactly how defective P-cadherin results in these retinal abnormalities, although mutations in other cadherins are known to result in retinal dysfunction e.g Usher 1D.



Tuesday 5th September 2006

Poster Parade

UNTREATED AMBLYOPIA: QUANTIFYING THE OPTICAL DEFICIT FOR OPTOTYPE, GRATING AND VERNIER ACUITY

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Purpose: To investigate the effect of removing only the optical deficit in untreated amblyopia.

Methods: Children under 8 years old were prospectively recruited and, in the unaided state underwent optotype (ETDRS-type Lea Symbols) as well as steady-state visual evoked potential (VEP) Grating and Vernier acuity. Retained participants were confirmed as normal or amblyopic after ophthalmic examination including refraction. Children with amblyopia were re-examined 4 weekly and acuity was re-tested on the first occasion after adapting to spectacles. This occurred when the corrected optotype acuity of the fellow eye was equal or better than in the unaided state. Monocular VEP acuity was measured for 2 Grating and 2 Vernier acuity conditions.

Results: Forty-seven amblyopes (12 anisometric, 21 strabismic, 14 mixed) with mean optotype acuity in the amblyopic eye of 0.73 (0.35 SD) LogMAR and interocular acuity difference (IAD) of 0.56 (0.38) were tested. Sixteen children with mean acuity of 0.04 (0.10) and IAD 0.10 LogMAR acted as controls. The dominant eye of anisometropes improved to super-normal levels after optical correction but only on Grating ($p = 0.03$) and Vernier ($p = 0.05$) acuity. The non-dominant eye of anisometropes showed trends toward significant improvement in all three classes of acuity. Dominant eyes of individuals with strabismic and mixed amblyopia were significantly abnormal regardless of optical correction ($p < 0.05$).

Conclusions: VEP Grating and Vernier acuity are more sensitive than optotype acuity to the effects of optical correction.

Acknowledgments: Funding 1: Guide Dogs for the Blind Association (Grant Code OR2001-99a) 2: Smith Kettlewell Eye Institute



Tuesday 5th September 2006

Poster Parade

VEP VERNIER AND GRATING ACUITY IN CHILDREN WITH UNTREATED AMBLYOPIA: A CONTROLLED PROSPECTIVE TREATMENT STUDY

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Purpose: In adults with amblyopia, vernier and Snellen acuity measures are well correlated whereas grating acuity underestimates amblyopia. We compared the relative sensitivity of VEP vernier and grating acuity measures to the amblyopic deficit in previously untreated children to ask whether a similar relationship exists before and during treatment.

Methods: Normal children (n =16) and untreated amblyopes (n =34) under eight years old were studied longitudinally during clinical treatment. The swept parameter VEP was used to estimate acuity thresholds by extrapolating the response functions to zero amplitude. Vernier displacement and spatial frequency thresholds were averaged across observers at key treatment milestones in amblyopes. Normals underwent the same assessment (every 4 months) for 12 months. Grating stimuli were swept between 32 and 2 c/deg using pattern-reversal and on-off modulation. Vernier offset was swept from 0.5 to 8 arcmin using two temporal frequency modulations.

Results: There was no significant difference in optotype interocular acuity differences (IAD) between anisometric (0.38 LogMAR) and strabismic (0.46) amblyopes before treatment. Untreated anisometropes demonstrated significant ($p = 0.02$) IAD for VEP vernier acuity but strabismics did not. VEP grating IADs were also greater for untreated anisometric than strabismic observers. Optotype IADs were significantly ($p = 0.003$) greater than for vernier or grating acuity for all untreated amblyopes. On optotype measures the greater treatment effect occurred for strabismics rather than anisometropes while the opposite was true for grating acuity. The anisometric dominant eye developed super-normal vernier thresholds despite occlusion treatment and contributed to further increases in vernier IADs after stopping treatment.

Conclusions: VEP vernier acuity is less sensitive than optotype measures of amblyopia in untreated children especially in strabismus. The two types of amblyopia, strabismic and anisometropia show distinctive patterns of loss and response to treatment.

Acknowledgments: Funding 1: Guide Dogs for the Blind Association (Grant Code OR2001-99a) 2: Smith Kettlewell Eye Institute



Tuesday 5th September 2006

Poster Parade

MOTION VEPs: A PILOT STUDY TO REFINE RADIAL MOTION STIMULUS PARAMETERS

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Purpose: In this pilot study our aim was to select stimulus parameters for recording motion VEPs using a radial motion stimulus displayed on a CRT monitor.

Methods: We compared binocular VEPs in one subject recorded at OZ, P7, P8 and POZ referenced to FZ for radial motion of 1 cpd sinusoidally modulated circles. Stimuli moved at 5 degrees per second for 200ms and stopped for 1000ms (except in the motion reversal condition where there was no static phase). A range of stimuli were presented that varied in: direction of motion: in, out and reversal (in and out). Contrast from three levels: 10%, 20% and 40%. Size of central mask, from a range of: no mask, 4°, 8° and 12°. Pattern onset and pattern reversal VEPs were also recorded using the same stimulus in order to demonstrate that the VEP was from the motion of the stimulus.

Results: Motion VEPs were larger for the directions in or out relative to motion reversal. The waveform has a negative component (N2) at 140-200ms, followed by a positive component (P2) at 200-250ms. Amplitudes of the N2 and P2 components became lower with increasing contrast and mask sizes while the amplitudes of the PR and PO components increased with higher contrast but decreased with larger mask sizes. To compare amplitudes across varying peak latencies root mean squared (RMS) analysis was performed on the 10% contrast, 4° central mask stimulus waveforms. This showed that amplitude was obtained at a contrast of 10% with a 4° central mask at electrode sites: OZ and P8. For this stimulus pattern reversal produced a VEP with RMS amplitudes less than the noise level while pattern onset produced a VEP of lower RMS amplitudes than motion in or motion out.

Conclusions: In the present conditions, motion VEPs elicited by radial waveform stimuli can be clearly distinguished from the PR and PO components of similar stimuli using the following parameters: motion in, contrast at 10% and a 4° central mask with the largest VEPs occurring at: OZ and P8.



Tuesday 5th September 2006

Poster Parade

THE EFFECT OF ELECTRICAL INTERACTION BETWEEN EYES ON EOG RECORDINGS

Malcolm Brown, Adele Stopforth, Richard Hagan, Anthony Fisher
Royal Liverpool University Hospital

Objective: To determine the content of the EOG signal which is derived from the fellow eye, and to assess its impact on interpretation of results, with special reference to cases with asymmetrical responses.

Method: EOG recordings were undertaken on normal cases and on subjects with only one working eye. From the results, an estimate of 'cross-talk' between the eyes has been made. In addition, results have been examined from cases where there is a significant inter-eye difference in the standing potential or Arden Ratio, and an assessment has been made of the likely impact of the cross-talk on the actual results.

Results: From the uni-ocular subjects, the level of cross-talk has been found to be up to 40% with a common nasal electrode, and 15% with the standard four electrode set.

With an absent fellow eye, the saccadic recordings show an inverse polarity to the functioning eye responses. In this situation the Arden Ratio can look similar for the two eyes.

This phenomenon has implications when the standing potentials or the Arden Ratios are dissimilar. For instance, in the situation that the light rise is absent in one eye and the standing potential is also low, the weaker eye appears to have a 'Negative' EOG.

If only the standing potentials are different, but with similar Arden ratios, the results are unaffected. If the standing potentials are the same, but the Arden ratios are different then the larger Arden ratio is exaggerated at the expense of the smaller one.

Conclusion: Arden ratios may be incorrect when there is a difference in either the standing potential or Arden Ratios derived from the two eyes due to crossover of potentials between the eyes and recording sites. If the differences are large, this may change the diagnosis. The percentage of crossover is determined mainly by the electrode positions.

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Tuesday 5th September 2006

Poster Parade

Examination of ISCEV photopic ERG waves to determine if the Photopic Negative Response could be useful in the early detection of ganglion cell disease

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Purpose: The photopic negative response (PhNR) of the photopic ERG can be significantly reduced in cases of ganglion cell disease even when the a-wave and b-wave are not significantly affected. This reduction can be present even before there has been significant vision loss in patients. This initial study aims to explore the potential for using the PhNR clinically in diagnosis of these diseases, using the ISCEV photopic ERG protocol without further optimisation.

Method: The first phase of the study was to evaluate examples of the photopic ERG from 4 groups of previous patients. The first group had completely normal electrodiagnostics, the second group had delayed VEPs, the third group suffered from glaucoma, and the fourth group showed a reduced N95 component of the PERG.

The ratio of the amplitude of the PhNR to the amplitude of the b-wave was calculated and the ratio of the amplitude of the PhNR to the amplitude of the i-wave was calculated. Statistics were prepared for these.

Results: These initial results show that the amplitude ratios are quite variable, and there is not a significant difference of the ratios between the groups in this limited study. The study also revealed variability arising from technical factors such as baseline drift and blink artefact.

Conclusions: Early conclusions suggest that the PhNR is not a good tool for ganglion cell disease diagnosis using ISCEV standard white stimuli and background. However, this may not be the best protocol for this test, and other stimuli combinations have been suggested to produce improved results.

Note: [1] This project is being undertaken by Anne Small as part of an M.Sc. course in Medical Physics

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Tuesday 5th September 2006

Poster Parade

OCULAR SHAPE AND THE STRUCTURE-FUNCTION RELATIONSHIPS IN THE PERIPHERAL RETINA

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This project aims to evaluate the relationships between eye shape, retinal structure and retinal function in the central and peripheral retina.

The following measures were recorded from the dilated right eye of seventy ocularly normal subjects, aged 20-40 yrs and with a range of refractive errors (+6.00 to -8.00D); auto-refractometry, multi-focal electroretinogram (mfERG), peripheral grating resolution acuity, central and peripheral retinal thickness using optical coherence tomography (OCT3) and both on-axis and off-axis eye length measurements using a Zeiss IOLMaster. For mfERG and acuity tests, subjects were optimally corrected for test distance with large diameter lenses placed at the anterior focal plane of the eye.

Preliminary results indicate 1) axial length is correlated with refractive error, $r=0.8$, 2) as axial length increases, the disparity between peripheral retinal function and central retinal function (assessed by mfERG amplitude) increases, 3) peripheral resolution acuity decreases with increasing refractive error, indicating a reduction in peripheral retinal sampling density, 4) the peripheral retina (20deg eccentricity) appears to be thinner in eyes with longer axial lengths and 5) The shape contour of the posterior retina appears to vary with the degree of myopia, displaying a flatter retina in emmetropes compared to myopes.

These results suggest interesting relationships between refractive error, axial length, ocular shape and retinal function in the periphery relative to the fovea.



Tuesday 5th September 2006

Oral Presentations

**13.15 Oral presentations
(Chair: Dr Lawrence Brown)**

- 13.15 mfVEP recovery after optic neuritis – implications for MS
Stuart Graham, Alex Klistorner, Clare Fraser, Ray Garrick, John Grigg
Save Sight Institute, Sydney
- 13.30 The combined clinical application of PERG and mfERG:
Hagan R, Brown M.
- 13.45 Clinical applications of multimodal imaging using combined OCT. SLO
and micro-multifocal ERG:
Dudgeon S, Parks S, Keating D.
- 14.00 Classification of the mfERG using a supervised self-learning expert
system:
Fisher AC, Hagan R, Brown M et al.
- 14.15 Local macular ERG in retina research. Experience of application over 25
years:
Shamshinova AM, Zolnikova IV, Kazarjan AA et al.



Tuesday 5th September 2006

Oral Presentations

mfVEP recovery after optic neuritis - implications for MS

Stuart Graham, Alex Klistorner, Clare Fraser, Ray Garrick, John Grigg
Save Sight Institute, Sydney

No abstract available at time of printing. This paper was offered at very short notice, and the organising committee were pleased to accept the opportunity to hear from our Australian colleagues about their latest work.



Tuesday 5th September 2006

Oral Presentations

THE COMBINED CLINICAL APPLICATION OF PERG AND MFERG.

Richard Hagan, Malcolm Brown
Royal Liverpool University Hospital, Liverpool, UK

Purpose: To review clinical cases in which both PERG and mfERG have been performed, and to identify those cases in which pathology was identified by both tests, and those in which they disagreed.

Methods: The reports of adult patients referred for electrophysiological testing were reviewed to determine the contribution of PERG and mfERG to the final diagnosis. PERGs were carried out to ISCEV standard (50# only). mfERGs were performed using a simplified procedure stimulating 19 segments in a 21 degree radius, scaled 4:1 and recording with gold foil electrodes for both.

Results: The majority of patients seen had one or both of the macular sensitive tests carried out (PERG or mfERG). The majority of cases which had both tests had similar findings, ie both were normal or both were abnormal. In some cases the PERG identified a ganglion cell problem that was not picked up by the mfERG. The mfERG was able to identify small central problems that were not picked up by the PERG and also problems where there was sparing of central vision with peripheral vision affected.

Comments: In our hospital the mfERG has quickly established itself as a useful tool in the clinical electrophysiology unit, both in corroborating evidence from other tests and providing evidence of dysfunction which is not shown by other tests. The PERG remains a useful test particularly when assessing post-retinal damage.

Acknowledgement: None

Grant: None

Keywords: mfERG, PERG

Subjects: Patients



Tuesday 5th September 2006

Oral Presentations

CLINICAL APPLICATIONS OF MULTIMODAL IMAGING USING COMBINED OCT/SLO AND MICRO-MULTIFOCAL ERG

Sinead Dudgeon, Stuart Parks, David Keating
ElectroDiagnostic Imaging Unit, Tennent Institute of Ophthalmology, Gartnavel General Hospital, Glasgow

Purpose: To assess the clinical applications of multimodal imaging (MMI) using combined optical coherence tomography (OCT), scanning laser ophthalmoscope (SLO) and micro-multifocal ERG (micro-mfERG). The technique allows simultaneous high resolution imaging of the surface, substructure and function of the macula.

Methods: An OCT/SLO scanner (OTI, Toronto, Canada) was modified to include an organic light emitting diode (OLED) display within the optics of the system to facilitate simultaneous high resolution micro-multifocal ERG recording and OCT/SLO imaging of the central 15 degrees. During micro-mfERG recording time, OCT scanning was performed both in coronal and transverse planes in various retinal locations to allow accurate correlation of structure and function at multiple macular sites. Patients with various macular pathologies were assessed with conventional mfERG (90 degree field) in addition to MMI and the results compared. Long term studies are currently being performed on the effects of surgical intervention for macular hole and macula-off retinal detachment and on the effects of pharmacological intervention for age-related macular degeneration (ARMD).

Results: The results so far show that micro-mfERG provides information on macular function at significantly higher spatial resolution than conventional mfERG. This increased sensitivity allows subtle changes in macular function to be accurately assessed. The OCT/SLO image recording quality is unaffected by the integration of micro-mfERG into the system. It has been possible to accurately correlate structural and functional changes seen at the macular region following surgical or pharmacological intervention for various macular disorders. These results indicate that changes in macular structure are not necessarily reflected by alterations in function and vice versa.

Conclusion: MMI is a robust new technology which facilitates accurate correlation of information on the surface, substructure and function of multiple macular sites. It is proving to have a variety of useful clinical applications and the results obtained so far may indicate that function is in fact a more reliable prognostic indicator than structure. We envisage MMI may be used increasingly in standard clinical practice in the assessment and monitoring of patients with various macular pathologies.



Tuesday 5th September 2006

Oral Presentations

CLASSIFICATION OF THE mfERG USING A SUPERVISED SELF-LEARNING EXPERT SYSTEM

Anthony Fisher, Richard Hagan, Malcolm Brown, David Keating*, Stuart Parks*
*Dept. of Clinical Engineering and Clinical Eye Research Centre, Royal Liverpool Univ. Hospital, and
Tennent Institute of Ophthalmology, Glasgow

Purpose: To classify mfERG records automatically into diagnostically-relevant classes using an expert system based on an architecture of artificial neural networks.

Introduction: Recently an expert system for the automatic identification of cardinal positions (cursoring points) in ERG, PERG, VEP and mfERG has been described (SpoC, Internet reference www.liverpooleye.org). This system uses a self-learning paradigm in which learning datasets are automatically generated from morphologically-perturbed instances of a reference template embedded in random noise. In the present study, this technique is developed as a classifier using 6 templates representing distinct clinical mfERG presentations.

Method: 28 clinical mfERG records were retrieved and classified by DK and SP into classes: normal; amplitude-reduced; delayed; reduced-and-delayed; negative; absent. Records were 200ms long, and sampled at 1kHz. A learning dataset of 2000 examples was synthesised using all records as templates: random noise of random gain was added to each record before band-pass filtering for the interval [1 .. 75]Hz. The time axis was compressed using a log scale to (effectively) progressively de-emphasise data with time. An architecture of artificial neural networks was constructed based on multi-layer perceptrons using back-propagation. Learning was constrained by 'early stopping' when accuracy was = or > 95% to maintain 'generalisability'. A number of architectures was explored. MatLab R15 2006a with the Neural Network Toolbox was used for all programming.

Results: In the artificial dataset an average classification accuracy (un-biased) of > 95% was achieved across all network architectures for all classes with the exception of the 'negative' class which was very sensitive to architecture.

Conclusions: This automatic method of classification appears highly attractive and can be directly incorporated into a hierarchical system of differential diagnosis. It is robust in poor SNRs where it is likely to significantly outperform the clinical expert.. The learning strategy is adaptive and can accommodate local expert rules and idiosyncratic measurement techniques. Its future development will require a consensus approach by experienced clinical workers to establish the most appropriate diagnostic classes.

This application will be made available over the Internet via www.liverpooleye.com



Tuesday 5th September 2006

Oral Presentations

LOCAL MACULAR ERG IN RETINA RESEARCH. EXPERIENCE OF APPLICATION OF 25 YEARS

A.M. Shamshinova, Zolnikova I.V., Kazarjan A.A., Arakeljan, M.A. Seidova F.G. Rogova S.U.
Moscow Helmholtz Research Institute of Eye Diseases . MBN Company

Local(macular)ERG(MERG) is the method, applied in clinical ophthalmology over 25 years. This method has different modifications and is not included in ISCEV Standards.

Purpose: To demonstrate the significance of the own developed MERG in the research of macular function and clinical practice.

Methods: It is very difficult to obtain macular ERG because of light scattering, small stimulus size and difficulties with control of gaze fixation. The corneal circular electrode with built-in optic system and red, green or blue LEDs equalized by brightness was used as stimulator to provide stimulus of 15" which enables true stimulation of the to macula, not depending on the eyes movement, presence of central scotoma and degree of vision reduction. The satisfactory degree of locality (70 % of the local answer) by V.I.Govardovsy calculations, can be obtained at the certain combination of stimulus size and brightness.

Results: In normal subjects distinct answers to red (10-18 µiV), green(40-60µiV) and blue (50-70µiV) stimuli are revealed, amplitude depending on topography of photoreceptors and colour vision neurophysiology. Numerous investigations (over 10000 patients) retinal and optic nerve diseases have shown, that decreased macular ERG is found in all cases of photoreceptors dystrophies, and impairment of 1-2 neuron of macula area. In initial stages of pathological processes in pigment epithelium and Bruch membrane(AMD) M-ERG remains within the normal range, being reduced in late stages of the disease. MERG amplitude reduction and increase of the implicit times b-waves was registered in Stargardt dystrophy already in initial stages of disease($p < 0,001$), 11-chromosomal retinoshisis, some forms of retention pigmentosa with macula involvement. At vascular retinopathy with macular ischemia, glaucoma MERG was changed variably from super- to subnormal($p < 0.002$), depending on stage of pathological process. Normal MERG was found in amblyopia, optic nerve diseases. Parameters MERG in Morbus Best depended on vitelliform cyst stage and photoreceptor involvement. M-ERG changes correlated with reduced visual acuity.

Conclusions: This MERG technique enables the investigation of macula response in clinical conditions and is important in initial and differential diagnosis of various retinal and optic nerve diseases.



Tuesday 5th September 2006

Nitty-gritty Session

15.00

**Nitty-gritty session
(Chair: Professor Colin Barber)**

1. Electrode tips. Daphne McCulloch (Glasgow)
2. VEP protocols in children: Dorothy Thompson (London)
3. Principles of measurement: Malcolm Brown (Liverpool)
4. Data transforms in electrodiagnostic recordings: Tony Fisher (Liverpool)



Tuesday 5th September 2006

Nitty-gritty Session

ELECTRODE TIPS

Daphne L McCulloch
Vision Sciences, Glasgow Caledonian University

The most basic instrument of clinical electrodiagnosis is the physiological electrode. Although electrodes are deceptively simple devices for making electrical the range of options can be quite complex. Should you choose gold lenses, silver threads or tin cups? Whatever the answer, appropriate selection, application and positioning of physiological electrodes may be the most important factor in the quality of your test results.

In this presentation, I will review the basic principals and definitions relevant to physiological recordings and electrodes. Following that, I will give an overview of the available types and materials available in the electrodes used for clinical electrophysiological tests of the visual system, ERGs, EOGs and VEPs. Particularly for ERG electrodes, a number of studies have been published providing inter-electrode comparisons of amplitude and of other practical features. I will summarise these as a guide to electrode selection. Finally, I hope to provide a few tips for noise and artefact reduction.



Tuesday 5th September 2006

Nitty-gritty Session

VEP PROTOCOLS IN CHILDREN

Dorothy Thompson
Great Ormond Street Hospital for Children, London

Children can be enchanting and charming, but these qualities fade rapidly to a distant memory if they have to sit still for more than 20 seconds and look at a spot in the middle of a black and white pattern.

This nitty gritty session will be a broad ranging conversation and exchange of ideas about different practical ways of encouraging the best VEP from infants and children.

It will ask you to question why you do things the way you do and to look around your clinical labs from knee height. It will include: positioning infants and children in front of the stimulators; choosing complementary dynamic protocols; the order of presentation; which stimulus is your first choice; how large is the screen; how to keep electrodes on; averaging ...how many times; using cartoons, toys, audio, CCTV, and team-work.

I hope we can share ideas of basic techniques for children and find new possibilities for our clinical practices.



Tuesday 5th September 2006

Nitty-gritty Session

BASIC PRINCIPLES OF MEASUREMENT (METROLOGY): ACCURACY, PRECISION, UNCERTAINTY

Malcolm Brown
Royal Liverpool University Hospital

This talk is intended to be a primer or revision in the basics of measurement (metrology).

To be meaningful, all measurements must be made relative to some standard, such as a ruler, and that ruler has been made and 'calibrated' relative to some higher standard etc. Thus all measurements should be 'traceable' up to the most accurate calibrated source, usually held in some national standards laboratory.

In metrology, some words and definitions have specific meanings which may be different from their everyday meaning. The words accuracy and precision are almost interchangeable in everyday use, but in metrology they are quite different. For instance a value or measurement may be precise but not accurate. i.e. it is always the same, but wrong. Conversely it can be accurate, but not precise.

Estimating and understanding error, is one of the most important issues in metrology. Describing error is usually a statistical statement of the likelihood of the true value falling within a particular range, and is properly called 'uncertainty of measurement', although 'confidence interval' and other statistical descriptors are also acceptable. Error usually accumulates as the r.m.s. (root of the mean square) of the individual errors, so it is possible to estimate likely error in many situations. However, there are difficulties such as estimating the error of a small difference between two large values.

In this 'Nitty Gritty' presentation, practical advice will be given to members on the intelligent use of measurements in electrophysiology and photometry.

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Tuesday 5th September 2006

Nitty-gritty Session

DATA TRANSFORMS FOR PROCESSING EYE ELECTRODIAGNOSTIC RECORDINGS

Anthony Fisher

Dept. of Clinical Engineering, Royal Liverpool University Hospital

Clinical ophthalmic electrodiagnostic testing has been slow to adopt the majority of the modern signal processing techniques that is currently available. Whereas higher order statistics, frequency-time representations and, most recently, discrete wavelet transforms are well established in ECG, EEG and audiometry, they are yet to make any significant impact in ophthalmology outside a few specialised research groups.

This tutorial and primer attempts, without recourse to formal mathematics, to introduce some of the very powerful analytical techniques now available to the electrophysiologist. There is no assumption made that the audience be familiar with any but the most basic mathematics: all principles will be explained and illustrated using 'live' graphics and pictorial illustration. Most examples will be made available as interactive demos via the website www.liverpooleye.org.

The following topics will be covered in order:

- What is a sampling window?
- Time domain - frequency domain: exactly what do we mean by these terms?
- Fourier Analysis: everybody's heard about it but what can it do for us? FT, DFT, FFT, PSD, Fourier Series: The same? Different? Similar?
- Short Term Fourier Transform (STFT): OK .. really grown-up maths but what is it and can it do anything for us?
- Wavelet analysis: the discrete wavelet transform (DWT) ... recently the very height of fashion! Trendy but do we need more to worry about? Maybe we are already overloaded with smart maths? This author doesn't think so!

Whilst we must accept that the formal theory behind most of the above is quite formidable, it is proposed that, used judiciously and presented appropriately to the electrodiagnostic community, these modern techniques are potentially too powerful and useful to ignore.

