

Free Paper 1
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1
RHEGMATOGENOUS RETINAL DETACHMENTS IN CHILDREN IN INDIA: CLINICAL CHARACTERISTICS, RISK FACTORS AND SURGICAL OUTCOMES

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Purpose: To describe the spectrum of clinical features and surgical outcomes in a series of children with rhegmatogenous retinal detachments (RRD's) in a tertiary care hospital of north India.

Methods: 230 eyes of 216 children 18 years of age or younger who underwent surgery for RRD were studied. Detailed history, complete ophthalmic and systemic examination wherever essential was done. Characteristics of retinal detachment were noted with respect to macular status, and proliferative vitreoretinopathy (PVR) graded. Risk factors for retinal detachment were noted and classified into following categories: (1) trauma - open globe or closed globe (2) Predisposing lesions in peripheral retina - with and without myopia (3) Iridofundal coloboma related RRD (4) Associated with structural ocular abnormalities, (5) previous surgery, and (6) preceding uveitis. Buckling alone or with pars plana vitrectomy was done.

Results: Mean age was 11.12 + 3.56 years, and 81.9% of patients were boys. Thirty-five (16.2%) patients had bilateral retinal detachment at presentation. Every eye had at least one risk factor for retinal detachment, if more than one risk factor was there, eye was grouped according to primary pathology causing RRD. Detachments tended to be complex, with 54.3% (125/230 eyes) having some form of PVR. Mean follow-up was 12.3 months. Complete retinal reattachment was achieved in 88.7% of eyes; however, visual recovery was modest. Mean preoperative and post-operative visual acuities were 0.032 + 0.119 and 0.096 + 0.168 respectively (p=0.000).

Conclusions: Most common causes predisposing to RRD were peripheral degenerations and posttraumatic. RRD's secondary to iridofundal coloboma may be more common than previously reported. Combination of buckling and vitreoretinal techniques can help achieve retinal reattachment in most cases. Presence of anterior PVR is a poor prognostic factor in terms of both anatomic success as well as visual gain.

2
RETINAL DETACHMENT AND PROPHYLAXIS IN TYPE 1 STICKLER SYNDROME

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Purpose: To report the prevalence of retinal detachment and results of prophylaxis against detachment from giant retinal tear in a large cohort of patients with type 1 Stickler syndrome.

Methods: Pedigrees and individuals with type 1 Stickler syndrome were identified from the vitreous research clinic and divided into 3 groups. Group 1 consisted of patients that received no prophylaxis (control group). Group 2 consisted of patients that had bilateral 360° prophylactic cryotherapy (study group). Group 3 consisted of patients referred with unilateral retinal detachment for surgical repair and underwent prophylaxis in the fellow eye (mixed group).

Results: In 111 patients who had no prophylactic retinopexy (group 1, average age 49 years), 73% (81 of 111) suffered retinal detachment, of whom 48% (53 of 111) were bilateral. In 62 patients who had bilateral prophylactic cryotherapy (group 2, average age 21 years), 6.5 % (4 of 62) suffered unilateral retinal detachment. There were no cases of bilateral detachments. The mean follow-up period was 11.5 years. In 31 patients who had unilateral prophylactic cryotherapy to the fellow eye (group 3, average age 36 years), detachment occurred in 10% (3 of 31) of cases with a mean follow-up of 15.5 years. The difference in prevalence of retinal detachment in eyes with prophylaxis compared to eyes without was statistically different ($\chi^2= 119.2$, 1df p<0.001).

Conclusions: Prophylactic cryotherapy substantially reduces the risk of retinal detachment in type 1 Stickler syndrome and virtually eliminates the risk of bilateral detachments.

3
MECHANICAL FORCE ENHANCES MMP-2 ACTIVATION VIA P38 SIGNALING PATHWAY IN HUMAN RETINAL PIGMENT EPITHELIAL CELLS IN VITRO

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Purpose: The retina may be stretched by vitreous during the development of retinal detachment. The neurosensory retinal layer conducts force

Table Abstract 1.

| Our results as compared to other studies | | | | | | |
|--|-------------|-------------|-------------------------|------------------------------|----------------------------|--|
| Study | No. of Eyes | Patient Age | Mean Follow-up (months) | Visual Acuity > 0.1 n (%age) | Success No. of Eyes (%age) | Comments |
| Ferrone et al, 1994 | 48 | < 16 | 23 | 2 (4.2) | 16 (35) | Vitrectomy with 1000 cs or 5000 cs oil |
| Moisseiev et al, 1998 | 28 | < 15 | 24 | 5 (18) | 9 (32) | Vitrectomy with 1000 cs oil |
| Akabane et al, 2001 | 32 | < 15 | 16.6 | 28 (87.5) | 30 (93.8) | Buckling in 25 eyes while vitrectomy in 7 eyes out of which two failed |
| Scott et al, 1999 | 211 | < 16 | 13.9 | 38 (18) | 117 (56) | Vitrectomy for complex RRD with 1000 cs oil |
| Weinberg et al, 2003 | 39 | < 18 | 24 | NR | 31 (79) | Scleral buckle (41%) as well as vitrectomy (67%) |
| Our study | 230 | < 18 | 12.3 | 69 (30) | 204 (88.7) | Buckling (85 eyes) as well as vitrectomy (159 eyes) with 1000 cs oil |

to the RPE layer. However, little is known about the influence of mechanical stretch on RPE cells. It has been shown that mechanical stretch activates intracellular signal transduction pathways and enhances matrix metalloproteinases (MMP) expression. We assessed whether mechanical stretch changed production of MMP, tissue inhibitor of metalloproteinases-2 (TIMP-2), and fibronectin (FN) by RPE cells via a mechanism that involved the phosphorylation and activation of mitogen-activated protein kinases (MAPK) signaling pathways and investigated the relationship between mechanical stretch and retinal detachment.

Methods: Collagen-coated magnetite beads and magnetic fields were used to apply tensile forces to cultured RPEs at focal adhesions. The activation state of the MAP kinases extracellular signal-regulated protein kinase (ERK), c-jun N-terminal kinase (JNK), and p38 in RPEs was determined over a time course from 3 minutes to 30 minutes with western-blot analysis. The expression change of active p38 kinase was also observed with immunofluorescence staining. The mRNA levels of MMP-2, MMP-9, TIMP-2 and FN were analyzed with semiquantitative RT-PCR. Active MMP-2 and MMP-9 were demonstrated by zymography. Secretion of MMP-2 was evaluated by enzyme immunoassay (ELA). The effects of SB203580 (inhibitor of p38) on the MMPs expression of RPE under the mechanical stress were also studied.

Results: Total ERK, JNK, and p38 were detected in RPEs. Active ERK, active p38, and barely no active JNK were detected. Activation of ERK was unchanged during the stress. In contrast, although p38 activation was barely detected in the normal cells, this stress-activated protein kinase exhibited a robust activation after 5 minutes. SB203580 blocked the p38 activation during force stimulation. The force stimulation also increased the fluorescence quantity of active p38 with fluorescence staining. MMP-2, -9; TIMP-2; and FN were expressed in cultured RPE cells. mRNA of FN and MMP-2 increased at 15min and 4h after stress, respectively. Stretch led to increased release and activation of MMP-2, which blocked by SB203580. The expressions of MMP-9 and TIMP-2 did not change during 12-hour stretch.

Conclusions: The mechanical stretch plays an important role in the upregulation of expression of MMP-2 and FN in RPE cells and accounts for a directional shift in the balance between MMPs and TIMPs in part by a mechanism that involves p38 signaling pathway. Thus, it appears that the mechanical stretch potentially contributes to physiologic remodeling of the neural retina-RPE cell interface.

4

RECOVERY OF MACULA FUNCTION AFTER SCLERAL BUCKLING FOR RHEGMATOGENOUS RETINAL DETACHMENT

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Purpose: To observe the recovery of macula function after successful retinal detachment (RD) surgery by scleral buckling.

Methods: Prospective study of consecutive patients presenting with rhegmatogenous RD. They were divided into 3 groups - macula 'on' (Group A), macula 'partially off' (Group B) and macula 'totally off' (Group C). After successful scleral buckling, the patients were assessed subjectively by BCVA and color vision; and objectively by indirect ophthalmoscopy, OCT and multifocal ERG. These tests were performed at 1 week, 1, 3 and 6 months after surgery.

Results: Twenty seven eyes of 26 patients were recruited (8 in Group A, 13 in Group B and 6 in Group C). Mean age was 45.0 years (18 to 76

years) with the oldest ages in Group C (mean age 58.7 years). Seventeen were males. Twenty two eyes were myopic with mean of -5.70DS (-1 to -10DS). Mean duration of symptoms was 18.7 days (1 day to 3 months). All eyes were reattached anatomically after 1 surgery. All eyes in Group A achieved BCVA of 6/12 or better at 6 months with normal color vision and OCT. At 6 months, only 2 eyes in Group B failed to achieve BCVA 6/12 or better, 8 eyes had tritan color defects, 2 eyes still had residual subretinal fluid (SRF) on OCT. At 6 months, only 1 eye in Group C achieved 6/12 or better BCVA, 3 eyes had tritan color defect, residual SRF on OCT in 1 eye and 2 eyes showed cystic changes on OCT. After 6 months, no complete recovery of retinal function on ERG was seen in all groups but was worse in group.

Conclusions: Macula function after retinal reattachment can continue to improve up to 6 months post surgery. If the macula is totally detached, the patients tend to be older, have residual SRF on OCT and have poorer recovery of retinal function.

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CENTRAL SEROUS CHORIORETINOPATHY: AN OPTICAL COHERENCE TOMOGRAPHY STUDY

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Purpose: To describe Optical coherence tomography (OCT) findings in central serous chorioretinopathy (CSCR) and to compare them with fundus fluorescein Angiography findings (FFA).

Methods: Observational case study of 120 eyes of 110 patients with recent onset CSCR. Complete ophthalmic examination, OCT and FFA performed in all patients. Macular thickness, extent of neurosensory and retinal pigment epithelial (RPE) detachment and changes in underlying RPE choriocapillaris layer were recorded. Findings were compared to those of FFA.

Results: OCT revealed underlying RPE detachments in 46 eyes with neurosensory detachment. Focal RPE hyperreflective changes were noted in 26 eyes and localized RPE bulges were seen in 17 eyes. These RPE disturbances had a strong topographic correlation with leakage points on FFA. Subretinal precipitates and plaques were noted lying beneath the detached retina in 23 eyes. OCT also quantified increased thickness of the detached neurosensory retina in CSCR.

Conclusions: OCT offers a new approach to diagnose and evaluate retinal and RPE changes in CSR.

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OPTICAL COHERENCE TOMOGRAPHY FOR EVALUATION OF THE POSTERIOR SEGMENT IN CLOSED GLOBE INJURY

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Purpose: Evaluation of posterior segment in closed globe injury on OCT. **Methods:** 58 patients with blunt trauma, with posterior pole involvement were evaluated. Main outcome measures were ultra-structural changes at macula and their correlation with BCVA.

Results: OCT revealed high incidence of macular edema (32%) and epiretinal membranes (33%) compared to clinical diagnosis of 8% and 5% respectively. OCT detected choroidal rupture in cases with overlying edema and hemorrhages. BCVA correlation with macular thickness / volume was not significant.

Conclusions: OCT is a useful imaging modality for initial assessment of posterior segment trauma, diagnosing subclinical macular edema, ERM and underlying choroidal tear.

8
BLUE LIGHT-FILTER IOLS AND PREOPERATIVE BIOMETRY IN VITRECTOMY COMBINED WITH CATARACT SURGERY - AN INCREASING RETINAL ISSUE

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Purpose: Already focus of research in standard cataract surgery, the role of macular protecting types of intraocular lenses (IOLs) and postoperative refraction in combined surgery have not been studied yet. We designed two prospective, controlled clinical trials evaluating the surgical conditions during vitreoretinal procedures using the yellow blue light-filter IOL and evaluating the influence of additional vitrectomy on the accuracy of preoperative biometry and subsequently on the refractive outcome.

Methods: Clinical Trial I: Main outcome measures were intraoperative conditions for the surgeon, complication rates and functional outcome. Clinical Trial II: Main outcome measure was the IOL power prediction error (PE).

Results: Clinical Trial I: The yellow tint of blue light-filter IOL lens had no adverse effect on intraoperative conditions for the surgeon, on complication rates or on the patients' outcome, compared to the clear UV-filter IOL ($p > 0.05$). Clinical Trial II: A significant difference for the PE ($p < 0.05$) was found between combined surgery and cataract surgery (-0.37 diopters versus 0.04 diopters). Additionally, the PE was significantly different ($p < 0.04$) between diagnosis macular hole and epiretinal membrane (-0.20 diopters versus -0.52 diopters).

Conclusions: The routine use of the yellow blue light-filter IOL in combined surgery can be recommended, although only evidence proved data will show that the blue light is an important variable in age-related macular degeneration (ARMD). The preoperative biometry in combined surgery using the IOL Master is not always accurate in choosing lens powers. A universal correction factor cannot be recommended as the myopic shift is strongly depending on the diagnosis and the need for intraocular tamponade.

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A NEW, SAFE TECHNIQUE OF STABLE FIXATION OF SCLERAL FIXATED INTRA-OCULAR LENS

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Purpose: To experimentally evaluate best suturing technique for fixation of a Scleral Fixated IOL (SFIOL) and its clinical evaluation in aphakes with no posterior capsular support.

Methods: An experimental SFIOL model was created: Two plastic sheets glued to a board and 2 holes (0.5 mm apart) drilled 2 mm below the top edge of plate and covered on both surfaces with adhesive tape. A rheostat-controlled electromagnet was fixed underneath these plates. A 13.5 mm Domilens per lens 2 SFIOL with a hole for scleral fixation on inner curvature of haptic was coated on both surfaces of optic with a non-magnetic alloy making the optical surfaces highly reflective. An Iron piece was glued to posterior surface of SFIOL. SFIOL was experimentally

Table Abstract 9.

| Case number | Age (years) | Pre-operative visual acuity | Post-operative visual acuity | Complication |
|-------------|-------------|------------------------------|------------------------------|-----------------------|
| 1 | 4 | PL+, PR accurate | 6/60 | |
| 2 | 37 | 4/60 | 6/18 | |
| 3 | 42 | 3/60 | 6/36 | |
| 4 | 5 | PL+, PR accurate | 4/60 | |
| 5 | 34 | 3/60 | 6/24 | |
| 6 | 7 | 2/60 | 6/12 | |
| 7 | 48 | PL+, PR accurate | 6/60 | |
| 8 | 8 | Hand movements close to face | 6/36 | |
| 9 | 11 | 1/60 | 6/18 | Vitreous hemorrhage |
| 10 | 56 | PL+, PR accurate | 6/24 | |
| 11 | 5 | Hand movements close to face | 5/60 | One haptic Pre-iridal |
| 12 | 57 | 2/60 | 6/36 | |
| 13 | 6 | PL+, PR accurate | 2/60 | |
| 14 | 62 | 1/60 | 6/12 | |
| 15 | 9 | Hand movements close to face | 6/60 | |
| 16 | 42 | Hand movements close to face | 5/60 | |
| 17 | 10 | 4/60 | 6/12 | |
| 18 | 37 | 3/60 | 6/18 | |

"scleral fixated" by two techniques, Technique 1 (T1) involved tying suture to the IOL hole and to outer surface of plate. Technique 2 (T2) involved a suture passing through IOL hole with a knot on outer surface of plate. 18 eyes with eccentric corneal opacity with or without pupillary membrane and without adequate support to place a PCIOL underwent T2. Pars plana anterior vitrectomy and membranectomy was performed to obtain a clear pupil. Two triangular partial thickness scleral flaps were raised at 3 & 9 o'clock meridian and anterior chamber entered through a superior corneo-scleral groove. 10/0 prolene suture was passed 1.0 mm behind the limbus through a 26-gauge needle. Suture loop was brought out through corneo-scleral section and identical procedure performed on other side. Each loop was cut and threads passed through hole in SFIOL and knot pulled out of the eye. SFIOL was slid into ciliary sulcus and suture tied on both sides underneath the scleral flaps ensuring a sutureless loop intra-ocularly. Scleral flap and corneo-scleral section were sutured.

Results: Greater amount of current was required to produce same deviation of reflected laser beam with T2 as compared to T1 suggesting T2 (4 point fixation) to be a better technique than T1 (2 point fixation). Clinical results shown in Table.

Conclusions: An uneventful follow up of 2 to 4.5 years of our cases suggests that T2 is a good technique. Any torque created intra-ocularly is unable to tilt the lens as 2 sutures on either end counter-balance the torque mutually making SFIOL stable.

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FOLLOW-UP AFTER INTRAVITREAL TRIAMCINOLONE ACETONIDE FOR DIABETIC MACULAR EDEMA

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Purpose: To report on the follow-up of patients who received an intravitreal high-dosage injection of triamcinolone acetonide (IVTA) as treatment of diffuse diabetic macular edema.

Methods: The clinical interventional case-series study included 109 eyes (90 patients) with diffuse diabetic macular edema who consecutively received an IVTA of about 20 mg. Mean follow-up was 11.2 ± 6.2 months.

Results: Visual acuity improved significantly ($p < 0.001$) from 0.89 ± 0.33 logMAR to a best minimum of 0.65 ± 0.35 logMAR. An increase in best visual acuity by at least 1 Snellen line, 2 lines and 3 lines was found in 91 (83%) eyes, 68 (62%) eyes, and 45 (41%) eyes, respectively. Differences in visual acuity between baseline and follow-up examinations were significant for measurements performed at 1 month ($p < 0.001$), 2 months ($p < 0.001$), 3 months ($p < 0.001$), and at 6 months ($p = 0.001$) after the injection. At 9 months after the injection, mean visual acuity regressed significantly so that visual acuity at 9 months ($p = 0.83$) and at 12 months after the injection ($p = 0.58$) compared with baseline values did not differ significantly. Forty seven (43%) eyes developed a rise in intraocular pressure (pressure > 21 mm Hg) for 6 to 8 months after the injection. No other severe complications were detected.

Conclusions: The duration of a visual acuity increase and intraocular pressure rise after high-dosage IVTA in diffuse diabetic macular edema is about 6 to 8 months. Compared with data in the literature, the high-dosage IVTA may not have a markedly higher profile of side effects than low-dosage IVTA.

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IN VITRO RETINAL TOXICITY OF VARIOUS STEROIDS

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Purpose: To expand our understanding of the safety profiles of various steroids on retinal cells in vitro by evaluating the effects of loteprednol (Lotemax®) on retinal pigment epithelial (ARPE-19) and retinal neurosensory (R28) cells in culture as compared to the effects of triamcinolone acetate (Kenalog®), preservative free triamcinolone (PFTA), dexamethasone, betamethasone, and methyl prednisolone acetate (Depomedrol®) on these same cell types.

Methods: ARPE-19 and R28 cells were grown in tissue culture in Dulbecco's modified Eagle's medium (DMEM, GibcoTM, Carlsbad, CA) containing 10% fetal bovine serum. Cells were treated with various concentrations of the steroids, with their respective preservative and vehicle, for 2, 6, and 24 hours. Cells were also treated with the steroid alone suspended in the culture medium at the above mentioned concentrations, and also separately with the preservative alone. Toxicity was measured by the trypan blue dye exclusion assay (Beckman Coulter Inc., Fullerton, CA).

Results: Loteprednol 31.25 $\mu\text{g/ml}$ (clinical dose: 125 $\mu\text{g/ml}$) was toxic to both ARPE-19 and R28 cells after 24 hours ($P < .001$); as was betamethasone 90 $\mu\text{g/ml}$ (clinical dose: 150 $\mu\text{g/ml}$) and methyl prednisolone 100 $\mu\text{g/ml}$ (clinical dose: 1000 $\mu\text{g/ml}$) ($P < .001$). Triamcinolone 200 $\mu\text{g/ml}$ ($P < .01$) reduced ARPE-19 and R28 viability after 24 hours. ARPE-19 viability was also reduced after 2-hour exposure to triamcinolone 200 $\mu\text{g/ml}$ without vehicle ($P < .001$) and R28 viability was reduced after 6- ($P < .001$) and 24-hour ($P < .01$) exposure (clinical dose: 1000 $\mu\text{g/ml}$). ARPE-19 viability was reduced after 2-hour exposure to PFTA 0.8 mg/ml ($P < .001$) but not 0.05, 0.1 and 0.2 mg/ml; R28 viability was reduced after 2-hour exposure to PFTA 0.8, 0.4 and 0.2 mg/ml ($P < .05$). Cell viability was unaffected by dexamethasone 0.125, 0.25 and 0.50 mg/ml (clinical dose: 100 $\mu\text{g/ml}$), but 1 mg/ml was toxic after 24 hours ($P < .001$).

Conclusions: Clinically relevant concentrations of loteprednol were toxic to retinal cells in vitro. This was also true for triamcinolone, betamethasone,

and methyl prednisolone, but was not seen with concentrations of dexamethasone commonly used in clinical practice.

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EFFICACY AND SAFETY OF A NOVEL INTRAVITREOUS DEXAMETHASONE DRUG-DELIVERY SYSTEM AFTER APPLICATOR OR INCISIONAL PLACEMENT IN PATIENTS WITH MACULAR EDEMA

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Purpose: Evaluate the safety and efficacy of dexamethasone in a novel biodegradable intravitreal drug-delivery system (DDS) in patients with macular edema (ME) and compare the safety of applicator and incisional placement of the DDS.

Methods: Two studies were conducted. One was a multicenter, 6-month, randomized, prospective, single-masked study in 315 patients with persistent ME refractory to medical or laser treatment. Patients were randomized to observation or to treatment with 350 μg or 700 μg dexamethasone in a surgically implanted DDS ($n = 105$ per group). In the second study, patients with ME were randomized to insertion of 700 μg dexamethasone DDS via a 22-gauge applicator system ($n = 20$) or by incisional placement ($n = 10$). Outcome measures for the 2 studies included best-corrected ETDRS visual acuity (VA), intraocular pressure (IOP), and adverse events.

Results: In the first study, VA improved by ≥ 15 letters in 18.1% of patients in the 700 μg group vs. 5.7% in the observation group at day 90 ($P = .006$); the improvement persisted through day 180. Similarly, in the second study, VA was improved by ≥ 15 letters in 20% of eyes in both dexamethasone DDS groups at day 180. The dexamethasone DDS was well tolerated. In the first study, reports of cataract were similar among all study groups, and only 2% of treated patients and 1% of observed patients had an IOP increase of ≥ 10 mm Hg at day 90. All cases of increased IOP were managed with observation or topical medications. There were no cases of treatment-related endophthalmitis or retinal detachment. In the second study, applicator placement was quicker than incisional placement. Sutures were needed to close the insertion wound for all eyes in the incisional group but none in the applicator group. The incidence of ocular adverse events was lower in the applicator group than in the incisional group. Two patients in the incisional group and none in the applicator group had an IOP increase of ≥ 10 mmHg at day 180. Vitreous hemorrhage occurred in 2 eyes in the incisional group and no eyes in the applicator group.

Conclusions: In patients with persistent macular edema, 700 μg dexamethasone in a novel DDS produced sustained, clinically meaningful improvements in visual acuity and was well tolerated. Applicator placement of the DDS was quicker than incisional placement, was at least as safe, and produced similar beneficial effects on visual acuity. *CR

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INHIBITION OF POLY (ADP-RIBOSE) POLYMERASE (PARP) COUNTERACTS DIABETES-INDUCED RETINAL OXIDATIVE STRESS AND APOPTOSIS

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Purpose: To access the role for poly (ADP-ribose) polymerase activation in oxidative stress and apoptosis in diabetic retina and free fatty acid (FFA)-exposed retinal pericytes and endothelial cells. FFA is an important player in oxidative stress and apoptosis of vascular cells in diabetes.

Methods: Control (C) and STZ-diabetic (D) rats were treated with/without the PARP inhibitors, 1,5-isoquinolinediol (ISO, 3 mgkg⁻¹d⁻¹ i.p.) or 10-(4-Methyl-piperazin-1-ylmethyl)-2H-7-oxa-1, 2-diaza-benzo [de]-anthracen-3-one (GPI 15427, 30 mgkg⁻¹d⁻¹), for 10 weeks after 2 weeks without treatment. The rate of apoptosis was assessed in flat-mounted retinas by TUNEL assay with immunoperoxidase staining. Primary bovine retinal pericytes and endothelial cells were cultured with/without 0.6 M palmitate, for 48 h. Apoptosis was assessed by TUNEL and caspase-3 assays, superoxide production by ethidium fluorescence, cell viability with Trypan blue, and nitrotyrosine (NT) and poly (ADP-ribose) (PAR) by immunocytochemistry.

Results: The number of TUNEL-positive nuclei (Mean ± SEM) was increased ~4-fold in D (207 ± 33 vs. 49 ± 4 in C, p < 0.01), and this increase was completely corrected in D+ISO and D+GPI 15427 (49 ± 15 and 43 ± 7, respectively, p < 0.01 vs. D). Palmitate, at the 0.2-0.8 M concentrations, dose dependently increased superoxide production and reduced cell viability in cultured retinal cells. GPI 15427, 20 microM, prevented FFA-induced increase in the rate of apoptosis and alleviated NT and PAR accumulation in both pericytes and endothelial cells.

Conclusions: PARP inhibition counteracts oxidative stress and prevents apoptosis in diabetic retina and FFA-exposed retinal pericytes and endothelial cells. *CR

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SERUM PARAOXANASE (PON1) LEVELS IN RELATION TO HYPERHOMOCYSTEINEMIA AND OXIDATIVE STRESS IN CENTRAL RETINAL VENOUS OCCLUSION (CRVO) AND AGE RELATED MACULAR DEGENERATION (ARMD)

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Purpose: Hyperhomocysteinemia (HHcys) has been implicated as a risk factor in cerebral as well as cardiovascular diseases. In ocular pathology, it is identified as a risk factor in retinal occlusive disease such as venous, (CRVO) and artery Occlusion (CRAO), and Optic neuropathy apart from the recent reports in Age-related macular degeneration (ARMD). The atherogenic effect of Hcys can also be accounted for by homocysteine thiolactone (HCTL) apart from its direct effect. Homocysteine thiolactone in blood is hydrolyzed to Hcys by homocysteine thiolactonase (HTase) activity of the paraoxanase-1 (PON1) contained in high-density lipoproteins (HDL). PON1

is also an essential antioxidant enzyme, which protects against lipid peroxidation. As the enzyme has the dual role of acting as an antioxidant as well as homocysteine thiolactonase, our objective was to see serum PON1 levels and see if there is any correlation with the levels of total homocysteine and oxidative stress markers in two retinal diseases sharing the common atherothrombotic feature of HHcys namely ARMD and CRVO in the study subjects representing Indian population.

Methods: The serum PON1 levels and its correlation with plasma Hcys, oxidative stress marker namely, Thiobarbituric Acid Reactive substances (TBARS) and the total antioxidant capacity (TAC) was seen in CRVO (n =20), and in ARMD patients (n=10) along with age and sex matched apparently healthy case controls respectively.

Results: Significant decrease in serum PON1 levels was seen in the CRVO patients (p= 0 .001) as well as in the ARMD patients (p = 0.0004). A significant negative correlation between PON1 and TBARS and between PON and Hcys was found in CRVO (p = 0.02; p =0.043) as well as in ARMD (p = 0.0001; p= 0.021). While a larger sample size is being worked upon to arrive at the odds ratio of PON1 as a risk factor for ARMD, the odds ratio analysis revealed that PON1 is a risk factor for CRVO, (OR-6.0, CI-1.08, 33.2).

Conclusions: Significantly lowered serum PON1 levels in association with hyper-homocysteinemia (HHcys) and increased oxidative stress seems to be major factor involved in the disease process of CRVO and ARMD.

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PENETRATION OF BEVACIZUMAB THROUGH THE RETINA AFTER INTRAVITREAL INJECTION IN MONKEY

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Purpose: The purpose of this work was to study the penetration of intravitreally injected bevacizumab in its commercial formulation (Avastin®) through the retina, since it has been speculated whether a full-length antibody would be able to penetrate the retina as easily as an antibody fragment. Moreover, a first approach was tried to find out what cell types eventually take up and/or transport the bevacizumab molecule.

Methods: Five Cynomolgus monkeys (*Macaca fascicularis*) were used in this study. Two runs of intravitreal injection were performed, the one with commercial Avastin® (Group 1) and the other one with commercial Avastin® labeled with ¹²⁵I (Group 2). The animals were sacrificed 1, 4, 7 or 14 days after injection, respectively, for subsequent histological analysis of the eyes by immunocytochemistry or electron microscopy. Fundoscopy was performed before the injection and at several time points thereafter. Moreover, blood samples were collected at different time points from the animals that received radioactively labeled protein.

Results: Fundoscopy did not show any pathological changes within the time of experiment. Animals were enucleated 1, 4, 7 and 14 days after the injection, respectively, and eyes were prepared for immunohistochemistry and electron microscopy. Bevacizumab immunoreactivity was already found in the inner layers of the retina 1 day after the injection, and spread to the outer layers and the choroid within the following days, in particular to photoreceptors and blood vessels. Using Avastin® labelled with ¹²⁵I, radioactivity could already be detected in blood serum 1 day after the intravitreal injection, and remained relatively stable until day 7.

Conclusions: The results clearly show that Avastin can penetrate all retinal layers and is also transported into RPE and choroid after injection into the vitreous of monkeys. Active transport mechanisms seem to be involved.

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PD1 EXPRESSION ON THE ADULT AND DEVELOPMENTAL RETINA

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Purpose: Programmed cell death1 (PD-1), a member of CD28 family, functions as a negative regulator in immune system, and its pathway plays a crucial role in down-regulating T cell responses and maintenance peripheral tolerance. PD-1 was previously thought to be exclusively expressed on the activated T cells, B cells and myeloid cells. We recently identified its expression in the central nervous system. The purpose of this study is to characterize PD-1 expression in the adult and developmental retina.

Methods: Immunohistochemistry was performed to identify PD-1 protein expression on retina from embryonic day 12 to post natal day 5 during development. Real time PCR was also carried out to examine the PD-1 mRNA expression in the retina and brain.

Results: PD-1 was constitutively expressed on the adult retina, primarily in retinal ganglion cell layer and inner nuclear layer. During development, a low level of PD-1 expression was initially observed in the retinal ganglion cell layer at embryonic day 14, and its expression increased during development. Double staining with retinal cell markers showed that PD-1 was co-localized with retinal ganglion cell markers.

Conclusions: PD-1 was expressed on the retinal ganglion cells and its expression was dynamically changed during retinal development. This observation raises the possibility of a developmental role for PD-1 in maturation of the ganglion cell layer.

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ACQUIRED OCULAR TOXOPLASMOSIS - CLINICAL PROFILE, SEROLOGICAL CO RELATION, TREATMENT AND VISUAL OUTCOME OF 80 PATIENTS IN A TERTIARY CARE OPHTHALMIC CENTER IN INDIA

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Purpose: To study clinical features, serological correlation, treatment and visual outcome in 80 patients with acquired ocular toxoplasmosis.

Methods: It was a retrospective study where 80 patients with active lesions of ocular toxoplasmosis (first attack or recurrence) were included. Numerous variables including age, gender, onset and course of infection, clinical features, laboratory data, therapeutic strategies, visual outcomes, recurrences and complications were studied.

Results: There were 47 (58.75%) males and 33 (41.25%) females with a mean age of 29.72 years. All had unilateral involvement. The chief complaints were blurred vision in 95% and floaters in 71.25% of cases. Active lesions included retinochoroiditis in all patients and disc hyperemia in 14 (17.5%), macular edema in 28 (35%), phlebitis in 28 (35%) and kyriellies arteriolitis in 13 (16.25%) cases. Central lesions were seen in 70 of 80 eyes (87.5%) and peripheral lesions outside the vascular arcade were present in 16 of 80 eyes (20%). Serological tests revealed IgG antibodies in 63 patients indicating chronic phase of systemic infection and both IgG and IgM antibodies in 17 patients suggestive of acute infection. Anterior chamber paracentesis showed IgG antibodies against toxoplasma in 15 eyes. All patients were treated with clindamycin, azithromycin,

trimethoprim- sulphamethoxazole in various combinations along with oral steroids. Complications were seen in 42 of 80 (52.5%) patients, macular scar was the commonest of all seen in 30 (37.5%) patients, followed by glaucoma in 6 (7.5%), subretinal neovascular membrane in 3 (3.75%), retinal detachment in 1 (1.25%), cataract in 1 (1.25%) and disc pallor in 1 (1.25%). Recurrences were seen in 7 patients (9.09%).

Conclusion: Ocular toxoplasmosis commonly affects the macula and seriously impairs visual acuity. Majority of the patients in our series showed complete resolution of the lesion with various treatment regimens.

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COMPARISON OF ANTERIOR CHAMBER DEPTH PROFILES IN JAPANESE AND SINGAPOREAN POPULATIONS USING SCANNING PERIPHERAL ANTERIOR CHAMBER DEPTH ANALYZER

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Purpose: To compare anterior chamber depth (ACD) profiles between Japanese and Singaporean subjects using Scanning peripheral anterior chamber depth analyzer (SPAC).

Methods: SPAC is a new non-contact instrument using optical principles to grade the peripheral and central anterior chamber depth. A screening study in a community clinic recruited 502 Singaporean subjects for whom a comprehensive ocular examination including gonioscopy was performed. The ACD data collected were compared with the Japanese normative database incorporated in SPAC using t-test for independent samples with unequal variances.

Results: 552 Japanese subjects (48 - closed angles; 502 - open angles) and 502 Singaporean subjects (107 - closed angles; 395 open angles) underwent SPAC. The temporal peripheral iris profiles in the Japanese sample appear to be shallower than the Chinese patients. The upper limits of central and most peripheral anterior chamber depths appear to be not statistically significant ($p=0.21$ and 0.51 respectively). However, the three shallower grades (1, 2, 3) showed significant difference between the races ($p=0.03$).

Conclusions: There are some differences in ACD profiles between Singaporeans and Japanese populations. There is a possibility of interracial asymmetry in peripheral iris profile, which need to be considered when screening subjects using SPAC. *CR

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QUANTITATIVE EVALUATION OF CHANGES IN ANTERIOR SEGMENT BIOMETRY FOLLOWING PERIPHERAL LASER IRIDOTOMY USING SCHEIMPFLUG IMAGING IN EYES WITH PRIMARY ANGLE CLOSURE

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Purpose: To quantify the effects of peripheral laser iridotomy (PLI) on peripheral anterior chamber depth (PACD), central internal anterior chamber depth (ACD) and anterior chamber volume (ACV) using Rotating Scheimpflug Imaging System (Oculus, Wetzlar, Germany).

Methods: 24 eyes of 15 consecutive patients with Primary angle closure (PAC) were enrolled. The Pentacam was used to scan the anterior ocular segment with the 25 image acquisition scan protocol at 12500 points ranging from the optical axis to the limbus. The PACD, central ACD and ACV were measured using the Pentacam. The PACD was measured in nasal, temporal, superior and inferior meridians at 4mm and 8mm circles. A Neodymium-YAG Laser Iridotomy was performed in the periphery of iris. Pre-iridotomy, immediate post-iridotomy and one-week post iridotomy data for PACD, ACD and ACV was acquired. Data was analyzed using the Paired t test, the Mann-Whitney U test, and the repeated ANOVA. P-values less than 0.05 were considered statistically significant.

Results: The ACV increased significantly immediately after (27.28mm^3) and at one week post iridotomy (11.94mm^3) ($p=0.000$ and $p=0.014$). There was no change in central ACD ($p=0.434$ and 0.936). No significant PACD deepening was observed at 4mm in any meridian immediately or one-week after PLI ($p>0.05$). Significant PACD deepening at 8 mm was observed at each meridian ($p<0.01$ for all meridians) immediately after PLI but not at one-week follow up. The extent of the PLI induced PACD increase was enhanced with increasing distance from the optical axis.

Conclusions: PLI significantly increases the PACD and ACV. The effect is maximal immediately after PLI. There is a demonstrable deepening of the anterior chamber only in the periphery indicating the opening up of angles. Pentacam can be used as an investigative tool for quantitative estimation of anterior chamber biometry in PAC and quantifying the influence of peripheral laser iridotomy on ACD and ACV.

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PROGRESSION OF CATARACT AFTER PROPHYLACTIC ND:YAG LASER IRIDOTOMY IN ASYMPTOMATIC PRIMARY ANGLE CLOSURE SUSPECTS

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Purpose: To analyze the progression of cataract using LOCS 2 grading system in primary angle closure suspects undergoing prophylactic Nd:YAG laser iridotomy.

Methods: Thirty six primary angle closure suspects (PACS) underwent prophylactic Nd:YAG laser iridotomy in both eyes. PACS was defined as posterior trabecular meshwork not seen for 180 degrees. Complete ocular examination, ocular biometry and Lens Opacification Classification System 2 (LOCS 2) grading was done at baseline, 1st year and 2nd year of follow up. Right eye was included for analysis. Progression of cataract was defined as increase in LOCS 2 grading by a single grade in any of the

regions. The significance of progression of cataract for each region for each year was assessed by Wilcoxon signed rank test. Logistic regression analysis was used to assess the association of age > 60 years, average angle width > shaffer grade 1 by gonioscopy at baseline, Anterior chamber depth >2 mm, Lens thickness > 4.5 mm and presence of peripheral anterior synechiae at each year with progression of cataract.

Results: The mean age of the subjects was 48.9 ± 10.1 yrs. The mean baseline LOCS 2 grades in the posterior subcapsular, nuclear and cortical regions were 1, 1.8 ± 0.84 and 2, respectively. At 12 months of follow up, 7 of the 33 eyes (21%) showed significant progression in cataract in any of the region ($p = 0.003$). At 24 months of follow up, 7 of the 31 eyes (23%) showed significant progression in any lens region ($p=0.004$). The progression in nuclear region was followed by posterior subcapsular region at first year (9 vs. 5) and at second year (6 vs. 1). Logistic regression analysis did not identify any risk association for cataract progression with the parameters analyzed.

Conclusions: There was significant progression of cataract in the nuclear followed by posterior subcapsular regions after prophylactic Nd:YAG laser iridotomy for PACS at first and second year of follow up. However we could not identify any risk factors for the progression. Larger sample with control subjects are needed to confirm and identify risk factors.

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THE ASSOCIATION OF PSEUDOEXFOLIATION SYNDROME WITH NARROWER RETINAL ARTERIOLES

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Purpose: Pseudoexfoliation syndrome is a generalized connective tissue disorder with effects on the circulatory system and ocular structures. We assessed the in vivo relationship between pseudoexfoliation and retinal vessel wall signs.

Methods: The Blue Mountains Eye Study is a population-based study of eye diseases in older persons ($n=3654$, aged 49-97 at baseline in 1992-4). Signs of pseudoexfoliation were graded clinically during slitlamp examination, after excluding 108 persons who had bilateral cataract surgery. Retinal vessel calibers were measured using a computer-assisted method from digitized retinal photographs taken at the same examination. Focal retinal signs (focal arteriolar narrowing, arterio-venous nicking, retinopathy lesions in persons without diabetes) were also graded. Generalized estimating equation models were used to assess associations between pseudoexfoliation and retinal vessel wall signs.

Results: Pseudoexfoliation was present in 115 out of 7112 eyes (1.6%). Eyes with pseudoexfoliation had narrower mean retinal arteriolar caliber than eyes without pseudoexfoliation ($183.0\mu\text{m}$, 95% Confidence Interval 177.2-188.7, and $190.7\mu\text{m}$, 190.0-191.4, $p=0.01$ respectively). After adjustment for age, sex, systolic blood pressure, smoking, body mass index, diabetes and open angle glaucoma, this association attenuated slightly (mean retinal arterial caliber $185.8\mu\text{m}$, 180.4-191.2, and $190.7\mu\text{m}$, 190.1-191.4, $p=0.07$ comparing eyes with and without pseudoexfoliation). Pseudoexfoliation was not associated with retinal venular caliber, focal arteriolar narrowing, arterio-venous nicking or non-diabetic retinopathy.

Conclusions: Our findings provide evidence to support the concept that pseudoexfoliation may be related to small vessel structural changes.

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STUDY OF ULTRASOUND BIOMICROSCOPIC PARAMETERS IN FAMILY MEMBERS OF PRIMARY ANGLE CLOSURE GLAUCOMA PATIENTS

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Purpose: To identify treatable cases among family members of primary angle closure glaucoma (PACG) patients.

Methods: 46 PACG patients and their 184 family members underwent angle measurement on Ultrasound biomicroscopy.

Results: Affected family members (26.5%) had trabecular iris angle (TIA) of $6.45 \pm 4.9^\circ$, angle opening distance of $0.037 \pm 0.6\text{mm}$ and $0.104 \pm 0.9\text{mm}$ at 250μ and 500μ respectively as compared to $22.3 \pm 7.8^\circ$, $22.7 \pm 9.2^\circ$, $0.131 \pm 0.10\text{mm}$, $0.303 \pm 0.19\text{mm}$ in unaffected ($p=0.0001$). Angle recess area was $0.069 \pm 0.05\text{mm}^2$ in affected and 0.174 ± 0.12 in unaffected family members.

Conclusions: UBM is an important tool for screening of family members of PACG patients and can not only aid in the detection of affected members, but can also help in the detection and evaluation of PAC suspects.

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PREDICTIVE VALUE OF ANTERIOR CHAMBER VOLUME ON SCHEIMPFLUG IMAGING IN EYES WITH NARROW ANGLE

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Purpose: To evaluate the predictive value of anterior chamber volume on Pentacam as a screening tool to identify the eyes with narrow angles.

Methods: A non randomized, comparative, prospective, non interventional study. Seventy five consecutive normal subjects (Spherical equivalent of ± 1 D and no other ocular pathology) with BCVA of 20/20 both eyes were prospectively enrolled from the outpatient department for the study with informed consent. The patients underwent in addition to routine slit lamp biomicroscopy, 4 mirror gonioscopy using Sussmans 4 mirror and angle grading was done using modified Schaffer's classification. Subjects also underwent Scheimpflug imaging on Pentacam (25 scan protocol) for evaluation of anterior chamber parameters like anterior chamber volume (ACV), central internal anterior chamber depth (ACD), ACD in all quadrants at 4 mm and 8 mm and angle assessment as indicated on Scheimpflug images in nasal and temporal quadrants only. The two observers were masked to each other's findings. The statistical analysis was done using Pearson's correlation test, paired t test. Sensitivity, specificity, likelihood ratio and predictive values of ACV set at cut off 110mm^3 was calculated.

Results: Thirty two eyes had average angular width of >2 defined as open angle and forty three eyes had <2 average angular width on gonioscopy classified as narrow angles. Mean age for eyes with open angle was 47.3 ± 13.11 years while for narrow angles was 56.01 ± 7.41 years. For all grades of angle on gonioscopy, the paired differences for anterior chamber volume were statistically different ($p < 0.05$). The most significant were ACV for Angles grade 2 versus angle grade 3 ($p=0.002$) and grade 4 ($p=0.005$) while for ACD, significant difference was observed in eyes with grade 1 versus grade 3 and grade 2 versus grade 3 ($p < 0.01$). The mean ACV for Grade 0 angle was $88.6 \pm 11.9\text{mm}^3$, Grade I was 99.6

$\pm 13.6\text{mm}^3$, Grade 2 was $111.7 \pm 27.67\text{mm}^3$; grade 3 was $157.5 \pm 36.1\text{mm}^3$ and grade 4 was $214 \pm 1.41\text{mm}^3$. However, on Pearson's correlation, neither ACV nor ACD correlated significantly with average angular width. On further analysis of ACD at 4 mm and 8 mm in respective quadrants also had no significant correlation with angle grades in respective quadrants ($p > 0.05$). The sensitivity of ACV at a cut off of 110mm^3 (ACV $< 110\text{mm}^3$ is narrow angle) for detecting narrow angles was 88.37%, specificity of 90.62%, positive predictive value 92.7%. Patients with ACV $< 110\text{mm}^3$ are 9 times more likely to have narrow angles.

Conclusions: Anterior chamber volume on Pentacam has very high predictive value and acceptable sensitivity and specificity for detecting eyes with narrow angles. Pentacam imaging is a simple, easy to use, repeatable, reliable tool and has a definite value for quick screening for eyes with narrow angles.

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EVALUATION OF ANTERIOR SEGMENT IN OPAQUE GRAFTS WITH POST PENETRATING KERATOPLASTY GLAUCOMA USING ULTRASOUND BIOMICROSCOPY

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Purpose: To evaluate the anterior segment changes in opaque grafts with post-penetrating keratoplasty glaucoma (PPKG) using ultrasound biomicroscopy (UBM).

Methods: Forty eyes of 40 patients with PPKG, with failed opaque grafts precluding anterior segment slit lamp biomicroscopy and gonioscopy were included. Indication for keratoplasty, lens status, intraocular pressure (IOP) at the time of presentation and the time of diagnosis of glaucoma were noted. Ultrasound biomicroscopic evaluation included imaging of the irido-corneal angle in each clock hour, graft host junction, central anterior chamber and measurement of central corneal pachymetry.

Results: The mean applanation IOP was $32.7 \pm 6.5\text{mm Hg}$ (range 28 - 56 mm Hg). The mean CCT was $1013.2 \pm 305.3\mu\text{m}$ (range 753-1764 μm). The meantime of follow up after penetrating keratoplasty was 8.7 ± 3.8 months (range 3-18 months). Of the 40 patients, 18 had undergone penetrating keratoplasty for therapeutic purposes (perforated corneal ulcer post infectious keratitis) while the remaining 22 had undergone keratoplasty for optical reasons. 15 patients were pseudophakic (37.5%), 14 aphakic (35%), and 11 phakic (27.5%). The types of synechiae noted on the UBM included, peripheral anterior synechiae (PAS) in 39/40 eyes, (97.5), synechiae at the graft host junction in 15/40 eyes (37.5%), central irido-corneal synechiae in 6/40 eyes (15%), and IOL iris synechiae in 5/40 eyes (12.5%). Three out of forty (7.5%) patients had peripheral anterior synechiae extending up to 90° of the circumference of the angle, 8/40 (20%) had synechiae ranging from $90-180^\circ$, 16/40 (40%) had synechiae from $180-270^\circ$, and 13/40 (32.5%) had synechiae from $270-360^\circ$. Anterior chamber IOL haptic touching the corneal endothelium was seen in 3 eyes.

Conclusions: Secondary angle closure caused by peripheral anterior synechiae formation is the major cause for PPKG in eyes with opaque grafts. UBM evaluation reveals significant distortion of the anterior segment anatomy in such eyes and must be performed prior to implantation of a glaucoma drainage device or filtration surgery.

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SIGNIFICANCE OF ULTRASOUND EXAMINATION IN DIAGNOSIS OF DIFFERENT CLINICAL TYPES OF OCULAR ISCHEMIC DISEASES

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Purpose: to study the ultrasound parameters of blood flow in ocular vessels in different clinical types of ocular ischemic diseases (OID).

Methods: Ultrasound examinations - high frequency duplex ultrasonography, Color Doppler Imaging (CDI), spectral Doppler analysis, 3D-mode sonography - were performed in 180 patients with OID aged 35-70 years, 104 of these with acute and 47 with chronic type. In all cases we measured blood-flow parameters of the following vessels: ophthalmic artery (OA), central retinal artery (CRA), the posterior ciliary artery (PCA) and internal carotid artery (ICA). The investigations were made using ultrasound diagnostical system VOLUSON 730 Pro "Kretz".

Results: Signs of disordered blood flow in the orbital arteries were detected in patients with acute disease: the peak systolic waveform was blunted, diastolic flow was absent or markedly reduced, 2-fold decreased maximum systolic blood flow velocity, 5-fold decreased end diastolic blood flow velocity, and an increase in the resistance index in comparison with the norm. Chronic type of OID was characterized by decreased maximum systolic blood flow velocity (by 1.5 times) and end diastolic blood flow velocity (3-fold) in comparison with the norm in arteries. We determined the high extent of correlation between resistance index (RI) ICA and RI OA ($r=0,62$), RI ICA and RI CRA ($r=0,47$). Hence, we studied carotido-ophthalmic index (COI) of the vessels examined: $COI\ OA=RI\ ICA/RI\ OA$; $COI\ CRA=RI\ ICA/RI\ CRA$. In healthy subjects this parameter was from 0,86 to 1,15. Those with OID turned out to have a lower magnitude in OA - $0,82\pm 0,01$, in CRA - $0,79\pm 0,02$. After surgery these parameters were increased: in OA - $0,97\pm 0,03$ ($p<0,001$), in CRA - $0,95\pm 0,01$ ($p<0,001$). OID remained lower only in 9 patients (5%) with postoperative transit ischemic attacks (7) and postoperative stroke (2), with occurred under conditions of moderate restenosis (OID magnitude $0,83\pm 0,006$).

Conclusions: The use of modern ultrasound technologies for blood flow evaluation in the ocular vessels in patients presenting with two types of OID enables to make an early diagnosis of blood flow impairment in occlusive stenotic lesions of carotid arteries and to determine indications for vascular reconstructive operations jointly with angiosurgeon. If the patients, who underwent carotid arteries reconstructive surgery for OID, have COI higher than 0,85 in late postoperative period, the surgery can be considered effective. The indication for surgical treatment of OID is COI-magnitude less than 0,85.

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ULTRASOUND BIOMICROSCOPIC CHARACTERISTICS OF THE ANTERIOR SEGMENT IN PRIMARY CONGENITAL GLAUCOMA

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Purpose: To qualitatively and quantitatively evaluate ultrasound biomicroscopic (UBM) features of the anterior segment in eyes with primary congenital glaucoma.

Methods: UBM of 55 eyes of previously operated patients > 5 years of age were studied and correlated with ocular biometry. The iris thickness,

ciliary body thickness, ciliary body lens distance, posterior chamber depth and anterior chamber angle were measured and compared with normal control eyes. Other features of anterior segment were qualitatively evaluated.

Results: A thin splayed rarefied ciliary body and abnormal tissue at iridocorneal angle were features seen in 90% of UBM scans. Iris hypoplasia and stretched zonules correlated with the axial length ($p=0.04$) but not with the mean corneal diameter. Approximate location of scleral spur was found to be $0.4+0.9$ mm behind the iris root.

Conclusions: Characteristic anterior segment dysplasia and ciliary body anomalies should be kept in mind while operating primary congenital glaucoma eyes.

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COMPARISON OF EFFICACY OF SELECTIVE LASER TRABECULOPLASTY (SLT) IN OPEN ANGLE GLAUCOMA AND ANGLE CLOSURE GLAUCOMA PATIENTS

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Purpose: To compare efficacy of selective laser trabeculoplasty (SLT) in lowering intraocular pressure in patients with open angle glaucoma and angle closure glaucoma.

Methods: Retrospective, comparative case series. Medical records of 61 patients who underwent selective laser trabeculoplasty from June 2005 to July 2006 at King Chulalongkorn Memorial hospital, Bangkok, Thailand, were reviewed. 34 open angle glaucoma patients and 13 angle closure glaucoma patients, who had visible trabecular meshwork more than 180 degrees, were enrolled into the study. Intraocular pressure (IOP) and number of glaucoma medication were assessed at baseline, 4 weeks and 12 weeks after SLT. Main outcome was intraocular pressure reduction more than 20% from baseline at each follow up visit. Fisher's Exact test was used to compare the difference of numbers of patients who reached target IOP at week 4 and week 12 between open angle and angle closure groups.

Results: Mean (SD) intraocular pressure in open angle glaucoma and angle closure glaucoma patients at baseline were 18.60 (4.73) and 18.27 (3.48), respectively. At 4-week post SLT, 8/34 (23.53%) open angle glaucoma patients and none of angle closure glaucoma patients had intraocular pressure reduction more than 20% from baseline ($p = 0.085$). At 12-week post SLT, 14/34 (41.18%) open angle glaucoma patients and 2/13 (15.38%) angle closure glaucoma patients had intraocular pressure reduction more than 20% from baseline ($p = 0.168$). The average number of glaucoma medication used at baseline in open angle glaucoma and angle closure glaucoma patients, presented as mean (SD), were 1.79 (0.64) and 1.77 (1.01), respectively. At 12-week post SLT, the average number of glaucoma medication in open angle glaucoma group was 1.88 (0.69), whereas in angle closure glaucoma group was 1.85 (0.90).

Conclusions: Selective Laser Trabeculoplasty can reduce intraocular pressure in either open angle glaucoma or angle closure glaucoma patients. The efficacy of IOP reduction of SLT in both groups was not shown statistically significant.

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EARLY GLAUCOMA DIAGNOSIS: A BLIND CLINICAL COMPARISON OF FDT, MAGNOCELLULAR SPECIFIC VEP CONTRAST THRESHOLDS AND PSYCHOPHYSICAL THRESHOLDS TO THE SAME STIMULUS

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Purpose: To confirm, with strict controls, Vaegan and Hollow's finding that in one field visual evoked potential (VEP) contrast thresholds to a magnocellular cell specific stimulus resembling that used in the Frequency Doubling Test (FDT), detected glaucoma better than the corresponding subjective threshold and to select test parameters giving the best signal/noise ratios.

Methods: The optimal reversal rate, modulation mode electrode montage and SNR calculation method were identified in preliminary experiments on groups of 5-9 young normals. We tested both eyes of 61 subjects, blindly classified by an independent clinician as normal (N=25), OHT (N=4), POAG (N=26) or cataract (N=6). Only 25 patients were tested by FDT. For VEPs and psychophysics the stimulus was one pattern filling a 34x20° screen at 57cm. It had 0.25 cy/° patterns, modulated sinusoidally in space and time usually at 18.5RPS. Monocular VEPs (4x1sec traces) were recorded for 15 sweeps from 64 to 1% contrast in octave steps in 4 almost orthogonal channels. For each channel and contrast, derived signals, the average T² circ were calculated and SNR was estimated. VEP thresholds were estimated from by line fits to the rising phase of the amplitude by contrast curve. Psychophysics used a two alternative forced choice task.

Results: Log amplitude by contrast functions were flat up to a ca 4% threshold and then linearly increasing to saturation, indicating an exponential contrast gain. Contrast thresholds showed a linear decrease with age among normal patient. Comparison of contrast threshold showed high degrees of correlation between VEP and FDT test result. Almost 50% the eyes classified as being glaucomatous were classified as have normal contrast threshold.

Conclusions: VEP threshold discriminated between groups better than psychophysical thresholds to the same stimulus. The optimal parameters and threshold measurement methods are now better defined. These VEPs probably reflect all M cells because SNR was no greater near MT or at frequency doubling speed (>30RPS). Useful bits: These objective VEP contrast thresholds in one field detected glaucoma better than corresponding psychophysical thresholds at 18Hz as they had at 7Hz. A better rule to determine the contrast threshold in the future, as it could be very uncertain in patients. The method can be used on untrained animals, further improved and made multifocal.

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CYTOKINES LEVELS IN OPEN-ANGLE GLAUCOMA PATIENTS ARE ASSOCIATED WITH OPTIC NERVE DAMAGE

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Purpose: To detect the levels of cytokines between patients with open-angle glaucoma and normal subjects and investigate the concentrations of each cytokine on different glaucomatous neuropathy stages.

Methods: 32 patients with POAG or NTG (glaucoma group) and 26

normal individuals (control group) were analyzed. Cytokines sIL-2R, IL-2, IL-12, IL-12p40, IL-23, TNF- α , IFN γ , IL-4, IL-6 were assayed by Enzyme-linked immunosorbent assay (ELISA) and then compared the mean concentrations in different groups. The visual fields were examined in all 32 patients of glaucoma group. For each patient, the eye with the worse mean defect of the visual field test was enrolled in the study. 32 eyes were divided into 2 groups according to the MD (mean defect) (group A: MD<12dB; group B: MD \geq 12dB) and the levels of each cytokines were compared between groups. HRT-II examination was performed by an examiner masked to the clinical examination findings. Optic disc parameters were recorded. The participants were tested with HRT after one and a half year follow-up, and the changing of the cup volume (ΔV) was calculated. When the optic disk parameter $\Delta V > 0.1$, the patient was regarded as the glaucomatous damage was progressing. Statistical study of each cytokines between progressive group and the non-progressive group was performed.

Results: The levels of sIL-2R, IL-4 and IL-12p40 in glaucoma group were higher than that in control group (P=0.045, 0.030, 0.006 respectively); the levels of IL-6, IL-12, IL-23 and TNF- α were lower in glaucoma group (P=0.011, P=0.000, P=0.024; P=0.024 respectively). There were no significant differences in IL-2 and IFN γ between two groups (P=0.956, 0.138, respectively). And in patients with open-angle glaucoma, the level of sIL-2R in group A (60.44 \pm 27.15pg.ml⁻¹) is significantly lower than that in group B (83.10 \pm 13.42 pg.ml⁻¹) (P=0.032); and the concentration of Th1 type cytokine TNF- α in group A (66.24 \pm 39.85 pg.ml⁻¹) is significantly lower than that in group B (95.20 \pm 44.62 pg.ml⁻¹) (P<0.001). Th2 type cytokine IL-4 in group A (213.30 \pm 63.62 pg.ml⁻¹) is significantly lower than that in group B (278.49 \pm 38.91 pg.ml⁻¹) (P=0.028). There were no statistic significances of the other cytokines at any stage of diseases. Patients with $\Delta V > 0.1$ exhibited significantly lower level of cytokine IL-2 (P=0.009) than $\Delta V < 0.1$ group. There were no significantly difference levels between the two groups in other cytokines.

Conclusions: Decreasing of cytokines IL-12, IL-23, TNF- α , IL-6 and increasing of IL-12p40 and IL-4 in POAG population suggests that a possibility of abnormal immune environments contributes to glaucomatous neuropathy of POAG.

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IDENTIFICATION OF BIOMARKER CANDIDATES IN TEAR FLUID IN DRY EYE SYNDROME USING ITRAQ QUANTITATIVE PROTEOMICS

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Purpose: The proteins found in tears play an important role to maintain the ocular surface and the changes in tear protein components may reflect changes in the health of the ocular surface. The objective of this

study is to search biomarker candidates in tear fluid of dry eye patients using quantitative proteomics.

Methods: Twenty-eight patients with aqueous-deficient dry eye and 20 healthy subjects were recruited for this study. Tear fluids for all patients were collected using Schirmer strip. iTRAQ coupled with 2D-nanoLC-nano-ESI-MS/MS was used for quantitative analysis of tear proteins.

Results: In total 93 tear proteins were identified with $\geq 99\%$ confidence. Among them, 6 up-regulated proteins, α -enolase, α -1-acid glycoprotein 1, S100 A8, S100 A9, S100 A4 and S100 A11 and 4 down-regulated proteins, prolactin-inducible protein, Von Ebner's gland protein, lactoferrin and lysozyme were found to be associated with aqueous-deficient dry eye. The performance of individual biomarker candidate and biomarker panel were evaluated using ROC curve. Using a 4-protein biomarker panel, the diagnosis accuracy can be improved to 98% (sensitivity: 93.3%; specificity: 93.1%).

Conclusions: Those 10 potential tear protein biomarkers reflect the aqueous secretion deficiency from lacrimal gland, inflammatory conditions on ocular surface and healthy status of ocular surface cells. Classification of severity of dry eye is also possible using a group of inflammation associated proteins. (Supported by Singapore NMRC grants: NMRC/0808/2003, NMRC/CPG/002/2003, NMRC/0982/2005 and IBG).

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THE SPECIFICITY AND SENSITIVITY OF ORBSCAN II TOPOGRAPHY SYSTEM IN THE DIAGNOSIS OF KERATOCONUS

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Purpose: To determine the Orbscan II topography indices that have the highest specificity and sensitivity in order to distinguish keratoconus eyes from normal eyes in clinical practice.

Methods: One eye of 130 keratoconus patients and 120 age and sex matched healthy control subjects were examined with Orbscan II topography system (Orbtek Inc., Bausch&Lomb, Rochester, USA) between January 2003 and August 2006. Anterior best-fit sphere (BFS), posterior BFS, anterior elevation, posterior elevation, maximum (Kmax) and minimum (Kmin) simulated keratometer values, global pachymetry including center, nasal, superior, temporal, inferior, and thinnest point values of the each eye were recorded. The specificity and sensitivity of the each topographic parameter were calculated by using receiver operating characteristic (ROC) curves. $P < 0.05$ was considered statistically significant.

Results: The area under the curve and cutoff value was 0.856, 44.1 diopters (D) for the anterior BFS; 0.878, 53.9 D for the posterior BFS; 0.991, 0.016 mm for the anterior elevation; 0.997, 0.051 mm for the posterior elevation; 0.954, 46.4D for the Kmax; and 0.897, 45.3D for the Kmin, respectively. The area under curve value among the global pachymetry values was the highest for the thinnest point pachymetry (0.977 with a cutoff value of 451 μ m). An anterior elevation value of 0.016 mm or more had 98.3% sensitivity and 96.7% specificity and a posterior elevation value of 0.051 mm or more had 97.4% sensitivity and 98.9% specificity in distinguishing keratoconic eyes from normal eyes.

Conclusions: The posterior elevation and anterior elevation indices had the highest sensitivity and specificity for detecting keratoconus. These parameters of Orbscan II topography should be considered in the evaluation for keratoconus before refractive surgery and contact lens fitting.

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THERAPEUTIC CONTACT LENSES PROMOTE OCULAR SURFACE EPITHELIAL GROWTH: A POTENTIAL CELL TRANSFER OPTION FOR PATIENTS WITH SEVERE CORNEAL DISEASE

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Purpose: We pursued this investigation after observing some fascinating ocular surface epithelial growth sustaining properties of commercially available soft contact lens (CLs), which we routinely use as a bandage for patients post pterygium surgery. The aim of this investigation was therefore to determine the efficacy of culturing human ocular surface epithelial cells on therapeutic CLs in autologous serum with a view to utilizing this system to transfer epithelial cells to patients with persistent corneal/limbal defects.

Methods: Graft tissue resected from patients undergoing pterygium surgery (n=3) consisting of limbal epithelium was cut into small segments and placed onto the concave surface of two commercially available and commonly used siloxane-hydrogel CLs [lotrafilcon A (CIBA Vision) and balafilcon A (Bausch and Lomb)]. Limbal explants were covered with media (EMEM) supplemented with 10% autologous serum and placed in a humidified incubator set to 37°C and 5% CO₂. Morphology, proliferative capacity, and a partial keratin profile was established by phase contrast, light and electron microscopy (EM) and by immunohistochemistry.

Results: Lotrafilcon A CLs sustained proliferation and migration of cells from limbal tissue as early as one day in culture. Cells on the CL surface became confluent after 10-14 days and consisted several layers displaying a corneal phenotype (CK3⁺/CK12⁺/CK19⁻) and a propensity to proliferate (p63⁺). Scanning and transmission EM revealed an extensive network of microvilli on the apical surface with prominent cell projections acting as adhesive anchors, indicating that these cells were indeed stable and likely to survive long term under these conditions. No cell growth was observed from limbal explants cultured on balafilcon A CLs.

Conclusions: We have developed a technique for culturing human ocular surface epithelium on commercially available CLs without feeder cells or animal sera. This method may allow expansion and transfer of autologous limbal epithelial cells whilst avoiding the risks of transplanting allogeneic tissue and minimizing the risk of zoonotic infection. If successful, this technique may be potentially useful for the treatment of patients with corneal defects such as limbal stem cell deficiency.

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PROFILE OF STEVENS-JOHNSON SYNDROME AT A TERTIARY EYE CARE CENTRE - A 15 YEAR ANALYSIS

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Purpose: To review the demographic profile, triggering factor, and results of treatment of cases of Stevens-Johnson syndrome (SJS) at a tertiary care centre in South India over a fifteen year period.

Methods: Records of 399 patients presenting with SJS between January 1990 through December 2004 were examined retrospectively. Information about age, sex, triggering factor, ocular involvement, treatment, and visual outcome were collected.

Results: Of the 399 patients, 194 (48.6%) were males and 205 (51.4%) were females. Mean age at presentation was 24.66 + 15.51 years. Mean follow up was 19.57 + 33.24 months. All cases had bilateral involvement. The mean duration from onset to presentation at our institute was 24.66 + 34.23 months. The most common triggering factor identified was drugs (77.7%) with Sulphonamides accounting for the major bulk (42.9%). Infection was the triggering factor in 22.3% of cases with Varicella Zoster being the commonest (53.9%). BCVA was 6/12 or better in 31.0% (n=245) eyes at presentation and 28.9% (n=238) at last follow up. The ocular manifestations noted were lid margin keratinization in 26.6% (n=212), symblepharon in 28.3% (n=226), severe dry eye in 41.1% (n=328) eyes and superficial corneal vascularisation of the cornea in 44.5% (n=335). All eyes were treated medically and 174 eyes (21.8%) underwent various surgical procedures. Mean time of surgical intervention from presentation was 24.02 + 34.22 months. Visual acuity was maintained or improved in 57.5% (n=100) of the operated eyes (statistically significant, $p < 0.0001$).

Conclusions: A slight female preponderance was seen in this series. Drugs were the most important triggering factor. Corneal vascularisation and severe dry eye were the commonest ocular manifestations. Judicious surgical intervention resulted in better visual outcome.

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ENDOTHELIAL CELL COUNT FOLLOWING FEMTOSECOND LASER ASSISTED PENETRATING KERATOPLASTY

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Purpose: To investigate endothelial cell count changes following femtosecond laser assisted penetrating keratoplasty.

Methods: Eleven eyes of ten patients underwent uneventful penetrating keratoplasty using the Femtec femtosecond laser (20/10 Perfect Vision, Germany). Endothelial cell count was performed on the corneal donor buttons prior to surgery. All patients were examined following a standard postoperative scheme which includes endothelial cell count measurements 12 months postoperatively using a Tomey EM-1000 specular microscope (Tomey, Germany).

Results: The preoperative cell counts for the corneal buttons ranged between 2000 and 3250 cells/mm². Twelve months postoperatively all corneal transplants were clear and visual acuity improved from preoperative levels. The endothelial cell counts ranged between 1750 and 2100 cells/mm².

Conclusions: Twelve months follow-up of penetrating keratoplasty using a femtosecond laser revealed good surgical outcomes with endothelial cell loss numbers in a similar percentage range than reported in the peer-reviewed literature for penetrating keratoplasty using conventional trephines.

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IN VIVO CONFOCAL MICROSCOPY OF FUCHS' ENDOTHELIAL DYSTROPHY

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Purpose: The aim of the current study was to examine the appearance of Fuchs' endothelial dystrophy using a laser scanning in vivo confocal microscope.

Methods: Cross-sectional study of 20 corneas with Fuchs' endothelial dystrophy compared with the corneas of 20 healthy volunteers with no history of ocular disease. Subjects were assessed using clinical ophthalmic history and examination, followed by corneal topography and laser scanning in vivo confocal microscopy.

Results: No significant difference was observed in age ($p = 0.666$) and gender ($p = 0.747$) between the two groups. Good confocal microscopy images were obtained in all subjects, however, endothelial cell density was unable to be assessed in 9 (45%) subjects with Fuchs' dystrophy due to confluent or near confluent corneal guttata. Subjects in whom endothelial density was unable to be assessed had higher central corneal thickness (673 vs. 596 μm , $p = 0.006$) and lower posterior stromal keratocyte density (173 vs. 265 cells/mm², $p = 0.001$). Central corneal thickness was higher in subjects with Fuchs' endothelial dystrophy in comparison with controls (632 vs. 560 μm , $p < 0.001$), however, no difference was observed in simulated keratometry between the two groups. Subjects with Fuchs' endothelial dystrophy had significantly lower epithelial (5060 vs. 6180 cells/mm², $p < 0.001$), anterior stromal (335 vs. 594 cells/mm², $p = 0.001$), posterior stromal (224 vs. 292 cells/mm², $p = 0.004$) and endothelial (1614 vs. 2414 cells/mm², $p < 0.001$) cell densities in comparison with controls. No significant difference in sub-basal nerve fiber density was observed between the two groups.

Conclusions: In vivo confocal microscopy offers the opportunity to observe early changes at all levels of corneas with Fuchs' endothelial dystrophy and can obtain clear images of the corneal endothelium in subjects even with advanced corneal edema. This study demonstrated lower cell density at all corneal levels in subjects with Fuchs' endothelial dystrophy.

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DAB (DOUBLE AIR BUBBLE) IN DALK (PERSONAL TECHNIQUE): STANDARDIZATION OF A MANUAL TECHNIQUE

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Purpose: To standardize a reproducible, short and safe deep lamellar keratoplasty technique using some concepts of Melles' DALK (Deep Anterior Lamellar Keratoplasty) and Anwar's DALK with Big Bubble.

Methods: The technique was performed on 18 patients:

- 16 with keratoconus, 1 with inherited stromal dystrophy, 1 with Herpes Simplex leucoma
- mean age 45 years
- 11 females and 7 males

The surgical technique was performed by the same surgeon. The instruments used were: Melles' spatulas set, the needle used for hydraulic retinal detachment in macular translocation and Hanna's trephine. Corneal center was marked and air introduced in anterior chamber with a cannula. A corneal tunnel is created with the first spatula of Melles' set until the pre-Descemet area is visualized as a reflex that is enhanced by the air bubble. This peculiar ring-shaped reflex around the spatula's tip is used as a landmark. The needle of the hydraulic probe is then introduced in the tunnel, air is introduced at 40-50 atmospheres over the Descemet causing its' detachment. Hanna's trephine is then centred on the corneal surface and rotated until the desired deepness is reached (about 400 microns). The cleavage creates a sort of pocket that is extended among the corneal surface for 360° using the other spatulas of Melles' set. The endothelial and Descemet layers of the corneal graft are eliminated with a cellulose

tip and finally the flap is sutured with 10.0 nylon.

Results: In 13 cases there were no complications. In 5 cases a corneal perforation occurred but only 2 of these were converted to PK, because in the other 3 cases the micro-perforation was self-sealing. The cleavage between stroma and Descemet is easy and quite fast to perform. Visual outcomes were good in all cases with a mean BCVA of 0.8. The actual follow up is 6-20 months.

Conclusions: DAB appears a quite fast and easy technique. It requires some training and maybe further improvement and it has a certain risk of micro-perforation. It seems more reproducible compared to other deep lamellar keratoplasty techniques. Deep lamellar keratoplasty, compared to perforating keratoplasty; is recommended for young patients for the reduced risk of endothelial damage, less post-operative astigmatism and lower rejection rate.

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PREVALENCE AND RISK FACTORS OF DRY EYE IN ELDERLY THAI POPULATION

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Purpose: To determine prevalence and risk factors of dry eye in elderly urban Thai population.

Methods: Six hundred twenty-five subjects, aged 50 years old or older, were recruited from residents of Romklao district, Bangkok, Thailand, into this population-based study. Subjects were interviewed to determine whether they have symptoms of dry eye, to grade their severity (mild, moderate and severe), and to determine dry eye risk factors. Dry eye symptoms included in the interview were eye discomfort, foreign body sensation, dryness, tearing, itching, burning sensation, blurred vision and photophobia. For this study, diagnosis of dry eye was made if a subject has at least one severe dry eye symptom. Dry eye risk factors analyzed in this study were: gender, associated systemic diseases, history of allergies, dry mouth symptom, menstrual status, hormone replacement therapy, smoking, alcohol consumption, contact lens usage, computer usage, and previous eye surgery. Main outcome measurements were prevalence of dry eye and associated risk factors. Associations between dry eye and risk factors were determined by chi-square test, and they were considered significant if p-value <0.05.

Results: Of the 625 subjects included in this study, 89 subjects (14.2%) had at least one severe symptom of dry eye. Blurred vision was the most common of the dry eye symptoms. Female subjects were more likely to have dry eye (p-value=0.030). Glaucoma, allergy, dry mouth symptom and previous eye surgery were also associated with dry eye (p-value=0.019, 0.005, 0.001, and <0.001, respectively). Other risk factors were not found to be associated with dry eye.

Conclusions: The prevalence of dry eye in our cohort study was 14.2%. Risk factors associated with dry eye included female gender, glaucoma, allergy, dry mouth symptom and previous eye surgery. This is the first report of population-based prevalence of dry eye in elderly Thai people.

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FEMTOSECOND LASER-ASSISTED INTACS SEGMENT INSERTION FOR THE TREATMENT OF KERATOCONUS

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Purpose: To evaluate the safety and efficacy of intacs segment (Addition Technology) insertion for keratoconus with the aid of the femtosecond laser (FEMTEC, 20/10 PERFECT VISION, Heidelberg, Germany).

Methods: This is a prospective clinical trial recruiting patients with mild to moderate keratoconus. Intacs segments were inserted into the corneal intrastromally for the treatment of keratoconus. The intacs segment insertion was performed either with the aid of the femtosecond laser or with a mechanical trephine. The size of the intacs segments was determined by a normogram and Swanson's steep axis incision technique was employed for placement of the incision.

Results: Five cases of intacs segments (Addition Technology) insertion for keratoconus were performed, 4 performed with the aid of the femtosecond laser and 1 with the mechanical trephine. Ease of femtosecond laser-assisted channel dissection was far greater, as compared to mechanical trephination. One patient had the complication of segment intrusion into the anterior chamber intraoperatively and the procedure was aborted. The mean age of the patients was 26 years. The mean preoperative corneal power was 47.2 dioptre (D), mean maximum keratometry (K) 50.5, mean minimum K 45.5D. Postoperatively at a mean follow-up of 3.3 months, the mean corneal power was 45D; mean maximum K 47D and mean minimum K 43.6D. The unaided visual acuity improved by an average of 2 snellen lines. No postoperative complications were noted.

Conclusions: Femtosecond assisted Intacs segment insertion for the treatment of keratoconus appears to be a simpler alternative to mechanical trephination, and has the added advantage of using the femtosecond laser to perform the radial incision with precision and ease. Care is still needed at the stage of device insertion to avoid inadvertent perforation at this stage.

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RISK FACTORS FOR CONTACT LENS-ASSOCIATED FUSARIUM KERATITIS IN SINGAPORE: A CASE-CONTROL STUDY

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Purpose: To identify the risk factors that contributed to the outbreak of Fusarium keratitis in Singapore.

Methods: We conducted a nationwide case-control study of Fusarium keratitis amongst cosmetic contact lens users in Singapore. From March 2006 to May 2006, we recruited 61 patients with Fusarium keratitis, and 188 population-based and 179 hospital-based controls. A standardized interview was conducted to obtain comprehensive information on possible risk factors.

Results: Case patients were more likely to use a ReNu brand (Bausch & Lomb, USA) contact lens solution (95%, n=58/61 cases) than either population (34.3%, n=62/181) or hospital (30.1%, n=50/166) controls. After controlling for age, gender, contact lens hygiene and other factors, there was a significantly increased risk of Fusarium keratitis with the use of either ReNu with MoistureLoc (odds ratio 98.0, 95% confidence intervals, 18.3, 524.0, p<0.001) or ReNu MultiPlus solution (odds ratio 18.3, 95% confidence intervals, 3.9, 112.1, p<0.001).

Conclusions: The use of ReNu contact lens solutions significantly increased the risk of contact lens-associated Fusarium keratitis in Singapore. Our data supports the worldwide recall of ReNu with MoistureLoc from the market. Further evaluation into the role of ReNu MultiPlus is required.

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THE QUALISYS OPTICAL TRACKER IN THE QUANTIFICATION OF OPHTHALMIC MICROSURGICAL SKILL

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Purpose: To examine the feasibility of using Qualisys motion capture system for assessing ophthalmic surgical ability.

Background: We have developed a new application of motion analysis using optical tracking for the quantification of ophthalmic microsurgical and oculoplastic skills. It could enhance future monitoring of technical skills development during training, providing an objective assessment of technical proficiency.

Methods: Multiple camera systems with incooperated infrared (IR) light emitting diodes (LEDs) were used for 3D motion analysis of three expert surgeons. Three tasks from phacoemulsification cataract surgery, and two tasks from oculoplastic surgery were completed and repeated twice. Main outcome measures used were overall path length, average velocity, and total number of movements.

Results: Detailed motion of hand structure and anatomy was achieved in all tasks, detecting minute and rapid changes in velocity. Analysis of Intra and interobserver outcome measures was achieved and clearly demonstrated that the optical-infrared-based motion capture system is viable for this type of motion.

Conclusions: The feasibility of applying motion analysis to ophthalmology is demonstrated and has potential for future application to training and assessment.

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AUTOLOGOUS SERUM-DERIVED CULTIVATED ORAL EPITHELIAL TRANSPLANTATION FOR SEVERE OCULAR SURFACE DISEASE

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Purpose: Severe ocular surface disease arising from conditions such as Stevens-Johnson syndrome and chemical injury are devastating conditions that may result in limbal stem cell deficiency, corneal scarring and severe visual loss. Management of these complex cases remains a major clinical challenge. We evaluated the use of autologous serum (AS)-derived cultivated oral epithelial transplantation for the treatment of patients with severe ocular surface disease.

Methods: AS from 10 patients with severe ocular surface disease and total limbal stem cell deficiency were used in developing autologous cultivated oral epithelial equivalents. These were compared with those derived from conventional fetal bovine serum (FBS) supplemented medium. Surgery involved removal of the corneal pannus and surrounding disease tissue, and transplantation of the AS-derived epithelial equivalents. The oral equivalents were analyzed by histology and immunohistochemistry.

Results: Oral epithelial sheets cultivated in AS and FBS supplemented media were similar in morphology, and formed basement-membrane assembly proteins important for maintaining graft integrity. Complete corneal epithelialization was achieved within 2-5 days postoperatively. The ocular surface remained stable without major complications in all eyes during a mean follow-up of 12.6±3.9 months. The visual acuity improved by more than 2 lines in 9 out of 10 eyes, with transplanted oral epithelium surviving up to 19 months.

Conclusions: The successful use of an AS-derived oral epithelial equivalent to treat severe ocular surface disease represents an important advancement in the pursuit of completely autologous xenobiotic-free bioengineered ocular equivalents for clinical transplantation.

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FEMTOSECOND LASER-ASSISTED PENETRATING KERATOPLASTY - A CASE SERIES

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Purpose: To evaluate the efficacy and safety of using a femtosecond laser to perform recipient and donor trephination in penetrating keratoplasty.

Methods: A prospective, non-randomized interventional case series. The FEMTEC laser (20/10 Perfect Vision, Heidelberg, Germany) was used to trephine both donor and recipient corneas. Conventional perpendicular trephination profiles were used. Donor trephination was performed epithelial surface up using either the disposable Katena, or Hanna artificial chamber. Adjunctive procedures including cataract extraction and intraocular lens implantation were performed.

Results: Eight patients underwent surgery with mean follow-up of 6.23 months (4-10). Mean age was 60.25 years (37-75). Cases included corneal decompensation or scarring from intraocular surgery (n=3), laser peripheral iridotomy (n=1), Fuch's endothelial dystrophy (n=1), herpetic keratitis (n=1) and corneal graft rejection (n=2). Preoperatively, best corrected acuities (BCVA) ranged from 20/400-hand movements. Laser

trephination was performed effortlessly and graft edge profiles were precisely defined and perpendicular. Post-operatively, all grafts were clear with well apposed margins. Excluding two patients with retinal pathology, post-operative BCVA ranged from 20/30-20/80 with four patients having $\leq 1.5D$ of astigmatism at three months. No complications related to the femtosecond laser were seen.

Conclusions: The FEMTEC laser reliably trephines donor corneas and recipient beds for penetrating keratoplasty, providing good visual outcomes. Further studies for alternate trephine profiles and deep corneal lamellar surgery are currently ongoing.

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AUTOKERATOPLASTY- ROBBING PETER TO PAY PAUL

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Purpose: Long-term success of penetrating keratoplasty in glaucomatous corneal decompensation is affected by graft rejection, glaucoma and endothelial failure, and these cases are generally considered as high risk due to pre-existing surgery and anterior synechiae. These risks are especially poignant in one-eyed patients. We present a novel surgical alternative to conventional penetrating keratoplasty in one-eyed patients with glaucomatous corneal decompensation.

Methods: 6 glaucoma patients with corneal decompensation in one eye, and with a relatively healthy cornea in the eye (blind from end-stage glaucomatous optic neuropathy) underwent a novel corneal exchange from one eye to the other. The healthy cornea from the blind eye was first trephined and kept aside. The decompensated cornea was then removed from the better eye, and the healthy autologous cornea transplanted in place, thus obviating any risk of allograft rejection in this good eye. The transplanted autologous cornea was oversized to ensure maximal transfer of healthy endothelial cells and to deepen the AC and reduce synechial recurrence. A lamellar grade allograft cornea was used in the blind eye, and a Gunderson conjunctival flap placed to prevent subsequent painful bullous keratopathy in that eye.

Results: This alternative approach resulted in healthy clear grafts with good visual outcomes in all patients in the seeing eye, with vision ranging from 6/9 to 6/45, limited only by pre-existing glaucomatous optic nerve damage. Five of the six patients attained 6/18 or better vision. The average follow up was 7.7 months, and glaucoma control remained stable in all cases. One eye with pre-existing low endothelial cell count eventually underwent corneal decompensation 12 months later and is now awaiting a conventional corneal allograft procedure.

Conclusions: Autotransplantation, using the healthy cornea from a blind eye, is a viable and safe option. Careful planning and execution of this elegant procedure precludes graft failure from allograft rejection, ensures longer-term visual success in these one-eyed patients.

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THE SINGAPORE OOKP STUDY (SOS): RESULTS OF OSTEO-ODONTO-KERATOPROSTHESIS-SURGERY FOR END-STAGE CORNEAL DISEASE IN ASIAN EYES

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Purpose: The management of severe ocular surface diseases and end-stage dry eye disorders such as Stevens Johnson syndrome and chemical/thermal burns with conventional keratoplasty or keratolimbal allografting remains unsatisfactory, with poor long-term outcomes due to instability of the ocular surface and allograft rejection. The osteo-odonto-keratoprosthesis (OOKP) is a form of keratoprosthesis (KPro) designed to treat the most severe of these cases. We report on our clinical results of the first series of OOKP patients in Asian eyes - the Singapore OOKP Study (SOS).

Methods: SOS is a prospective, open-ended clinical trial of OOKP surgery in Asian eyes conducted by the Singapore National Eye Center. Patients were from the Asia-Pacific region, including Singapore, Malaysia, Indonesia, Thailand, Vietnam, Sri Lanka, Bangladesh and Australia. Surgery was performed in 2 stages: in Stage 1, an OOKP optical cylinder was inserted into an autologous canine tooth which was implanted into the cheek, and a full thickness buccal mucosal graft replaced the damaged ocular surface. In Stage 2, performed 2-4 months later, the tooth/cylinder complex was retrieved and implanted into the cornea, after lifting of the buccal mucosal flap, corneal trephination, iris and lens removal and anterior vitrectomy.

Results: Since February 2004, a total of 18 patients (mean age: 31.25 yrs, range 18-51 yrs) have undergone this radical procedure, with 15 having completed Stage 2 surgery. Follow-up period ranges from 3 to 27 months (mean = 14.3 months). Diagnoses include chemical burns (n=9), Stevens Johnson syndrome (n=8), and one bomb blast victim. All patients were bilaterally blind, 3 had no previous surgery, while the rest had an average of 2.8 previous ocular surgeries (range 1-10 procedures). Anatomical success of OOKP implantation was achieved in all 15 patients who completed Stage 2 surgery, and no significant KPro-related complications have occurred to date. 11/15 (72.3%) attained BCVA of 6/12 or better - of these, 9 (60%) achieved 6/6 vision. In the remaining 4 cases, visual acuity ranged from 6/30 to 6/120 due to pre-existing glaucoma and previous retinal detachment. One patient subsequently developed endophthalmitis after glaucoma surgery, unrelated to KPro surgery.

Conclusions: OOKP surgery appears to be a highly promising procedure in Asian eyes, and is able to restore good vision to the most severe cases of end-stage corneal disease, when all else has failed. Further follow-up will be required to establish long-term stability and maintenance of vision in these patients.

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MORPHOMETRIC ANALYSIS OF CORNEAL ENDOTHELIAL GRAFTS

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Purpose: The aim of the study was the analysis of endothelial bottons thickness and total corneal thickness in eyes after posterior lamellar keratoplasty.

Methods: For the study 50 patients (43 women, 17 men, mean age 67,2±24.8 years) were qualified. Posterior lamellar keratoplasty was performed for pseudophakic/phakic corneal edema and endothelial corneal dystrophies. During two months following surgery corneal pachymetry was measured on 1st, 7th, 14th, 30th, 60th day. Measurements were performed with OCT Visante (Carl Zeiss Meditec) to establish central corneal thickness.

Results: In follow-up period slow decrease in graft and total corneal thickness was observed in majority of eyes, despite of 3 failed grafts. On 1 day after surgery we observed high differentiation in thickness of endothelial bottom. The lowest was 54µm, the highest - 439µm, mean thickness was 192,2±112,6µm. Mean central thickness of the graft on 7th, 14th, 30th, 60th day was 181,4±122,0, 131,5±98,2, 104,6±96,1 65,8±48,9µm respectively Total corneal thickness was 887,5±293,7µm on the first day after surgery and was decreasing with time: from 845,6 ±189,8µm after 7 days to 613,2±271,6µm on 2nd month after transplantation. Restoring visual acuity was dependent on total corneal thickness. BCVA in eyes with pachymetric values crossing 900µm were up to 0,06, while eyes with central thickness below 600µm noted mean BCVA 0,25±0,19 2 months after surgery.

Conclusions: Corneal pachymetry is a prognostic factor of endothelial graft success. OCT can be a useful device in long-term monitoring of corneal morphometry in endothelial grafts.

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OUTCOME OF CULTIVATED LIMBAL STEM CELL TRANSPLANTATION IN PEDIATRIC PATIENTS

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Purpose: To report the outcome of autologous cultivated limbal stem cell transplantation in pediatric patients for ocular surface reconstruction.

Methods: Medical records of 57 eyes of 57 Patients with limbal stem cell deficiency were reviewed. The mean age was 6.9 years (+/- 3.38). History of trauma was present in 2 patients, thermal injury in 1 patient and alkali injury in 54 patients. The median duration of time before reporting here after the injury was 20 weeks. 15 patients had undergone some form of surgery elsewhere prior to presentation to us. Patients were treated with autologous cultivated limbal stem cell transplantation. The mean duration of follow up was 18.26 weeks (+/- 8.44). Recurrence of conjunctivalization after cultivated limbal stem cell transplantation.

Results: Out of the 57 patients, 43 were male and 14 were female. Mean duration of follow-up was 18.26 weeks (+/- 8.44). Recurrence rate was 33.33 %. Survival probability of the transplants was 58.6 % (SE +/- 8.2%) at 5 months. Recurrence was seen to be more in patients with limbal ischaemia (p = 0.01). Presence of Conjunctivalisation and number of surgeries done before autologous cultivated limbal stem cell transplantation did not affect the outcome.

Conclusions: The limbal stem cell transplantation in pediatric age group has moderate success as compared to adults.

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TOPICAL ENZYMATICALLY ACTIVE CRE RECOMBINASE ABOLISHES CORNEAL AVASCULARITY IN FLT-1^{LOXP/LOXP} MICE

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Purpose: Corneal avascularity, which is required for optical clarity and optimal vision, is still an active subject of mechanistic inquiry. We hypothesized that the cornea remains avascular despite the constitutive presence of vascular endothelial growth factor (VEGF)-A due to expression of soluble VEGFR-1 (sflt-1), an endogenous VEGF-A trap.

Methods: Corneal expression of sflt-1 and membrane boundflt-1 (mbflt-1) was assayed by WB, ELISA, IHC and in situ hybridization. Becauseflt-1 deletion is embryonically lethal, we performed conditional ablation by delivering a cell permeable enzymatically active Cre recombinase containing a nuclear localization sequence (NLS-Cre) to the cornea by topical eye drops inflt-1^{loxP/loxP} mice and wild-type mice. Cre expression was assessed by WB and IHC. Corneal vascularization was assessed by photography and CD31-stained flat mounts.

Results: Corneal epithelium constitutively synthesized mRNA and protein for sflt-1 but not mbflt-1. NLS-Cre but not NLS-β-galactosidase induced Cre expression in the cornea of wild-type mice within 1 hour of eye drop application. Cre expression resulted in spontaneous invasion of CD31⁺ LYVE-1⁻ blood vessels into the cornea offlt-1^{loxP/loxP} mice within 2 days and consumed the entire cornea within 2 weeks (n=11; P<0.001). No corneal vascularization occurred in wild-type mice after topical NLS-Cre or NLS-β-galactosidase (n=8-11).

Conclusions: These data demonstrate that sflt-1 is the dominant anti-angiogenic factor preserving corneal avascularity, knowledge that can serve to rationally guide usage of the avascular cornea as a platform for studies on angiogenesis. This original demonstration of topical tissue-specific gene ablation is a significant addition to the arsenal of gene manipulation. This novel approach elides the drawbacks of the traditional Cre-lox system (toxicity of constitutive Cre expression, leaky or weak promoters, time consuming interbreeding) while conferring exquisite spatial and temporal selectivity: a strategy sure to find broad applicability in the future.

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51 OCULAR DOMINANCE AND REFRACTIVE ERROR

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Purpose: A recent study on the effect of dominance on anisometropia suggested that when there was an anisometropia > 1.75D, the dominant eye was always more myopic. The aim of this study was to assess the relationship between eye dominance and refractive error in Singapore children.

Methods: Eye dominance was assessed using the hole-in-the-card test, done three times, in children during their 5 year follow-up review in the SCORM (Singapore Cohort study Of the Risk factors for Myopia) study. Hand dominance, cycloplegic refraction and axial length measurements were also tested.

Results: Refractive and axial length measurements were obtained in 543 of the 579 children at the 2006 follow-up visit. Three out of 3 similar readings on the hole-in-the-card test was obtained in 477 children (89.3%). Right eye dominance was noted in 66% of the children. The mean spherical equivalent was -2.56 +/- 2.46D and -2.45 +/- 2.52D in dominant and non-dominant eyes respectively (P = 0.22). Dominant eyes had significantly less astigmatism than non-dominant eyes (-0.88 +/- 0.80D vs. -1.00 +/- 0.92D, P < 0.001). There was no significant difference in the change in refractive error (spherical equivalent or cylinder power) over the prior three years between dominant and non-dominant eyes. There was, however, a small but significant prior increase in axial length in the dominant eye (1.05 +/- 0.65mm vs. 1.01 +/- 0.66mm, p = 0.02). Where anisometropia was > 1.75D (n=25), dominant eyes were more myopic in 56%, and more hyperopic in 44% (P = 0.56) (p values to 2 significant figures). Where astigmatic power was >1D between eyes, dominant eye was less astigmatic in 85%.

Conclusions: Spherical equivalent and change in spherical equivalent were not associated with eye dominance, although greater increases in axial length were more likely in the dominant eye. Where there was anisometropia > 1.75D, dominant eyes were not always more myopic. Cylindrical error or astigmatism may be a better predictor of eye dominance.

52 THE ASSOCIATION OF VEGF POLYMORPHISMS WITH DIABETIC RETINOPATHY

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Purpose: The influence of genetic polymorphism in the regulation of VEGF has been demonstrated extensively in various clinical disorders including Diabetic Retinopathy (DR). We sought to screen polymorphisms in the promoter and 3'UTR of the VEGF gene, which are believed to play a role in the VEGF transcript regulation.

Methods: We used a case-control approach to screen for polymorphisms at position -2549, -2578, -634, -1158 and 936. The study subjects

included 148 non-proliferative diabetic retinopathy (NPDR), 63 proliferative diabetic retinopathy (PDR) and 196 Type 2 diabetic subjects without any form of retinopathy (DM). Statistical analysis was carried out using SPSS v10 and haplotype analysis was carried out using EM algorithm. We also carried out a semi quantitative RT-PCR for the VEGF₁₂₁ and VEGF₁₆₅ in peripheral mononuclear cells isolated from the study subjects.

Results: We found that the -2549 I/D polymorphism were in complete linkage disequilibrium with the -2578 A/C SNP. Further we found that the -2578 and -634 polymorphisms significantly differed between the PDR and DM without DR group. The minor allele frequencies for the -2578 between DM and PDR are .32 and 0.43 with a P value <0.05 and minor allele frequency for the -634 SNP are 0.41 and 0.31 with a significant difference at a p value < 0.05. We further extended this to a stepwise haplotype analysis for markers -2578, -634 and 936 and we found ACT haplotype induced susceptibility to PDR. The mRNA for VEGF₁₂₁ differed between the groups on the influence of GG genotype of -634 polymorphism whereas no such difference was found for the CC genotype or for the VEGF₁₆₅ isoform.

Conclusions: The results conclude that VEGF -634 and -2578 polymorphisms are susceptibility markers for the development of PDR in South Indian population.

53 ANTIOXIDANT INTAKE AND ITS ASSOCIATION WITH AGE-RELATED MACULAR DEGENERATION

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Purpose: We aim to evaluate the associations of past dietary antioxidant and vegetable intake with the prevalence of Age-related macular degeneration (AMD) in the Melbourne Collaborative Cohort Study.

Methods: In this prospective cohort study of 41,528 participants, baseline nutrient intake was estimated from a food frequency questionnaire completed in 1990-94. In the follow up study, from 2003 onwards, digital macula photographs are being taken with a non-mydratic camera and graded for AMD. We present an interim analysis of 3605 participants aged 70 and over.

Results: Leafy vegetable intake, ≥6.5 times/week vs. <1times/week, was directly associated with increased odds of any AMD (odds ratio {OR} 1.33, [95% confidence interval 1.07-1.64] p trend 0.051). Allium vegetables intake, ≥6 times/day vs. <1.5 times/day, showed the same trends with any AMD when we excluded subjects with supplement intake (OR 1.27 [1.00-1.62] p trend 0.034). Dietary Vitamin C and Vitamin E intake, comparing highest quartile to lowest quartile, was directly associated with increased odds for any AMD (OR 1.19 [0.93-1.52] p trend 0.031 and OR 1.23 [0.95-1.59] p trend 0.058, respectively). No significant associations with AMD were found for lutein, zeaxanthin, β-carotene, zinc and fruit intake. A below median intake of all 4 nutrients, vitamin C, E, β-carotene and zinc, was associated with a reduced risk of AMD (OR 0.75 [0.61-0.92]).

Conclusions: Though our results contradict some previous studies where inverse associations were found between leafy vegetables and AMD, other studies have also shown a direct association between its intake and AMD, especially in the elderly population. Survival bias where subjects over 70 years of age who consume a healthy diet of fruits and

vegetables are the only subjects alive to participate in the analysis is one possible explanation for our results. Higher leafy vegetables and vitamin E intake were directly associated with any AMD and early AMD respectively, in our study of elderly participants. We shall continue to evaluate these associations in the younger subjects as the study continues.

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MITOCHONDRIAL DNA HAPLOGROUPS AND AGE-RELATED MACULOPATHY

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Purpose: As certain mitochondrial diseases have retinal pigmentary abnormalities similar to those observed in age-related maculopathy (ARM), we hypothesized that mitochondrial haplogroups may be associated with ARM.

Methods: We assessed the association between mitochondrial haplogroups and ARM in a population-based sample of 3509 persons aged 49+ years, residing west of Sydney. Retinal photographs of both eyes were taken (1999-2001) and subsequently graded for ARM following the Wisconsin Grading System. Genetic analysis for mitochondrial DNA (mtDNA) haplogroups was performed. Associations between these genetic markers and risk factors for ARM were assessed.

Results: After adjusting for age, sex and smoking, haplogroup H was associated with a reduced prevalence of any (early and late) ARM (odds ratio, OR, 0.75, 95% confidence interval, CI, 0.58-0.97), early ARM (OR 0.75, CI 0.57-0.98), and large distinct and indistinct soft drusen (OR 0.70, CI 0.56-0.89). Haplogroup J was associated with a higher prevalence of large soft distinct drusen (OR 1.80, CI 1.18-2.73). Haplogroup U was associated with an increased prevalence of retinal pigment abnormalities (OR 1.45, CI 1.11-1.91).

Conclusions: Our findings of associations between different haplogroup types and prevalent ARM or ARM lesions suggest that these haplogroups may be genetic markers indicative of an individual's susceptibility to ARM.

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DIABETIC RETINOPATHY PREDICTS CORONARY HEART DISEASE

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Purpose: To examine the relation of diabetic retinopathy to incident coronary heart disease.

Methods: A population-based, prospective cohort study of 1,542 middle-aged persons with type 2 diabetes selected from four communities in the United States. Diabetic retinopathy signs were ascertained from retinal photographs and graded according the Early Treatment of Diabetic Retinopathy Study severity scale. Incident coronary heart disease events were prospectively identified and validated according to standardized protocols.

Results: Over an average follow-up of 7.8 years, there were 215 coronary heart disease events. After adjusting for age, gender, race, study

center, body mass index, 6-year mean arterial blood pressure, use of anti-hypertensive treatment, fasting glucose, duration of diabetes, cigarette smoking, education, lipid profile and inflammatory markers, diabetic retinopathy was associated with an increased risk of coronary heart disease (Hazard Rate [HR] ratios of 2.02, 95% confidence interval [CI]: 1.41 to 2.88) in both men (HR 1.87, 95% CI: 1.15 to 3.04) and women (HR 2.13, 95% CI: 1.21 to 3.76).

Conclusions: Diabetic retinopathy predicts future risk of coronary heart disease, independent of traditional risk factors. More comprehensive cardiovascular evaluation may therefore be warranted in diabetic persons with retinopathy.

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THE RELATION OF RETINAL VASCULAR CALIBER TO REFRACTIVE ERRORS AND OCULAR BIOMETRY IN YOUNG CHILDREN

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Purpose: To describe the relation of retinal vascular caliber to refractive errors and ocular biometric parameters in children.

Methods: A cross-sectional, school-based study of 767 children aged 7 to 9 years. Retinal vascular calibers were measured from retinal photographs using a validated computer-based program. Standardized examination of refraction and ultrasound biometry was performed for all children.

Results: The mean retinal arteriolar caliber was 156.4 μ m (95% CI, 155.4-157.3) and mean venular caliber was 225.4 μ m (95% CI, 224.1-226.8). Eyes with myopic refraction had smaller retinal arteriolar and venular calibers than emmetropic or hyperopic eyes ($p < 0.001$). After adjusting for age, gender, race, height, body mass index, parental myopia and smoking, retinal arteriolar caliber was narrower by 2.56 μ m (95% CI, 1.59, 3.54, $p < 0.001$) and venular caliber by 3.06 μ m (95% CI 1.72, 4.40, $p < 0.001$) for each standard deviation (SD) decrease in spherical equivalent refraction (2.0 D). Retinal vessel calibers were narrower with longer axial lengths, 4.06 μ m (95% CI 3.06, 5.07, $p < 0.001$) for arteriolar caliber and 6.22 μ m (95% CI 4.88, 7.57, $p < 0.001$) for venular caliber per 1.02 mm (SD) increase in axial length. Retinal vessel calibers were also narrower with steeper corneal curvatures, thinner lenses and deeper vitreous chambers.

Conclusions: In healthy school-aged children, retinal vascular calibers are correlated with refractive errors and ocular biometric parameters. Our study documents the impact of variations in refraction and ocular dimensions on absolute retinal vascular caliber measurements.

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SANKARA NETHRALAYA DIABETIC RETINOPATHY EPIDEMIOLOGY AND MOLECULAR-GENETIC STUDY (SN-DREAMS II): ESTIMATING PREVALENCE OF DIABETES AND DIABETIC RETINOPATHY IN THE URBAN POPULATION

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Purpose: To elucidate prevalence of type II diabetes and diabetic retinopathy in the general urban population.

Methods: SN-DREAM I*, a population-based study was conducted in the urban Chennai, India between 2003 and 2006. Using stratified random sampling, based on socioeconomic status, 5784 individuals above the age 40 years were enrolled. All known and newly diagnosed diabetics underwent comprehensive ophthalmic evaluation including 45° four field digital fundus photographs.

Results: The overall prevalence of type II diabetes was 31.6% (95% CI: 30.4 -32.8); known diabetics were 74.2%, and newly detected, 25.8%. Age and gender adjusted prevalence of Diabetes was 28.2% (95% CI: 27 -29.3). The prevalence of diabetic retinopathy was 12 % (95% CI 10.3- 13.8); 13.6% (95% CI: 11.7-15.7) in known diabetics and 4.4% (95% CI: 2.2-7.7) in newly detected diabetics ($P = <0.0001$). Age and gender adjusted prevalence of Diabetic retinopathy was 10.9% (95% CI: 9.3 -12.5) Socioeconomic status did not influence the occurrence of diabetes and so was true for diabetic retinopathy.

Conclusions: The study shows that every fourth individual in the general population could be an undetected diabetic individual. The prevalence of diabetic retinopathy in a defined population of diabetic was 12%; around 4.5% of newly diagnosed diabetic also showed evidence of diabetic retinopathy at the time of their initial diagnosis.

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POST CATARACT SURGERY GLAUCOMA IN AN URBAN SOUTH INDIAN POPULATION FROM THE CHENNAI GLAUCOMA STUDY

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Purpose: To determine the prevalence of glaucoma among aphakes and pseudophakes in an urban south Indian population.

Methods: 3850 subjects aged 40 years or above underwent a complete ophthalmic examination including applanation tonometry, gonioscopy, optic disc evaluation and frequency doubling perimetry. Glaucoma in aphakia/pseudophakia was diagnosed using the International Society of Geographical and Epidemiological Ophthalmology (ISGEO) criteria.

Results: 406 persons (10.5%) of the population had undergone cataract surgery. 38 of them (0.99% of 3850 subjects) had glaucoma associated with aphakia/pseudophakia. This included 15 aphakes and 23 pseudo-phakes (9.36% of 406 aphakes/ pseudophakes). Aphakia, older age, higher intraocular pressure (IOP) and longer duration from surgery were risk factors for glaucoma on univariate analysis. On multivariate analysis, older age and higher IOP were risk factors for glaucoma. 20% of aphakic and 4.3% of pseudophakic eyes were blind due to glaucoma. Aphakes were at greater risk of blindness than pseudophakes (Odds ratio: 11.2, 95%CI: 1.2,109).

Conclusions: Glaucoma was a significant cause of morbidity in those who had undergone cataract surgery in this urban population.

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INTRAOCULAR PRESSURE IN A CENTRAL INDIAN POPULATION. THE CENTRAL INDIA EYE AND MEDICAL STUDY

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Purpose: To evaluate intraocular pressure (IOP) and its demographic associations in an urban and rural population in Central India.

Methods: The Central India Eye and Medical Study (CIEMS) is a population-based cohort study carried out in Nagpur / Maharashtra / Central India. The interim analysis of the population-based, cross-sectional cohort study included 603 subjects. Mean age was 49.13±13.49 years (range, 30-95 years), mean refractive error was -0.23±1.78 diopters (range, -20.0 diopters to +6.00 diopters). IOP was measured by applanation tonometry.

Results: IOP data were available for 601 subjects. Mean IOP was 13.29±3.64 mm Hg (median, 13 mm Hg; range, 6 to 34 mm Hg). IOP was not significantly associated with age ($P=0.29$; 95%CI: -0.033, 0.010) and gender ($P=0.39$; 95%CI: -0.33; 0.84). It was significantly not associated with refractive error ($P=0.29$; 95%CI: -0.25, 0.08). IOP increased significantly ($P<0.001$; correlation coefficient $r=0.18$; 95%CI: 0.01, 0.03) with central corneal thickness.

Conclusions: In the adult central Indian population, mean and median of IOP as measured by applanation tonometry is 13 mm Hg, following a Gaussian distribution curve, slightly skewed to the right side. It was not associated with refractive error, age and gender. The IOP measurements increased with central corneal thickness.

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LASER PERIPHERAL IRIDOTOMY AND PROGRESSION OF LENS OPACITIES

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Purpose: To determine if prophylactic laser peripheral iridotomy (LPI) is associated with progression of lens opacities.

Methods: In 1999, 685 Mongolian volunteer participants aged ≥50 years underwent slit lamp examination including LOCSIII grading for lens opacity after glaucomatous optic neuropathy had been excluded. Using ISGEO definitions, 156 were diagnosed with occludable angles and treated with LPI. Six years later, 138/685 (20.1%) had died. 298 of 547 participants traced (54.5%) were re-examined between March and September 2005. The effect of age, gender, baseline Shaffer grading on the progression of all types of lens opacity was assessed using chi squared test, t-test or the Wilcoxon rank sum test. Progression of lens opacity was identified as an increase of LOCSIII grades beyond a threshold derived from the inter-observer variation tests, approximating to a change of 1.0 LOCSIII units for nuclear opacity (NO), color (NC), and posterior subcapsular lens opacity (PSCLO), and 1.5 units for cortical lens opacity (CLO).

Results: The baseline CDR was the same in those with and without follow up (0.3, IQR: 0.2-0.4, $p=0.49$). Progression of NO was identified in 40 participants (14.6%; 95% CI 10.5-18.8%), NC in 39 participants (14.4%; 10.2-18.6%), CLO in 62 participants (23.4%; 18.3-28.5%) and PSCL0 in 9 participants (3.4%; 1.2-5.6%). Progression of CLO and PSCL0 was associated with increasing age and progression of NC was associated with narrower baseline Schaffer grading ($p<0.05$). There was also evidence of NO and NC progression with LPI ($p<0.05$). However, in a multivariate analysis, adjusting for age and baseline Shaffer grading, this association between LPI and progression of any lens opacity no longer appeared significant.

Conclusions: The similarities in baseline CDR mitigate the effect of selection bias. Progression of lens opacity was not associated with LPI in this population.

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INCIDENCE OF REFRACTIVE ERROR AND OTHER OCULAR ABERRATIONS IN SCHOOL CHILDREN IN THE NATIONAL CAPITAL REGION OF INDIA

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Purpose: High incidence of low vision among young children that goes unnoticed by the parents and teachers may lead to compromised confidence and growth for the child and also adds to avoidable misery for the individual and family. These refractive errors can be diagnosed early, much before getting into symptomatic phase, through regular school and preschool eye screening programs. The authors have undertaken to screen in a year around 10,000 school kids aged between 5 and 10 years. This 3 year multi-tiered program aims to identify the cases and causes of unnoticed visual impairment such as refractive errors, amblyopia and squints among young children; advise them, their parents and teachers on preventive and corrective measures; and study if socio-economic and demographic parameters affect early incidence and detection of ocular aberrations.

Methods: We selected the schools from rural and urban areas with different socio-economic backgrounds. After involving the school management, a team of ophthalmologist, optometrist and ophthalmic assistant screened children for refractive errors, amblyopia, and squints, including color vision defects among the male children using standard techniques.

Results: Ocular aberrations in 420 out of screened 1828 cases indicated high incidence (23%) of unnoticed cases of visual impairment. Refractive errors revealed to be the most prevalent (93%) aberration present in 21.4% of the sample population. Amblyopia was detected in 24 (6.1%) out of 391 cases of refractive errors.

Conclusions: High incidence of unnoticed but correctable ocular aberrations among young children warrants a systemic approach including involvement of diverse group of stakeholders.

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PREVALENCE OF UNDER-CORRECTED REFRACTIVE ERRORS IN AN URBAN MALAY POPULATION: THE SINGAPORE MALAY EYE STUDY (SIMES)

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Purpose: Under-corrected refractive error is a major but preventable cause of visual impairment. We describe the prevalence and risk factors of under-corrected refractive error in an urban Malay population.

Methods: A population-based, cross-sectional study of 3,280 (78.7% response rate) Malays aged 40-79 years in Singapore. The population was selected based on an age-stratified random sampling procedure of Malay people living in the south-western part of Singapore. Participants had an interview, examination and ocular imaging at a centralized study clinic. Presenting and best-corrected visual acuity (VA) was measured using standardized protocol. Under-corrected refractive error was defined as an improvement of at least 0.2 LogMAR units (2 lines) between the presenting and best correct VA in the better eye.

Results: Data were available in 3,234 participants. There were 790 individuals who had under-corrected refractive error (prevalence of 24.4%). The prevalence of under-corrected refractive error increased with age (15.9%, 24.4%, 28.9%, and 29.6% among participants aged 40-49, 50-59, 60-69 and 70-79 years, respectively, $p<0.001$) and was higher in women than men (26.2% vs. 22.5%, $p=0.016$).

Conclusions: This population-based study shows that a quarter of Malay adult persons have under-corrected refractive error. Visual impairment in these people can be simply corrected by appropriate prescription of glasses.

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DISTRIBUTION AND SYSTEMIC CORRELATIONS OF INTRAOCULAR PRESSURE: THE SINGAPORE MALAY EYE STUDY (SIMES)

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Purpose: To describe the distribution and factors influencing intraocular pressure (IOP) in Malay adults in Singapore.

Methods: A population-based, cross-sectional study of 3,280 (78.7% response rate) Malays aged 40-80 years in Singapore. The population was selected based on an age-stratified random sampling procedure of Malay people living in the south-western part of Singapore. Participants had a standardized interview, clinical examination and imaging of the lens and retina at a centralized study clinic. IOP was measured from the Goldmann applanation tonometer before pupil dilation.

Results: Data on IOP were available from 3,258 right eyes and 3,259 left eyes. IOP was normally distributed with a mean of 15.4 mmHg (95% confidence intervals [CI], 15.3 to 15.5) in right eyes and 15.3 mmHg (95% CI, 15.2 to 15.5) in left eyes. Mean IOP (right eye) was not associated with age (15.2, 15.6, 15.6, and 15.1 mmHg, among participants aged 40-49, 50-59, 60-69, and 70-80 years, respectively, $p=0.85$). IOP was significantly higher in women than men (15.7 vs. 15.0 mmHg, $p<0.001$). IOP was significantly and positively correlated with systolic blood

pressure (Pearson's correlation coefficient 0.19, $p < 0.001$), diastolic blood pressure (0.14, $p < 0.001$), random glucose (0.14, $p < 0.001$), glycosylated hemoglobin (0.10, $p < 0.001$), height (-0.09, $P < 0.001$) and weight (0.03, $P = 0.06$).

Conclusions: This study provides population-based data on the distribution and determinants of IOP in an urban adult Malay population in Singapore. IOP is associated with higher blood pressure and hyperglycemia.

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THE PREVALENCE OF REFRACTIVE ERROR AMONG MALAY SCHOOL CHILDREN, AGES 13 -16 YEAR OLD IN KOTA BHARU, KELANTAN

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Purpose: To determine the prevalence of visual impairment and refractive error in Malay school children age 13 to 16 years old.

Methods: A cross sectional study was conducted among Malay school children, age ranging from 13 to 16 year old. Seven out of 36 secondary schools in Kota Bharu District were randomly selected. Written consent was obtained from parent prior to examination. Visual assessment includes visual acuity, ocular motility, external eye examination and direct funduscopy were conducted at the selected schools. Automated refraction using Retinomax Nikon was performed to those students who had visual acuity of 20/40 or less. Direct questionnaires regarding student's background and near work activity were also obtained from the students.

Results: A total of 929 Malay students were recruited. The prevalence of visual impairment was 15.2% with refractive error (98.3%) as the major causative factors. Myopia ($-0.50D$ or less) was found in 97.9% of students with refractive error. The uncorrected refractive error was 58.2% and 37.65 of them were unaware of their visual problems. Based on multivariate study analysis, there was significant association of refractive error with near work using computer ($p < 0.05$) and positive family history of refractive error among sibling ($p < 0.05$) and parents ($p < 0.05$).

Conclusions: Although the prevalence of refractive error among Malay teenagers is almost similar to other reported studies but higher number of them was uncorrected. Visual screening and health education should be emphasized to ensure better academic achievement.

Keywords: visual impairment, refractive error, myopia

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CLINICAL AUDIT OF RETINAL ABNORMALITIES AMONG ACUTE ISCHEMIC STROKE PATIENTS

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Purpose: Older age, hypertension and diabetes are known risk factors for both ischemic stroke as well as retinal abnormalities. We studied the prevalence, spectrum and associations of retinal abnormalities among patients with acute ischemic stroke. We also investigated the need for ophthalmology referral among ischemic stroke patients.

Methods: We studied consecutive acute ischemic stroke patients admitted to the Singapore General Hospital neurology department who agreed to participate in the study. If consent was given and there were no contraindications, mydriatic eye drops were instilled for patients. Retinal photographs involving the optic disc, central macula, superior arcade and inferior arcade were taken and analyzed by an ophthalmologist, who determined if an ophthalmology referral was advised.

Results: From May 2006 to September 2006, we recruited 190 ischemic stroke patients. Six patients were excluded as their retinal photographs were ungradable. Of the 184 patients studied, the median age was 64 years, 64% were male, 85% were Chinese, 10% Malay and 5% Indian. The prevalence of hypertension was 58% and diabetes 25%. Retinal abnormalities were detected in 51% (94/184) of the patients studied; 47 had hemorrhages, 19 micro-aneurysms, 20 cotton wool spots, 9 hard exudates, 55 age-related macular degeneration and 2 neo-vascularisation. There was no association between the prevalence of retinal abnormalities with age, gender and hypertension. A higher proportion of diabetics had retinal abnormalities than non-diabetics. (71% vs. 45%, $p = 0.003$). Of note, the prevalence of retinal abnormalities among patients with neither diabetes nor hypertension was 47%. Three patients (2%) were advised to see an ophthalmologist urgently, two for neo-vascularisation and one for advanced age-related macular degeneration. Non-urgent ophthalmology referral was advised for 53 (29%) patients.

Conclusions: Our findings of 51% of ischemic stroke patients with retinal abnormalities detected through screening and 31% requiring an ophthalmology consultation suggest that retinal examination should be routine for all acute ischemic stroke patients.

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ANTERIOR CAPSULAR PLAQUE IN CONGENITAL CATARACT: MORPHOLOGICAL AND ULTRASTRUCTURAL STUDY

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Purpose: To study the morphological, immunofluorescence and ultrastructural characterization of congenital anterior capsular plaque (ACP) and to determine its prevalence in pediatric eyes undergoing congenital cataract surgery.

Methods: Present study is prospective, observational study on 260 pediatric eyes undergoing cataract surgery. Anterior lens epithelium from cataract without ACP and with ACP was collected from patients undergoing cataract surgery. The samples were subjected for light microscopy and transmission electron microscopy. The whole mounts of lens epithelium were stained with PAS-hematoxylin. 5µm thick sections of ACP were subjected for immunofluorescence localization of α A-crystallin, α -smooth muscle actin (α SMA), collagen type I and collagen type IV. Ultra-thin sections were studied under the electron microscope.

Results: The lens epithelial cells (LECs) of cataract without ACP showed changes like cytoplasmic vacuolization and heterogeneity in the shape and size of nuclei. Scattered superimposed cells were also found. The lens epithelium of cataract with ACP was consists of plaque and non-plaque regions. The cells of non-plaque region were similar to the LECs

of cataract without ACP. The plaque region revealed fibroblast like cells suspended in large amount of extracellular matrix. Depend on the area occupied plaque region can be divided into small, medium and large. The cells of plaque region were positive to α A-crystallin and α SMA. The extracellular matrix was abundant in collagen type I. The cells were surrounded by collagen type IV. Ultrastructurally, the plaque region was consists of cells with increased rough endoplasmic reticulum and large, circular mitochondria. The extracellular matrix was fibrillar and non-fibrillar. The prevalence of ACP in pediatric eyes undergoing cataract surgery was 11.53% (30 out of 260 eyes). The prevalence of ACP was highest in mature cataract (29%).

Conclusions: Pediatric ACP showed large amount of extracellular matrix abundant in collagen type I and cells were positive to α SMA. The cells within the ACP retained proteins of undifferentiated LEC like α A-crystallin and were surrounded by collagen type IV. The prevalence of ACP in pediatric eyes undergoing cataract surgery was 11.53%.

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MODULATION OF ANTI-APOPTOTIC AND CHAPERONE FUNCTIONS OF ALPHA-CRYSTALLIN BY A METABOLIC DICARBONYL COMPOUND

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Purpose: Alpha-crystallin is a major protein in the lens. It is also present in a number of other tissues, e.g., retina. Methylglyoxal is a ubiquitous metabolic dicarbonyl compound that reacts with arginine and lysine residues to form stable adducts on proteins. We have investigated the effect of MGO modification of alpha-crystallin on its chaperone and anti-apoptotic properties.

Methods: Structural perturbations and chaperone activity were determined in MGO-modified and site-directed mutants (replaced MGO-reacting arginines) human alphaA-crystallin. Anti-apoptotic activity was measured by transferring MGO and native alpha-crystallin into HLEB-3 cells.

Results: At low concentrations of MGO, modification enhanced the chaperone function of alphaA-crystallin in a concentration dependent manner, without significant changes either in secondary or tertiary structure. Major sites of MGO-modification were found to occur on R21, R49 and R103. To determine the importance of these arginine residues, we generated site-directed mutants of alphaA-crystallin in which one or more of these arginine residues was replaced by alanine. We found that R21A and R103A mutants to exhibit significantly higher chaperone function than the wild type protein, linking neutralization of positive charge on these arginine by MGO to enhanced chaperone function. MGO-modified alpha-crystallin also exhibited higher anti-apoptotic activity than the wild type protein in staurosporine-treated HLEB-3 cells. Inhibition of caspase-9 was found to be a mechanism for such enhancement in the anti-apoptotic property.

Conclusions: Enhancement of the chaperone and anti-apoptotic functions of alpha-crystallin by MGO could be an adaptation to cope with dicarbonyl stress that occurs in tissues during aging and diabetes.

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PREVENTION OF CATARACT DEVELOPMENT BY GLYCINE MAX IN EXPERIMENTAL CATARACTOGENESIS

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Purpose: Legumes play an important role in the traditional diets of many regions throughout the world. Glycine max (Soya beans) unique is among the legumes, because they contain a variety of bioactive principles, including saponins, protease inhibitors and iso flavones. In several studies they have been reported to possess potent antioxidant, anti diabetic and anti cancer properties. In the present study, we investigated the anti-cataract potential of Soya beans in galactose-induced cataractogenesis.

Methods: All animal procedures performed in this study complied with the ARVO statement for the Use of Animals in Ophthalmic and Vision Research. Diet containing Soya Beans (SB) 10% along with 30%galactose were fed to treatment groups and only 30% galactose diet to control group of albino rats for one month. The pre-treatment with SB was started one week prior to the galactose challenge. The eyes were examined for the development of various stages of cataract (stage I=lenses showing faint peripheral opacity, stage II=irregular peripheral opacity with slight involvement of the lens in the center, stage III= faint opalescence visible with the naked eye, stage IV=mature nuclear cataract) and grading was done periodically on 7th, 14th, 21st and 30th day through slit lamp to assess the progression of cataract. Tropicamide- 1% was used to dilate the pupil size.

Results: It was observed, on 30th day 100% eyes were in stage IV in the control group, Opacity Index 4, where as in the treatment group of SB 10% diet, none of the eyes were in stage IV (30% eyes were in Stage I, 40% eyes were in Stage II and 30% eyes were in Stage III) Opacity Index 2. The results of the present study demonstrated that Glycine max prevented the development of cataract in galactose induced cataractogenesis in rats.

Conclusions: The anti cataract activity of Glycine max may be because of the antioxidant, free radical scavenging activity and anti diabetic action.

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OCIMUM SANCTUM ATTENUATES OXIDATION INDUCED APOPTOTIC CHANGES IN HUMAN LENS EPITHELIAL CELLS (HLEC)

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Purpose: Hydrogen peroxide (H_2O_2) induced lipid peroxidation has been shown to produce lens epithelial cell death or apoptosis leading to cataractogenesis in both animals and human. The present study was aimed to investigate the role of aqueous extract of Ocimum sanctum (OS), commonly known as tulsi, in preventing oxidation induced HLEC damage and cell death in vitro.

Methods: HLEC were subjected to oxidative stress by incorporating H_2O_2 (100 μ M) in the culture medium with or without supplementation of OS (150 μ g/ml). Resulting morphological/biochemical and apoptotic changes

were observed after 30 minutes of incubation. To ascertain the protective effect of OS, electron microscopic studies, antioxidant status of HLEC and expression of pro/anti apoptotic proteins were monitored. The antioxidant status of HLEC was monitored by estimating the levels of reduced glutathione, lipid hydroperoxides, enzymes like superoxide dismutase, catalase, glutathione peroxidase and glutathione-S-transferase. Apoptosis in HLEC was assessed by TUNEL assay. The expression of Bcl₂ (antiapoptotic) and Bax (proapoptotic) protein was studied immunohistochemically.

Results: Under electron microscope, normal HLEC showed round nucleus with few small vacuoles in the cytoplasm, well-demarcated cell membrane and intact cytoplasmic organelles. H₂O₂ was found to induce formation of vacuoles in the HLEC along with chromatin condensation, loss of nuclei which finally result in cell death. OS preserved the normal architecture of HLEC and prevented cell death. H₂O₂ induced HLEC apoptosis in 4.2% (SD 0.4) cells whereas TUNEL positive nuclei with OS were found to be only 0.9% (SD 0.08). H₂O₂ also increased Bax level by 5.67 fold and decreased Bcl₂ level by 5 fold over the basal level. An upregulation of Bcl₂ (2 fold) and down regulation of Bax (4.3 fold) was observed with lycopene. Inhibition of lipid peroxidation (62.9%) and a positive modulation of antioxidant enzymes together with restoration of glutathione levels (64.44%) were observed.

Conclusions: The present study supports the fact that oxidative stress in the epithelium can cause LEC death and thus contribute to cataractogenesis. Furthermore the study indicates the potential antiapoptotic and antioxidant potential of OS. Thus OS may have clinical implications for the prevention of maturity onset cataract formation.

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ADVANCED BIOMETRY IN POST-REFRACTIVE SURGERY EYES: THE BESST© FORMULA

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Purpose: The estimation of corneal power after laser refractive surgery is inaccurate if keratometric values are used without any adjustment. This can lead to inaccurate IOL power calculation and refractive surprises after lens surgery. We describe a new formula which significantly improves the accuracy and the predictability of IOL power calculations in those eyes.

Methods: (Moorfields Eye Hospital Protocol No: BORE1001) A new formula (BESST© Formula) based on the Gaussian Optics Formula was developed on 170 eyes undergoing kerato-refractive surgery (123 myopic; 47 hyperopic LASIK/LASEK). The formula only requires anterior and posterior corneal curvature and corneal thickness from the Pentacam™ (Oculus) without the need of any pre-refractive surgery information. A personal computer software program containing this formula was developed (BESST© Corneal Power Calculator) and corneal power was calculated in 25 eyes which had previously undergone refractive surgery and needed biometry for cataract surgery.

Results: In the 25 eyes undergoing cataract surgery following both myopic and hyperopic ablations, the target refractions calculated with the BESST© Formula (Absolute SD= ±0.26) were statistically significantly closer to the actual postoperative refractions than those calculated with either the Historical Technique (SD= ±1.06 SD; p=0.05); the Hard Contact-Lens Method using Holladay 2 formula (SD= ±1.80 SD; p=0.03); the Historical Technique with Double-K Adjustment (SD= ±1.62 SD; p=0.05); the Holladay 2 formula using K values from the Atlas™ (Zeiss Meditec) topographer (SD= ±0.49 SD; p=0.05).

Conclusions: The BESST© Formula is statistically significantly more accurate and has tighter SD than the most advanced techniques currently available, both after myopic and hyperopic ablations, and has the advantage of not requiring any pre-refractive surgery information. *CR

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PHACOEMULSIFICATION (PE) IN POSTERIOR POLAR CATARACT (PPC) - A NEW TECHNIQUE

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Purpose: To demonstrate a new technique of phacoemulsification in a posterior polar cataract (PPC) and to evaluate the intraoperative and postoperative results with that technique.

Methods: 26 eyes of 26 consecutive patients with PPC were operated upon by a single surgeon. The technique included a superiorly eccentric capsulorhexis (4.5 to 5.5 mm in diameter), hydrofreedissection with a cyclodialysis spatula, no hydrosteps, progressive debulking of the accessible inferior half of the nucleus and no rotation of the nucleus. The inferior segment of the nucleus was debulked using phaco-chopping or slow motion sculpting and aspiration depending upon the grade of nuclear sclerosis. The residual superior half of the nucleus was gently viscodisplaced through the superiorly eccentric rhexis, elevated with a spatula and emulsified at the rhexis plane.

Results: Posterior capsular rent occurred in 5 (19.2%) patients, 3 of which required automated anterior vitrectomy and posterior chamber intraocular lens (PCIOL) placement in the sulcus. The 2 patients without vitreous disturbance had PCIOL placed within the capsular bag. There were no other complications. Best corrected visual acuity of 6/9 or better was achieved in all patients.

Conclusions: The results of this study show that phacoemulsification employing the new technique described in the study, is quite safe and gives very satisfactory results in posterior polar cataracts.

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RISK FACTORS, PRESENTATION, MANAGEMENT AND FINAL VISUAL OUTCOME IN PATIENTS WITH LENS FRAGMENT DROP FOLLOWING PHACOEMULSIFICATION - A TEN YEAR RETROSPECTIVE ANALYSIS

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Purpose: To analyze the risk factors, clinical presentation, management and final visual outcome of patients treated for nucleus or lens fragment drop following phacoemulsification.

Methods: The authors performed a retrospective chart review of 90 eyes of 90 patients with dislocated lens fragments after phacoemulsification, managed with pars plana vitrectomy at a tertiary care centre in Southern India. These eyes were operated between January 1993 and December 2003.

Results: The age of the patients ranged from 35 years to 87 years. Preoperative risk factors were posterior polar cataract (15.55%), high myopia (13.33%), pseudoexfoliation (0.02%), complicated cataract of uveitic etiology and prior vitreoretinal surgery (0.02%). Trenching/

emulsification (71.79%) was the most common stage at which nucleus drop occurred. 15.55% had vitrectomy and nucleus removal done in the same sitting. In patients who were taken up as 2nd sitting the presenting features were corneal edema in 65.55%, anterior uveitis in 43.33%, vitritis in 33.33% and increased intraocular pressure in 31.11%. The timing of pars plana vitrectomy ranged from during the same sitting to 337 days following posterior dislocation. IOL insertion following vitreous surgery was done in 47.76%. Post-operative follow up ranged from 1.27 to 91.87 months (average - 13.63 months). Final best corrected visual acuity improved more than 6/ 60 in 85.54% patients (6/6 to 6/12 in 56.66% patients). Intraocular inflammation, corneal edema and glaucoma improved in all but 5 patients. Reasons for a poor visual outcome included macular retinal pigmentary changes in 10 %, epiretinal membrane in 7.77%, cystoid macular edema in 4.44%, retinal detachment in 4.44%, co-existing ocular condition in 12.22 %, optic disc pallor in 4.44%, persisting inflammation/glaucoma/corneal edema in 5.55% and subretinal neovascular membrane in 2.22% cases.

Conclusions: The use of vitrectomy to remove posteriorly dislocated lens fragments has been shown to be an effective treatment method. The final visual outcome was not affected by the time interval from the primary surgery. The visual outcome is reasonably good but dependent on associated underlying posterior segment pathology.

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INJECTING AN AIR BUBBLE AT THE END OF SUTURELESS CATARACT SURGERY TO PREVENT INGRESS OF OCULAR SURFACE FLUID

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Purpose: To demonstrate how an air bubble in the anterior chamber, at the end of sutureless cataract surgery, can prevent inflow of ocular surface fluid.

Methods: 14 serial patients, aged 74 to 92 years, showing minimal bleeding from the limbal capillary bed during phacoemulsification were included. Surgery was performed in six sessions under a single surgeon. A 2.8-mm limbal incision was performed, and all wounds underwent hydrosealing with an irrigation cannula. External pressure using the speculum, simulating patient manipulation, was applied before and after injection of a 0.1ml air bubble. Ingress of blood-tinged ocular surface fluid into the anterior chamber through the wound was monitored using digital video recording.

Results: With increasing external pressure by speculum manipulation, ingress of ocular surface fluid was observed in six out of 14 eyes before air bubble introduction. This was obliterated on the introduction of an air bubble. Of the six patients, two were squeezing excessively allowing spontaneous fluid inflow. Digital video recording demonstrated (Image file: 3 Patients)

- Ingress of ocular surface fluid
- Immediate stoppage of ingress on with air bubble.

Conclusions: Ingress of ocular surface fluid can occur with speculum removal at the end of surgery, excessive squeezing, or manipulation by the patient. Introduction of an air bubble allows the anterior chamber more compliance, preventing wound gape and therefore ingress ocular surface fluid during the first 24 hours after intraocular surgery. Other advantages of a bubble include:

- Unrolling a descemet's scroll
- Ball-cock seal of a (superior) wound

- Confirms eye not leaking (bubble does not get bigger)
- Defocusses light (if any corneal procedures are required after IOL implanted) so prevents phototoxicity

This simple procedure along with wound hydrosealing could prevent intraocular contamination leading to reduction in the rate of post-operative endophthalmitis.

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EFFECT OF SLEEVELESS AND SLEEVED TIP ON THE CORNEAL INCISIONS USED FOR PHACOEMULSIFICATION

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Purpose: To evaluate alteration in the histomorphology and immunofluorescence localization of type 1 collagen around the corneal incisions used with sleeveless tip and sleeved tip phacoemulsification.

Methods: Left eye of 10 New Zealand Albino rabbits were randomly subjected to phacoemulsification using either sleeveless (bare) or sleeved tip. Right eye of each rabbit served as control where only incision is made without further surgical interventions. The rim of anterior portion of the eye containing corneal incision was fixed in buffered neutral formalin and processed for wax embedding and PAS-hematoxylin staining. 7 x 5 mm piece of corneal tissue encompassing the incision tunnel in the centre was processed for taking frozen sections. The methanol fixed frozen sections were processed for the immunofluorescence localization of type I collagen.

Results: The corneal incision exposed to sleeveless tip showed extensive damage compare to sleeved tip. The epithelium was damaged near the outer end of the incision. The stromal fibers show contracture and the tunnel lining was ragged with thickened areas. The corneal endothelium was detached near the inner end of the incision. Type 1 collagen fibers in the stroma were disorganized.

Conclusions: Rabbit corneal incisions exposed to phacoemulsification using sleeved tip induces less damage compared to sleeveless tip. Phacoemulsification with sleeved tip may be preferred to maintain the integrity of the corneal incision. Present study also warrants evaluation of the incision at the end of the surgery. During surgery the surgeon should avoid distortion of the incision and use techniques with improved fluidics that inflict least damage to the tissues.

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IMPACT OF STROMAL HYDRATION OF CLEAR CORNEAL INCISIONS VIA QUANTIFICATION OF INGRESS OF TRYPAN BLUE INTO ANTERIOR CHAMBER AFTER PHACOEMULSIFICATION

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Purpose: To determine whether stromal hydration reduces ocular surface fluid ingress at the end of phacoemulsification by using Trypan blue as a quantifiable ingress tracer.

Methods: This prospective, randomized study comprised 80 eyes undergoing phacoemulsification using 2.2mm incisions split into equal numbers to have stromal hydration (Group 1; completed by injecting BSS to hydrate the lateral walls and internal entry of the incision) or no stromal hydration (Group 2) at the end of either surgery. One-half ml of 0.

0125% sterile Trypan blue was instilled on the ocular surface and kept for 2 minutes. Aqueous fluid (0.1 ml) was aspirated from the anterior chamber and its optical density was measured using UV spectrophotometry. Logs of dilutions were used for statistical analysis using non-parametric Mann Whitney U test.

Results: There was a statistically significant decrease and difference ($P < 0.001$) in mean dilution of Trypan blue in aqueous aspirate with 1: 11337 in Group 1 as compared to 1: 220 in Group 2. Logs of mean dilutions of Trypan blue was statistically significantly less in Group 1 than Group 2, (3.21 and 2.14, respectively; $P < 0.001$).

Conclusions: Stromal hydration of the clear corneal incision reduced ingress of Trypan blue instilled upon ocular surface in the anterior chamber. Clinically, these findings may have a beneficial effect in reducing the risk of post-operative endophthalmitis.

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LONG TERM CONTROL OF POST-LASIK MYOPIC SHIFT IN HIGH MYOPIA WITH TOPICAL TIMOLOL MALEATE

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Purpose: To describe the effects of topical Timolol maleate on myopic regression after laser in-situ keratomileusis (LASIK).

Methods: Timolol maleate was used twice daily in 32 eyes of 19 patients (age 29.9 ± 7.9 years) who had myopic regression and decrease of visual acuity (spherical equivalent [SEQ] of -1.00 or more). The treatment began 2-36 months after uneventful LASIK, and followed up for 10-38 months. SEQ, uncorrected visual acuity (UCVA), intraocular pressure (IOP), pre-operative pachymetry, ablation depth and number of laser pulses were recorded. The main outcome measure was the SEQ reduction during treatment with topical Timolol.

Results: The pre-operative SEQ was -9.6 ± 2.9 D (range -5.75 to -14.75) in the right eye and -9.9 ± 2.6 (range -6.87 to -14.25) in the left eye. After 2-36 months, a residual myopia of -1.87 ± 0.77 D (range -1 to -2.75 D) was noted in 32 eyes, and topical Timolol maleate was started. After 1.78 ± 1.23 months (range 1-6 months) the SEQ was reduced to -0.94 ± 0.57 D (range 0 to -1.75 D), $p < 0.0001$ (Wilcoxon test). The UCVA improved from 0.34 ± 0.15 to 0.63 ± 0.23 ($p < 0.0001$, Wilcoxon test). The IOP did not change and remained stable. The reduction in SEQ correlated with the pre-operative SEQ ($r = -0.48$, $p = 0.0059$), and with the post-operative SEQ before treatment was started ($r = -0.69$, $p < 0.0001$). It marginally correlated with the calculated residual stromal bed ($r = -0.32$, $p = 0.072$), and the pre-operative central corneal thickness ($r = -0.29$, $p = 0.09$). Patients who continued the Timolol use maintained a lower SEQ at the last follow up visit, compared to those who decided to discontinue the treatment (-1.00 ± 0.43 D vs. -1.59 ± 0.66 D, respectively; $p = 0.025$, Mann-Whitney test). The time between surgery and beginning of Timolol treatment did not affect the SEQ reduction.

Conclusions: Long term treatment with topical Timolol maleate reversed residual myopia and improved visual acuity after LASIK. The beneficial effect of Timolol was maintained as long as the treatment continued.

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PATTERN OF POST LASIK INFECTIOUS KERATITIS IN DEVELOPING COUNTRIES

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Purpose: To report the clinical picture, microbiology profile, management, and outcomes in cases of infectious keratitis after LASIK.

Methods: Retrospective, non-comparative, interventional case series. All the cases referred to cornea service of L V Prasad eye institute for management of microbial keratitis after LASIK were included in the study. Medical and microbiology records of these cases were reviewed to acquire information related to clinical picture, onset of symptoms, initial management and microbiology work-up, duration between onset of symptoms and referral, clinical picture at the time of presentation at our institute, results of microbiology evaluation, treatment and outcome.

Results: Between 1999 and July 2006 we managed 17 eyes of 15 subjects who developed keratitis (13 unilateral; 2 bilateral) after LASIK. 1 case had initial microbiology work up. Mean duration of onset of symptoms was 113.5 days; mean duration of time to referral was 29.9 days. All cases had interface infiltrates. 14 eyes were culture proven microbial keratitis (3 fungus, 4 Nocardia, 4 mycobacterium, 2 acanthamoeba, 1 staphylococcus), 2 cases were smear positive only (1 fungal, 1 Gram positive bacilli), and 1 was resolving microbial keratitis. All cases were treated initially with appropriate antibiotics. Surgical intervention included flap lift with antibiotic irrigation (09 eyes), flap amputation (05 eyes), and therapeutic keratoplasty (04 cases). 9 cases resolved completely on medical treatment, 5 didn't resolve (4 therapeutic graft, 1 medical treatment only) and 3 cases were resolving at last visit. Mean time from diagnosis to resolution was 33.5 days (9 cases). 4 cases (5 eyes) were referred to us within 10 days of onset of symptoms all of which were resolved with visual acuity ranging from 20/20 to 20/80. 11 cases (12 eyes) were referred to us for more than 10 days out of which 5 eyes did not resolve, 4 required flap excision and 3 resolved with vision of 20/25 to 20/80. All eyes infected with Nocardia, corneobacterium and staph. epidermidis resolved on medical treatment. 3 out of 4 fungal cases required therapeutic penetrating keratoplasty while 1 required flapectomy. Out of 4 eyes infected with mycobacteria, 1 required therapeutic graft, 2 underwent flapectomy, and one resolved on medical treatment with a vision of 20/25. One of 2 acanthamoeba cases didn't resolve to medical treatment.

Conclusions: Microbiology profile of Infectious keratitis after LASIK is different in developing countries than reported from developed countries. Delay in identifying the complication, lack of appropriate microbiology work-up, empirical initial treatment resulted in delayed diagnosis and poor outcome in these cases.

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ASSOCIATION OF GST POLYMORPHISM WITH MYOPIA

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Purpose: Myopia or short sightedness is the most common human eye disease affecting 30% of world population. Genetic and environmental factors are implicated in the onset of myopia. Environmental causes include mechanical factors, oxidative stress, nutritional factors etc.

Humans vary in their ability to metabolize endogenous and exogenous compounds. Glutathione- s-Transferase is one of the enzyme systems, which can detoxify several carcinogens and cytotoxic drugs. The lack of enzyme activity might result in accumulation of toxic compounds resulting in several disease states. The GST M1, GST T1 are two of the genes of GST family which exhibit null genotypes.

Methods: In the present study 101 cases of myopia comprising of 31 of low myopia and 70 high myopia cases were analyzed for GST polymorphism using multiplex PCR. These results were compared with 176 cases of age and sex matched controls.

Results: There was no significant difference in the genotype distribution of GST M1 and GST T1 polymorphism between disease and controls. When the data on myopia was sub grouped with respect to different parameters, interesting results were obtained. Patients with low myopia (16.12%), earlier age at onset (12%) had very high frequency of double null genotype, MOTO as compared to high myopia (4.28%). Further high myopia patients having MOTO genotype had very high refractive error (>15D).

Conclusions: These results that indicate that inefficient detoxification system to combat the accumulation of carcinogenic substances and free radicals might be responsible for the onset of low myopia whereas genetic predisposition is necessary for the onset of high myopia. If high myopia patients happen to have MOTO genotype, the refractive error would increase to very high levels. Which might lead to retinal complications. There was no association of GST polymorphism with sex of the proband, familial incidence and parental consanguinity.

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CLINICAL SPECTRUM AND MANAGEMENT OF DUANE RETRACTION SYNDROME (DRS) AT A TERTIARY CARE CENTER IN SOUTH INDIA

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Purpose: To study the clinical features and surgical outcome of patients with DRS.

Methods: Retrospective study.

Results: We reviewed 258 consecutive patients of DRS. The mean age of subjects was 13.9 ± 12.2 years and 152 (58.9%) were females. 24 (9.3%) subjects gave a family history of strabismus and 12 (4.7%) subjects had consanguineous parents. The left eye was affected in 158 (61.3%) subjects, the right eye in 59 (23.0%) and both eyes in 40 (15.6%) subjects. The BCVA in the better eye was better than 20/60 for 243 subjects (94.5%); 3 (1.2%) subjects had a BCVA worse than 20/200 in the better eye. Duane's retraction syndrome type 1 was present in 213 (85.2%) subjects, type 2 in 10 (4.0%) and type 3 in 27 (10.8%) subjects. The presence of face turn was recorded for 180 subjects; 82 (45.6%) subjects had a face turn to the left, 63 (35.0%) subjects had a face turn to the right and 33 (19.4%) subjects had no face turn. Amblyopia was noted in 30 (11.6%) subjects. Indication for surgery and outcomes are discussed.

Conclusions: Clinical features are similar to the global trend of DRS. Significant number of patients had paradoxical face turn and surgical intervention when indicated showed good outcome.

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TEMPORALIS MUSCLE TRANSFER IN THE TREATMENT OF LAGOPHTHALMOS-OUR EXPERIENCE

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Purpose: One of the eye problems faced by Leprosy patients and with seventh cranial nerve palsy due to other causes is lagophthalmos. The treatment available for the same is both medical and surgical. Medical line of treatment is symptomatic. Of all the surgical treatment, one of surgical management modality is temporalis muscle transfer. This gives static support and dynamic function. We here by present our experience with the same.

Methods: Three cases of lagophthalmos secondary to Hansen's disease were selected, two cases were of two years duration and one of one year duration and one of the patients had poor Bell's phenomenon leading to exposure keratopathy. For these three patients we did temporalis muscle transfer using facia lata from lateral aspect of the thigh.

Results: Results evaluated by palpebral fissure height on attempted closure, improvement of ocular surface integrity and patients symptoms. Follow up till date reveals improvement in all of the above criteria.

Conclusions: Temporalis muscle transfer procedure in the management of lagophthalmos is one of the most effective and promising modality which can be practiced by general Ophthalmologist.

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CENTRAL RETINAL ARTERY AND VEIN COLLAPSE PRESSURE IN GIANT CELL ARTERITIS VERSUS NONARTERITIC ANTERIOR ISCHEMIC OPTIC NEUROPATHY

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Purpose: Using a new method of ophthalmodynamometry, it was the purpose of the study to measure the central retinal artery (CRA) and vein (CRV) collapse pressure in anterior ischemic optic neuropathy.

Methods: In the clinical observational comparative case series study a Goldmann contact lens associated ophthalmodynamometer was used. The diastolic collapse pressure of the CRA and CRV were measured in 6 patients (8 eyes) with giant cell arteritis induced anterior ischemic optic neuropathy (GC-AION) and in 10 patients (12 eyes) with acute non-arteritic anterior ischemic optic neuropathy (NAION).

Results: CRA collapse pressure was significantly ($P=0.001$; 95% confidence interval (CI): -68.7, -20.0) lower in the GC-AION group (52.7 ± 24.6 arbitrary units) than in the NAION group (97.0 ± 25.8 arbitrary units). CRV collapse pressure did not vary significantly ($P=0.47$).

Conclusions: As measured by ophthalmodynamometry, CRA pressure is significantly lower in GC-AION than in NAION. CRV pressure does not vary markedly. These finding may be helpful for the clinical differentiation between GC-AION and NAION, and may give hints for the pathogenesis.

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HYPERHOMOCYSTEINEMIA IN NAION IN YOUNG

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Purpose: To study the prevalence of Hyperhomocysteinemia in young patients (< 50 years) with NAION.

Methods: We retrospectively analyzed the case records of the patients < 50 years of age who were diagnosed to have NAION for the presence of various risk factors including Diabetes, hypertension, Hyperlipidemia, abnormal carotid Doppler, Hyperhomocysteinemia.

Results: There were 15 patients of NAION < 50 years of age. Mean age at presentation was 43.2 years. 3 were diabetics, 1 hypertensive, 4 had hyperlipidemia and 5 had all three. Abnormal carotid Doppler was noted in 4 patients. Elevated serum Homocysteine was noted in 12 / 15 patients, 7 / 15 patients did not have a common risk factor and 5 out of these 7 had hyperhomocysteinemia as a common risk factor. Mean serum Homocysteine levels in these patients was $37.14 \pm 17.63 \mu\text{mol/L}$ vs. $9.36 \pm 17.63 \mu\text{mol/L}$ in the normal population. The odds ratio for the difference in the NAION patients vs. general population was found between 5.4 and 10.6. Treatment with vitamin supplements reduced homocysteine levels to normal in all patients.

Conclusions: Hyperhomocysteinemia represents a potentially modifiable risk factor for the development of NAION.

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CEREBRAL STROKE: OPHTHALMIC PREMONITIONS

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Purpose: Study of ocular signs in cerebral stroke which can help prompt diagnosis, faster management and reduced mortality.

Methods: Clinical study of consecutive 124 cases of stroke with detailed ophthalmic examination during 2000-05. All underwent comprehensive neuro-ophthalmologic and general neurological examination within 48 hours of admission, including measurement of palpebral fissures, marginal reflex distance, and range of upper lid movement. Features were corroborated with MRI/CT scans.

Results: 64/124 cases had premonitory eye signs: subconjunctival hemorrhages, Hollen horst plaque, ptosis, gaze paresis, 6th nerve palsy. Ptosis and gaze palsy had maximum statistical value.

Conclusions: Neurophthalmic workup (like fundoscopy) should be included in routine examination of vulnerable patients.

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STRABISMUS AND DIPLOPIA AFTER REFRACTIVE SURGERY

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Purpose: Multiple factors are involved in the relationship between strabismus and refractive error. With refractive surgery now commonplace, recognition of patients with strabismus or with compromised binocular vision prior to correction of their refractive error has become increasingly important. Multiple factors are involved in the relationship between strabismus and refractive error. Prospective study of Post-LASIK cases

for the presence of diplopia and strabismus.

Methods: Post-LASIK cases (2000-2005) were followed up prospectively for at least 6 months following LASIK. Detailed orthoptic examination was done along with W4DT pre and postoperatively.

Results: Out of 52 cases with mean age 24.6yrs, mean refractive error of -8.5 D .4 cases developed exophoria lasting for more than 6 hours/day 4 cases developed exotropia of more than 10 degrees.

Conclusions: Proper orthoptic examination, contact lens trial and 24 Hours patch- test could be helpful to detect vulnerable cases.

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HORIZONTAL RECTUS MUSCLE TENOTOMY: A NEW PROCEDURE FOR CONGENITAL NYSTAGMUS

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Purpose: To evaluate the effectiveness of horizontal rectus muscle tenotomy for congenital nystagmus.

Methods: Four patients, aged 6-21 years having congenital nystagmus with no null point were selected for the study. Tenotomies of all four horizontal rectus muscles were performed in all patients. Muscles were detached from insertion and immediately reattached to insertion. No recession or resection of muscles was performed in any patient.

Results: Dampening of nystagmus observed in all patients. Monocular and binocular visual acuity improved from 1 to 3 Snellen lines after procedure in all patients. No complication like diplopia, anomalous head posture or strabismus was encountered in any patients. Mean follow up was 7 months (3 to 9 months). Beneficial effect of surgery lasted till last follow-up in all patients.

Conclusions: Horizontal rectus muscle tenotomy is an effective procedure for congenital nystagmus.

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STRABISMUS REOPERATIONS - ANALYSIS OF THE NATURE AND THE PROBABLE CAUSES

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Purpose: To analyze the clinical situations where, the management of strabismus required re operations.

Methods: A retrospective analysis of the case reports of those patients who had undergone more than one strabismus procedures between 2000 and 2006 at our institute was made. We had 124 patients of 1 to 65 years of age (mean = 11.4). The types of strabismus, the nature and number of re operations and the probable factors responsible were analyzed.

Results: The series comprised of 77 congenital strabismus and 47 acquired. Thirty six percent had congenital esotropia, 26.6% had intermittent divergent type, 10.5% had MED and 7.2% had paralytic strabismus. Ninety of the re operations were for residual strabismus, 27 for consecutive and 3 for recurrent strabismus. The maximum number of re operations was 4 in 1 patient, 1 patient had 3 re operations, 10 had 2 and the rest (112) had 1 re operation. We found associations like oblique over actions, DVD's, patterns etc to be common in these patients.

Conclusions: In spite of meticulous pre operative assessments and careful planning, strabismus surgical success remains a challenge.

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INNOVATIONS IN TELEMEDICINE BASED EYE CARES. KUMAR¹, I.J. CONSTABLE², Y. KANAGASINGAM¹¹Centre of Excellence in e-Medicine, Perth, AUSTRALIA, ²Lions Eye Institute, Perth, AUSTRALIA

Purpose: Non availability of eye care specialist makes the rural regions vulnerable for blindness. This study aims to research, develop, implement and evaluate key components and strategies essential for effective and lasting eye care interventions in rural and remote regions. Lions Eye Institute (LEI) developed innovative, portable eye testing devices to reach remote regions which may not even have electricity and telecommunication facilities. The technology and methodology developed are affordable, transferable, and adaptable to the needs and realities of the developing world. The issues relating to this innovative mode of eye care intervention are analyzed.

Methods: Trained health worker at Carnarvon Regional Hospital (CRH) used innovative testing devices and transmitted patient data to specialists at 940 kms away in Perth City. Diagnostic and management decisions were provided to all patients within 24 hours. Questionnaire and interview approach assessed the satisfaction of the patients and ophthalmologists. Economic data was gathered from the Department of Health, the CRH and the LEI.

Results: Teleophthalmology proved to have impact on all the patients. Following teleconsultation, only 3 % of patients were referred to city hospital. 36 % of patients required regular follow up and 3 % of patients received treatment at CRH itself. The free exchange of service and ideas between city based specialist and rural healthcare workers is viewed as a catalyst for a positive change in rural eye care culture. Analysis further identified challenges faced between city-rural eye health service collaborations.

Conclusions: This study provided access to specialist consultation and complex eye examinations to the remote regions. Study highlighted the importance of redefining utilization criteria in order to achieve efficiency. This collaborative rural health programs are being devolved to Aboriginal patients so eye care can be controlled and delivered at the community level.

Key Words: Digital, Internet, Rural and Remote, Teleophthalmology.

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EPIDEMIOLOGY OF PEDIATRIC CATARACT IN BANGLADESH: RESULTS FROM A PROSPECTIVE STUDY OF 786 CHILDREN

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Purpose: To describe the epidemiology, demography and care seeking behavior of a prospective cohort of children with cataract in Bangladesh.

Methods: All children (0-15 year) with cataract, presenting at 4 eye hospitals during a 17 month study period, were recruited. In addition, children with cataract who were identified by community volunteers through 'active case detection' during the study period, were recruited. Children were examined by ophthalmologists and detailed information was recorded in a standard performa.

Results: Of 786 children with cataract, 72% were boys. Median age at presentation for surgery was 108 months, although median age of first recognizing child's eye problem was 12 months. Only 7% of children presented for surgery during 1st year of their life, while another 20% by

the age of 5 years. In 70% of cases, the mother noticed child's eye problem first although 73% of mothers were unable to read or write. 47% fathers were farmers, 32% daily laborer and only 4% were professionals. 68% mentioned lack of money as the main reason of delayed presentation and another 7% thought their child was too young for treatment. 50% of children were identified from the community through 'active case detection program' and referred for free surgery, while only 13% were 'walk-in patients' in the eye hospitals. Remaining children were referred by various types of primary care providers. 72% children presented with total cataract while 14% with lamellar and 11% with nuclear cataract. 47% presented with nystagmus, 22% had manifest strabismus but only 4% had associated microphthalmos or microcornea and only 0.3% had coloboma. Only 18% children had unilateral cataract, of them 10% traumatic and 8% non-traumatic unilateral cataract. Among the children with traumatic cataract, 52% suffered from penetrating injury. Most common object of injury was stick (33%), followed by metal objects (29%), thorn (11%), vegetable material (8%) and bow/arrow (3%). Vast majority of injury occurred in children while playing (73%), followed by accidental injury at home (14%) and in some children while they were working (8%). Of the 647 children with bilateral cataract, 4.9% had hereditary cataract, 3% congenital rubella but 91% children had idiopathic bilateral cataract.

Conclusions: Large number of children with bilateral cataract were staying blind without accessing services. There is a need for an active case finding program' for children with cataract so that they could benefit from surgery before developing dense amblyopia. Public education campaign is required to prevent traumatic cataract. High proportion of idiopathic cataract highlights the need for further etiological research to investigate the genetic and environmental risk factors.

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FIVE-YEAR VISUAL RESULTS FOLLOWING LENSECTOMY FOR PEDIATRIC CATARACT

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Purpose: To report 5-year visual outcome after lensectomy for pediatric cataract in less than 2 years of age.

Methods: The records of 70 patients (130 eyes) who underwent lensectomy were reviewed; only those who had a minimum of 5 years of follow-up were analyzed.

Results: The mean age at the time of surgery was 6.6 months (range, 3 weeks to 18 months). The mean follow-up was 7 years (range, 5 to 10.5 years). Snellen's visual acuity of 6/18 or better was achieved in 43 eyes (33.1%), between 6/24 and 6/60 in 58 eyes (44.6%), and less than 6/60 in 29 eyes (22.3%). Visual acuity of 6/60 or better was achieved in 80% of cases with bilateral cataract, and in 20%, with unilateral cataract. Patients who had surgery below 4 months of age attained 6/60 or better visual acuity 5.8 times higher than those who had surgery after one year of age. Factors influencing the visual recovery of 6/24 or better included nystagmus ($p=0.002$) and microcornea ($p=0.002$).

Conclusions: The long-term visual results following lensectomy are governed by age at which surgery is performed and bilaterality of cataract; presence of nystagmus and ocular anomalies such as microcornea were associated with a lower visual acuities.

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15-YEAR EXPERIENCE IN THE TREATMENT OF CONGENITAL CATARACT

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Purpose: To present long-term results in the treatment of congenital cataract from data of a 15-year experience in a pediatric hospital.

Methods: A standardized technique for congenital cataract surgery does not exist because of the frequent association with other congenital abnormalities (aniridia, microphthalmia, hyperplastic primitive vitreous persistence). Two different surgical approaches were used: the "conventional approach" capsulorexis or anterior capsulotomy, anterior chamber maintainer, infusion-aspiration automatized with routine posterior capsulotomy and anterior vitrectomy (in children younger than 6 years) and the "pars plana vitrectomy approach" (more used in case of complicated cataract and in rubella cataract). Monofocal and multifocal lenses was implanted in two different groups of children. Main outcome measures: anatomical results, ocular tension, visual acuity were tested every six months.

Results: In a 15-year experience, about 1100 eyes have been operated for congenital cataract at our Institution. We present and discuss visual results and complications related to the surgical approach, early vs. delayed intraocular lens implant, type of lens implanted.

Conclusions: Good visual results have been obtained with early diagnosis, prompt surgical removal, early intraocular lens implant and strict management of amblyopia.

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RETINAL NERVE FIBER LAYER THICKNESS IN AMBLYOPIAS. PRABAKARAN¹, P. RAJUL², B. GANESH³, A. UDAY KUMAR³, G. SEKHAR², R. RAVI THOMAS²¹National University of Singapore, Singapore, SINGAPORE, ²L V Prasad Eye Institute, Hyderabad India, INDIA, ³L V Prasad Eye Institute, INDIA

Purpose: To investigate the hypothesis that eyes with anisometropic amblyopia may have an increase in the retinal nerve fiber layer thickness (RNFLT).

Methods: Group I included 30 eyes of 30 subjects with anisometropic amblyopia (defined as amblyopia secondary to uncorrected refractive error with difference of >2.0D sph. between the eyes or equivalent spherical error and difference of visual acuity of 2 line or more between two eyes). Group II included 45 eyes of 45 strabismus amblyopia (defined as amblyopia secondary to the presence of an ocular deviation with decrease visual acuity difference of 2 line or more and difference of < 1.0Dsph. or equivalent spherical equivalent error). All subjects underwent complete ophthalmic examination including refraction, measurement of ocular deviation with prism bar, axial length measurement. RNFLT was measured using optical coherence tomogram (Stratus OCT 3, Carl Zeiss Meditec, Dublin, CA) after pupillary dilatation. Average RNFLT thickness was compared between amblyopic eye and contralateral normal eye using paired "t" test.

Results: Mean age in anisometropic amblyopia was 17.5 year (SD: 8.5) and 15.2 year (SD: 10.4) in strabismus amblyopia. In the 30 patients with anisometropic amblyopia, the difference in RNFLT between the amblyopic eyes and the normal fellow eyes was not significant ($p = 0.7$). In the 45 patients with strabismus amblyopic group the difference in RNFLT

between both eyes also did not reach statistical significance ($p = 0.2$).

Conclusions: RNFLT thickness not affected by anisometropic amblyopia.

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CLINICAL PROFILE AND INCIDENCE OF STRABISMUS AFTER SCLERAL BUCKLING SURGERY

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Purpose: To study the incidence and types of strabismus following scleral buckling surgery and elucidate factors influencing its occurrence.

Methods: We reviewed the records of 344 patients who underwent scleral buckling surgery; all patients had a minimum of six months follow-up.

Results: Strabismus occurred in 48 patients (13.9%) following scleral buckling surgery; however, only in 16 (4.6%) it persisted after 6 months. Diplopia was observed in 17 patients (35.4%). Horizontal deviation was noted in 36 patients (75%). Factors that influenced the incidence of strabismus were multiple surgeries ($p=0.02$) and placement of buckle under the scleral flap (implant surgery) ($p=0.02$). Age, visual acuity, buckle width, number of muscles involved in the buckle did not significantly influence the incidence of strabismus. Based on ocular motility, reasons of strabismus were tethering of the muscles (60.4%) and mechanical restriction (31.2%). Diplopia could be relieved with prism alone in 13 patients.

Conclusions: Incidence of strabismus after scleral buckling procedure was 4.6%. Multiple scleral buckling procedures and implant surgery did influence the occurrence of strabismus. Most patients do not need surgical correction for strabismus.

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OCULAR ASSOCIATIONS AND VISUAL PROFILE IN CHILDREN WITH CEREBRAL PALSY

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Purpose: To analyze the ocular associations and visual profile in children diagnosed to have cerebral palsy.

Methods: This was a retrospective analysis of 99 children (less than 12 years of age) referred with a diagnosis of cerebral palsy for visual assessment. All had a detailed history taking, clinical examination including visual assessment by Snellen, Lea's symbols, Cardiff cards or fixation pattern, anterior and posterior segment examination, cycloplegic refraction. Neuroimaging was also in selected patients. Ocular associations like nystagmus, strabismus, optic disc pallor etc and the causes for subnormal vision in such children were analyzed.

Results: Of the 99 children, 24.2% had prematurity, 46.5% had birth asphyxia and 64.6% had seizure history. Ocular associations like nystagmus were present in 43.4%, strabismus in 62.6% and optic disc pallor in 46.2%. Visual levels sufficient for formal education or vocational training were present in at least 70% of these children. Children with poor vision were found to have optic disc pallor or neuroimaging abnormalities.

Conclusions: Children with cerebral palsy seem to have various levels of vision contributed by ocular and non-ocular factors. A good assessment and management is mandatory to help rehabilitate them.

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EXPRESSION OF C-FOS PROTEIN IN THE VISUAL CORTEX OF BINOCULARLY SUTURED RATS

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Purpose: To investigate the expression of c-fos protein in the visual cortex of amblyopia rats, and to seek out whether there is plasticity remained in the visual cortex of the adult amblyopia rats which has overgrown the critical period of visual system.

Methods: Rats were subjected to binocular suture during the critical period (postnatal days 13), and reared with control group until postnatal days 180 in the normal light-dark condition. Visual cortex area 17 were sectioned for c-fos staining by immunohistochemistry.

Results: In group of binocularly sutured rats, numerous c-fos neurons were detected in almost all layers except layer I. By contrast, only a small number of Fos-immunoreactive neurons was obtained in the visual cortex in the control group.

Conclusions: Significant difference was detected in c-fos expression in the visual cortex between amblyopia and normal rats. This suggested that contrast to the normal, there may remained some plasticity in the visual cortex in the amblyopia rat.

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VISUAL EVOKED POTENTIAL (VEP) IN HYDROCEPHALUS - CORRELATION WITH CT SCAN

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Purpose: To correlate visual evoked potential with clinical features and severity of ventriculomegaly before and after treatment and simultaneously to search for a reliable and cost-effective alternative to CT scan in hydrocephalic patients.

Methods: A total of 24 cases of hydrocephalus of various etiologies and 21 controls, age sex matched were included for our study. The cases were treated either medically or surgically. Each patient was followed at 1 & 3 months after treatment. Flash VEP was recorded with the help of LED (light emitting diode) goggles at pretreatment & post-treatment follow-up. Ventriculomegaly (graded with the help of Cella Media Index on CT scan) and other clinical features were correlated with VEP response.

Results: All cases and controls were distributed into three age groups (0-6 months, >6-<18 months and \geq 18 months). Significant difference of VEP response was noted between cases & controls ($p=0.002$). After 1 & 3 months post-treatment significant improvement was found in VEP response and ventriculomegaly (p value 0.006 & 0.001 respectively). On comparing VEP response in each eye separately, we found that in right eye, the mean (\pm SD) of P1 latency reduced from pretreatment i.e. 123.92 msec (\pm 11.74) to 120.04 msec (\pm 9.00) at 1 month and 114.78 (\pm 8.54) at 3 months follow-up. The difference was statistically significant at 3 months follow-up ($p=0.002$). In left eye, the pretreatment latency reduced from 121.96 (\pm 11.13) to 121.14 (\pm 10.19) at 1 month and 116.34 (\pm 9.88) at 3 months follow-up. The 'p' values were 0.76 and 0.01 respectively. Whereas VEP latency in hydrocephalic patients consistently improved post-treatment till 3 months follow-up, the amplitude showed variable response. This result suggests that the latency change (not amplitude) is probably a reliable indicator for evaluating response to treatment. Ventriculomegaly as graded by Cella Media Index (CMI) improved considerably with

treatment. The mean (\pm SD) CMI improved from 2.27 (\pm 0.90) pre-treatment to 2.48 (\pm 0.87) at 1 month and 2.62 (\pm 0.83) at 3 month follow-up. The 'p' value were 0.002 and <0.001 respectively.

Conclusions: VEP & Cella Media Index on CT scan both can be used as investigative modalities for assessment of response to treatment in hydrocephalus. In addition, flash VEP has visual prognostic value. Further studies are required with large number of patients and long term follow-up for using VEP as alternative to CT scan in such cases.

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THE VARIANTS IN TYR402HIS IN THE CFH GENE AND ALA69SER IN THE LOC387715 GENES ARE ASSOCIATED WITH AN INCREASED RISK OF AMD AMONG INDIAN PATIENTSI. KAUR¹, S. KATTA¹, N. HUSSAIN², A. MATHAI², A. HUSSAIN², T. DAS², A.B. MAJJI², P.K. NIRMALAN³, S. CHAKRABARTI¹*¹Hyderabad Eye Research Foundation, Hyderabad, INDIA, ²LV Prasad Eye Institute, Hyderabad, INDIA, ³International Centre For Advancement Of Rural Eye Care, Hyderabad, INDIA*

Purpose: Genetic association studies have implicated single nucleotide polymorphisms (SNP) in the CFH (Tyr402His) and LOC387715 (Ala69Ser) genes as major contributing risk factors in age related macular degeneration (AMD). Our earlier studies through LD and haplotype analysis in a cohort of AMD cases in India confirmed the association of the Tyr402His SNP with AMD. Multiple studies across cohort of Caucasian origin have suggested that Tyr402His and Ala69Ser SNPs act together in an additive manner. In light of this, we have attempted to evaluate the association of the Ala69Ser SNP with the Tyr402His SNP in AMD cases from India.

Methods: The cohort comprised unrelated AMD cases ($n=220$) diagnosed as per the AREDS criteria and age-matched normal controls ($n=160$). The two coding exons were screened by resequencing to generate haplotypes at the 3 coding SNP loci (rs10490924, rs10490923 and rs2736911). Haplotypes frequencies were estimated from the Haploview and Phase softwares that uses the EM algorithm. The additive effect of the high risk alleles Ala69Ser (LOC387715) and Tyr402His (CFH) along with the population attributable risk (PAR) was assessed.

Results: The cohort of cases and controls conformed to Hardy-Weinberg equilibrium. Significant association was noted with the Ala69Ser SNP amongst AMD cases ($p=2.10 \times 10^{-4}$), while the other SNPs were uninformative. Individuals homozygous for the risk allele "TT" had a relatively higher risk of AMD (OR=6.86, 95%CI, 2.34-19.60) than those heterozygous for the "T" allele (OR=2.04; 95%CI, 0.91-4.56). Haplotypes with the mutant "T" allele at the Ala69Ser locus (G-C-T) was associated with a significant risk of AMD ($p=3.01 \times 10^{-4}$), while presence of the wild type allele at this locus (G-C-G) was protective ($p=0.0030$). Homozygosity of the risk alleles at both the Tyr402His (CFH) and Ala69Ser (LOC387715) loci accounted for a PAR of 77% for AMD (OR=9.82, 95%CI, 4.57-21.08), which declined to 18% for the heterozygous alleles (OR=2.85, 95%CI, 1.82-4.47).

Conclusions: Similar to the Tyr402His variant (CFH), the present study provides an independent replication of the association of Ala69Ser (LOC387715) SNP as a major risk factor for AMD among Indian patients. Although the underlying biological functions of these two SNPs are yet unknown, their additive effect confers a significantly higher risk of AMD,

which is a function of their effect sizes. Thus, these SNPs could be used for predictive testing across populations worldwide.

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NPAS2 IS ESSENTIAL FOR THE CIRCADIAN OSCILLATION OF CHICKEN ARYLALKYLAMINE N-ACETYLTRANSFERASE (CAANAT) GENE EXPRESSION IN PHOTORECEPTORS

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Purpose: Circadian clocks are self-sustaining genetically-based molecular machines that impose ~24 hour rhythmicity on physiology and behavior, synchronizing these functions with the solar day-night cycle. Circadian clocks in vertebrates are thought to be composed of the transcriptional-translational feedback loops involving a highly conserved set of clock genes: namely, *Per1/2* and *Cry1/2*, which function as negative regulators; and *Bmal1*, *Clock*, and *Npas2*, which work as positive regulators. *AANAT* is a key regulatory enzyme that drives the circadian rhythm of melatonin synthesis. The gene encoding chicken *AANAT* (*cAanat*) contains a circadian E-box element in its proximal promoter that is capable of binding *BMAL1: CLOCK* and *BMAL1: NPAS2* heterodimers, which enhances transcription. The present study was conducted to investigate whether *NPAS2* functions as a component of the circadian oscillator that regulates *cAanat* expression in photoreceptor cells.

Methods: Photoreceptor-enriched cell cultures were prepared from embryonic neural retinas and incubated under 14h:10h light-dark cycle (LD) of illumination with lights on at zeitgeber time (ZT) 0. Cells were incubated for 8 days under LD and then transferred to constant (24/day) darkness (DD). *Npas2* siRNA was prepared using the Block-IT siRNA system (Invitrogen) and transfected on 7th day in vitro using Lipofectamine (Invitrogen). Cells were harvested every 6h in DD beginning at ZT 2 on the 9th day in vitro. The transcripts of five genes (*cNpas2*, *cClock*, *cPer2*, *cAanat*, and *cHprt*) were quantified by the real-time RT-PCR.

Results: *cNpas2*, *cBmal1*, *cPer2*, and *cAanat* transcripts were rhythmically expressed in cultures of mock transfected cells, while no circadian rhythm of *cClock* mRNA was observed. While *Npas2* siRNA significantly ($p < 0.001$) reduced *cNpas2* expression at all timepoints, it completely failed to alter the expression of *cClock*. The knockdown of *cNpas2* had little or no effect on circadian rhythms of *cBmal1* and *cPer2* transcript levels, but dramatically abolished the circadian rhythm of *cAanat* mRNA.

Conclusions: Circadian oscillations of core clock genes persist in the presence of reduced *cNpas2* expression, while rhythmic expression of *cAanat* is abolished. Thus, *NPAS2* appears to function in the clock output pathway that regulates the rhythmic expression of *cAanat* in photoreceptors rather than as a core component of the oscillator.

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A NOVEL TRANSCRIPTION FACTOR FOR OPTIC VESICLE INDUCTION AND NEUROEPITHELIUM DIFFERENTIATION DURING EYE DEVELOPMENT IN MOUSE

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Purpose: Most degenerative retinal diseases are progressive and advance to serious visual impairment later in life. Understanding the molecular mechanisms of retinal development will contribute to elucidation of its pathogenesis. Neuronal differentiation in the developing retina starts from neuroectoderm as early as in optic vesicle stage during eye development. Though the developing eye is believed to be a highly specialized extension from the developing brain, the formation of major eye structures should be induced via a separate series of coordinated inductive interactions and regional specifications; maturation to a functional eye; and formation of neural connections between retina and optic tectum.

Methods: In order to identify the eye-specific genes in different stages of developing eye, we studied the gene expressions in mouse embryonic eyes from optic vesicle stage at E9.5 gestation to basic eye structure at P0 newborns using microarray containing 15,000 mouse embryonic ESTs. The developing brain segments were used for comparison.

Results: A novel transcription factor was found to be highly expressed in the developing eye at E9.5. The differential expression of the transcriptional factor was confirmed by quantitative real-time PCR and in situ hybridization. RNA interference was employed to knockdown the function of the transcriptional factor during eye development. The loss-of-function phenotype was clearly demonstrated by absence of optic vesicle in the developing embryos. This revealed the transcriptional factor plays an important role in early optic vesicle induction. To characterize the transcriptional factor, immunohistochemistry study in mouse eyes from E9.5 to P14 showed that the transcriptional protein was highly specific in the neuroectoderm of developing optic vesicles at E9.5, in the differentiating retinal layers from E14.5 to E16.5, and then restricted to RGC cells in later life. Transfection study in developing retina suggested the protein is essential to promote neuronal differentiation.

Conclusions: The results identified a new neural tube-independent transcription factor for the induction of optic vesicles and neuroepithelium differentiation in early eye development. In order to characterize its molecular function in retinal development and differentiation, gene targeting by knock-out method is now undertaken.

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GENE EXPRESSION OF HUMAN FETAL RETINAL GANGLION CELL DURING EARLY EYE DEVELOPMENT

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Purpose: Retinal ganglion cell (RGC) loss is commonly observed in various neuropathies such as glaucoma. However, loss of RGC is irreversible because of the RGC is lack of dividing capability. To give a comprehensive picture of genes important for RGCs survival and differentiation

during retinogenesis, we characterized the gene expression profile of human fetal RGCs during early eye development.

Methods: Human embryos at organogenesis stages (week 8-14) are prospectively obtained in the legal termination of pregnancy (TOP) approved by the Ethics Committee with written informed consent. RGCs were isolated by laser capture micro dissector (PALM) and mRNA was extracted according to Agilent's protocol using Cy3 and Cy5 with Superscript plus indirect labeling kit from Invitrogen. Expression array from Agilent Whole Human Genome Microarray at 4x44K format were used to compare RGCs transcripts with individual's own retinal cells. Immunohistochemical staining and real-time quantitative PCR were used to confirm the temporal and spatial expression of genes identified.

Results: By histology from individual fetal eyes, we confirmed that RGCs can be found on week 8 of gestation in human. Our study samples also feature the physiological window of retinal morphogenesis: the inner and outer neuroblastic layers (ONBL and INBL) differentiate into photoreceptor cells and ganglion cells. Size of retinal ganglion cell layer and number of the RGCs continuously increased were documented. Therefore, differentially up and down regulated genes identified from our RGCs between wk8 and wk14 represent genes that might contribute to survival and differentiation of human RGCs. Comparing the gene identified with our human fetal eye un-normalized library (NEIBank NcLib0065), our RGC specific genes have similar number of genes involved in protein bindings, but contained more genes related to cell communications and morphogenesis. Early known retinogenesis genes, which encode for intrinsic and also extrinsic factors, (e.g. Pax6, Math5, Hes1 and Hes2) affecting the progenitor cell fate and (e.g. Brn3a, Brn3b, Brn3c, GDF11, and Shh signal) for RGC development were also identified from our microarray data. Interesting, we also identified some known genes (transcription factors) with potential novel functions during RGC development evidenced by confocal microscopy studies and real-time PCR.

Conclusions: Our investigation reveals a number of transcripts that are predominantly expressed in the human fetal RGCs. Many of them encode proteins of yet undiscovered physiological functions in eye development.

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A GLAUCOMA-ASSOCIATED MUTANT OF OPTINEURIN SELECTIVELY INDUCES DEATH OF RETINAL GANGLION CELLS WHICH IS INHIBITED BY ANTIOXIDANTS

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Purpose: Certain missense mutations in the coding region of the optineurin gene (OPTN) are associated with normal tension glaucoma as well as POAG. While the function of the optineurin protein is yet to be elucidated, its most common mutation, E50K, is associated with a severe phenotype. In the present study we have explored some of the functional characteristics of optineurin and its mutants, in particular E50K.

Methods: Plasmids expressing normal or wild type (WT) optineurin, and E50K, R545Q, H26D and H486R mutants of optineurin were prepared. They were then transfected into HeLa, Cos-1, IMR32 and the rat retinal ganglion cell line RGC-5 and their effects on cell survival was monitored by morphological observation of cells. Their effects on tumor necrosis factor-alpha-induced cell death were also analyzed. Expression of

optineurin and its mutants was monitored by immunofluorescence staining of cells and also by Western blotting.

Results: The E50K mutant was seen to selectively induce the death of rat retinal ganglion cells (RGC-5) but not of the other cell lines tested (Cos-1, HeLa & IMR-32). Neither the other mutants nor WT optineurin were seen to do so. This cell death was seen to require caspases-1 & 9, and was inhibited by Bcl-2 and. It was also inhibited by antioxidants N-acetyl cysteine and Trolox, and by the free radical scavenger superoxide dismutase (MnSOD). While expression of wild type and E50K mutant suppressed cell death induced by TNF-alpha in HeLa cells, they were seen to potentiate such cell death in RGC-5 cells.

Conclusions: The E50K mutant of optineurin has acquired the ability to induce cell death selectively in retinal ganglion cells. This cell death is mediated by oxidative stress, since it is inhibited by antioxidants and by MnSOD. Hence, our findings raise the possibility of the use of antioxidants for delaying or controlling some forms of glaucoma.

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TEAR PROTEOME ANALYSIS IN FUNGAL KERATITIS

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Purpose: Fungal keratitis is an important cause of corneal blindness in India. The visual prognosis following this disease is poorer than bacterial keratitis. A proper understanding of the pathogenesis may help in refining the existing treatment. The purpose of this study is to examine the total tear proteins of fungal keratitis patients, which may have a bearing on pathogenesis and disease progression.

Methods: Tear samples were collected from culture positive fungal keratitis patients. Tears from the fellow eye and from other healthy individuals served as controls. Two-dimensional (2D) electrophoresis was used for separation of fractionated tear proteins and followed by MALDI TOF based detection of selected protein spots from the gels. Wherever needed tag sequencing of peptide fragments was done to confirm the identification.

Results: The Glutaredoxin related protein was expressed only in the tears of fungal keratitis patients. Six other normal tear proteins were present in both samples, but with varied expression levels. Secretory actin-binding protein and serum albumin precursor were up regulated in the infected samples. Cystatin S precursor, cystatin SN precursor, cystatin and human tear lipocalin were down regulated in the infected samples.

Conclusions: Both qualitative and quantitative variation in the infected tear samples could be determined by our approach. Glutaredoxin related protein is known to be produced by *Aspergillus fumigatus* during oxidative stress condition, and presence of this protein in the tears of patients with fungal keratitis indicates that this pathogen undergoes stress related gene expression during infection.

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LENTIVIRUS-MEDIATED GENE TRANSFER TO THE RAT, OVINE AND HUMAN CORNEA

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Purpose: Gene therapy of the cornea shows promise for modulating corneal transplant rejection but the most appropriate vector for gene transfer has yet to be determined. We investigated a novel lentiviral vector for its ability to transduce corneal endothelium.

Methods: An HIV-1-based lentiviral vector expressing enhanced yellow fluorescent protein (eYFP) under the control of the Simian virus type 40 early promoter (LV-SV40-eYFP) was applied to the endothelium of rat, ovine and human corneas. Transgene expression by in vitro organ-cultured corneas was measured using fluorescence microscopy. The stability of eYFP expression in rat and ovine corneas following ex vivo transduction of the donor cornea was assessed following orthotopic corneal transplantation. A second lentiviral vector (LV-SV40-IL10) encoding the immunomodulatory cytokine interleukin-10 (IL10) was applied to the endothelium of ovine corneas. Transcription of IL10 by endothelial cells of corneas transduced by LV-SV40-IL10 was quantified by real-time RT-PCR. Secreted IL10 in corneal organ culture supernatant was detected by ELISA.

Results: LV-SV40-eYFP transduced 80-90% of rat, ovine and human corneal endothelial cells as detected by fluorescence microscopy. The kinetics of gene expression varied amongst species, with ovine corneal endothelium showing a relative delay in detectable reporter gene expression compared with the rat or human corneal endothelium. Vectors containing the myeloproliferative sarcoma virus promoter or the phosphoglycerate kinase promoter were not significantly more effective than LV-SV40-eYFP. Following transduction ex vivo, eYFP expression was maintained in corneal endothelial cells for at least 28 days after corneal transplantation in the sheep and >60 days in the rat. Real-time RT-PCR demonstrated transcription of IL10 in ovine corneas transduced by LV-SV40-IL10, as early as 1 day post-transduction. The rate of IL10 secretion by ovine corneas transduced with LV-SV40-IL10 increased over the first week following transduction.

Conclusions: Rat, ovine and human corneal endothelial cells were efficiently transduced by the novel lentiviral vector, and gene expression appeared stable over weeks in vivo. The performance of the vector prompts its exploration as a means of achieving sustained expression of therapeutic transgenes in human corneal transplantation.

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ROLE OF COMPLEMENT REGULATORY PROTEINS (CRPS) AND APOPTOSIS IN THE RESOLUTION OF EXPERIMENTAL AUTOIMMUNE ANTERIOR UVEITIS (EAAU)

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Purpose: Experimental autoimmune anterior uveitis (EAAU) is an organ-specific autoimmune disease of the eye and serves as an animal model of idiopathic human anterior uveitis. This study was undertaken

to investigate the role of Complement Regulatory Proteins (CRPs) and apoptosis in the protection of autologous ocular tissue as well in the resolution of EAAU.

Methods: EAAU was induced in Lewis rats by using bovine melanin associated antigen (MAA). The levels of Crry and CD59 during the course of EAAU were studied using RT-PCR and Western blot analysis. The in vivo role of the complement regulatory proteins in EAAU was studied by blocking the function as well as expression of Crry and CD59 using neutralizing monoclonal antibodies, anti-sense oligonucleotide and siRNA against rat Crry and CD59. Apoptosis was monitored using TUNEL staining of the paraffin sections of eye from the rats during different stages of EAAU. Caspase-3, -8, -9, expressions were analyzed using RT-PCR and their activation was assessed using Western blot. Levels of Bcl-2 and Bax were investigated using Western blot analysis.

Results: The levels of Crry and CD59 in the eyes of Lewis rats increased during the induction of EAAU and remained elevated when the disease resolved. Suppression of Crry and CD59 in vivo before the onset or at the onset of EAAU, by neutralizing mAb or AS-ODN and siRNA resulted in early onset of disease, exacerbation of intraocular inflammation as well as delayed resolution of uveitis. Interestingly, there was no obvious histologic damage to the ocular tissue after the resolution of EAAU in these animals. TUNEL positive cells could be detected during the early phase of the disease. However the TUNEL positive cells were maximum during the resolution of EAAU. The levels of caspase-3 also peaked on day 23 post-immunization and the increase in levels of caspase-8 and -9 preceded the increase in caspase-3. The pro-apoptotic protein Bax also was high during EAAU whereas the anti-apoptotic protein Bcl-2 was absent during the peak of EAAU. This indicated that both extrinsic and intrinsic caspase pathways play an important role in the resolution of EAAU.

Conclusions: Our study demonstrated that apoptosis and CRPs play a critical role in the resolution of EAAU by removing the inflammatory cells from eyes with EAAU and by down regulating complement activation during autoimmune uveitis. These results have clinical implications for autoimmune uveitis and recombinant soluble CRPs and proapoptotic proteins may be therapeutically useful in the treatment of idiopathic autoimmune anterior uveitis in humans.

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IL-6, IL10 AND TNF- α GENES POLYMORPHISMS IN CORNEAL GRAFT REJECTION

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Purpose: The aim of the study was the analysis of three cytokines gene polymorphism in patients undergoing penetrating keratoplasty complicated with further graft rejection syndrome (GRS).

Methods: For the study 60 patients after PK performed for different corneal pathology (20 with corneal edema - CO, 20 with corneal dystrophies - CD, 20 with postinflammatory leucomas - PL) were qualified. All of them underwent reversible or irreversible GRS in post operative period. Symptoms of rejection were graft edema, endothelial precipitates and inflammatory cells in aqueous humour. Polymorphisms in the IL-6 - 174 C, G, IL-10 (-1082A, -819T; -1082G, -819C; -1082A, -819C; -819T, -592A; -819C, -592C) and TNF- α - 308 A, G promoter regions was genotyped in 60 patients. According to the genetic profile of both cytokines patients were classified as low producers (LP), intermediate producers (IP - only IL-10) and high producers (HP). Peripheral blood lymphocytes were the source of genomic DNA. Cytokines single nucleotide polymorphisms

identification (SNP) was performed using PCR-SSP.

Results: Result of the typing are presented in order: CO/CD/PL. Among patients with GRS typing for IL-6 and TNF- α genotypes showed: 4/6/5 (C/C) and 11/8/9 (G/G) persons classified as LP, and as HP 16/14/15 (7/7/4 - G/G, 9/7/11 - G/C) and 9/12/11 (G/A - 7/6/6, A/A - 2/6/5) respectively. IL-10 producers were: HP - 5/2/6 persons, IP - 5/5/7, LP - 10/13/7.

Conclusions: High percentage of HP releasing proinflammatory IL-6 and high percentage of IP and LP of anti-inflammatory IL-10 correlate with GRS in corneal graft recipients.

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CLINICAL PROFILE OF SARCOID UVEITIS: CORRELATION WITH SERUM ANGIOTENSIN CONVERTING ENZYME (ACE)

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Purpose: To present a series of sarcoid uveitis seen in an ophthalmic tertiary care center in India.

Methods: Retrospective chart review of sarcoid uveitis, diagnosed from January 1999 to June 2006. Patients having elevated serum ACE levels (>52U/L) with either skin anergy (Mantoux), or biopsy proven sarcoidosis were included in the study.

Results: 30 patients (51eyes) out of 3441 patients (0.8%) screened in uveitis clinic from 1999 to 2006 had sarcoid uveitis. The mean age was 42.33 years (range 11-60 years); male/female ratio was 11/19. In 15 (50%) patients, ocular sarcoid was the initial presentation. Systemic associations included joint involvement in 10 (33%) patients, respiratory complaints and seventh nerve palsy in 2 (6.6%) patients each and skin nodules in 1 (3.3%) patient. 26 eyes (50.9%) had intermediate uveitis, 10 eyes (19.6%) each had posterior uveitis and panuveitis, 5 eyes (9.8%) had anterior uveitis. Fundus examination revealed pars plana membranes and exudates in 32 eyes (62.7%), choroidal nodules in 19 eyes (37.3%), optic nerve lesions in 5 (9.8%) eyes, vasculitis in 4 eyes (7.86%). Mantoux negativity was seen in 21 patients (70%). Higher serum ACE levels were significantly associated with vitreous cells ($p=0.017$, OR=2.9, 95%CI=1.17-7.13), parsplanitis ($p=0.02$, OR=1.69; 95%CI=1.10-2.59). Anterior uveitis was also associated with higher ACE levels ($p=0.04$, ANOVA). Serum lysozyme was high in 9 patients (30%). Chest x-ray showed hilar lymphadenopathy in 13 (43.3%) patients. 9 patients underwent computerized tomography of the chest, of which 6 had hilar lymphadenopathy. 5 patients (16.6%) had biopsy proven sarcoidosis. 28 eyes (54.5%) had posterior subtenon injection of triamcinolone acetonide. Oral prednisolone was given in 22 (73.3%) patients, whereas 4 (13.3%) received intravenous methyl prednisolone. Fourteen patients (46.7%) received oral azathioprine or methotrexate. Mean follow up was 14.41 months (range 6 days to 92 months). Visual improvement of > 2 Snellen lines was seen in 10(19.6%) eyes, deterioration of > 2 Snellen lines was seen in 6(11.8%) eyes, while stabilization (+ 1 Snellen line) was seen in 35(68.6%) eyes. Complicated cataract in 15(25.4%) eyes, cystoid macular edema in 13 (29.4%) eyes, secondary glaucoma in 8(15.7%) eyes, phthisis, exudative retinal detachment in one eye (1.9%) each were the complications noted.

Conclusions: Sarcoid uveitis has protean manifestations and commonly presents as intermediate uveitis and responds to systemic steroids mainly. Recalcitrant cases need immunosuppressive therapy. Vitreous cells, pars plana exudates and anterior uveitis are significantly associated with higher serum ACE levels.

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SARCOIDOSIS WITH UVEITIS IN TAIWAN— AN ANALYSIS OF 60 CASES IN AN UVEITIS CLINIC FROM 1986 TO 2005

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Purpose: To assess the clinical features of uveitis with sarcoidosis in Chinese.

Methods: A retrospective study of 60 consecutive patients was performed at the uveitis clinic of Taipei Veterans General Hospital from 1986 to 2005. Diagnosis of sarcoidosis was based on the presence of non-caseating granuloma on tissue biopsy along with uveitis. Other granuloma-forming processes were excluded.

Results: Of the 60 patients, 8 were male and 52 female. Forty-four patients (73%) were found in the last four years. Mean age of uveitis onset was 48 years. The most common tissue proof sites were mediastinum lymph node, lung and conjunctiva. Fifty-four patients (90%) were bilateral involved and 6 patients (10%) with unilaterality. Isolated anterior uveitis occurred in 2 eyes of 2 patients. Panuveitis occurred in 32 patients (53.3%) and 26 patients (43.3%) with only intermediate and posterior segments involvement. In the 114 eyes, mutton-fat keratic precipitates were found in 43 eyes (37.7%), iris nodule in 12 eyes (10.5%), tent-like peripheral anterior synechiae in 41 eyes (36.0%). Those findings were suggesting granulomatous anterior uveitis. However acute attack with non-granulomatous iritis found in 23 eyes (20.2%), in which hypopyon found in one eye. Intermediate uveitis with vitritis was seen with various degrees. Snowball opacity seen in 66 eyes (57.9%), snow banking in 14 eyes (12.3%) and mass opacity in 4 eyes (3.5%). The most common findings of posterior segment were periphlebitis in 96 eyes (84.2%), choroidal nodule in 90 eyes (78.9%), "candle-wax drippings" in 59 eyes (51.8%) and retinal exudates in 47 eyes (41.2%). Glaucoma was the most common complication as found in 27 eyes (23.7%), all controlled by medication except 1 receiving peripheral iridectomy. Recurrence of uveitis found in 38 patients (63%) of patients.

Conclusions: The spectrum of uveitis with sarcoidosis in Chinese is chronic and granulomatous and sometimes acute and non-granulomatous. Posterior segment is the most common involved area.

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LID HYGIENE WITH POVIDONE IODINE 5%W/V, AN EFFECTIVE MODALITY IN THE TREATMENT OF BLEPHARITIS: A FOLLOW UP OF A HUNDRED CASES

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Purpose: To evaluate the efficacy of Povidone Iodine 5%w/v as an effective lid scrub in the treatment of blepharitis.

Methods: Povidone Iodine 5%w/v solution was used as an effective lid scrub in the therapy for blepharitis. Lid hygiene was performed with a Q-tip or a stub of sterile cotton wool dipped in the solution. The study included 100 patients who were treated over 2 weeks. Slit lamp examinations were performed on day 1 (baseline) and day 7 and day 14 (end of study) to assess lid edema, lid erythema, debris, and pouting of Meibomian glands, the progress was recorded.

Results: Povidone Iodine 5%w/v was superior to other previous modalities applied for lid Hygiene. Lid Hygiene with Povidone Iodine 5%w/v solution 2 times daily over 2 weeks was found to be efficacious in the treatment of acute and chronic forms of blepharitis.

Conclusions: Povidone Iodine the Gold Standard surgical scrub with its antibacterial, antiviral, antifungal and antiprotozoal properties was well tolerated and safe as an effective lid scrub to maintain lid hygiene and subsequently effectively treat all forms of blepharitis.

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PRESENCE OF EPSTEIN BARR VIRUS DNA IN OCULAR ADNEXAL LYMPHOPROLIFERATIVE LESIONS

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Purpose: To evaluate the presence of Epstein Barr virus (EBV) DNA in ocular adnexal lymphoproliferative disorders (LPD) using molecular techniques.

Methods: Molecular testing for the presence of EBV-DNA in a retrospective case series comprising of patients diagnosed with ocular adnexal LPD was carried out in a tertiary center. DNA extracted from 16 randomly selected paraffin-embedded specimens of ocular adnexa of 12 patients with LPD between 1995 and 2005 was subjected to quantitative real-time PCR detection of cytomegalovirus (CMV) and Epstein-Barr virus (EBV). Molecular testing for T cell receptor rearrangement was also carried out.

Results: CMV DNA was undetectable in all specimens, whereas EBV DNA was detected in a third of the specimens, both malignant and non-malignant LPD. In all cases where the EBV- DNA was detected, the T-cell receptor rearrangement for α/β chain was monoclonal. This in itself may just indicate T cell activity and not necessarily malignancy.

Conclusions: While EBV seems to be potentially involved in all kinds of adnexal LPD, CMV is uniformly absent. This is of interest for the understanding of possible viral associations, but has limited diagnostic or therapeutic use until the pathogenesis of the LPD is completely understood.

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ROTATIONAL STABILITY AND CORNEAL ASTIGMATISM CORRECTION WITH THE MICROSIL TORIC INTRAOCULAR LENS

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Purpose: To determine the efficacy of MicroSil 3-piece toric intraocular lenses (Toric IOL) in the correction of preoperative astigmatism. To assess the effects of newly introduced Z-shaped haptics on rotational stability.

Methods: All eligible patients with a preoperative astigmatism of over 2D and no concurrent ocular pathology were prospectively enrolled over an 18-month period (August 2004 - Feb 2006) 41 consecutive MicroSil 6116TU Toric IOLs were implanted by a single surgeon (JG). Keratometry

and refraction was performed preoperatively. The IOL orientation was assessed postoperatively at Day 1, Day10 and refraction repeated at 4 weeks. The Power Vector and Polar value (Naeser) method of Vector analysis was carried out to assess the astigmatic component of refractive error.

Results: Toric IOLs with mean toric power of 4.06D (range 2.00-9.00D) were implanted. Median uncorrected visual acuity (UCVA) was 6/18 pre- and 6/6 post-operatively. Mean pre- and post- operative astigmatism was 2.73D (sd 1.54D) and 0.99D (sd 0.67D) respectively. Overall reduction in astigmatism is shown in Figures 1 & 2. The Surgically induced refractive change of the cylinder was 1.84D (sd 1.46D) and torque 0.3D (sd 0.84D). 61% and 93% of patients fell within 1D and 2D of the predicted cylinder. Lens rotation was noted in 2 patients (5%) in the first week and successfully dialed back into position, giving a good final outcome.

Conclusions: The HumanOptics MicroSil 6116TU toric intraocular lens is effective in correcting corneal astigmatism. In this series there was a lower rate of rotation relative to other toric IOLs suggesting improved short-term rotational stability with Z-shaped haptics. However, the proportion of patients falling closer to predicted cylinders is much smaller than observed in routine practice. Optimization of the Toric IOL formulae might improve this and enable more accurate lens selection.

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POSTOPERATIVE PHOTOASTIGMATIC REFRACTIVE KERATECTOMY VERSUS INTRAOPERATIVE LIMBAL RELAXING INCISION FOR THE CORRECTION OF PRE-EXISTING CORNEAL ASTIGMATISM AFTER CATARACT SURGERY

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Purpose: To compare effects of photoastigmatic refractive keratectomy (PARK) and limbal relaxing incision (LRI) on corneal astigmatism and higher-order aberrations (HOAs) in eyes undergoing cataract surgery.

Methods: A retrospective study of patients who had undergone phacoemulsification and intraocular lens implantation through astigmatically neutral incision either followed after 3 months by PARK (80 eyes), or accompanied by LRI (45 eyes) to control preexisting corneal astigmatism greater than 1.25 diopters (D). Corneal astigmatism and HOAs were compared before and 3 months after surgery.

Results: Among eyes that underwent PARK, corneal astigmatism averaged 2.45 ± 1.61 D preoperatively and 1.18 ± 1.18 D postoperatively. For a 4-mm pupil, HOAs of the whole eye averaged 0.21 ± 0.16 μ m preoperatively and 0.34 ± 0.35 μ m postoperatively ($p < 0.001$, Mann-Whitney U test). For a 6-mm pupil, HOAs of the whole eye averaged 0.70 ± 0.53 μ m preoperatively and 1.05 ± 0.53 μ m postoperatively ($p < 0.001$). On the other hand, among eyes that underwent LRI, corneal astigmatism averaged 2.37 ± 1.05 D preoperatively and 1.70 ± 0.90 D postoperatively ($p > 0.05$). For a 4-mm pupil, HOAs of the whole eye averaged 0.37 ± 0.37 μ m preoperatively and 0.31 ± 0.15 μ m postoperatively. For a 6-mm pupil, HOAs of the whole eye averaged 0.77 ± 0.27 μ m preoperatively and 1.20 ± 0.91 μ m postoperatively ($p = 0.09$). No vision-threatening complications occurred in either group.

Conclusions: PARK was more effective than LRI for the correction of corneal astigmatism after cataract surgery. PARK induced a significant increase in HOAs. In contrast, LRI induced no significant change in HOAs, although HOAs for 6-mm tended to increase after surgery.

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PROSPECTIVE RANDOMIZED COMPARISON OF VISUAL ACUITY AND CONTRAST SENSITIVITY BETWEEN TECNIS Z2000, TECNIS Z2003 AND ACRISOF SA60AT INTRAOCULAR LENS

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Purpose: To evaluate visual functional outcome in pseudophakic patients implanted with either conventional acrylic intra-ocular lens or an acrylic lens with aspheric IOL design.

Methods: Forty-five eyes of 45 patients each were evaluated with best corrected visual acuity (BCVA) and contrast sensitivity under photopic and mesopic light conditions after either silicon lens with aspheric IOL design (AMO Inc. Santa Ana. CA Tecnis Z2000), conventional acrylic intra-ocular lens (Alcon AcrySof SA60AT) or an acrylic lens with aspheric IOL design (AMO Inc. Santa Ana. CA Tecnis Z2003) at post-op day 1, week 1, months 1 and 3. The BCVA evaluation was done using the Early Treatment Diabetic Retinopathy Study charts. Contrast sensitivity was measured by sinusoidal grating charts, FACT (Functional Acuity Contrast Testing, StereoOpticals Co., Inc. Chicago, Illinois, USA) for distance under photopic (85 cd/m²) and mesopic (3cd/m²) luminance levels with optical correction in place. The tested spatial frequencies were 1.5, 3, 6, 12 and 18 cycles per degree (cpd).

Results: The mean BCVA (decimal acuity) was 0.96 + 0.12 in the Tecnis acrylic group, 0.99 ± 0.11 in the Tecnis silicon group and 0.98 + 0.11 in the Acrisof group (P value not significant). Eyes with aspheric IOL design showed statistically significant (p<0.05) better contrast sensitivity at all spatial frequencies under mesopic conditions and at higher spatial frequencies (18 cpd) under photopic conditions when compared with the conventional design IOL. The difference between the contrast sensitivity achieved in cases implanted with Tecnis acrylic and Tecnis silicone was not significant. On an average, patients implanted with the aspheric Tecnis IOL (silicone or acrylic) showed better contrast sensitivity than their counterparts who were implanted with the conventional AcrySof IOL.

Conclusions: The aspheric Tecnis design yielded better distance contrast sensitivity than the conventional design. The difference was clinical significant for the higher spatial frequencies.

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COMPARING HIGHER ORDER ABERRATION AND CONTRAST SENSITIVITY BETWEEN ACRYSOF SN60AT AND SN60WF INTRAOCULAR LENSES

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Purpose: To compare postoperative best corrected visual acuity (BCVA), contrast sensitivity and wavefront aberrometry between the AcrySof Natural SN60AT and AcrySof SN60WF IOLs following cataract surgery.

Methods: Prospective, randomized study involving 40 eyes of 20 patients with bilateral age-related cataracts. Patients with ocular conditions that might affect visual acuity or aberrometry were excluded. Each patient was randomized to receive SN60AT in 1 eye and SN60WF in the other eye. Four to six weeks postoperatively BCVA and contrast sensitivity (Pelli-Robson) were assessed under photopic and mesopic conditions according to the ETDRS protocol. In addition, color perception, wavefront aberrometry (Zywave 5.09, Bausch & Lomb), Orbscan, and Scheimpflug photography were performed.

Results: Four eyes were excluded due to surgical complication, macular hole, amblyopia and retinal folds. One patient deceased during the study period. A further 2 patients developed a degree of capsulophimosi and aberrometry was not able to be performed. Four patients were lost to follow up for their second eyes. In respect to the 18 eyes available for analysis, the average age was 75.2 ± 7.4 years with no significant difference in preoperative best corrected visual acuity (SN60AT=1.09, SN60WF=0.73). There was a trend for the post-operative photopic (SN60AT= 0.04, SN60WF=- 0.05) and mesopic BCVA (SN60AT=0.04, SN60WF=-0.03) to be better in the SN60WF group, however this failed to reach conventional statistical significance (photopic p=0.06, mesopic p=0.16). The contrast sensitivity score was better in the SN60WF group in both photopic (SN60AT = 1.46, SN60WF = 1.55,) and mesopic (SN60AT=1.26, SN60WF = 1.39) conditions, however, this was not statistically significant (photopic p=0.32, mesopic p=0.36). The wavefront analysis revealed significant difference in the higher order total root mean square between the SN60AT group (0.911±0.186µm) and the SN60WF group (0.406±0.190µm) (p=0.003). It was still significant (p=0.003) when spherical aberration was excluded (SN60AT=0.523±0.202µm, SN60WF=0.247±0.139µm). The most prominent higher order aberration in both groups was spherical aberration, which was significantly lower in the SN60WF compared to SN60AT (p<0.0001) group.

Conclusions: The SN60WF IOL with a modified surface produced significant reduction in spherical aberration compared to conventional SN60AT IOL. Although eyes with SN60WF IOL had higher contrast sensitivity score in both photopic and mesopic conditions, these observations were not significantly different. *CR

Table Abstract 115. FACT Contrast Sensitivity: Mesopic

| Spatial Frequency (cpd) | Tecnis Acrylic (Z9003) a | Tecnis silicon (Z9000) b | Acrysof (SA60AT) c | Significance levels | | |
|-------------------------|--------------------------|--------------------------|--------------------|---------------------|---------|---------|
| | | | | a vs. c | a vs. b | b vs. c |
| 1.5 | 46.3 + 6.40 | 47.6 + 9.03 | 40.7 + 6.83 | 0.024 | 0.02 | 0.628 |
| 3 | 69.3 + 11.87 | 70.8 + 11.66 | 61.6 + 9.52 | 0.06 | 0.025 | 0.724 |
| 6 | 61.4 + 6.68 | 62.7 + 4.90 | 53.8 + 9.81 | 0.019 | 0.04 | 0.559 |
| 12 | 18.7 + 3.61 | 20.1 + 3.20 | 15.3 + 3.86 | 0.02 | 0.001 | 0.271 |
| 18 | 10.1 + 2.06 | 11.2 + 1.65 | 8.1 + 1.76 | 0.01 | 0.001 | 0.130 |

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VISUAL DISABILITY QUESTIONNAIRE: THE IMPORTANCE AND DIFFICULTY OF DAILY LIVING ACTIVITIES IN PATIENTS WITH LOW VISION

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Purpose: To develop a reliable and valid questionnaire (Visual Disability Questionnaire, VDQ) that measures the disability in daily living activities in adults with low vision in India.

Methods: Twenty-five items were chosen from pre-existing questionnaires that have been validated for the Indian population and from a review of records of patients attending the Center for Sight Enhancement (CSE) at our tertiary eye care center. The questionnaire was administered verbally by a single interviewer to 73 patients, aged 16 to 89 years, with low vision. Each item was rated for importance and difficulty using a 5-point likert scale from 0 to 4 (for difficulty, 0 - no difficulty and 4 - impossible; for importance, 0 - not at all important and 4 - highly important). Rasch analysis was used to estimate interval measures of patient ratings.

Results: We combined response categories 1 and 2 for importance ratings and response categories 2 and 3 for difficulty ratings, as these were rarely used by our patients. Content validity was demonstrated by good separation indices for importance ratings (2.68 and 4.00) and for difficulty ratings (3.06 and 5.46) with high reliability scores (0.88 and 0.90 for importance ratings and 0.90 and 0.97 for difficulty ratings) for the person and item parameters respectively. The most important items were reading newspaper (0.86 logits) followed by grooming (0.84 logits) and recognizing faces from distance (0.71 logits). Although threading a needle was the least important item (-2.36 logits) it was the most difficult task (2.22 logits). Moving around in familiar places was the least difficult item (-1.58). The mean person measures of importance was -0.24 logits with SD 0.89 logits, which demonstrates that average patient gave less importance to the items than the average value of importance. The mean person measures for visual ability (difficulty ratings) was 0.21 logits with SD 0.26 logits, which indicates that the perceived visual ability of the patient is higher than mean required visual ability. There was no significant correlation between estimated importance and difficulty measures for both persons ($r = 0.22$, $p = 0.06$) and items ($r = -0.22$, $p = 0.29$).

Conclusions: The VDQ is a reliable and valid questionnaire using importance and difficulty ratings. This questionnaire could be used to prioritize the goals for rehabilitation intervention in patients with low vision.

Key words: Importance, difficulty, disability, Rasch analysis

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A VERSATILE, INTERACTIVE, THREE-DIMENSIONAL, RENDERING AND MEASURING SYSTEM FOR UHR-OCT

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Purpose: To create a vivid and highly versatile three-dimensional (3D) rendering and analysis system for ultrahigh resolution optical coherence tomography (UHR-OCT) using software ray tracing algorithms.

Methods: Using B-mode scan data sets (consisting of 60 cross sections with 1024 x 1024 pixels per scan) from a 3D UHR-OCT based on a Titanium: sapphire laser with an axial resolution of 2-3 μm and the ray tracing package Cinema 4D XL 9.102 (Maxon Computer Inc., Friedrichsburg, Germany), several procedures for 3D UHR-OCT rendering have been developed. Secondly, several subroutines have been designed, which recognize patterns in each B-mode scan and correlated them to the preceding B-mode scans, creating "solid mesh" objects (retinal 3D segmentation). Thirdly, algorithms to virtually and interactively dissect retinal specimens have been developed. Finally, a 3D measuring system to quantitatively analyze the spatial dimensions of retinal structures has been created.

Results: A versatile 3D rendering system for UHR-OCT, which provides highly solid spatial representations as well as quantitative volumetric analysis of the examined structures and pathologies has been produced. The software is unique due to its high level of user control and versatility.

Conclusions: The virtual biopsy 3D rendering system for UHR-OCT offers unprecedented ability to visualize, virtually dissect, segment, and spatially quantify physiological and pathological structures of the retina. The use of this rendering system will significantly contribute to a better understanding of the pathogenesis of various retinal diseases as well as improve monitoring of therapeutic approaches.

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A 6-YEAR REVIEW OF MALIGNANT TUMORS OF THE EYE AND OCULAR ADNEXA AT KING CHULALONGKORN MEMORIAL HOSPITAL

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Purpose: To study the relative frequency and patient characteristics of various malignant tumors of the eye and ocular adnexa according to the anatomic location.

Design: Retrospective descriptive study.

Methods: Data was collected from the surgical records, outpatient and in-patient hospital files during 2000 to 2005. A total of 90 patient data were reviewed. Patients' gender, age of presentation and clinical presentation were collected. Histopathology results were classified by the anatomical location: eyelid, conjunctiva, orbit, lacrimal gland, and intraocular. Pathology slides were reviewed.

Results: Of all malignancy, the most common presentation was mass (44.6%), followed by proptosis (10.8%), and ulcer (9.6%). The other presentations were visual loss, eye irritation, eye pain, red eye, inflammation, leukocoria, abnormal pigmentation, eye discharge, recurrent hordeolum, and by routine eye screening. Most of tumors were found in male. The most common site was the conjunctiva (35.6%), followed by the eyelid (27.8%), the lacrimal gland (14.4%), orbital malignancies (10%), and intraocular malignancies (8.9%). Conjunctival squamous cell neoplasia (84.4%) was the most common conjunctival malignancy. The average age was 56.4 years. Basal cell carcinoma (55.2%) was the most common eyelid malignancy. The mean age of presentation was 67.4 years. Lymphoma was a major malignancy of the lacrimal gland (84.6%) and the orbit (62.5%). Retinoblastoma was the most common intraocular malignancy with a mean age of 24 months. There was only one case of corneal malignancy which was corneal intraepithelial neoplasia.

Conclusions: The conjunctiva was the most common location of malignancy of the eye and ocular adnexa. The demographic data help ophthalmologists and epidemiologists to monitor trends of malignancy of the eye and ocular adnexa in this geographic region and provide comparison with other populations.

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CLINICAL AND HISTOPATHOLOGICAL ANALYSIS OF 38 CASES OF RETINOBLASTOMA WITH SPONTANEOUS REGRESSION

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Purpose: To investigate the clinical and histopathological features of spontaneously regressed retinoblastoma.

Methods: A retrospective review of 835 patients who received diagnosis of Rb between January 1980 and June 2006 revealed 38 histopathologically proven spontaneously regressed Rb. Analysis included history, physical examination, imageology and histopathological results.

Results: Seventy-one percent of the patients (n=27) had leukocoria, 18 (47%) had red eyes, 9 (24%) had microphthalmos and 3 (8%) presented strabismus. Histopathology demonstrated extensive necrotic and apoptotic cells appeared in regressive areas, but there were still some living cells in the regressed tumor focus.

Conclusions: Attention should be paid to children with atypical presentation of Rb. The close follow-up is important.

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ABROGATION OF HSP70 EXPRESSION INDUCES GROWTH INHIBITION AND APOPTOSIS IN RETINOBLASTOMA CELLS

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Purpose: Heat shock proteins (HSPs) are ubiquitous proteins that protect cells from damage through their function as molecular chaperones. Elevated levels of 70-kDa heat shock protein (HSP70) have been reported in some tumors and their expression has been associated with cell proliferation, disease prognosis and resistance to chemotherapy. The functional significance of HSP70 proteins in human retinoblastoma is not well understood. Hence, the present study was designed to investigate the effect of abrogating HSP70 expression by HSP70 antisense oligonucleotides treatment on human retinoblastoma cells.

Methods: Human Retinoblastoma cells isolated from primary tumors were treated with HSP70 antisense, sense or nonsense oligomers. The protein expression of HSP70 was determined by immunoblotting. Cell growth inhibition was analyzed using trypan blue dye exclusion test. For identification of apoptotic cells, propidium iodide staining was done and cells were examined by fluorescent microscopy. Flow cytometric and DNA fragmentation analyses were performed to confirm apoptosis.

Results: Immunoblotting analysis confirmed inhibition of HSP70 expression by HSP70 antisense oligomers. Retinoblastoma cells treated in vitro with HSP70 antisense oligomers, displayed propidium iodide stained condensed nuclei. Ladder like pattern of DNA fragments was observed in cells treated with HSP70 antisense oligomers. Flow cytometric analysis revealed the hypodiploid DNA peak of propidium iodide stained nuclei in the antisense oligomers treated cells. Decrease in the percentage of cells in S phase of cell cycle was observed in HSP70 antisense oligomers treated cells, suggesting inhibition of cell proliferation.

Conclusions: These results indicate that HSP70 antisense oligomers

inhibit growth and induce apoptosis in retinoblastoma cells through abrogating HSP70 expression, suggesting HSP70 is required for proliferation and survival of retinoblastoma cells. Thus, HSP70 is a tempting target for therapeutic interventions.

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INDIGENOUS DEVICE FOR MEASURING ORBITAL IMPLANT AND PROSTHESIS MOVEMENTS

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Purpose: To describe a custom-made slit-lamp device with real-time digital photographic documentation for measuring ocular, implant and prosthesis movements. To the best of our knowledge no such device has been documented or described in the literature.

Methods: The device was indigenously fabricated with two-millimeter rulers, 15mm and 5mm long. The larger ruler placed horizontally, represented the X-axis while the smaller one, placed vertically, represented the Y-axis. The larger horizontal ruler was fixed and the vertical ruler was arranged such that it could be slid over the horizontal ruler. The complete measurement device was mounted on a rod of length 15 cm, which was then placed in the Hruby lens holder of the slit lamp biomicroscope. The external digital camera was aligned to face the patient. This camera was kept at a prior marked distance of 1.5 ft and the zoom was kept at 2.3 x in all patients for standardization. To measure implant or prosthesis movements, an eye speculum was placed, mark was made using a non-toxic marker on the conjunctiva (to measure implant movements) under topical anesthesia and over the center of corneal surface of the prosthesis (to measure prosthesis movements). Limbal to limbal difference was taken to measure the ocular movements. The photographs were taken first in the primary gaze, later in extreme horizontal and vertical sequentially. The photographs were downloaded and software Adobe Photoshop version 6.0 was used to measure the excursions of the implant or prosthesis by taking the difference between the reading of the marked point in primary gaze and its reading in the moved direction of gaze.

Results: This is an objective method to measure ocular, implant and prosthesis movements. All possible subjective error could be avoided as measurement is done at a fixed position. Movements recorded in different cases using this device appear to be precise and comparable.

Conclusions: We have found that this device can be useful in routine practice, for documentation of implant and prosthesis motility. Further tests are required to validate and find the specificity and sensitivity of this instrument.

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IMPLANT AND PROSTHESIS MOTILITY FOLLOWING EVISCERATION AND MYOCONJUNCTIVAL TECHNIQUE OF ENUCLEATION

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Purpose: To compare the implant and prosthesis motility following evisceration and myoconjunctival technique of enucleation.

Methods: Prospective comparative non-randomized interventional study, which included two groups with 10 consecutive patients in each, group1:

patients who underwent evisceration and group 2: patients who underwent myoconjunctival enucleation. The surgeries included the placement of silicon orbital implant in all patients, who were subsequently fitted with custom made ocular prosthesis after 6-8 weeks. The implant and prosthesis motility was objectively measured using an indigenous custom-made slit lamp mounted device with digital photographic documentation. The motility lag (difference between the implant and prosthesis motility) was then calculated.

Results: Student t-test was used for statistical analysis. The mean horizontal and vertical implant motility in evisceration group were 9.15 and 8.5mm respectively; that in myoconjunctival group were 6.0 and 5.8mm respectively. This shows implant motility was significantly better in the evisceration group in both horizontal ($p=0.01$) and vertical ($p=0.01$) meridian. The mean horizontal and vertical prosthesis motility in evisceration group were 6.6 and 8.5mm respectively; that in myoconjunctival group were 8.1 and 7.1mm respectively which showed no statistically significant difference both in horizontal ($p = 0.09$) and vertical ($p=0.10$) meridian. Motility lag in evisceration group showed the lag of 2.55mm ($p= 0.01$) in horizontal meridian and 0 ($p= 1.0$) i.e. no lag in vertical meridian. This indicates that the implant motility was better than the prosthesis motility (in horizontal meridian) and 100% transmission of movements from implant to prosthesis in vertical meridian; where as in myoconjunctival group the values were -2.1 mm ($p= 0.01$) and -1.3 mm ($p= 0.02$) respectively in horizontal and vertical meridians which indicates that prosthesis motility was better than the implant motility in both horizontal and vertical meridians. This could be due to the transmission of forniceal movements along with the implant motility in case of myoconjunctival enucleation.

Conclusions: Although evisceration provides better implant motility compared to myoconjunctival enucleation, prosthesis motility and cosmesis that actually matters to patient is comparable with both evisceration and myoconjunctival technique of enucleation.

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A MAJOR, 10-YEAR REVIEW OF OCULAR SURFACE SQUAMOUS NEOPLASIA IN AUCKLAND, NEW ZEALAND

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Purpose: The term ocular surface squamous neoplasia (OSSN) encompasses the conditions dysplasia, carcinoma in situ, and invasive squamous cell carcinoma. OSSN has a high rate of recurrence and the potential to metastasize. We report the incidence, presentation, management and outcome of OSSN in Auckland, New Zealand over a 10-year period.

Methods: Retrospective review of all cases of OSSN in Auckland over a ten-year period. Pathology reports were used to identify all patients diagnosed with OSSN between July 1996 and July 2006. Medical charts were then reviewed and data including patient demographics, management, outcome and follow-up were recorded.

Results: One hundred and ten cases were identified. The mean age was 64.8 years (range 25 - 91 years). The majority of cases (76.4%) were male. Main symptom on presentation was a foreign body type sensation that was documented in 36 cases (33%). Thirty-five patients (32%) were asymptomatic. Three patients had a history of previous skin cancer (3%). Most lesions involved the limbus (69%). The majority of cases (40%) were treated by excision biopsy and cryotherapy, but 4 patients (4%) received adjuvant therapy that included topical mitomycin C, 5-fluorouracil or

interferon, and 8 patients (7%) had an amniotic membrane graft. Histology confirmed 56 (51%) cases as dysplasia, 44 (40%) as carcinoma in situ, and 10 (9%) as squamous cell carcinoma. Twenty-six eyes (24%) had suspected recurrence of OSSN within 499 days of initial treatment and had further surgery. No patients had metastatic disease but 4 subjects (4%) required orbital exenteration. The incidence of OSSN was noted to increase over the study period.

Conclusions: OSSN typically occurs in sun damaged ocular surface, usually at the limbus in elderly men. In Auckland the incidence of OSSN over the last 10 years has increased. Recurrence was relatively common and orbital exenteration may be required to control local disease, therefore, management requires adequate excision, adjuvant treatment and careful follow up to detect early signs of recurrence.

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OCULAR SURFACE SQUAMOUS NEOPLASIA IN NORTHERN THAILAND

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Purpose: To retrospective study the clinical characteristics, treatment, and outcome in patients with ocular surface squamous neoplasia (OSSN) in Northern Thailand.

Methods: Patients diagnosed as either intra-epithelial or invasive squamous cell carcinoma (SCC) of the conjunctiva and cornea from May 2000-April 2006 were reviewed.

Results: Fifty-nine patients were analyzed (33 intra-epithelial and 26 invasive disease). The mean age was 54 years (31-99 years). Males were affected in 65%. In most cases (81%), the tumor was located at the limbus. Sixteen of 30 patients (53%) who had a blood test for human immunodeficiency virus (HIV) were sero-positive. The most common feature of the tumor was a papilliform appearance (41%) followed by a leukoplakia (22%), gelatinous (17%), and combined form (12%). Two cases masqueraded as an ulceration or chronic inflammation. Six (10%) patients had pigmented lesion and 19(32%) cases were associated with pterygia. The main initial treatment was surgical excision (52.6%), followed by topical mitomycin C (32%). Mean follow up time of 15 months (0-110) reviewed a recurrence in 4 cases with invasive SCC.

Conclusions: OSSN in Northern Thais usually involved the limbal area and had a papilliform pattern. HIV related should be suspected in cases with young age or atypical presentation. Management requires an adequate excision adjunct with cryotherapy and careful follow up. Topical mitomycin C had a favorable response to both initial and adjuvant therapy.

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PRESUMED RETINAL INFILTRATION IN ATYPICAL PERIOcular AND ORBITAL XANTHOGRANULOMA

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Purpose: To describe xanthogranuloma with atypical periorbital & intraorbital lesions & presumed retinal infiltration.

Methods: Biopsy of periocular lesions was taken and relevant clinical & ophthalmic examination done.

Results: Patient's BCVA was no PL and 3/60 OD & OS resp. She had multiple, non-tender firm to hard large papulo-nodular skin lesions along the orbital margin sparing the lids. Fundus details were not visible OD because of healed keratouveitis & cataract while OS revealed vitritis, hyperemic disc, perivascular infiltration & diffuse retinal pigment epithelial (RPE) changes. Fluorescein angiography showed staining of disc and vessels with no active leak. MRI scan of the head and orbit revealed periocular & intraconal mass lesions with kinking of the optic nerves bilaterally. Biopsy of lesions showed focal collection of sheets of histiocytes & lymphocytes within the dermis. The histiocytes had abundant pale vacuolated cytoplasm with small round nuclei. Multinucleated foreign body type & occasional Touton type of giant cells were also present. Immunohistochemical staining showed strong positivity for CD-68 & focal cytoplasmic immunoreactivity of the foam cells to S-100 antibody.

Conclusions: We report a patient with periocular & orbital xanthogranuloma simultaneously with ocular manifestations suggestive of infiltrative vasculopathy.

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CLINICAL CHARACTERISTICS CHANGING IN RB PATIENTS AT CIPTO MANGUNKUSUMO HOSPITAL

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Purpose: To describe the clinical characteristics of retinoblastoma patients in Cipto Mangunkusumo Hospital in the period of 2001-2004; and to compare the outcomes with those in the previous period of studies.

Methods: A retrospective study in retinoblastoma patients at Pediatric Ophthalmology Division Dr. CM Hospital was conducted during the period of 2001-2004. The diagnosis of retinoblastoma was based on clinical features, ultrasound, CT and/or confirmed by histopathology. Medical records were reviewed to verify the patients age at first symptom, age at time of admission, and tumor laterality. The first symptom included leukocoria, strabismus, red eye, proptosis and decreased vision. Clinical findings included leukocoria, strabismus, red eye, proptosis, hyphema, buphthalmos and phthisis bulbi. In patients suffering from bilateral retinoblastoma, the stage was defined according to the eye with more advanced staging or presentation. The outcomes were then compared with those found in the period of 1982-1985, 1986-1991, and 1993-2000.

Results: There were 84 patients diagnosed with retinoblastoma admitted to the study in the period of 2001-2004. Most cases were grouped into the age of <1 year (46.62%). The most frequent initial symptoms was leukocoria (91.66% cases), while proptosis accounted for 48.80 % of the clinical findings. In comparison to the previous studies, proptosis group was accounted in 37.7% of cases in the period of 1982-1985; 37.04% in the period of 1986-1991; and 49.09 % in the period of 1993-2000.

Conclusions: In general the four periods showed no change in the clinical characteristics of retinoblastoma patients admitted to the hospital, although the number of patients presenting proptotic eye tends to increase during the period of 1986-1991 and 1993-2000. These findings indicate the importance of early detection through an educational program to the patient's family and the communities, in order to find cases in an earlier stage of the disease.