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NOTTINGHAM EYE SYMPOSIUM *and Research Meeting*

31st January 2014

Programme
and Abstracts

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PROGRAMME SUMMARY

8.30am: Registration and Coffee

9.00am: Chairman's Welcome and Opening Remarks

9.10am: Clinical and Translational Research Presentations

Chairs: Professor Harminder Dua and Professor Martin Rubinstein

10.20am: Optometry Guest Speaker – Introduction by Professor Martin Rubinstein

Visual Function in the Deaf

Professor Peter Allen, Anglia Ruskin University, Cambridge

10.45am: Coffee, Trade Stand and Poster Viewing

11.15am: Clinical and Translational Research Presentations continued

Chairs: Mr Winfried Amoaku and Mr A King

12.10pm: In the Pipeline: Sponsor Presentations

12.30pm: Hot Buffet Lunch, Trade Stand and Poster Viewing

1.30pm: 18th Norman Galloway Lecture - Introduction by Professor Harminder Dua

Prerequisites for complex optics IOL implantation

Professor Marie-José Tassignon, University Hospital Antwerp, Belgium

Symposium 'Cataract Sound and Video Show'

Chair: Professor Harminder Dua

2.30pm: Biometry: Pointers, pitfalls and personalising

David Sculfor, Stoke Mandeville Hospital

2.55pm: 'Routine' Cataract Surgery: Avoiding and dealing with problems

Larry Benjamin, Stoke Mandeville Hospital

3.20pm: Coffee, Trade Stand and Poster Viewing

3.50pm: 'Difficult' Cataract Surgery: Subluxated lenses, Pseudoexfoliation, Vitrectomised and High myopia eyes

Brian Little, Moorfields Eye Hospital

4.15pm: Choosing the right lens: Monofocal, Multifocal, Toric, Accommodative

Milind Pande, Vision Surgery and Research Centre, East Riding of Yorkshire

4.40pm: Femtolaser Cataract surgery

Alexander Day, Moorfields Eye Hospital

5.05pm: Research and Poster Prize Presentations

5.15pm: Chairman's Concluding Remarks and Close of Meeting

5.30pm: CLOSE

See you next year!

9.10AM: CLINICAL AND TRANSLATIONAL RESEARCH PRESENTATIONS, PART 1

Chairs: Professor Harminder Dua and Professor Martin Rubinstein

9.10am: Transdifferentiation of CD34⁺ Corneal Stromal Cells into Corneal Epithelial Cells
Laura Sidney, University of Nottingham

9.17am: Determinants of Adoption of Regenerative Therapies in Ophthalmology
James Rose, University of Nottingham

9.24am: Transfer of Mesenchymal Stem Cells on Nanofiber Scaffolds for Treatment of a Chemical Injury of the Cornea
Anna Lencova, Academy of Sciences of the Czech Republic, Prague and University of Nottingham

9.31am: Characteristics of Normal Foveal Development in Infants and Young Children as Imaged Using Hand-Held Optical Coherence Tomography
Helena Lee, University of Leicester

9.38am: A Protein Mapping Technique for the Study of Vitronectin Protein Deposition on Bandage Contact Lenses
Manpreet Cooner, Aston University, Birmingham

9.45am: National Survey of Pachymetry Use Across Eye Units in the UK
Ankur Barua, Royal Preston Hospital

9.52am: Unravelling the Function of Retinoic Acid in Human Corneal Stroma Health and Disease
Ricardo Gouveia, University of Reading

9.59am: Ultrastructural Characterisation of a Newly Discovered Neuronal Structure in Human Corneas
Mouhamed Al-Aqaba, University of Nottingham

10.06am: Collagen Cross-linking with Photoactivated Riboflavin for the Treatment of Advanced Infectious Keratitis with Corneal Melting
Mohamed Elalfy, University of Nottingham

10.13am: Removal of Artificial Iris Implants Due to Bilateral Angle Closure Glaucoma and Corneal Decompensation
Sarmi Malik, University Hospital Coventry

ABSTRACTS

9.10pm: Transdifferentiation of CD34⁺ Corneal Stromal Cells into Corneal Epithelial Cells

Sidney, L.E., Branch, M. J., Hashmani, K., Dua, H. S. and Hopkinson A.

Ophthalmology, Division of Clinical Neuroscience, University of Nottingham, UK.

Purpose: The integrity of the corneal epithelium is essential for clarity of vision. Under normal circumstances, superficial epithelial cells are shed into the tear film and regenerated by epithelial stem/progenitor cells located at the limbus. Damage or depletion of the limbal cells leads to conditions such as limbal stem cell deficiency (LSCD). Current treatment for this condition involves transplantation of limbal epithelial cells expanded ex-vivo; however cell numbers are limited. In this study, we identify a source of multipotent stem cells located in the corneal stroma that express CD34 upon isolation. These cells demonstrate an enhanced ability to transdifferentiate into the corneal epithelial cell lineage.

Methods: Peripheral and limbal stem cells (PLCSC) were cultured in a traditional DMEM-based keratocyte medium and an M199-based stem cell medium, and analysed for a range of cell surface

markers using flow cytometry. Subpopulations within the PLCSC population were analysed by magnetic sorting for CD34+ and CD34- populations. The ability of the subpopulations to transdifferentiate into a corneal epithelial phenotype in a serum-free epithelial differentiation medium (CnT-20) was assessed using flow cytometry, RT-qPCR and immunocytochemistry.

Results: Cells cultured in M199 showed a more stem-like cell surface marker profile and retained CD34 expression for several passages, when compared to the DMEM-based medium. When CD34+ cells were transferred to epithelial differentiation medium, they showed a rounded epithelial morphology with increased expression of cytokeratin 3, cytokeratin 19 and HES1. Considerable upregulation of genes related to corneal epithelial cells (ABCG2, DeltaN63, LEF1, HES1, FRZB1, KRT19, DTC and CDH1), was seen when compared to CD34- cells.

Conclusions: This work will help production of robust methodologies to create cell banks for generation of corneal epithelium, from a corneal stromal stem cell source, leading to improved surgical and visual outcomes in LSCD patients.

9.17am: Determinants of Adoption of Regenerative Therapies in Ophthalmology

James B Rose^{1,2}; Andrew Hopkinson²; David J Williams³

¹*School of Pharmacy, University of Nottingham, NG7 2RD;* ²*Ophthalmology, Division of Clinical Neuroscience, University of Nottingham, UK;* ³*Healthcare Engineering Group, Loughborough University, LE11 3TU*

Purpose: The adoption of regenerative medicine products is relatively uncharted territory, with very few demonstrators making it to the market. However, understanding the processes involved in the uptake of these therapies into research and into healthcare will be critical to the creation of a viable and sustainable regenerative medicine industry sector. Investigating the adoption processes in the UK and Canada this work looks to assess factors of importance in the translation and system-wide adoption of regenerative therapies in Ophthalmology, as perceived by consultant clinicians.

Methods: Using problem-centred interviews, 22 consultant ophthalmologists from both the UK and Canada were interviewed about potential barriers to the translation, reimbursement and adoption of novel therapies such as regenerative medicines. Respondents were from a range of specialisms, and covered a variety of postcodes in the UK, and 3 provinces in Canada. Interviews typically lasted 30 to 40 minutes and were recorded and transcribed immediately. Transcriptions were processed through open-coding, and codes were then assembled into themes. The number of respondents commenting or describing a theme's importance and the number of times the theme was mentioned was quantified for comparison.

Results: High quality interview data yielded insight into priorities and factors of importance affecting clinician's attitudes to adoption and their ability to adopt. Results showed that clinician characteristics were similar both in Canada and in the UK, despite the differences in healthcare delivery of the two nations. Infrastructure and system setup in the UK appears to have afforded a distinct advantage in allowing clinicians to adopt as part of translational studies or clinical research.

Conclusions: Despite both the UK and Canada operating single-payer models of healthcare, the two systems are distinct in the way healthcare is delivered, and healthcare research is governed. As markets for regenerative medicine single-payer dominated systems could have some distinct advantages for regenerative therapies, although in order for these to be realised some major hurdles will have to be overcome.

9.24am: Transfer of Mesenchymal Stem Cells on Nanofiber Scaffolds for Treatment of a Chemical Injury of the Cornea

Lencova, Anna^{1,2,3}; Cejkova, Jitka¹; Holan, Vladimir¹; Martin, Filipec²

¹*Institute of Experimental Medicine, Academy of Sciences of the Czech Republic, Prague*, ²*European Eye Clinic Lexum, Prague*, ³*Department of Ophthalmology, University Hospital, Queen's Medical Centre, Nottingham*

Purpose: To investigate whether rabbit bone marrow-derived mesenchymal stem cells (MSCs) effectively decrease alkali-induced oxidative stress in the rabbit cornea.

Methods: The alkali (0.15 N NaOH) was applied on the cornea of the right eye and then rinsed with tap water. The study group was divided into 2 groups. In the first group of rabbits the injured corneas remained untreated. In the second group, nanofiber scaffolds with MSCs were transferred onto the corneas immediately after the injury and the eyelids were sutured for two days. After two days, the sutures and nanofiber scaffolds were removed. The rabbits were sacrificed on days four, ten or fifteen after the injury. The immunohistochemical, morphological and Real-time PCR analysis of corneas was performed. The pachymetry measurements were done preoperatively and on day two and tenth postoperatively.

Results: Corneal neovascularization and stromal inflammatory infiltration were significantly suppressed in corneas treated with MSCs compared to the untreated corneas. At the end of the experiment, (on day 15) the injured untreated corneas were vascularized and numerous inflammatory cells were present in the corneal stroma. After chemical injury, the corneal thickening was noticed in both groups. The corneal thickening after alkali injury returned to normal levels over the course of ten days only in the injured corneas treated with MSCs on nanofiber scaffolds. In the injured corneas, those treated with MSCs on nanofiber scaffolds a higher expression of aldehyde dehydrogenase 3A1 was found. This enzyme protects the cornea from oxidative stress caused by chemical injury. The gene expression of pro-inflammatory cytokines (IL-1 beta, IL-6 and IFN-gamma) was significantly reduced in the group treated with MSC compared to the group without treatment.

Conclusions: MCSs transferred on nanofiber scaffolds effectively reduce alkali-induced oxidative stress in the cornea and they suppress the inflammatory reaction. They also decrease corneal neovascularization and significantly contribute to healing process after alkali injury in an experimental rabbit model.

9.31am: Characteristics of Normal Foveal Development in Infants and Young Children as Imaged Using Hand-Held Optical Coherence Tomography

Lee, Helena; Purohit, Ravi; Patel, Aarti; Papageorgiou, Eleni; Bibi, Mashal; Sheth, Viral; Maconachie, Gail; McLean, Rebecca; Proudlock, Frank A.; Gottlob, Irene

Ophthalmology, University of Leicester, Leicester, England, United Kingdom

Purpose: To characterise the time course of normal foveal development *in vivo* in children using hand-held spectral domain optical coherence tomography (HH-SDOCT).

Methods: 256 children aged between 0-6.9 years and 39 older children and adults aged between 7.1-27 years were recruited. All participants had a full ophthalmological examination and HH-SDOCT scans. Each retinal layer was segmented and quantified in ImageJ and correlated with log gestational age (logGA) and visual acuity.

Results: The central macular thickness (CMT) increases linearly with logGA by 85% between birth and three years of age, after which it plateaus. The foveal outer segment (OS) and inner segment (IS) of the photoreceptors and the outer nuclear layer (ONL) also follow a linear pattern, with a 330%, 24% and 55% increase in thickness respectively, between birth and eighteen months of age, after

which they plateau. The foveal outer plexiform (OPL), inner nuclear (INL), inner plexiform (IPL) and ganglion cell layers (GCL) decrease in thickness with GA. The parafoveal thickness of the retinal nerve fibre layer (RNFL) and GC complex (GCL and IPL) initially decrease in thickness until two years of age, followed by a gradual increase. The CMT, ONL and IS are significant predictors of VA, with $r^2 = 0.739$ ($p=0.000$) and 0.748 ($p=0.000$) respectively.

Conclusion: We have characterised the time course of normal foveal development in children using the HH-SDOCT. Several predictors of visual acuity have been identified. This is important as the HH-SDOCT will play an increasingly prominent diagnostic and prognostic role in children with retinal pathology.

9.38am: A Protein Mapping Technique for the Study of Vitronectin Protein Deposition on Bandage Contact Lenses

Manpreet K Cooner¹, Brian Tighe¹, Aisling Mann¹, Martin Rubinstein², Pete Pawson³, Jayshree Gandwehar²

Aston University, Birmingham¹, Leicester Royal Infirmary, Leicester², Warwick Hospital, Warwick³

Purpose: Vitronectin is an adhesive glycoprotein with a high affinity for bandage contact lenses (BCLs). Its deposition to the lens surface can consequently influence plasmin upregulation. This work involves the comparison of vitronectin deposition to lenses worn for the treatment of two different chronic ocular conditions.

Methods: Subjects: The study involved patients who required long term BCL use for either dry eye syndrome ($n=3$) or bullous keratopathy ($n=6$), with an age range of 60-83. All patients received a comfilcon A (Biofinity) lens in the affected eye. Wear time ranged from 2-6 weeks.

Cell attachment assay: The relative quantity and location of adsorbed vitronectin on the posterior surface of the BCL was assayed by the use of 3T3 Swiss mouse fibroblasts as a probe, exploiting the RGD cell-binding domain on vitronectin.

Results: Vitronectin mapping shows the interaction between the BCL and the cornea is predominantly with the peripheral region of the posterior lens surface. Greater vitronectin deposition was found on the surface of lenses worn in dry eye patients (102 ± 5 average cell count per field), in comparison to lenses worn in bullous keratopathy cases (83 ± 4 average cell count per field).

Conclusion: The vitronectin mapping technique provides a valuable method to study the physical interactions of the BCL with the corneal tissue bed, thereby detecting the locus of vitronectin deposition on the lens surface. Observations of vitronectin mapping for different clinical conditions, and subsequent plasmin upregulation, offers benefits in the design and selection of BCLs.

9.45am: National Survey of Pachymetry Use across Eye Units in the UK

Barua, A., Bhargava, A

Royal Preston Hospital and MREH

Purpose: Pachymetry plays a crucial role in diagnosing glaucoma and for corneal assessment prior to corneal surgery. There have been several outbreaks of epidemic ocular infections in ophthalmology clinics worldwide with reports of viral, parasitic and prion disease. Contact pachymetry will be at risk of contamination and a possible vehicle of transmission.

Aim and Methods: To identify what method of pachymetry is used, and methods used for cleaning the pachymetry tip. A telephone survey was carried out, and a senior nurse or sister was questioned.

Results: Of 109 responses, 10 eye units were unaware of the device name and 4 were unaware of the cleaning method used. 56/109 (51%) were cleaned with some form of alcohol wipe between patients, 12/109 (11%) used presept solution to soak the pachymetry head mainly 5-10 minutes, but 2 replied 20-30 minutes. Milton solution was used by 4 units (4%) (10s to 10min). 3 used H2O2 solution for 10 minutes (3%). 3 (3%) used an alcohol solution. 15 (14%) of units used some chlorine based solution (actichlor/choroprep) for 5-10 minutes. 2 units combined an alcohol based wipe with solution to soak afterwards.

Conclusions: The majority of eye units use alcohol/chlorine based wipes for cleaning the pachymetry heads. The average immersion in solution is 5-10 minutes. There is a large variation in methods and duration of tip disinfection amongst eye units.

9.52am: Unravelling the Function of Retinoic Acid in Human Corneal Stroma Health and Disease

Gouveia, R. M. and Connon, C. J.

School of Chemistry, Food and Pharmacy, University of Reading, Whiteknights, Reading RG6 6UB, UK

Purpose: Although Retinoic Acid (RA) deficiency is a well-established cause of corneal disease, little is known about its function in the corneal stroma, and particularly in the biology of cells populating this tissue, the keratocytes. As such, we investigated the effects of RA on human corneal keratocytes cultured *in vitro* for extended periods.

Methods: Keratocytes isolated from human corneas were cultured up to 21 days in serum-free media supplemented with RA or DMSO vehicle. The effects of RA, and of its removal after treatment, on cell proliferation and morphology were evaluated. In addition, the expression of keratocyte markers was quantified at the transcriptional and protein levels. Furthermore, the effects of RA on keratocyte migration were tested using scratch assays.

Results: RA enhanced keratocyte proliferation and stratification while reducing cell migration in a dose-dependent effect up to 10 μ M. Concomitantly, RA was shown to significantly enhance cellular production of extracellular matrix (ECM) components such as collagen type-I, keratocan, lumican, and decorin, whilst reducing the expression of metalloproteases involved in ECM degradation and turnover. Importantly, the removal of RA from the media induced a reversal of these effects without compromising cell viability.

Conclusions: RA was shown to control the phenotype of human corneal keratocytes cultured *in vitro* by regulating cell behaviour and extracellular matrix composition. Our findings constitute an important step in understanding corneal stromal biology in health and disease, and may prove useful in tissue engineering, cell biology, and clinical applications.

9.59am: Ultrastructural Characterisation of a Newly Discovered Neuronal Structure in Human Corneas

Mouhamed Al-Aqaba¹ and Virinder Dhillon¹, Trevor Gray², James Lowe², Harminder S. Dua¹

¹*Ophthalmology, University of Nottingham; ²Division of Histopathology, University of Nottingham.*

Purpose: To study the ultrastructural features of a newly discovered bulb like structure at the site of perforation of stromal nerves into the sub-basal plane using transmission (TEM) and scanning (SEM) electron microscopy.

Methods: Thirteen corneal specimens were included (7 for TEM and 6 for SEM). Corneal samples for TEM were pre-stained with Acetylcholine esterase method for corneal nerve demonstration. Alcohol delamination was used to expose the nerves at the sub-basal plane for SEM study.

Results: clustered outlined areas of intense staining especially at the Bowman's zone or the basal epithelium were strongly suggestive of either stromal nerve endings when present in the Bowman's zone or sub-basal nerves if seen between corneal epithelial cells or its 'perforation sites' if seen at the basal epithelium. The bulbous termination of the stromal nerves was noted in cross sectioned specimens using TEM. They are located just above Bowman's zone. They contain bundles of neuro tubules and abundant mitochondria. The relation of these bulbous structures to the sub-basal nerves was demonstrated with SEM where a leash of Sub-basal nerves was seen to originate from them.

Conclusions: This study confirms the presence of these novel structures and it provides preliminary and interesting data on their anatomical organization and intracellular features. However, their functional significance is still unknown.

10.06am: Collagen Cross-linking with Photoactivated Riboflavin for the Treatment of Advanced Infectious Keratitis with Corneal Melting

Said, D.G.^{1,4}, Elalfy, M.S.^{1,4}, Gatzios, Z.², El-Zakzouk, E.S.¹, Hassan, M.A.³, Saif, M.Y.³, Zaki, A.A.¹, Dua, H.S.⁴, Hafezi, F^{2,5}.

¹*Research Institute of Ophthalmology, Cairo, Egypt, ²Division of Ophthalmology, Dept. of Clinical Neuroscience, Geneva University Hospitals, Geneva, Switzerland, ³Department of Ophthalmology, Beni-Suef University Hospitals, Egypt, ⁴Ophthalmology, Nottingham University Hospitals, UK, ⁵Keck School of Medicine, University of Southern California, Doheny Eye Institute, Los Angeles, CA, US*

Purpose: To investigate the efficacy and safety of corneal collagen cross-linking with photoactivated riboflavin (CXL) in the management of infectious keratitis associated with corneal melting.

Methods: Prospective, randomized, comparative case control study. Forty eyes from 40 patients with advanced infectious keratitis and co-existing corneal melting. Twenty-one patients (21 eyes) underwent CXL treatment in addition to antimicrobial therapy. The control group consisted of 19 patients (19 eyes) who only received antimicrobial therapy. The slit-lamp characteristics of the corneal ulceration, corrected distance visual acuity (CDVA), duration until healing and complications were documented in each group. Student's t-test was used for statistical analysis. P values less than 0.05 were considered statistically significant.

Results: The average time until healing was 39.76 ± 18.22 days in the CXL group and 46.05 ± 27.44 days in the non-CXL group (t-test, $p=0.19$). CDVA after treatment and healing was 1.64 ± 0.62 in the CXL group and 1.67 ± 0.48 in the non-CXL group (t-test, $p=0.11$). Corneal ulceration's width and length was significantly bigger in the CXL group ($p=0.014$ and 0.0026). Three patients of the non-CXL group developed corneal perforation; one had their infection recur. No serious complications occurred in the CXL group.

Conclusions: CXL did not shorten the time to corneal healing; however, the complication rate was 21% in the non-CXL group, whereas there was no incidence of corneal perforation or recurrence of the infection in the CXL group. These results indicate that CXL may be an effective adjuvant therapy in the management of severe infectious keratitis associated with corneal melting by reducing the occurrence of severe complications such as corneal perforation and recurrence of infection.

10.13am: Removal of Artificial Iris Implants Due to Bilateral Angle Closure Glaucoma and Corneal Decompensation

S Malik, AJ Ghauri, R Al-Mousa, G Smith, R Robinson

University Hospital, Clifford Bridge Road, Coventry CV22DX

Purpose: We describe the management of a 38 year old male retired police officer, who presented to eye casualty with loss of vision in the left eye and episodes of intermittent angle closure in the right eye. His intraocular pressures were 54 in the right eye and 68 in the left eye. He had undergone cosmetic artificial iris insertion to both eyes two years ago in Turkey. His original brown irises were visible beneath the artificial blue ones and appeared to be fixed. His anterior chambers were shallow. In addition, the implants were rubbing on the corneal endothelium. He had left corneal oedema with bullae. Both eyes had closed angles. He was initially treated medically for raised intraocular pressure. We describe the subsequent surgical removal of the implants.

Methods: Single case report

Results: A superior corneal incision and an inferior port were made. Viscodissection of the artificial iris was done using viscoat between the iris implant and the natural iris. The implant was cut using vitreoretinal scissors. It was then removed using fine forceps, through the superior incision. The patient has been informed that he will need glaucoma surgery in future.

Conclusion: Artificial iris implants are only recommended for medical reasons, such as aniridia. They are not approved for cosmetic purposes.

10.20AM: OPTOMETRY GUEST SPEAKER

PROFESSOR PETER ALLEN, ANGLIA RUSKIN UNIVERSITY, CAMBRIDGE 'VISUAL FUNCTION IN THE DEAF'



Dr Peter Allen is a full-time principal lecturer. He is a College of Optometrists council member representing the East Region, a trustee and sits on the Education Committee. He is a fellow of the College of Optometrists and Higher Education Academy. Peter's research interests include refractive error development, vision and reading difficulties and visual function in specialist groups.

'Visual Function in the Deaf' intuitively one might think that when one sense is compromised then the other senses will 'step up' to compensate. The talk will discuss how this is not the case in children who are deaf and will describe the visual difficulties that they experience.

11.15AM: CLINICAL AND TRANSLATIONAL RESEARCH PRESENTATIONS, PART 2

Chairs: Mr Winfried Amoaku and Mr A King

11.15am: Supplementing the Corneal Donor Pool using Human Decellularised Corneas
Samantha Wilson, University of Nottingham

11.22am: Laser Suture Stretch for Post Trabeculectomy Bleb Management
Rohit Saxena, Nottingham University Hospitals NHS Trust

11.29am: Vascular Morphology in Optic Nerve Head Drusen and Optic Disc Oedema Patients
Anastasia Pilat, University of Leicester

11.36am: Prevalence of Cataract within the Bridlington Eye Assessment Project
Ali Poostchi, Nottingham Universities NHS Trust

11.43am: Comparison of Electroretinographical Responses in Albinism, Idiopathic Infantile Nystagmus and Healthy Controls
Zhanhan Tu, University of Leicester

11.50am: Spectroscopic Measurements in Scleritis: Bluish-Red or Deep Red?
Matthew Wakefield, Leicester Royal Infirmary

11.57am: Is the One-Day Postoperative IOP Check Following Routine Uncomplicated Phacoemulsification Necessary in Patients with Pre-Existing Glaucoma and Ocular Hypertension? A Clinical and Questionnaire Study
Ankur Gupta, Nottingham Universities NHS Trust

ABSTRACTS

11.15am: Supplementing the Corneal Donor Pool using Human Decellularised Corneas

S.L. Wilson, L.E. Sidney, M.J. Branch, S.E. Dunphy, H.S. Dua, A. Hopkinson

Ophthalmology, Division of Neuroscience, University of Nottingham, Queen's Medical Centre Campus, NG7 2UH, UK

Purpose: There is a significant clinical need for reliable and quality biomimetic corneas that are as effective, preferably superior to cadaveric donor tissue. Decellularised matrices are advantageous over synthetic or semi-synthetic engineered tissues in that the complex native milieu is preserved to retain intrinsic biological cues including growth factors, cytokines and glycosaminoglycans (GAGs). However, there is currently no effective, standardised decellularisation protocol suitable for human corneas. Therefore, the purpose of this work was to provide a systematic evaluation of common decellularisation methods in terms of efficacy, reproducibility, reliability and ability for manufacture upscale.

Methods: Corneal eye-bank tissue deemed unsuitable for transplantation was utilised to determine an optimal human specific decellularisation technique. Hypertonic NaCl; ionic detergent, SDS; non-ionic detergent, Triton-X100, mechanical agitation, followed nuclease treatments were investigated. Removal of detectable cellular and immune reactive material was evidenced by immunofluorescence and quantitative assays. Preservation of optical properties and light transmittance was evaluated. Retention of corneal architecture and GAGs was assessed via histological, immunofluorescence and quantitative analysis.

Results: No currently employed decellularisation techniques successfully removed 100% of cellular components. The techniques which had the least residual DNA were most structurally compromised. GAG analysis demonstrated the stripping effects of the different decellularisation treatments.

Conclusion: The ability to utilise, reprocess and regenerate tissues deemed "unsuitable" for transplantation allows us to salvage valuable tissue. Reprocessing the tissue has the potential to have a considerable impact on addressing the problems associated with cadaveric donor shortage, which would have a significant economic benefit. Patients would directly benefit by accessing greater numbers of corneal grafts and health authorities would fulfil their responsibility for the delivery of effective corneal reconstruction to alleviate corneal blindness.

11.22am: Laser Suture Stretch for Post Trabeculectomy Bleb Management

Saxena R, Hovan M, Vernon SA

Queens Medical Centre, Nottingham University Hospitals NHS Trust

Purpose: Trabeculectomy aims to promote a filtering conjunctival bleb formation with a loose scleral flap to allow aqueous outflow, but tight enough to prevent hypotony and flat anterior chamber. The purpose of this study was to describe the performance and safety of a new technique of laser suture stretch (LSS) for managing a tight scleral flap following trabeculectomy.

Methods: Medical records of a consecutive series of 42 laser suture stretch procedures performed between Oct'2009 and Dec'2012 at our hospital were reviewed. There were 21 male and 20 female patients (mean age 69.8 years). Mean follow up was for 14.07 months. The mean interval between trabeculectomy and laser suture stretch was 12 days.

Outcome measures included IOP levels immediately following LSS, at three months and at last review, hypotony, bleb leak, and further surgery rates.

Results: Mean pre-stretch IOP was 25.2 (Range 12-38) mmHg, reducing to a mean of 12.7mmHg (range 4-20) immediately after the procedure. None of the patients had any significant shallowing of the anterior chamber or any demonstrable bleb leak. The mean IOP at 3 months was 10.5mmHg (Range 2-29) & 12.5mmHg at last review. None of the patients required further surgery in the follow up period.

Conclusions: LSS achieves loosening of scleral flap sutures in a controlled, graded manner and is a safe alternative to laser suture lysis and adjustable sutures.

11.29am: Vascular Morphology in Optic Nerve Head Drusen and Optic Disc Oedema Patients

A. Pilat, H. Lee, F. A. Proudlock, M. Lawden and I. Gottlob

Ophthalmology Group, University of Leicester, United Kingdom

Purpose: In patients with optic nerve head drusen (ONHD) retinal vascular abnormalities such as abnormal branching, vessel trifurcations, increased capillarity and large shunt vessels have been found. By contrast, in optic disc oedema (ODE) retinal haemorrhages and venous dilatation have been described. We aimed to analyse quantitatively the peripapillary retinal vessels morphology in patients with ONHD and ODE.

Methods: 25 ONHD, 22 ODE patients and 25 healthy participants were investigated using computer-based fundus analysis (ARIA software, Peter Bankhead). Colour optic disc (OD) photographs were taken in mydriasis using FF 450 plus IT, Carl Zeiss, Germany fundus camera (30° field). The vessel parameters were measured in ring with diameters 4.2-8.4 mm (no OD prominence was measured by optical coherence tomography).

Results: Patients with ONHD showed larger diameters of arteries without branching ($p=0.05$), arteries after primary/before secondary branching ($p=0.04$) and secondary venous branching started closer to the OD ($p=0.03$) compared to healthy controls. ODE patients had reduced number of small peripapillary veins and larger number of veins without branching as compared to ONHD and controls ($p=0.02$). Anomalous branching with arterial and venous trifurcation presented in the ODE and ONHD groups with higher prevalence in ODE patients for venous trifurcations as compared to both ONHD and controls ($p=0.02$).

Conclusions: In ONHD changes may be attributed to anomalous vessel development or compensatory vascular changes due to retinal hypoxia while patients with ODE could have increased size of small peripapillary veins and venous trifurcations to decrease the venous pressure and prevent retinal damage.

11.36am: Prevalence of Cataract within the Bridlington Eye Assessment Project

A Poostchi, P Dhillon, J Hillman, SA Vernon

Nottingham University Hospitals, Nottingham, UK

Purpose: To describe the prevalence of cataract in a population based setting.

Design: Prospective cross sectional survey of individuals over the age of 65 years within the town of Bridlington.

Methods: Individuals were invited to attend a screening visit where history and visual acuity were recorded by a study nurse and a full eye examination was performed by one of four specially trained optometrists. Lens assessment was performed at the slit lamp by the examining optometrist using the LOCS 3 grading. Those with new or unexplained ocular pathology including significant lens opacities, or a suspicious / abnormal visual field were automatically referred or to the hospital eye service for further assessment and outcomes were recorded at each visit in a prospective longitudinal manner.

Results: 7059 eyes of 3537 individuals were graded, corresponding to >99% of the enrolled population. 406 (11%) of individuals were pseudophakic and 7 were aphakic in at least one eye. Significant lens opacities (defined as LOCS 3 nuclear sclerosis ≥ 4 or cortical ≥ 3 or posterior subcapsular ≥ 2) were present in 1471 (41%) of individuals. 221 patients were referred to the hospital eye service for assessment of cataract of whom 122 went on to have cataract surgery. 62 individuals referred for other reasons also underwent cataract surgery.

Conclusion: Significant cataracts were present in 41% of the population but only 6% were deemed to require surgery. 12% of the population had previously undergone cataract surgery in at least one eye.

11.43am: Comparison of Electroretinographical Responses in Albinism, Idiopathic Infantile Nystagmus and Healthy Controls

Zhanhan Tu¹, Christopher Degg², Viral Sheth¹, Irene Gottlob¹, Frank Proudlock¹

¹*Ophthalmology Group, University of Leicester, ²Medical Physics, University Hospitals of Leicester*

Introduction: Previous studies describe children with albinism showing significantly better ERG results compared to controls, while idiopathic infantile nystagmus (IIN) had normal ERGs using small sample sizes and skin electrodes.

Purpose: To compare ERG results between a large sample of adults with albinism, IIN and controls. We investigated the correlation between ERGs with visual fields (VF) and retinal structure measured using optical coherence tomography (OCT).

Methods: Sixty-seven albinism, 43 IIN and 24 controls were recruited. Dilated Ganzfeld flash ERG testing was performed using DTL™ corneal electrodes. The thicknesses of retinal layers in the foveal area were obtained using OCT and Humphrey VF test was used.

Results: The IIN group demonstrated significantly smaller photopic a- and b-wave amplitudes compared to controls ($P<0.001$, $P<0.01$, respectively). The IIN group also showed significantly longer photopic b-wave latencies compared to the albinism group ($P<0.01$). However, the IIN group has shorter b-wave latencies compared to albinism group under scotopic conditions with standard flash. The thicknesses of macular, inner plexiform and inner segment layer were correlated with b-wave amplitude, a-wave latency and b-wave latency, respectively under photopic condition. The VF was strongly correlated with scotopic b-wave latency with dim flash.

Conclusions: Our findings of reduced photopic a- and b-wave amplitudes and longer b-wave latencies in IIN may indicate a subclinical reduction of retinal function in IIN which has not been previously detected. Interestingly, participants with albinism did not show the same changes despite having nystagmus possibly because hypopigmented retinae can cause increased ERG responses.

11.50am: Spectroscopic Measurements in Scleritis: Bluish-Red or Deep Red?

Wakefield MJ¹, Bannister NP², Tatham A¹, Bugby SL², Molyneux PM², Prydal JI¹

¹*Department of Ophthalmology, Leicester Royal Infirmary, Leicester, UK, ²Space Research Centre, Department of Physics & Astronomy, University of Leicester, Leicester, UK*

Purpose: To design a slit-lamp mountable spectrometer for the assessment of ophthalmic patients and to illustrate a potential clinical application by measuring the spectral characteristics of inflamed eyes of differing aetiologies.

Methods: A slit lamp mountable instrument was designed and built, and methods for data analysis developed. Reflectance spectra were recorded from 2 patients with scleritis, 3 with non-scleritic red eyes and from 2 controls with non-inflamed eyes.

Results: Measurements were reproducible and demonstrated statistically significant differences in the spectral characteristics between the three groups. Spectra from scleritic eyes revealed a relative increase in intensity of long wavelength red light, 650 – 740 nm, compared to non-scleritic red eyes. These longer wavelengths will be appreciated as a dark red. There was no increase in relative intensity in the blue part of the spectrum in scleritic eyes.

Conclusions: Reproducible measurements of the eye were made using an innovative, slit-lamp mountable spectrometer and its functionality demonstrated by differentiating the spectra from eyes with differing pathologies. While intending only to illustrate one potential application; for the cases examined, our results indicate that inflamed scleritic eyes exhibit a longer wavelength red light with no increase in shorter wavelength blue light. Thus our measurements would seem to confirm that the perceived redness of scleritis differs from other red eyes. However, it is a deeper darker red and not a bluish one as traditionally described.

11.57: Is the One-Day Postoperative IOP Check Following Routine Uncomplicated Phacoemulsification Necessary in Patients with Pre-Existing Glaucoma and Ocular Hypertension? A Clinical and Questionnaire Study.

Ankur Gupta, Stephen A Vernon

Department of Ophthalmology, Queen's Medical Centre, Nottingham, UK

Purpose: To determine if the one-day postoperative IOP check following routine uncomplicated phacoemulsification is necessary in patients with pre-existing glaucoma and ocular hypertension (OHT). To investigate the practice of UK glaucoma specialists in IOP prophylaxis and follow up regimes.

Methods: The IOP one-day post-operatively was analysed against the last recorded IOP before phacoemulsification in eyes that had a postoperative acetazolamide regime in patients with OHT or glaucoma who underwent phacoemulsification cataract surgery between December 2009 and September 2012 on a single morning operating list where it was routine practice to give acetazolamide postoperatively. An online questionnaire to analyse practice amongst UK glaucoma specialists from UK and Eire Glaucoma Society members.

Results: 107 eyes were studied; the mean IOP change was -0.8mmHg with only two eyes measuring >30mmHg postoperatively (2%, both 750mg acetazolamide). 18 (17%) eyes had an IOP rise of at least 30%. 32% of respondents to the survey did not use IOP prophylaxis. Only 26% routinely reviewed their patients one-day post-operatively.

Conclusion: Prophylactic acetazolamide appears to reduce, but not eliminate, the risk of an IOP >30mmHg on day one post routine phacoemulsification in glaucoma/OHT patients compared to

studies in which no IOP prophylaxis was used. However significant numbers of patients with pre-existing glaucoma or OHT, who undergo routine phacoemulsification, including acetazolamide prophylaxis, will require IOP management decisions on the first postoperative day. UK expert practice is non-uniform with regards to IOP prophylaxis and the one-day review, and further evidence-based guidance appears necessary.

12.15PM: IN THE PIPELINE

Updates on the most exciting new products coming to the market from some of our faithful sponsors

1.30PM: THE 18TH NORMAN GALLOWAY LECTURE

PROFESSOR MARIE-JOSÉ TASSIGNON



Professor Marie-José Tassignon (MD, PhD) completed her medical degree and residency in ophthalmology at the University Hospital Brussels. She completed her PhD thesis at the Rijksuniversiteit Leiden in 1990. In 1991 Professor Tassignon was appointed Head of Department at the University Hospital Antwerp and by 2003 had achieved full Professorship. In 2008 she became Medical Director of the Antwerp University Hospital. Professor Tassignon has been an ophthalmic surgeon since 1985 with personal participation of 59 % of total surgical activities of the ophthalmic operating rooms. Since 1992 her surgical activity has been oriented towards cataract surgery, corneal surgery and vitreo-retinal surgery in decreasing order of importance in surgical volume.

Professor Tassignon is a member of 8 national societies and 18 international societies, 6 of these national societies she is a board member for and 4 she is or has been President as well being a board member for 5 international societies including being Past-President of the European Society of Cataract and Refractive Surgery (ESCRS) and European Board of Ophthalmology (EBO) and Treasurer of the Academia Ophthalmologia Internationalis (AOI) and International Uveitis Study Group (IUSG).

Professor Tassignon is heavily involved in research and has supervised over 40 postgraduate students and has over 220 publications and over 140 abstracts. She has also filed 8 patents and designed 5 original instruments.

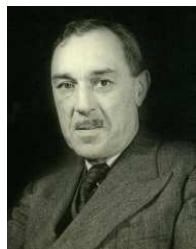
'Prerequisite for complex optics IOL implantation' the next generation IOLs will have the aim to correct corneal astigmatism, ocular aberrations and restore accommodation.

Is this goal a myth or reality? Which are the prerequisites to reach this goal? The most frequent complication of modern cataract surgery remains posterior capsule opacification (PCO) which is very disturbing when complex optics are concerned. PCO will refract the incoming light in an undesired way disturbing the pattern that was carefully calculated by the IOL manufacturer's complex optics to reach pseudo-accommodation as proposed by diffractive lenses.

Perfect transmission of the light within the eye which remains unaffected over time has never been reached until the bag-in-the-lens was proposed. Although very much criticized by the competitors, this lens design continues to surprise the ophthalmologists because of the multiple additive devices that enlarge the scope of indications for implantation. Weak zonules are no counter indication anymore since the advent of bean shaped rings which can be positioned in the capsular bag or in the sulcus.

The challenge for the near future is finding the best alignment methodology in order to improve quality of vision and optimize the effect of complex optics.

THE HISTORY



The Norman Galloway Lecture was endowed in 1996, by Mr Nicholas R Galloway, Consultant Ophthalmologist at the University Hospital Queen's Medical Centre Nottingham (retired 2001), in memory of his father. This has since become a key feature of what is now a nationally recognised symposium.

Norman Patrick Galloway was born at Rhynie in Aberdeenshire on 27th March 1895 and died in Rempstone near Loughborough, Leicestershire on 2nd February 1976. He was a graduate of the University of Edinburgh and became a House Physician in the Edinburgh Royal Infirmary. During the First World War he served with the Army in South Africa, afterwards deciding to take up Ophthalmology. He obtained his DOMS in Oxford and during his time in Oxford met his future wife Eileen Thompson, the daughter of a general practitioner in Nottingham.

In 1922 he was appointed Clinical Assistant to the Nottingham and Midland Eye Infirmary and five years later, in 1927, he was elected Honorary Surgeon. He held this appointment through World War II and, in 1948, with the advent of the National Health Service, became Consultant Ophthalmologist. In the 1920's, Norman Galloway was an active member of the British Medical Association and helped to organise the meeting that was held in Nottingham in 1926. At a national level, for many years he supported the Midland Ophthalmological Society, regularly presenting papers, and in 1951 was appointed their President. He was also a member of the Council of the Oxford Ophthalmological Congress. He saw the introduction of antibiotics and steroids and, during the difficult post-war period, helped to steer the Hospital House Committee through the numerous negotiations involved with the formation of the National Health Service. He was also instrumental in gaining funding for the Eye Hospital extension to the wards and outpatient department. From 1950 to 1951 he was President of the Nottingham Medico-Chirurgical Society.

During his working life, Norman Galloway saw and helped to implement great changes in the practice of Ophthalmology in Nottingham. The old outpatient system where the doctor stood by a desk facing a queue of patients was replaced by consulting rooms and the building of the new extension allowed the introduction of special clinics. Nottingham had an Ophthalmic Nursing School before the war and at an early stage had an Orthoptic Department. Norman Galloway retired from the hospital in March 1959 after 34 years of service. His patients remember him as a kindly man who preferred one-to-one relationships. He tended to avoid public speaking whenever possible.

Nicholas R Galloway

PREVIOUS NORMAN GALLOWAY LECTURES

2013: Professor José Alvaro Pereira Gomes, São Paulo, Brazil. *New Perspectives for the treatment of Ocular Surface Disease*

2012: Professor Irene Gottlob, University of Leicester. *What is moving in Nystagmus?*

2011: Professor F Kruse, Erlangen, Germany. *Descemet Membrane Endothelial Keratoplasty, the Thinner, the Better*

2010: Professor D Wong, University of Liverpool and Hong Kong. *East and West*

2009: Prof IG Rennie, Sheffield. *The Good, the Bad and the Ugly: The Metastatic Potential of Uveal Melanoma*

2008: Professor A Fielder, London. *Paediatric Ophthalmology – Where Next?*

2007: Professor J-J De Laey, Ghent, Belgium. *Paraneoplastic Retinopathies*

2006: Mr JKG Dart, Moorfields Eye Hospital, London. *When Topical Steroids Fail: Managing Severe Anterior Segment Inflammation*

2005: Professor D Azar, Massachusetts Eye Infirmary, Harvard University, Boston, USA. *Wavefront-guided Keratorefractive Surgery: Advantages and limitations*

2004: Professor R Hitchings, Moorfields Eye Hospital, London. *Normal Tension Glaucoma*

2003: Professor CNJ McGhee, University of Auckland, NZ. *Exploring the Topographic and Inner World of the Cornea to the Horizon of the Iris Plane: Contemporary Imaging of the Anterior Segment of the Eye*

2002: Professor AC Bird, Institute of Ophthalmology, University College London. *Prospects of Treating Inherited Retinal Diseases*

2001: Professor JV Forrester, University of Aberdeen. *Classification and Treatment of Posterior Uveitis*

2000: Professor PR Laibson, Wills Eye Hospital, Philadelphia, USA. *Herpes Simplex Viral Keratitis: What HEDS (Herpetic Eye Disease Studies) has taught us*

1999: Mr JRO Collin, Moorfields Eye Hospital, London. *Management of Traumatic Ptosis*

1998: Professor LA Donoso, Wills Eye Hospital, Philadelphia, USA. *Stargardt's Macular Degeneration*

1997: Professor DB Archer, Queen's University, Belfast. *Diabetic Retinopathy – a Tolerable Disease*

2.30PM: 18TH NOTTINGHAM EYE SYMPOSIUM 'CATARACT SOUND AND VIDEO SHOW'

Chair: Professor Harminder Dua

This year the symposium has the theme 'Cataract Sound and Video Show'. Age-related cataracts are responsible for 51% of world blindness, about 20 million people. Globally, cataracts cause moderate to severe disability in 53.8 million (2004), 52.2 million of whom are in low and middle income countries. The first references to cataracts and their treatment in Ancient Rome are found in 29 AD in *De Medicinae*, evidence of eye surgery in the Roman era also exists.

We have invited nationally renowned speakers to share their expertise on cataract surgery and biometry. The topics that will be covered span a wide range of implications.

2.30pm: Biometry: Pointers, Pitfalls and Personalising *David Sculfor, Stoke Mandeville Hospital*



David Sculfor is Consultant Optometrist and Head of Optometry at Stoke Mandeville Hospital in Aylesbury. He began his career in optics as a lens maker, gaining a qualification as an optical technician, and later as a dispensing optician. He studied Vision Sciences at Aston University, graduating in 1991 with First Class Honours, and completed his training in Optometry at Oxford Eye Hospital. In 1994 he moved to Stoke Mandeville Hospital to start a new Optometry Department, where his special interests include biometry, electrodiagnostics and diabetic retinopathy screening. Outside of work he is a keen hiker, and in his mid-life crisis he bought a drumkit and is learning to play the drums.

Accurate biometry is an essential part of the cataract surgery process, yet with increasing automation; the surgeon is often presented with a sheet of lens powers and little else. This talk will concentrate on giving surgeons some basic checks that they can use to assure themselves that the biometry is likely to be correct. It will also cover the how and why of a-constant optimisation, together with its limitations.

2.55pm: 'Routine' Cataract Surgery: Avoiding and Dealing with Problems *Larry Benjamin, Stoke Mandeville Hospital*



Mr Benjamin trained in Brighton, The Western Eye Hospital, Moorfields and The Oxford Eye Hospital. He was appointed as a Consultant in 1990 and since then has developed interests in Cataract surgery, the management of Diabetic Retinopathy including the use of early vitrectomy and surgical training. He was the first chairman of the Surgical Skills Sub-committee at the Royal College of Ophthalmologists during which he helped to develop the College microsurgical skills courses and chaired the committee which updated the latest College cataract surgical guidelines. He has served as the Chairman of the Education Committee and Senior Vice President of the College. He has served on the councils of UKISCRS and the ophthalmic section of the Royal Society of Medicine. He is currently chair of the microsurgical skills committee at the RCOphth.

3.50pm: 'Difficult' Cataract Surgery: Subluxated lenses, Pseudoexfoliation, Vitrectomised and High Myopia Eyes *Brian Little, Moorfields Eye Hospital*



After gaining a first class degree in Physiology, Mr Little qualified at Cambridge University with a distinction in surgery in 1983. He then underwent specialist training in ophthalmology at Oxford, St Thomas's and Moorfields Eye Hospital. His particular interests are cataract surgery and glaucoma. He is a consultant at Moorfields Eye Hospital, where he is responsible for running their training programme in cataract surgery. He has been performing phacoemulsification for over 20 years and he has a particular interest in complex cataract surgery. In 2010 he was listed in The Times "Top Doctors" as one of the five top ophthalmologists in Great Britain. Mr Little is involved in clinical research and has published over 50 articles in peer-reviewed journals as well as authored numerous chapters and contributed to major textbooks. He is Series Editor of the award-winning Video Atlas of Eye Surgery whose material is licensed to the American Academy of Ophthalmology (www.eyemovies.co.uk). He was elected a Member of the Guild of Master Craftsmen for his cabinet making skills and is a keen motorcyclist. In 1985 he built his own aluminium-bodied convertible classic sports car that was used in a TV series. He lives in north London and is married to Kate, his eternally tolerant GP wife. They have three grown up children who generally find them both an embarrassment.

There are always challenges that surgeons have to face when managing difficult cases. These include not only the more self-evident technical skills but also the equally important but less obvious skills of strategic and surgical planning. These are all needed in combination in order to maximise the chances of success through careful risk management. The types of cases selected to illustrate these principles include subluxed lenses, pseudoexfoliation, vitrectomised eyes and highly myopic eyes.

4.15pm: Choosing the Right Lens: Monofocal, Multifocal, Toric, Accommodative *Milind Pande, Vision Surgery and Research Centre, East Riding of Yorkshire*



Mr Pande heads the Vision Surgery and Research Centre in East Yorkshire. He trained initially in Yorkshire before taking up the prestigious Iris Fund Research fellowship at St Thomas' Hospital in London. He was a Lecturer in Oxford before joining the Hull Royal Infirmary as a Consultant. Has over 30 years of clinical and surgical experience in three continents in the field of Ophthalmology with sub-speciality experience in cataract, cornea and refractive surgery.

For the Nottingham Eye Symposium Mr Pande will share his wealth of experience on 'Choosing the Right Lens'.

4.40pm: Femtolaser Cataract surgery *Alexander Day, Moorfields Eye Hospital*



Alex is a Clinical Lecturer at Moorfields Eye Hospital and UCL Institute of Ophthalmology NIHR Biomedical Research Centre, where his main research interests are outcomes of cataract surgery and laser assisted cataract surgery. Alex has experience using the Optimedica Catalys system at Moorfields with Julian Stevens since August 2012.

His presentation will review the laser cataract surgery platforms, the evidence on their safety and efficacy, and his experience of laser assisted surgery at Moorfields.

POSTER PRESENTATIONS

- 1 The Effectiveness of a Retinal Prosthesis to Elicit Visual Percepts in Blind People
Ketan Agarwal, University of Liverpool
- 2 High Glucose Effects on Retinal and Choroidal Endothelial Cells: Permeability and Tight Junctions
Elizabeth Stewart, University of Nottingham
- 3 Central Retinal Artery Occlusion, a Case Based Review
Meera Mistry, University of Liverpool
- 4 Ocular Manifestation in Patients with Tuberous Sclerosis (case series)
N. Sarvananthan, A.Pilat, Leicester Royal Infirmary
- 5 Head Posture and Head Movements in Infantile Nystagmus
Vijay Patel, University of Leicester
- 6 Omnigen™: A Novel Dried Amniotic Membrane Product
Owen McIntosh, University of Nottingham
- 7 Optimisation of a Standardised Chemical Burn Animal Model for use in Corneal Wound Healing
Owen McIntosh, University of Nottingham
- 8 Precipitants of 5-Fluorouracil in Trabeculectomy Bleb Management - A Comparative Laboratory Study
Anna Bhargava, Royal Preston Hospital
- 9 Short Term Results of Intravitreal Dexamethasone Implant (OZURDEX®) in the Treatment of Macular Oedema Following Retinal Vein Occlusion
Mouhamed Al-Aqaba, Rotherham Hospital
- 10 Cosmetic Results of Angular Dermoid Cyst Excision Through a Superior Lid Crease Approach in a Pediatric Oculoplastics Service
Konstantinos Giannouladis, Nottingham University Hospitals
- 11 Central Visual Fields and Visual Acuity in Glaucoma Patients
Richard Stead, Nottingham University Hospitals
- 12 Use of Non-Parametric Analysis to Detect Glaucomatous Visual Field Progression Following Trabeculectomy Surgery in a Cohort of Patients with Advanced Glaucoma
Richard Stead, Nottingham University Hospitals
- 13 Postural Stability in Infantile Nystagmus
Zhanhan Tu, University of Leicester
- 14 Supplementing the Corneal Donor Pool using Human Decellularised Corneas
Samantha Wilson, University of Nottingham
- 15 Fibrin Glue in Corneal Epithelial Cell Migration
Aaron Yeung, University of Nottingham
- 16 Immunological Properties of Fetal Liver Mesenchymal Stem Cells for Ophthalmology
Matthew Branch, University of Nottingham
- 17 Transdifferentiation of CD34⁺ Corneal Stromal Cells into Corneal Epithelial Cells
Laura Sidney, University of Nottingham
- 18 Is raised intraocular pressure secondary to Ozurdex for retinal vein occlusion a cause for concern?
Susmita Bala, Moorfields Eye Hospital NHS Foundation Trust
- 19 Microperimetry Changes in Vitamin A Deficiency
Saker Saker, University of Nottingham

POSTER PRESENTATION ABSTRACTS

The Poster Exhibition is located in the Main Conference Hall

1: The Effectiveness of a Retinal Prosthesis to Elicit Visual Percepts in Blind People

Ketan Agarwal

University of Liverpool

Purpose: "It is a terrible thing to see, and have no vision", as quoted by Helen Keller, a deaf-blind American author. Being blind can send shivers down the spine; however, the retinal prosthesis promises a visionary future. This systematic review aims to critically appraise studies that have performed trials on blind subjects to evaluate the effectiveness of the retinal prosthesis in restoring vision.

Methods: The Medical databases Ovid Medline®, Scopus and the NHS evidence have been searched meticulously for studies from 2005 to 2013. The restrictions included articles in English language only. The resulting articles that met the criteria were critically appraised. The articles have been appraised using the critical skills appraisal programme (CASP) as a guideline.

Results: The results of the articles reviewed all point towards a strong conclusion that the retinal prosthesis is indeed very effective in eliciting visual percepts in blind subjects. This is achieved by stimulating the damaged photoreceptors of the retina using a small electrical current from the prosthesis.

Conclusions: These studies show a promising future to restoring vision. Further trials need to be conducted larger sample sizes. The current research involves subjects blinded with some form retinal degeneration; therefore further developments need to be accomplished with the prosthesis to achieve vision restoration in subjects blinded with other non-degenerative conditions, such as glaucoma.

2: High Glucose Effects on Retinal and Choroidal Endothelial Cells: Permeability and Tight Junctions

Stewart, E.A., Saker, S., Browning, A.C., Allen, C.L. and Amoaku, W.M.

Neovascularisation Group, Ophthalmology, DCN, University of Nottingham, Nottingham, UK. Email: wma@nottingham.ac.uk

Purpose: Diabetic retinopathy is the leading cause of preventable blindness in the working population and its prevalence continues to increase as the worldwide prevalence of diabetes grows. Diabetic choroidopathy is less well studied and occurs in the late stages of diabetic eye disease. The main cause of visual loss in diabetic eye disease is diabetic macular oedema caused by an increase in microvascular endothelial permeability. Endothelial cell permeability is influenced by multiple factors which have not been fully elucidated, particularly in human models. In addition, the gene and protein expression between retinal and choroidal endothelial cells, even in humans, has been shown to be heterogeneous.

Methods: The effect of high glucose (25mM) on human paracellular permeability was assessed in retinal and choroidal endothelial cells by measuring passage of Evan's Blue Albumin through cultured monolayers. The expression of selected tight junction molecules (Occludin, Claudin-5, JAM-A and JAM-C) and adheren junction (VE-Cadherin) molecules was compared using microarray, western blotting, qPCR and immunofluorescence.

Results: High glucose conditions significantly increased the permeability in both retinal and choroidal endothelial cells monolayers although the increase was higher in retinal endothelial cells.

Under normal glucose culture conditions microarray analysis determined that occludin and claudin-5 gene expression was higher in retinal endothelial cells than choroidal endothelial cells, and western blotting indicated that claudin-5 protein expression was also higher in retinal endothelial cells whilst JAM-A, and C and VE-cadherin levels were similar. In retinal endothelial cells exposed to high glucose claudin-5, occludin and JAM-A was found to be reduced, whereas the expression of VE-Cadherin and JAM-C was unchanged when evaluated with western blotting, immunofluorescence and qPCR. None of the proteins were significantly decreased by high glucose in choroidal endothelial cells.

Conclusions: The increase in retinal endothelial cell permeability is likely caused by a decrease in selective tight junction protein expression, leading to increased paracellular permeability. This may indicate differences in junctional molecule regulation of permeability in retinal compared to choroidal endothelial cells.

3: Central Retinal Artery Occlusion, a Case Based Review

Meera Mistry, Mr M Batterbury

University of Liverpool, St. Pauls Eye Unit at the Royal Liverpool University Teaching Hospital

Purpose: To report a case of Central retinal artery occlusion (CRAO) in the left eye.

Method: A 58 year old man presented with a sudden onset of painless and profound loss of vision in the left eye. On undertaking a complete history and thorough clinical examination, diagnosis was established. Appropriate investigations were implemented to exclude other underlying conditions. The patient was then followed up for treatment and the outcome evaluated. A literature search was conducted to highlight implications to improve the management of similar patients in the future.

Results: Evidence from a history of a sudden and painless loss of vision suggested a vascular aetiology. On examination a pale swollen retina with a cherry red spot at the macula was observed. Marked relative afferent papillary defect was also noted in the left eye. This led to the diagnosis of CRAO.

Conclusions: This report documents a clear case of CRAO. Given the marked compromise in the quality of life, there is yet no guideline endorsed therapy available. With the incidence of atherosclerotic disease increasing, the public awareness of CRAO should be expanded. This will encourage people to present earlier, but more importantly take measures to prevent the disease occurring altogether.

4: Ocular Manifestation in Patients with Tuberous Sclerosis (case series)

N. Sarvananthan, A.Pilat, P. Vasuvedan and S. Anwar

Department of Ophthalmology and Genetics, Leicester Royal Infirmary, United Kingdom

Purpose: Tuberous sclerosis (TS) is a rare genetic condition with non-malignant lesions in the brain, kidneys, heart, lungs, skin and eyes. We report the ophthalmological findings in four TS patients with genetically confirmed diagnosis.

Methods: All patients underwent standard ophthalmological examination including visual acuity, refraction, slit lamp, fundus examination, magnetic resonance imaging (MRI), ultrasound (USS) of brain and echocardiography.

Results: Two patients (males, 32 and 38 years) had only cardiac involvement with heart murmurs, multiple myxomas on echocardiograms. In one female patient TS was established prenatally (USS fetal examination showed brain changes and TS was diagnosed with a fetal MRI). In another female patient TS was diagnosed in the postnatal period. Both girls had cardiac involvement with multiple myxomas, epilepsy and cortical tubers (MRI). On initial examination patients fixed and followed well,

no changes were seen in the anterior segment and raised greyish lesions were found on fundus bilaterally. Both had developmental delay and epilepsy with stable changes on brain MRI and echocardiography. At the last examination, the older female patient was 9 years of age, with visual acuity of 0.05 LogMAR, full colour vision in both eyes. Motility showed distance exophoria and good near stereopsis. The younger female patient (one year of age) was fixing and following well with no manifest deviation. Both patients had stable retinal lesions on sequential fundus exam and imaging.

Conclusion: There is variation in the clinical features of TS with stable lesions seen in patients with ocular involvement.

5: Head Posture and Head Movements in Infantile Nystagmus

Vijay Patel, Dr FA Proudlock, Professor I Gottlob

University of Leicester

Purpose: The mechanisms behind Infantile Nystagmus (IN) null regions and their relationship to anomalous head postures is unclear. Our aims are to investigate the relationship between head postures and null regions two dimensionally and to investigate the nature of head movements in IN.

Methods: 18 IN patients and 15 controls were recruited. Null regions were mapped in IN patients in the horizontal and vertical plane using the EyeLink II binocular pupil tracker to measure the intensity of their nystagmus. Patients also carried out a number of visual tasks, during which head posture and movements were measured using the InertiaCube head movement measuring device and EyeLink 1000 head tracker. Eye movements were also recorded using the EyeLink 1000 monocular pupil tracker. Controls only carried out head posture and head movement experiments at 1.2m and 0.6m.

Results: Nystagmus characteristics in IN patients were shown to dramatically change in the vertical and horizontal planes. The individual characteristics of null regions varied between patients. Head postures were found to correlate to accessing the null region, particularly in tasks of high visual demand. Furthermore IN patients were found to make significantly more functional head movements than controls.

Conclusion: The two dimensional null region acquisition protocol enables a more comprehensive analysis of null regions than traditional methods. Whether null regions are accessed using anomalous head postures is dependent on a number of factors.

6: Omnipen™: A Novel Dried Amniotic Membrane Product

Allen, C.L., McIntosh, O.D., Dua, H.S., Hopkinson, A.

Ophthalmology, Division of Clinical Neuroscience, University of Nottingham, UK

Purpose: NuVision™ is a new University of Nottingham spinout company that aims to develop, validate and commercialise innovative and cost effective ophthalmic regenerative therapies to save sight. The company's pioneering launch product, Omnipen™, is an innovative dried amniotic membrane (AM). Dried AM is a useful therapeutic adjunct in ophthalmic surgery and possesses logistical advantages over cryopreserved AM (CPAM). The differences in preservation can significantly influence bio- chemical and physical properties of AM, affecting clinical efficacy. This poster provides details of a study between Omnipen™ and conventional cryopreserved AM.

Methods: Differently preserved AM substrates were compared using a number of assessments. Structural and visual comparisons were made using EM; localisation and release of AM biological factors were determined using immunofluorescence and immunoassays. The biocompatibility of

each substrate was tested using co-cultured primary corneal epithelial cells (CEC) or keratocyte monolayers, and assessed using standard cellular health assays.

Results: Omnigen™ did not devitalise as much as the other substrates, nor was there as much cellular damage. Omnigen™ showed greater factor retention and bioavailability compared to CPAM. The cellular health assays showed that Omnigen™ was superior compared to CPAM for CEC expansion, with increased proliferation and reduced cytotoxicity. This was supported by improved wound healing in Omnigen™ also.

Conclusions: Omnigen™ is superior to conventional CPAM, the only AM product currently available in the UK. It has been validated *in vitro* and *in vivo*, unlike other AM products.

7: Optimisation of a Standardised Chemical Burn Animal Model for use in Corneal Wound Healing

McIntosh, O.D., Allen, C.L., Dua, H.S., Hopkinson, A.

Ophthalmology, Division of Clinical Neuroscience, University of Nottingham, UK.

Purpose: The rabbit ocular surface has been used for many years as a reliable comparison for the study of human corneal injuries. This work aimed to create a standardised corneal epithelial injury using an alkali insult, which results in a type III healing response with wound healing. The ultimate aim is the use of this *in vivo* injury model to test novel ocular bandages and substrate treatments.

Methods: De-epithelialisation first required *in vitro* optimisation for reproducibility before use in *in vivo* rabbit models. Corneas obtained from New Zealand White rabbits were de-epithelialised with sodium hydroxide (NaOH) solution using a range of concentrations, durations and modes of application. The injury area, depth and severity were assessed using haematoxylin and eosin staining and transmission electron microscopy. The optimised *in vitro* model was applied to an *in vivo* pilot study in rabbits and tested for reproducibility using normal and fluorescein slit lamp images.

Results: *In vitro* optimisation revealed that higher NaOH concentrations and extended durations caused undesirable irreversible damage to the cornea. Lower concentrations and durations produced the injury required. The injury model was established in an *in vivo* pilot study using our optimal parameters and tested to see if a chemical burn with little variation in area or severity could be achieved. Following 48 hour treatment we were able to detect reliable wound healing using our refined model.

Conclusions: The *in vitro* optimisation showed us parameters that were sufficient to de-epithelialise the cornea, creating an injury without causing stromal damage. The model is now in use *in vivo*, to test the biocompatibility and efficacy of various ocular surface substrate treatments.

8: Precipitants of 5-Fluorouracil in Trabeculectomy Bleb Management - A Comparative Laboratory Study

Mercieca K¹, Bhargava A², Steeples L¹, Fenerty CH¹

¹*Manchester Royal Eye Hospital, Manchester, UK;* ²*Royal Preston Hospital, Preston, Lancashire*

Purpose: 5-Fluorouracil (5-FU) is an anti-metabolite commonly used to prevent post-operative scarring as part of trabeculectomy bleb management. Concerns about 5-FU corneal toxicity have led to various ways of reducing its corneal exposure including the application of various topical agents to induce its precipitation.

Methods: We present a double blind, descriptive, laboratory study comparing five different potential precipitants of 5-FU (proxymethacaine, oxybuprocaine, amethocaine, fluorescein, proxymethacaine + fluorescein) to a control group (normal saline). 0.01ml of each anonymised agent was applied adjacent to a clear comparison marker within a transparent sterile gallipot set on a black

background. 5-FU (0.01ml of 50mg/ml) was subsequently applied to each agent. The resultant change in transparency was photographed and compared to the central marker. The pH change following application was also noted for each group.

Results: Proxymethacaine, fluorescein and proxymethacaine + fluorescein did not cause any visible precipitation of 5-FU. Oxybuprocaine produced a moderate visible response and amethocaine produced very significant precipitation. Application of proxymethacaine, oxybuprocaine, amethocaine and proxymethacaine + fluorescein resulted in neutralisation of the alkaline 5-FU pH to 7. Saline and fluorescein retained an alkaline pH of 8.5 after application.

Conclusions: Proxymethacaine should be the topical anaesthetic of choice prior to 5-FU injection. Amethocaine should be the topical agent of choice to precipitate 5-FU to help prevent corneal exposure after injection into a trabeculectomy bleb. We propose the use of a cotton tipped bud dipped in amethocaine applied at the injection site as the best method to avoid corneal exposure of 5-FU in these cases.

9: Short Term Results of Intravitreal Dexamethasone Implant (OZURDEX[®]) in the Treatment of Macular Oedema Following Retinal Vein Occlusion

Mouhamed Al-Aqaba and Shakti Thakur

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Purpose: To study the efficacy and safety of a sustained release intravitreal implant of dexamethasone (Ozurdex[®]) as a new treatment modality recently approved in the United Kingdom for the treatment of macular edema secondary to retinal vein occlusion in a clinical setting.

Methods: A prospective consecutive case series study of patients with macular oedema secondary to branch or central retina vein occlusion treated with dexamethasone implant of 0.7 mg.

Results: Forty-five patients were included in this study (27 females, 18 males; mean age 70.9). They were 22 patients with CRVO and 23 with BRVO. Fifty percent of patients have their treatment within 6 months of diagnosis. 33% of patients achieved 3 lines or more of visual improvement. The branch retinal vein occlusion subgroup showed a better BCVA at 2 months post-treatment. The subjective response was good in about 60% of patients and fair in 20%. Only 20% of patients felt no difference with treatment. SD-OCT response was full with dry macula in 59% of patients. Partial response with variable amount of residual oedema was seen in 31%. Only 10% of patients showed no anatomical response to treatment. 29% of patients required treatment for raised intraocular pressure.

Conclusions: Intravitreal dexamethasone implant for macular oedema secondary to vein occlusion is effective and safe treatment modality. No serious complications were reported.

10: Cosmetic Results of Angular Dermoid Cyst Excision Through a Superior Lid Crease Approach in a Pediatric Oculoplastics Service

K Giannouladis, K Tambe

Nottingham University Hospitals NHS Trust

Purpose: To demonstrate our results of a superior lid crease approach to the excision of angular dermoid cysts.

Methods: Retrospective case series of angular dermoid cyst excisions with assessment of the cosmetic result from postoperative photographs and subjective impression of the parents. 11 cases were identified from 2010 to date.

Results: All cases reported being very satisfied with post-operative cosmesis. There was minimal scarring and well hidden under the upper lid crease for both laterally and medially located dermoid cysts with no adverse events or operative difficulties encountered with this approach.

Conclusion: The superior lid crease approach for the excision of dermoid cysts is a simple and effective technique with excellent cosmetic result and should be preferred over the standard direct incision as that may lead to visible scarring.

11: Central Visual Fields and Visual Acuity in Glaucoma Patients

Fayyaz U Musa, Richard E Stead, Samreen Uppal, Stephen A Vernon MD

Department of Ophthalmology, Queens Medical Centre, Nottingham, UK

Purpose: There is a relatively high incidence of glaucoma patients who require cataract extraction. This may simply be due to the advanced age of the majority of patients or as a result of topical therapy and/or drainage surgery. Prior to the onset of visually significant cataract we hypothesise that loss of visual acuity may be predicted by the analysis of central visual field testing.

Methods: Retrospective case note review of glaucoma patients undergoing 10-2 visual field testing using a Humphrey's visual field analyser at a tertiary referral centre in the UK. Unreliable tests and those patients with significant ocular co-morbidities were excluded. The central four points were examined and correlated with visual acuity.

Results: 67 visual fields were eligible for analysis. There was a trend towards reduced visual acuity with an increased number of quadrants with reduced sensitivity at all levels (0, <5 & <10 dB). The strongest correlation for reduced vision was in the inferior hemi-field, particularly the infero-temporal quadrant.

Conclusion: Central visual fields (10-2) visual fields in glaucoma patients with advanced or para-central visual loss can help predict visual acuity. If none of the four central points on the 10-2 test have sensitivity below 10dB pre-operatively post-operative acuity can be expected to be approximately 0.1 and at least 0.3 logMAR. Similarly, when there are three quadrants of sensitivity below 10dB the visual acuity is likely to be 0.5 and at best 0.37 logMAR.

12: Use of Non-Parametric Analysis to Detect Glaucomatous Visual Field Progression Following Trabeculectomy Surgery in a Cohort of Patients with Advanced Glaucoma

Richard E Stead, Anthony J King

Department of Ophthalmology, Queens Medical Centre, Nottingham, UK

Introduction: To apply nonparametric analysis to a cohort of patients with advanced glaucoma to assess its ability to detect progression of visual field defects in advanced disease. We also assessed the success of trabeculectomy surgery augmented with mitomycin C to help define success in terms of visual field progression.

Methods: Patients with advanced glaucoma (mean deviation (MD) of ≥ -20 dB) undergoing trabeculectomy with mitomycin C were identified. Those with at least two reliable pre-operative and two reliable post-operative 24:2 Humphrey visual plots with a minimum follow up of 12 months were included. Non-parametric progression analysis (NPA) was applied to evaluate visual field progression.

Results: Thirty three patients were included with a mean follow up of 47 months. No significant difference between mean pre-operative MD and final mean post-operative MD was demonstrated ($-24.99 \text{ dB} \pm 3.31$ and $-24.91 \text{ dB} \pm 5.39$ respectively; $p= 0.909$). NPA categorised 19 patients (58%) as having stable fields and 14 (42%) as having progressed following surgery. The mean change in MD

for the stable group was 1.95dB (-25.44 to -23.49 pre and post-op) and -2.45dB for those that progressed (-24.38 to -26.83).

Conclusion: Comparison of pre and post-op MD as recommended by the World Glaucoma Association would have suggested this group remained stable. NPA however identified a cohort in whom the disease was worsening. NPA appears to be a useful technique although further research is required to evaluate and validate the usefulness of NPA in assessing progression in patients with advanced glaucoma.

13: Postural Stability in Infantile Nystagmus

Zhanhan Tu¹, Christopher Degg², Viral Sheth¹, Rebecca Mclean¹, Peter O'Hara², Irene Gottlob¹, Frank Proudlock¹

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Purpose: Deficits in balance have been described in idiopathic infantile nystagmus (IIN) using Computerized Dynamic Posturography (CDP), concluding that greater relative emphasis is placed on somatosensory (SOM) and vestibular inputs in IIN, and less on vision. We investigated the role of vision on postural stability in albinism using CDP.

Methods: 10 participants with albinism, 7 with IIN and 14 controls underwent the sensory organization test using CDP which has a sway-referenced (SR) platform and a SR visual surround. The Equilibrium Score (ES) was used to estimate the relative importance of the three inputs.

Results: In contrast to previous findings, overall balance performance was similar and relatively good in all 3 groups in the 3 conditions with a fixed platform. The largest differences were observed when negating SOM inputs using the SR platform where deprivation of vision led to much greater drop in balance performance in the control group than in the albinism ($p=0.002$) and IIN ($p=0.009$) groups. However, albinism performed better than controls when only vestibular inputs were available ($p=0.031$).

Conclusion: Overall balance performance was better than expected in albinism and IIN and they could cope with deprivation of vision better, especially when proprioception is compromised. Individuals with IIN and albinism do not appear to use proprioceptive inputs differently to controls as evidenced by their good performance overall with a fixed platform. Individuals with IIN appear to use proprioceptive, visual and vestibular cues in a similar way to the controls. However, individuals with albinism use vision and vestibular cues with similar weighting.

14: Supplementing the Corneal Donor Pool using Human Decellularised Corneas

S.L. Wilson, L.E. Sidney, M.J. Branch, S.E. Dunphy, H.S. Dua, A. Hopkinson

Ophthalmology, Division of Neuroscience, University of Nottingham, Queen's Medical Centre Campus, NG7 2UH, UK

Purpose: There is a significant clinical need for reliable and quality biomimetic corneas that are as effective, preferably superior to cadaveric donor tissue. Decellularised matrices are advantageous over synthetic or semi-synthetic engineered tissues in that the complex native milieu is preserved to retain intrinsic biological cues including growth factors, cytokines and glycosaminoglycans (GAGs). However, there is currently no effective, standardised decellularisation protocol suitable for human corneas. Therefore, the purpose of this work was to provide a systematic evaluation of common decellularisation methods in terms of efficacy, reproducibility, reliability and ability for manufacture upscale.

Methods: Corneal eye-bank tissue deemed unsuitable for transplantation was utilised to determine an optimal human specific decellularisation technique. Hypertonic NaCl; ionic detergent, SDS; non-ionic detergent, Triton-X100, mechanical agitation, followed nuclease treatments were investigated. Removal of detectable cellular and immune reactive material was evidenced by immunofluorescence and quantitative assays. Preservation of optical properties and light transmittance was evaluated. Retention of corneal architecture and GAGs was assessed via histological, immunofluorescence and quantitative analysis.

Results: No currently employed decellularisation techniques successfully removed 100% of cellular components. The techniques which had the least residual DNA were most structurally compromised. GAG analysis demonstrated the stripping effects of the different decellularisation treatments

Conclusions: The ability to utilise, reprocess and regenerate tissues deemed “unsuitable” for transplantation allows us to salvage valuable tissue. Reprocessing the tissue has the potential to have a considerable impact on addressing the problems associated with cadaveric donor shortage, which would have a significant economic benefit. Patients would directly benefit by accessing greater numbers of corneal grafts and health authorities would fulfill their responsibility for the delivery of effective corneal reconstruction to alleviate corneal blindness.

15: Fibrin Glue in Corneal Epithelial Cell Migration

AM Yeung, LA Faraj, OD McIntosh, VK Dhillon, HS Dua

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Purpose: Fibrin glue has been used successfully in numerous ophthalmic surgical procedures. Recently fibrin glue has been used in limbal stem cell transplantation to reduce both operative time and negate the need for sutures. The aim of this study was to determine the effects of fibrin glue on epithelial cell migration *in vitro*.

Methods: Cornea-scleral rims were split to retain the superficial layer. Rims were cut into 8 equal sized pieces and were either placed on culture plates with or without fibrin glue. Rims were cultured over a 3 week period to allow epithelial cells to growth. Epithelial cells were photographed and immunofluorescence for anti-fibrin was performed.

Results: Explants that were glued demonstrated delayed epithelial cell growth and migration, compared to explants without glue. By Day 16, all fibrin glue had dissolved permitting cells to freely migrate and expand.

Conclusion: Fibrin glue delays epithelial cell growth and migration and thus can be used to our advantage in limbal stem cell transplantation.

16: Immunological Properties of Fetal Liver Mesenchymal Stem Cells for Ophthalmology

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Introduction: Mesenchymal stem cells (MSC) are found within the limbal stroma and support the expansion and phenotype retention of limbal stem cells. In model systems MSC have been shown to enhance corneal wound healing including epithelial regrowth. This may occur through the secretion of growth factors or through differentiation and/or incorporation into the cornea.

A significant issue in many cellular therapies is the immunogenicity of allogeneic cells. MSC are generally both non-immunogenic and immunomodulatory, however variations between different

sources and preparations of MSC are known to result in variable immunological properties. Fetal liver MSC (fIMSC) represent a poorly studied source of MSC that due to their immaturity may display increased potency and proliferative capacities. Herein the immunological properties of fIMSC *in vitro* are assessed.

Methods: fIMSC were incubated with peripheral blood mononuclear cells (PBMC) labelled with fluorescent 5(6)-CFDA, SE; CFSE. This is known as a lymphocyte proliferation assay (LPA). Mixed lymphocyte reactions were also used to assess the ability of fIMSC to modulate the ability of lymphocytes to respond to an immunogenic source (in this case 3rd party γ -irradiated PBMC). In these experiments TNF α and IFN γ were used to simulate inflammatory conditions which may promote fIMSC immunogenicity. For controls, immunogenic stimulation using PHA or γ PBMC caused proliferation of CD3+ lymphocytes indicated by a reduction in fluorescence. Unlabelled and labelled-unstimulated controls gave minimum and maximum fluorescent parameters respectively.

Results: fIMSC were demonstrated to be non-immunogenic and did not elicit a reaction from lymphocyte co-cultures. However they were unable to suppress their stimulation even in the presence of third party antigens. Lymphocyte stimulation with mitogens and inflammatory cytokines in the presence of fIMSC did cause some proliferation however this was reduced compared to stimulated controls without fIMSC.

Conclusions: This provides evidence which suggests fIMSC are non-immunogenic but do not modulate/inhibit localized inflammatory responses. This suggests that whilst not suitable for promoting graft acceptance they may be transplanted with minimal risk of rejection compared to other cell types.

17: Transdifferentiation of CD34 $^{+}$ Corneal Stromal Cells into Corneal Epithelial Cells

Sidney, L.E., Branch, M. J., Hashmani, K., Dua, H. S. and Hopkinson A.

Ophthalmology, Division of Clinical Neuroscience, University of Nottingham, UK.

Purpose: The integrity of the corneal epithelium is essential for clarity of vision. Under normal circumstances, superficial epithelial cells are shed into the tear film and regenerated by epithelial stem/progenitor cells located at the limbus. Damage or depletion of the limbal cells leads to conditions such as limbal stem cell deficiency (LSCD). Current treatment for this condition involves transplantation of limbal epithelial cells expanded ex-vivo; however cell numbers are limited. In this study, we identify a source of multipotent stem cells located in the corneal stroma that express CD34 upon isolation. These cells demonstrate an enhanced ability to transdifferentiate into the corneal epithelial cell lineage.

Methods: Peripheral and limbal stem cells (PLCSC) were cultured in a traditional DMEM-based keratocyte medium and an M199-based stem cell medium, and analysed for a range of cell surface markers using flow cytometry. Subpopulations within the PLCSC population were analysed by magnetic sorting for CD34+ and CD34- populations. The ability of the subpopulations to transdifferentiate into a corneal epithelial phenotype in a serum-free epithelial differentiation medium (CnT-20) was assessed using flow cytometry, RT-qPCR and immunocytochemistry.

Results: Cells cultured in M199 showed a more stem-like cell surface marker profile and retained CD34 expression for several passages, when compared to the DMEM-based medium. When CD34+ cells were transferred to epithelial differentiation medium, they showed a rounded epithelial morphology with increased expression of cytokeratin 3, cytokeratin 19 and HES1. Considerable upregulation of genes related to corneal epithelial cells (ABCG2, DeltaN63, LEF1, HES1, FRZB1, KRT19, DTC and CDH1), was seen when compared to CD34- cells.

Conclusions: This work will help production of robust methodologies to create cell banks for generation of corneal epithelium, from a corneal stromal stem cell source, leading to improved surgical and visual outcomes in LSCD patients.

18: Is raised intraocular pressure secondary to Ozurdex for retinal vein occlusion a cause for concern?

Bala S, Fernandez - Sanz G, Addison P

Moorfields Eye Hospital NHS Foundation Trust, London, UK

Introduction: Macular oedema is a common cause of vision loss in retinal vein occlusions (RVO), for which Dexamethasone intravitreal implant is one of the treatment options.

Purpose: To evaluate the safety of Dexamethasone intravitreal implant 0.7mg (Ozurdex®) with regards to raised intraocular pressure (IOP) in eyes with vision loss due to macular oedema associated with branch retinal vein occlusion (BRVO) or central retinal vein occlusion (CRVO).

Methods: Retrospective study of consecutive patients receiving Ozurdex® injection (first n=43, second n=13, third n=7, fourth n=1) for vision loss due to macular oedema secondary to BRVO or CRVO at Moorfields Eye Hospital between 1st Jan 2013 and 31st Mar 2013. 70 patients completed at least 2 months of follow-up. IOP was recorded immediately prior to injection and at all follow up visits.

Results: 81% of study patients had normal IOP at baseline, 10.5% of this group had raised IOP at follow-up and required topical IOP lowering medication. 38% of patients with pre-existing ocular hypertension or glaucoma required additional topical therapy for IOP control. A ≥10mmHg IOP increase from baseline was observed in 12.8% of eyes at 60 days after first Ozurdex® injection.

Conclusion: Increases in IOP after single or repeated Ozurdex® injection were either transient and did not require therapy or were controlled with topical therapy alone. No patients required laser treatment or glaucoma surgery.

19: Microperimetry Changes in Vitamin A Deficiency

Saker S, Morales MU, Stewart EA, Amoaku WM

Ophthalmology, Division of Clinical Neuroscience, University of Nottingham, UK.

Objective: To demonstrate retinal functional changes in a patient with vitamin A deficiency and how this would be modified by treatment modalities.

Methods: We present an observational case report which showed that reduced macular function attributable to vitamin A deficiency could be assessed using the Macular Integrity Assessment (MAIA) microperimetry equipment (CenterVue, Padova, Italy). A 67-year-old man diagnosed with vitamin A deficiency underwent the microperimetric tests in parallel with the electro diagnostic studies, before and after treatment.

Results: At presentation, there was a marked reduction in dark-adapted responses consistent with vitamin A deficiency. The MAIA results showed an important decrease of sensitivity of less than 6dB on both eyes with a large scotoma area; both eyes were found with unstable fixation; however the PRL of the left eye was located highly eccentric. Four weeks after initiating treatment with intramuscular vitamin A, ERG rod function significantly improved. Equally, the MAIA showed considerable improvements in retinal function in terms of macular sensitivity and fixation stability, alluding to more central and stable fixation.

Conclusions: These results alter our understanding of the microperimetry changes in vitamin A deficiency and associated retinopathy by indicating that there is a possible method in such disorders, whereby the effect of treatment could be identified and monitored. Furthermore, it is likely that some retinopathies associated with white-dotted appearance on fundus examination could be reflected in the characteristics of retinal sensitivity and fixation stability of the patients.

PREVIOUS PRIZE WINNERS

NOTTINGHAM RESEARCH PRIZE

A rolling trophy and an individual shield awarded to the best presentation in the clinical research category considered by a panel of judges on the day.

2013: H Lee, University of Leicester. *Characteristics of infantile nystagmus using hand-held ultra-high resolution spectral domain optical coherence tomography in infants and small children*

2012: G Maconachie, University of Leicester. *Effect of Compliance to Glasses Wear on Outcome of Visual Acuity After Refractive Adaptation*

2011: M G Thomas, University of Leicester. *High Resolution in-vivo Imaging in Achromaptosia*

2010: M Al-Aqaba, University of Nottingham. *Architecture and Distribution of Human Corneal Nerves*

2009: M G Thomas, University of Leicester. *Voluntary Modulation of Involuntary Eye Movements During Reading*

2008: A Bhan-Bhargava, University of Nottingham. *Glaucoma in an Elderly Caucasian Population (The Bridlington Eye Assessment Project)*

2007: A Shwe-Tin. *Digital Infrared Pupillometry for Comparing Cocaine with Apraclonidine Testing when Investigating Horner's Syndrome*

2006: M J Hawker. *Linear Regression Modelling of Rim Area to Discriminate Between Normal and Glaucomatous Optic Nerve Heads: The Bridlington Eye Assessment Project*

2005: M Awan, University of Leicester. *Can Patching be Improved in Amblyopia Treatment?*

2004: V S Maharajan, University of Nottingham. *Amniotic Membrane Transplantation for Ocular Surface Reconstruction: A Seven Year Retrospective Analysis*

2003: M Awan, University of Leicester. *Effect and Compliance of Strabismic Amblyopia Monitored with the Occlusion Dose Monitor*

2002: D Squirrell. *A Prospective, Case Controlled Study of the Natural History of Diabetic Retinopathy and Maculopathy after Uncomplicated Phacoemulsification Cataract Surgery in Patients with Type 2 Diabetes*

2001: J Morgan, University of Nottingham. *The Detection of T-Cell Activation by Retinal Autoantigen in Uveitis Patients using Cytokine Flow Cytometry*

2000: C Weir. *Spatial Localisation in Esotropia - is Extraocular Muscle Proprioception Involved?*

1999: P Hossain. *A Method to Visualise Leukocytes in the Retinal and Choroidal Circulation in vivo*

1998: C M Sloper, University of Nottingham. *Tacrolimus in High-Risk Corneal and Limbal Transplants*

1997: A R Sarhan, University of Nottingham. *Rapid Suture Management of Post-Keratoplasty Astigmatism*

DAVID MEYER RESEARCH PRIZE

A rolling plaque and an individual shield awarded to the best presentation in the basic science research category considered by a panel of judges on the day.

2013: J Rose, University Of Nottingham. *Evaluation of Electrospun Gelatin/ Polycaprolactone as a Material Suitable For Use in Corneal Regeneration*

2012: K Hashmani, University of Nottingham. *Corneal Stromal Stem Cells – A Mesenchymal Epithelial Transition*

2011: P Dhillon, University of Nottingham. *Characterisation of Corneal Stromal Cells as a Novel Mesenchymal Stem Cell Source*

2010: M G Thomas, University of Leicester. *High Resolution Spatial and Temporal Expression Profile of FRMD7 in Neuronal Tissue Provides Clues for Pathogenesis and Treatment*

2009: I Mohammed, University of Nottingham. *Interleukin-1 Beta induced RNase-7 Expression requires MAPK but not NF- κ B Signalling*

2008: E A Stewart, University of Nottingham. *Human Choroidal Endothelial Cell Growth Factor Signalling in Age-Related Macular Degeneration*

2007: S Thomas, University of Leicester. *Mutations in FRMD7, a Novel Gene, Cause X-linked Congenital Idiopathic Nystagmus*

2006: A Hopkinson, University of Nottingham. *Amniotic Membrane for Ocular Surface Reconstruction: Donor Variations and Handling affect Membrane Constituents*

2005: K H Weed. *In vivo Confocal Microscopy: Corneal Changes Following Retinal Detachment Surgery with Intra-ocular Silicone Oil*

2004: A Browning, University of Nottingham. *The Isolation and Characterisation of Adult Human Sub-macular Inner Choroidal Endothelial Cells*

2003: R D Hamilton, University of Nottingham. *Characterisation of an In vitro Model for Studies into Age Related Macular Degeneration*

NOTTINGHAM POSTER PRIZE

An individual shield awarded to the best poster presentation considered by a panel of judges on the day.

2013: S Wilson, Keele University. *Characterisation of Cultured Stromal Cells: In vitro Restoration of the Keratocyte Phenotype using Co-culture Approaches*

2012: M Branch, University of Nottingham. *Lymphocyte Proliferation Assay for Ophthalmology based Tissue Engineering*

2011: U Fares, University of Nottingham. *Correlation of Central and Peripheral Corneal Thickness in Healthy Corneas*

2010: I Mohammed, University of Nottingham. *Human Defensin 9, a 'Functional' Host Defence Protein*

2009: AM Otri, University of Nottingham. *Expression Pattern of Anti-microbial peptides (AMPs) in Acanthamoeba Keratitis*

2008: M Mathew, University of Nottingham. *Malignancies after Tacrolimus Therapy in the Management of Ocular Inflammatory Disease*

2007: J-J Gicquel, Poitiers, France. *A 24-month Follow-up of Severe Ocular Burns with Impression Cytology*

2006: P Ji. *Retinal Features in Children with Down's Syndrome*

2005: H Kolli. *Intravitreal Triamcinolone Acetonide in the Management of Refractory Uveitis*

2004: I Choudhari, University of Leicester. *National Survey of Management of Acquired Nystagmus*

2003: P Tesha, University of Leicester. *Interactive Teaching in Ophthalmology*

2002: D Thomas. *The Taut Thickened Posterior Hyaloid (TTPH)*

2001: R Amankwah, University of Nottingham. *Hyaluronic Acid Promotes the Migration of Corneal Epithelial Cells In vitro*

2000: IA El-Ghrably, University of Nottingham. *Quantitative Assessment of Cytokine mRNA and Secreted Protein in Proliferative Vitreoretinopathy*

1999: A Pearson. *Does Ethnic Origin Influence the Incidence or Severity of Keratoconus?*

1998: R Ahmed, University of Nottingham. *Modified Sheridan Gardiner Vision Test with Semi-transparent Card*

1997: D Raj, University Hospitals Nottingham. *Stem Cell Deficiency of the Corneoscleral Limbus: a New Approach to Surgical Management*

HONORARY DELEGATES

Nomination of delegates as “Honorary delegates” of the Symposium was considered for the first time in 2006. This was to recognise individuals who had supported the meeting and contributed to it over the years. These delegates have the privilege of full participation and attendance in the meeting as guests of the Symposium.

Mr Nicholas R Galloway, Nottingham (2006)

Professor Larry Donoso, Wills Eye Hospital, Philadelphia (2010)

Mr A A Zaidi, Rotherham, UK (2011)

Professor Martin Rubinstein, UK (2012)

NEXT MEETING

**The 19th Nottingham Eye Symposium and Research Meeting
featuring the Norman Galloway Lecture will be held on
Friday, 30th January 2015 (provisional date)**

- *Research trainee abstract presentations (oral and poster) and prizes*
- *Guest presentation by a leading optometrists*
- *A symposium with talks from prestigious ophthalmologists*
- *The Norman Galloway Lecture*
- *Excellent conference facilities including free parking*
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Contact the NES Meeting Co-ordinator: nes@nottingham.ac.uk to receive details on the next meeting and check out the website for details of previous and next year's meetings.

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