DR. G. VENKATASWAMY
EYE RESEARCH INSTITUTE
Aravind Medical Research Foundation

Mission:
To eliminate needless blindness
by providing evidence through
research and evolving methods to
translate existing evidence and
knowledge into effective action

REPORT 2007-2008
INTRODUCTION

From the initial days of performing large scale operational studies on barriers of service delivery, research at Aravind has grown to encompass all areas of research in ophthalmology - basic, clinical, operations research including community outreach and, with the establishment of Aurolab, product development. To integrate all these, the Dr. G. Venkataswamy Eye Research Institute was formed to be the nodal body.

The research activities at Aravind reflect Aravind’s commitment to finding new ways to reduce the burden of blindness. The combination of high clinical load, extensive community participation, and access to a large network of eye hospitals provide ideal opportunities for conducting clinical, laboratory, population-based studies and social and health system research.

The major current research areas are:

**Immunology**  

**Molecular genetics**  
Aniridia, Glaucoma, Congenital Cataract, Ocular Albinism, Corneal Hereditary Endothelial Dystrophy and Blepharophimosis, Ptosis and Epicanthus syndrome.

**Genetic susceptibility**  
Age-related cataract, Macular degeneration and Diabetic retinopathy and external influence

**Stem cell biology**  
Corneal epithelial stem cell marker and ex-vivo expansion

**Proteomics**  
Tear in fungal keratitis, plasma biomarker in glaucoma, vitreous in diabetic retinopathy and Eale’s disease

**Translational research**  
Prevention of posterior capsule opacification, corneal surface reconstruction and viral diagnosis in ocular tissues and fluids.

Numerous randomized controlled trials have been made possible, by virtue of the high patient load, the details of which are elaborated in this report. The integration of the manufacturing arm of the Aravind Eye Care system, the Aurolab, help the clinicians to work in close tandem with engineers and designers to develop and evaluate new instruments and allied gadgets. Aravind, through the Lions Aravind Institute of Community Ophthalmology continues to work with more than 231 eye hospitals throughout the world, resulting in acquiring immense knowledge on the aspects of eye care service delivery on a global level.

Now with the establishment of Centres of Excellence within Aravind’s speciality clinics, alongside its continued emphasis on academic rigor and its recent thrust on developing comprehensive service delivery models in areas like diabetic retinopathy, glaucoma and paediatric ophthalmology, as well as its rapid strides in the field of tele-opthalmology with remote consultations and teleconferencing between hospitals, Aravind is poised as never before to take on new challenges in research.
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VISION REHABILITATION SERVICES

The Madurai study of low vision children in blind schools

Investigators : Dr. K. Ilango, Aravind - Madurai
               Dr. P. Vijayalakshmi, Aravind - Madurai

Department : Vision rehabilitation centre and paediatric ophthalmology service

Background

There are over 1.4 million visually impaired children in the age group of 0-14yrs. The vast majority of visually impaired children with low vision condition in developing countries like India are sent to blind schools despite having usable vision because they do not have access to vision rehabilitation services that would enable to integrate them into regular schools. With this background in mind the Vision Rehabilitation Centre and Pediatric Ophthalmology service at Aravind eye hospitals planned the madurai study of low vision children in blind schools.

Objectives

- To identify 1,000 children who are with potential sight having low vision under curriculum for the blind.
- To provide appropriate low vision devices.
- To facilitate and transfer the low vision children from curriculum for the blind to normal curriculum with support of assistive devices and counselling to parents and teachers.

Results

A pilot study was conducted in a school for the blind in Madurai service area. The following results were obtained. Out of the 81 children who were screened 24 children (29.62%) had BCVA of >6/18-3/60, 12.34% improved with the help of low vision devices. 7 out of 81(8.64%) children had BCVA in the range of 6/18-6/60 who can study in normal schools with the help of assistive devices. They were counselled to be transferred to normal schools. These results emphasize the greater need of participation by the ophthalmic professionals in the compassionate caring and guidance of these unfortunate children not only in the prevention of blindness but also in appropriate education as a social responsibility.

UVEA SERVICES

Posurdex – intermediate and posterior uveitis study

Principal Investigator : Dr. Rathinam Sivakumar, Aravind - Madurai
Co-Investigator : Dr. Venu Nadella, Aravind - Madurai
Treating Investigator : Dr. R. Kim, Aravind - Madurai
Funding Agency : Allergan and Charles River Laboratories
Duration : Intermediate or Posterior Uveitis – 26 weeks (an 8 week Multicenter, Masked, Randomized Trial with an 18-week Masked Extension)

Objectives

To evaluate the safety and efficacy of the 700 micrograms and 350 micrograms DEX PS DDS (Dexamethasone Posterior Segment Drug Delivery System) Applicator Systems compared with Sham (needle-less) DEX PS DDS Applicator System in the treatment of non-infectious ocular inflammation in intermediate and posterior Uveitis
HLA-DR determination of Vogt-Koyanagi-Harada syndrome and sympathetic ophthalmia in South Indian patients

Principal Investigator: Dr. S. Rathinam, Aravind-Madurai  
Dr. Edoardo Baglivo, Geneva  
Dr. J. M. Tiercy, Geneva University Hospital

Funding Agency: Immunology unit, LNRH/Unité d’immunologie, De transplantation, HUG Geneva University Hospital

Duration: One year

Objectives

To study the distribution of human leukocyte antigen HLA-B antigens and HLA-DR Alleles and to investigate the immunogenetic background of Vogt-Koyanagi-Harada (VKH) syndrome and sympathetic ophthalmia in south Indian patients and to analyse possible impact on susceptibility/resistance and prognosis.

A double-masked, placebo-controlled, multicentric, parallel group, dose ranging study to assess the efficacy and safety of LX211 as therapy in subjects with non-infectious intermediate, anterior and intermediate, posterior or pan-uveitis

Principal Investigator: Dr. S.R. Rathinam, Aravind Eye Hospital-Madurai  
Dr. B. Manohar Babu, Aravind Eye Hospital-Coimbatore  
Co-Investigator: Dr. Venu Nadella, Aravind Eye Hospital-Madurai

Funding Agency: Lux Biosciences Inc, Jersey city, NJ 07302

Duration: 18 months - 12 months recruitment, 6 months follow-up

Objective

LX 211 is likely to have an improved safety profile compared to cyclosporine. A lower therapeutic dose can be used and the correlation of dose with blood concentrations has been improved. The objective was to study the safety and efficacy of LX211 as treatment and as maintenance in subjects with Uveitis.

LX 211-01: Treatment of active sight threatening non-infectious intermediate, anterior and intermediate, posterior or pan-uveitis
LX211-02: Treatment of clinically quiescent sight threatening, non-infectious Intermediate, anterior and intermediate, posterior or pan uveitis
LX211-03: Treatment of active sight threatening non-infectious anterior uveitis

All are multicentred, double masked, placebo controlled, randomised trials.

GLAUCOMA SERVICES

To compare the long-term effects of timolol 0.5% and latanoprost on central corneal thickness

Investigator: Dr. Neetu Asher, M.S., Dr. R. Ramakrishnan, M.S., Dr. Mohideen Abdul Kader, DNB., Dr. Saurabh Mittal, DNB., Aravind-Tirunelveli

Aim

To compare the long-term effects of Timolol 0.5% with Latanoprost on central corneal thickness.

Patients and methods

This study was conducted on 148 eyes with Ocular hypertension (30) and Primary Open Angle Glaucoma (118). Patients were started on Timolol 0.5% twice daily (112 eyes) or Latanoprost 0.005% once daily (36 eyes). Ultrasonic pachymetry of central cornea was performed at baseline and at average 18 months following treatment by a masked observer.
Results
Average central corneal thickness decreased by 3.74 µm from baseline 532.3µm. Central corneal thickness decreased by 5.3±13.7µm with Latanoprost and 2.18±2.6µm with Timolol, and there was no statistically significant difference between two groups. There was no significant change in central corneal thickness in different glaucoma types with either medication.

Conclusion
Latanoprost was equivalent to Timolol in terms of central corneal thickness changes. Long term use of both groups of drugs does not produce significant change in central corneal thickness.

Keywords: Latanoprost, Timolol 0.5%, Central Corneal Thickness

Table 1: Demographic profile

<table>
<thead>
<tr>
<th></th>
<th>Timolol (0.5%)</th>
<th>Latanoprost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>Range 37-77</td>
<td>42-77</td>
</tr>
<tr>
<td></td>
<td>Average 59.1 (± 9.39)</td>
<td>57.5 (± 9.4)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male 68</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Female 44</td>
<td>16</td>
</tr>
<tr>
<td>No. of patients</td>
<td>POAG 87</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>OHT 25</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total 112</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 2: Average pre and post treatment CCT values with Timolol 0.5% and Latanoprost group.

<table>
<thead>
<tr>
<th></th>
<th>Pre treatment</th>
<th>Post treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Timolol</td>
<td>Latanoprost</td>
</tr>
<tr>
<td>Pvalue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>536 ± 37.6</td>
<td>528.6 ± 31.7</td>
</tr>
<tr>
<td></td>
<td>0.25</td>
<td>0.07</td>
</tr>
<tr>
<td>PoAG</td>
<td>553 ± 33.8</td>
<td>526.9 ± 31.1</td>
</tr>
<tr>
<td></td>
<td>0.54</td>
<td>0.23</td>
</tr>
<tr>
<td>OHT</td>
<td>531.1 ± 37.4</td>
<td>539.4 ± 36.7</td>
</tr>
<tr>
<td></td>
<td>0.47</td>
<td>0.29</td>
</tr>
</tbody>
</table>

Table 3: Change in CCT with timolol 0.5% and latanoprost group

|                | Timolol       | Latanoprost   |
| Pvalue         |               |               |
| All            | -2.18 ± 2.6   | -5.3 ± 13.7   |
|                | 0.31          |               |
| PoAG           | -2.4 ± 16.3   | -4.4 ± 13.2   |
|                | 0.37          |               |
| OHT            | -2.1 ± 21.7   | -10.6 ± 17.4  |
|                | 0.05          |               |

Fig 1: Differences in pre and post treatment CCT in Timolol 0.5% and Latanoprost groups with different glaucoma types
Correlation of macular and RNFL thickness on OCT in primary open angle glaucoma

Investigator: Dr. Neetu Asher, Aravind - Tirunelveli
Dr. Jyothi, Aravind - Tirunelveli
Dr. Saurabh Mittal, Aravind - Tirunelveli

Purpose: The study of macular thickness changes in correlation with RNFL thickness changes on OCT in primary open angle glaucoma

Materials and methods

115 eyes of 230 patients (62 normal and 53 glaucomatous) were enrolled. Complete ophthalmic examination including slit lamp examination, gonioscopy, Goldmann applanation tonometry, dilated stereoscopic examination of optic disc, standard automated perimetry and OCT. Optical coherence tomographic imaging of peripapillary RNFL thickness analysis performed with 360° circular scan with a diameter of 3.4mm centered on optic disk and were displayed in three concentric circles, central (1mm) inner (2.22mm) and outer (3.45mm) diameter. The inner and outer circles were divided into four quadrants. OCT imaging of macular thickness measurement were generated using 6 radial scans (each 5.9mm) centered on the fovea. The statistical analysis was done with the help of SPS S 10.0 statistical software.

Results

RNFL thinning and its correlation with macular thickness were found statistically significant for outer zone and average of outer and inner zone in all quadrants in glaucomatous eyes. RNFL and macular thickness in all quadrants were thinner in glaucoma.

Conclusion

Macular thickness changes in correlation with RNFL thickness changes in primary open angle glaucoma with outer zone being more significantly affected were present on optical coherence tomography imaging.

Table 1: RNFL and macular thickness correlation of both groups in different quadrants

<table>
<thead>
<tr>
<th>RNFL thickness</th>
<th>Glaucoma</th>
<th>Normal</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior</td>
<td>81.53±22.4</td>
<td>149.49±22.52</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Inferior</td>
<td>81.94±29.32</td>
<td>122.92±20.09</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Nasal</td>
<td>57.87±15.34</td>
<td>88.77±23.11</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Temporal</td>
<td>54.13±14.89</td>
<td>65.77±13.69</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Macular thickness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sup. inner</td>
<td>254.11±23.62</td>
<td>244.79±23.45</td>
<td>0.076</td>
</tr>
<tr>
<td>Inf. inner</td>
<td>251.38±26.58</td>
<td>257.15±21.19</td>
<td>0.10</td>
</tr>
<tr>
<td>Nas. inner</td>
<td>249.43±20.37</td>
<td>249.6±20.83</td>
<td>0.64</td>
</tr>
<tr>
<td>Tem. inner</td>
<td>241.81±20.88</td>
<td>239.11±18.83</td>
<td>0.63</td>
</tr>
<tr>
<td>Sup. outer</td>
<td>249.68±23.65</td>
<td>265.09±15.09</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Inf. outer</td>
<td>238.13±24</td>
<td>260.3±16.32</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Nas. outer</td>
<td>259.3±20.92</td>
<td>270.28±17.36</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Tem. outer</td>
<td>236.62±19.85</td>
<td>251.3±15.97</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Ave. sup.</td>
<td>250.3±22.36</td>
<td>250.44±17.53</td>
<td>0.049</td>
</tr>
<tr>
<td>Ave. Inf.</td>
<td>244.74±23.05</td>
<td>258.73±17.53</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Ave. Nas</td>
<td>254.33±18.91</td>
<td>259.94±18.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Ave. Tem.</td>
<td>239.27±19.25</td>
<td>245.21±16.13</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Table 2: Correlation between RNFL and macular thickness for superior and inferior quadrants in glaucomatous eyes

<table>
<thead>
<tr>
<th></th>
<th>Sup. inner MT Pearson Correlation</th>
<th>Sup. outer MT Pearson Correlation</th>
<th>Ave. Sup MT Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sup. RNFLT</td>
<td>.228 (.100)</td>
<td>.374** (.006)</td>
<td>.318* (.20)</td>
</tr>
<tr>
<td>Inf. RNFLT</td>
<td>.397** (.003)</td>
<td>.622** (.000)</td>
<td>.552** (.000)</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Patient-reported barriers to glaucoma medication access, use, and adherence in Southern India

Investigators: Krishnadas SR, Aravind - Madurai
Minhee Cho, Department of Ophthalmology, New York
Betsy Sleath, University of North Carolina, USA
Alan Robin, Wilmer Eye Institute, Baltimore

Purpose

The objectives of the study were: (a) to describe the different types of problems that patients in southern India reported having when taking their glaucoma medications and (b) to examine the relationship between patient reported-problems in taking their glaucoma medications and self-reported patient adherence.

Patients and methods

A survey questionnaire was distributed by clinic staff to 243 glaucoma patients who were on at least one glaucoma medication in an eye clinic in southern India.

Statistical methods

Descriptive statistics, Pearson chi-square statistics, and t-tests were used to analyze the data. We used logistic regression to examine how patient characteristics and problems in using glaucoma medications were related to reported adherence.

Results

Found that 42% of patients reported one or more problems in using their glaucoma medications. Seventeen percent of patients reported that it took them more than one hour to get to their pharmacy. Approximately 6% of patients reported being less than 100% adherent in the past week. Unmarried patients and patients who reported difficulty in squeezing the bottle and difficulty in opening the bottle were significantly more likely to report non-adherence.

Conclusions

Patients in India reported many problems with their glaucoma medications. Unmarried patients and patients who reported difficulty in squeezing the bottle and difficulty in opening the bottle were more likely to report non-adherence.

Fig. 1 Factors related to less than 100% adherence to glaucoma meds
Table: Reported problems/difficulties in taking glaucoma medications (N=243)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Percent (N)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drops fall on cheek</td>
<td>8.6 (21)</td>
</tr>
<tr>
<td>Problem paying</td>
<td>21.8 (53)</td>
</tr>
<tr>
<td>Too many drops come out</td>
<td>9.9 (24)</td>
</tr>
<tr>
<td>Can’t get drops in eyes</td>
<td>9.9 (24)</td>
</tr>
<tr>
<td>Side effects</td>
<td>3.3 (8)</td>
</tr>
<tr>
<td>Hard to squeeze the bottle</td>
<td>4.5 (11)</td>
</tr>
<tr>
<td>Difficulty in remembering</td>
<td>10.7 (26)</td>
</tr>
<tr>
<td>Hard to open bottle</td>
<td>2.5 (6)</td>
</tr>
<tr>
<td>Dosage times inconvenient</td>
<td>7.0 (17)</td>
</tr>
<tr>
<td>Other</td>
<td>2.1 (5)</td>
</tr>
</tbody>
</table>

Since patients had one or more problems, 100% adherence could not be reported.

Plasma biomarkers in primary open angle glaucoma - A pilot study and analysis

Investigators: Krishnadas SR, Aravind - Madurai
Sundaresan Periasamy, Aravind Medical Research Foundation
Crabb JW, Cole Eye Institute, USA

Purpose

To develop a blood test for predicting susceptibility to primary open angle glaucoma (POAG) and for monitoring the efficacy of POAG therapeutics.

Methods

Blood was collected from clinically documented POAG and age-matched normal control (CTRL) donors at the Cole Eye Institute, Cleveland Clinic, Louis Stokes Cleveland VA Medical Center and at the Aravind Eye Hospital, Madurai, India.

Plasma were fractionated on C18 reverse phase magnetic beads and analyzed by MALDI TOF/TOF mass spectrometry. Bioinformatic cluster analysis for peptidomic patterns and cross validation was performed with Gene Spring Software.

Results

Plasma from 534 donors was analyzed in this preliminary study. For Indian donors (n = 118), mass spectrometric analyses of 48 POAG and 70 CTRL provided 92% correct prediction as either POAG or normal.

The peptide patterns from Indian and US plasma exhibit distinct differences. Relative to normal controls, the mean intensity of peptide m/z 1895 was elevated about 102% in the Indian POAG plasma and 160% in US POAG plasma while peptide m/z 2020 was reduced by about 30% in the Indian POAG plasma and 85% in the USA POAG plasma. Peptide m/z 1895 and 2020 have been sequenced and determined to be from complement C4 and C3 respectively.

Conclusions

These preliminary results provide proof of principle that plasma peptidomic patterns offer potential utility in predicting POAG susceptibility. Peptidomic pattern differences between USA and Indian plasma may reflect ethnic and environmental differences between the populations. The significance of the elevated complement C4B peptide in POAG plasma remains to be determined. Such findings may provide insights into the mechanism of POAG pathogenesis.
Thinner corneas correlate with severity of glaucomatous optic nerve damage in glaucoma

Investigators: Manju Anil Kumar Pillai, Aravind - Madurai
Pankhuri Johri, Aravind - Madurai
Rakhi Mehta, Aravind - Madurai
Mahalakshmi, Aravind - Madurai
Krishnadas SR, Aravind - Madurai

Purpose
To correlate central corneal thickness with severity of visual field loss in primary open angle glaucoma.

Design
Observational cross sectional study conducted at Aravind Eye Hospital, South India.

Patients and methods
225 eyes of 119 individuals diagnosed as POAG based on optic nerve excavation and open iridocorneal angles were subject to a complete ophthalmologic evaluation including applanation tonometry, central corneal thickness with ultrasound pachymetry and Humphrey achromatic autoperimetry. Patients were categorized into three groups based on mean deviation on autoperimetry: Mild (< -6 dB), moderate (-6 to < -12 dB) and severe (> -12 dB) field defect.

Results
Mean corneal thickness was found to be significantly reduced (p=0.021) in severe field defect group (525+395μ) as compared to moderate (540+353μ) and mild field defect (537+335μ) individuals by independent sample test. Significant difference was also observed between mean corrected IOP and severity of field loss (p=0.002). CCT was significantly thinner and field loss more severe with increasing age.
Conclusions

Thinner corneas are associated with more advanced visual field loss in glaucoma and are likely to reflect susceptibility of optic nerves to glaucomatous damage possibly owing to an abnormal lamina cribrosa.

Corneal thickness vs visual field severity groups (one way ANOVA p=0.021)

<table>
<thead>
<tr>
<th>Visual field severity groups</th>
<th>N</th>
<th>MEAN CCT(µ)</th>
<th>SD</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild damage</td>
<td>81</td>
<td>538</td>
<td>33.5</td>
<td>0.53</td>
</tr>
<tr>
<td>Moderate damage</td>
<td>48</td>
<td>540</td>
<td>35.4</td>
<td>0.53</td>
</tr>
<tr>
<td>Severe damage</td>
<td>96</td>
<td>525</td>
<td>39.5</td>
<td>0.52</td>
</tr>
</tbody>
</table>

CCT vs Corrected IOP - (0.000) – Kruskall-Wallis test

<table>
<thead>
<tr>
<th>Corneal thickness groups</th>
<th>N</th>
<th>Mean IOP</th>
<th>SD</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin cornea</td>
<td>84</td>
<td>21.90</td>
<td>5.0839</td>
<td>20.80</td>
</tr>
<tr>
<td>Adequate cornea</td>
<td>81</td>
<td>20.42</td>
<td>5.8261</td>
<td>19.13</td>
</tr>
<tr>
<td>Thick cornea</td>
<td>60</td>
<td>17.09</td>
<td>5.5387</td>
<td>15.66</td>
</tr>
</tbody>
</table>

IOP Elevation following intravitreal triamcinolone

Investigators: Vidhya Nagasubramanian, Aravind - Madurai
Dhananjay Shukla, Aravind - Madurai
Noela Prasad, Aravind - Madurai
Mahalakshmi, Aravind - Madurai
Chandra Mohan K, Aravind - Madurai
Krishnadas SR, Aravind - Madurai

Purpose
To evaluate the effect of patient age on intraocular pressure (IOP) response after intravitreal injection of triamcinolone acetonide (IVTA).

Design
Interventional case series.

Methods
A total of 164 outpatients (164 eyes) aged 21 to 80 years (mean, 56.8 years), presenting with exudative age-related maculopathy (51) or macular edema of various etiologies (113), received IVTA (4mg/0.1ml). The primary outcome measure was IOP elevation >21mmHg. Patients were re-evaluated at one week, and one, three, and six months.

Results
The mean baseline IOP was 15.07mmHg; and the mean rise was 6.6mmHg. IOP >21mmHg was observed in 42 (25.6%) patients. In the age group <45 years, IOP rise occurred in 45% (14/31) patients, compared with 21% (28/133) of older patients (P _0 .006). The groups were similar in baseline IOP, IOP rise, mean time-lag to maximum IOP, and response to treatment.

Conclusions
IVTA caused more frequent IOP elevation in younger patients; other aspects of IOP response and its treatment were similar to older patients.
Table: Age-wise intraocular pressure profile in patients receiving intravitreal triamcinolone injection

<table>
<thead>
<tr>
<th>Age group in years</th>
<th>No. of Patients</th>
<th>Incidence of IOP &gt;21 mmHg n (%)</th>
<th>Mean Initial IOP mmHg (95%CI)</th>
<th>Mean Pmax in mmHg (95%CI)</th>
<th>Percent IOP Rise (95%CI)</th>
<th>Time in months to Reach Pmax (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤45</td>
<td>31</td>
<td>14(45)</td>
<td>15.68±3.09 (14.55-16.81)</td>
<td>24.76±9.85 (21.15-28.37)</td>
<td>66.19±70.18 (40.45-91.93)</td>
<td>2.45±1.82 (1.78-3.12)</td>
</tr>
<tr>
<td>46-55</td>
<td>42</td>
<td>11(26)</td>
<td>15.90±2.60 (15.09-16.71)</td>
<td>22.12±11.13 (18.65-25.59)</td>
<td>46.32±58.01 (28.24-64.60)</td>
<td>2.81±1.81 (2.25-3.37)</td>
</tr>
<tr>
<td>56-65</td>
<td>47</td>
<td>14(30)</td>
<td>15.38±2.96 (14.51-16.25)</td>
<td>22.98±11.63 (19.57-26.39)</td>
<td>55.04±61.90 (36.87-73.21)</td>
<td>2.55±1.73 (2.04-3.06)</td>
</tr>
<tr>
<td>≥66</td>
<td>44</td>
<td>3(7)</td>
<td>13.52±2.75 (12.68-14.36)</td>
<td>17.61±3.76 (16.47-18.75)</td>
<td>36.41±34.76 (25.84-46.98)</td>
<td>2.23±1.75 (1.70-2.76)</td>
</tr>
</tbody>
</table>

IOP = intraocular pressure; Pmax = maximum IOP recorded during the follow-up; CI = confidence intervals.

Efficacy of intravitreal bevacizumab in management of neovascular glaucoma

Investigators: Neethu Mohan, Aravind - Madurai
Anand Rajendran, Aravind - Madurai
Sharmila, Aravind - Madurai
Krishnadas SR, Aravind - Madurai

Purpose
The study explores the role of intravitreal bevacizumab in the management of neovascular glaucoma.

Methods
A retrospective analysis of 20 eyes of 20 patients with neovascular glaucoma of various etiologies who received intravitreal Bevacizumab was studied. Patients with less than three months follow up were excluded. After an informed consent on the investigational nature of the drug, baseline evaluation of best corrected vision, anterior segment evaluation to assess extent of iris and angle neovascularisation, IOP by applanation and indirect retinal evaluation and anterior segment photograph to document iris new vessels were undertaken. Under topical anaesthesia, after ensuring asepsis, 1.25mg/0.05 ml of Bevacizumab (Avastin, Genentech) was administered as an intravitreal injection in the inferotemporal quadrant. Follow up evaluation included documentation of the extent of iris and angle neovascularisation, best corrected acuity and IOP.

Results
18 males and 2 females in the age range 17-77 years (Mean 54.6 years) were included. 15 eyes (75%) had significant reduction of iris neovascularisation, though two thirds had relapse of rubeosis over a mean period of 5.6 months. Intravitreal Bevacizumab did not significantly influence IOP or visual acuity.
Conclusions

Intraocular Bevacizumab may prove to be an adjuvant in management of neovascular glaucoma, by retarding ocular neovascularisation and antagonizing the effects of vascular endothelial growth factor and in the process contain progressive peripheral anterior synechiae. Although transient, it may have significant regressive effect on ocular neovascularisation facilitating better IOP control or increased success of glaucoma filtering surgery.

Rubeosis Iris - pre injection phase and regression of the new vessels 2 weeks after intravitreal bevacizumab needling revision of failed filtering blebs with adjuvant sub conjunctival 5 flurouracil

Investigators: Sharmila R, Aravind - Madurai
Prashanth, Aravind - Madurai
Anoop Thomas, Aravind - Madurai
George V Puthuran, Aravind - Madurai

Purpose

To evaluate the safety and efficacy of bleb needling with 5 Flurouracil in failing filtering surgeries (Trabeculectomies and glaucoma phaco triple surgeries).

Patients and Methods

A retrospective observational study of 25 eyes of 25 patients with impending bleb failure following trabeculectomy or phaco-trabeculectomy subject to bleb needling with adjuvant subconjunctival administration of 5 flurouracil were analysed. Patients with patent sclerostomy on gonioscopic evaluation and IOP considered inadequate to prevent further progression of optic nerve damage after laser suture lysis and additional medical treatment were recruited.

Results

21 males and 4 females in the age range 7-67 years (mean 44.9) with glaucoma of various types were analysed. The mean IOP at three months from Bleb needling procedure was 21.36mmHg (Range 14-36mm), a fall of 10.54mmHg from a pre operative mean of 31.9mmHg (Range 18-56mm). The mean time elapsed between primary surgery and bleb revision was 12.24 weeks (range 6-44) and the mean number of medications required post needling was 1.24 (Range 0-2), a reduction of 0.84 from pre needling phase (range 1-3). A total of 16 eyes (64%) achieved complete or partial success with IOP < 21mmHg following bleb revision with 5 flurouracil. No major complications were encountered.

Conclusion

Bleb needling for impending bleb fibrosis following filtering surgery, when combined with subconjunctival flurouracil may further serve to control IOP with or without additional ocular hypotensive medications, in two thirds of patients. The procedure is relatively safe and may reduce the need for glaucoma medications.

Efficacy of topical dorzolamide as compared to brimonidine in prevention of post operative IOP spike following trabeculectomy combined with phacoemulsification and foldable IOL implantation

Investigators: Vaishnavi, Aravind - Madurai
George V Puthuran, Aravind - Madurai

Purpose

To evaluate the intraocular pressure (IOP) lowering effect of dorzolamide as compared to Brimonidine in the immediate post operative phase (6 and 24 hours) following trabeculectomy combined with phacoemulsification and foldable intraocular lens implantation.

Patients and Methods

100 eyes of 100 consecutive individuals with primary open angle or exfoliative glaucoma with definitive glaucomatous damage and visually significant cataracts scheduled for trabeculectomy combined with
phacoemulsification and foldable IOL implantation were randomised to receive either 0.2% brimonidine or 2% dorzolamide immediately at completion of surgery. Intraocular pressures were measured by applanation at 6 and 24 hours following surgery by a masked observer. Student’s test and Mann Whitney U test were used for statistical analysis.

Results

There was no statistical difference between the two treatment groups with regard to pre operative IOP (p=0.705) as well as post operative IOP at 6 and 24 hours (p=0.866 and p=0.668, respectively).

Conclusions

0.2% Brimonidine and 2% Dorzolamide significantly reduced IOP after a single instillation following trabeculectomy and phacoemulsification and foldable IOL implantation. Both Brimonidine and dorzolamide were equally effective in preventing post operative IOP spike following trabeculectomy and IOL implantation in eyes with primary open angle or exfoliative glaucoma.

Relationship of intraocular pressure to postural change in Southern Indian patients with and without glaucoma

Investigators: Dr. Rengaraj Venkatesh, Aravind - Puducherry
Dr. Santosh Gupta, Aravind - Puducherry
Dr. Marlene Moster, Wills Eye Institute, Philadelphia
Dr. Mushifur Rehman, Wills Eye Institute, Philadelphia

Purpose

To evaluate postural intraocular pressure (IOP) change in patients with and without glaucoma.

Design

Prospective, comparative case controlled study, with patients randomized to either IOP measured first in sitting or in supine position.

Methods

Of the 54 patient’s (108 eyes) group 1 with POAG and PACG will be compared to 53 patients (106 eyes) group 2 without glaucoma. Patients randomized either to IOP measured first in supine Vs. sitting position with Tonopen. Demographics including age, sex, type of glaucoma documented.

Results

Mean age was 54 years (SD 9.9 years). Mean IOP was 17.12 (SD 4.89). Supine increase IOP 1.75 unit more than sitting after adjusting for age, sex and type of glaucoma (p<0.01). Patient with POAG or PACG, IOP increases 3.68 or 6.68 respectively when compared to patients without glaucoma (p<0.01).

Conclusion

There is a significant postural change in IOP and it also depends upon type of glaucoma.

Table 1: Demographic characteristics of the patients

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Values</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>1</td>
<td>61</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>46</td>
<td>43</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>0</td>
<td>53</td>
<td>49.53</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>41</td>
<td>38.32</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>13</td>
<td>12.15</td>
</tr>
<tr>
<td>Residence</td>
<td>1</td>
<td>37</td>
<td>34.58</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>70</td>
<td>65.42</td>
</tr>
<tr>
<td>Order</td>
<td>1</td>
<td>63</td>
<td>58.88</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>44</td>
<td>41.12</td>
</tr>
</tbody>
</table>
Table 2: Maximum likelihood estimates of the parameters using ANCOVA model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>T value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>7.408392</td>
<td>3.463649</td>
<td>2.139</td>
<td>0.03*</td>
</tr>
<tr>
<td>Age</td>
<td>-0.028593</td>
<td>0.022541</td>
<td>-1.268</td>
<td>0.21</td>
</tr>
<tr>
<td>Sex 2</td>
<td>-0.004165</td>
<td>0.443004</td>
<td>-0.009</td>
<td>0.99</td>
</tr>
<tr>
<td>Gla 1</td>
<td>3.167379</td>
<td>0.479077</td>
<td>6.611</td>
<td>&lt;0.01**</td>
</tr>
<tr>
<td>Gla 2</td>
<td>6.677079</td>
<td>0.676785</td>
<td>9.866</td>
<td>&lt; 0.01**</td>
</tr>
<tr>
<td>Eye left</td>
<td>0.135209</td>
<td>0.414007</td>
<td>0.327</td>
<td>0.74</td>
</tr>
<tr>
<td>Sit-sup supine</td>
<td>1.747664</td>
<td>0.414004</td>
<td>4.221</td>
<td>&lt;0.01**</td>
</tr>
<tr>
<td>CCT</td>
<td>0.015580</td>
<td>0.005675</td>
<td>2.745</td>
<td>&lt;0.01**</td>
</tr>
<tr>
<td>Order 2</td>
<td>-0.548398</td>
<td>0.430565</td>
<td>-1.274</td>
<td>0.20</td>
</tr>
<tr>
<td>Res 2</td>
<td>0.081664</td>
<td>0.479612</td>
<td>0.170</td>
<td>0.86</td>
</tr>
</tbody>
</table>

Factors associated with patients' adherence to anti-glaucoma therapy in South India

Investigators: Dr. Rengaraj Venkatesh, Aravind - Puducherry
Dr. Thangavel Tirumalai Kumar, Aravind - Puducherry
Dr. Ravilla D. Ravindran, Aravind - Puducherry
Dr. Alan L. Robin, Aravind - Puducherry

Aim
To determine the factors associated with patients’ adherence to anti-glaucoma medication regimens in South India.

Objectives
- To ascertain the socio-economic and demographic profile of patients attending glaucoma clinics.
- To assess the pattern of anti-glaucoma medication procurement and usage (i.e. Medication regimen used, medication procurement, medication instillation)
- To study financial, physical, and other barriers to good medication adherence.
- To assess patients’ level of adherence to prescribed medication regimen.
- To study strategies to facilitate better adherence to medication regimen (e.g. Enabling patients to pick up medication supply at office)

Design
Hospital / clinic based interview survey

Participants and methods
Physician’s experience and anecdotal information was used to design a questionnaire covering all the objectives to find out the adherence of antiglaucoma therapy. A trained counsellor did the interview on 318 patients attending the glaucoma clinic in Aravind eye hospital, Puducherry. All the 318 patients were established patients of glaucoma and attending the glaucoma clinic for more than a year. Main outcome measure: self-reported adherence to anti-glaucoma therapy.

Results
Of the 318 patients 59.4% surveyed were male, and 40.6% were female. Age of patients surveyed ranged from 18 to 81. Mean age = 58.6 (SD-11.3). More than 70% of the patients were from urban and 18% of the patients were from rural. Patients on one medication were 70%, two medications were 30%, and 9% taking three medications. Physical dependency on others to administer medications was 37.4% and 55.7% of patients reported taking medications for other medical problems, with high blood pressure and diabetes medications being the most common. Financial dependency on others for purchasing medications was 20.1% and 68.8% of dependent patients reported that they do mind bothering the person who helps financially to get the medication. 27.4% of
patients reported glaucoma medication costs as a burden. 64.5% reported that they would prefer to receive a sufficient amount of medications to last to their next visit.

**Conclusion**

Cost, obtaining medications and self-sufficiency are burdens for adherence to anti-glaucoma therapy.

<table>
<thead>
<tr>
<th>Money in Rupees (Rs.)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-500 Rs.</td>
<td>35.2%</td>
</tr>
<tr>
<td>50-200 Rs.</td>
<td>21.7%</td>
</tr>
<tr>
<td>&lt;50 Rs.</td>
<td>25.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational Status</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>8.8%</td>
</tr>
<tr>
<td>Elementary School</td>
<td>31.8%</td>
</tr>
<tr>
<td>High School</td>
<td>34.6%</td>
</tr>
<tr>
<td>Graduate</td>
<td>24.9%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Glaucoma Medicine</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timolol</td>
<td>59.7%</td>
</tr>
<tr>
<td>Latanoprost</td>
<td>22.6%</td>
</tr>
<tr>
<td>Betaxolol</td>
<td>13.5%</td>
</tr>
<tr>
<td>Brimonidine</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

**Objective**

Glaucoma is estimated to affect 12 million Indians; it is responsible for 12.8% of the total blindness in the country and it is considered to be the third most common cause of blindness in India. Prevalence of glaucoma in India is around 2.6%-4.1%. The only way at present for screening glaucoma is by routine ophthalmic examination (opportunistic screening), which basically needs a lot of awareness. But the awareness of glaucoma in urban India is as low as 2.3%. So we wanted to assess the level of awareness of glaucoma in an urban and rural population in Puducherry State of southern India.

**Design**

Population based cross sectional interview survey.

**Participants and Methods**

An interview was conducted in a total of 1024 subjects above the age of 35 years. Trained field investigators did interview with a questionnaire developed to assess the awareness of glaucoma. Of the 1024 subjects, 521 (50.88%) were from rural area and 503 (49.12%) were from urban area.

**Results**

Mean age of the subjects interviewed was 54.0±12.6 years, which ranged from 35 to 95. Awareness of glaucoma was found only in 48 (4.69%) subjects. Out of 48 people who were aware of glaucoma, 35 (72.92%) were from urban and 13 (27.08%) were from rural. Percentage of awareness comparing Urban Vs Rural is 6.95% Vs 2.49%. Multivariate analysis revealed that subjects in the elderly age group (>50 years) and subjects with more than high school education were more aware of glaucoma. The awareness knowledge was limited to “high
pressure in the eye” in 75% of the subjects. Around 50% of the subjects were aware of glaucoma from visiting an ophthalmologist for a routine eye check-up, 25% were aware from friend/relative/family member suffering from glaucoma and 25% from television/magazine/other media.

Conclusions

Awareness of glaucoma is poor in the urban and rural areas of southern India. The data suggest the need for community-based health education programmes to increase the level of awareness and knowledge about glaucoma. Such awareness and knowledge could lead to better understanding and acceptance of the importance of routine eye examinations for the early detection and treatment of glaucoma, thereby reducing visual impairment in this population.

Table 1: (Awareness of cataract, glaucoma, diabetes and diabetic retinopathy with age)

<table>
<thead>
<tr>
<th>Age</th>
<th>Cataract Rural (%)</th>
<th>Cataract Urban (%)</th>
<th>Glaucoma Rural (%)</th>
<th>Glaucoma Urban (%)</th>
<th>Diabetes Rural (%)</th>
<th>Diabetes Urban (%)</th>
<th>DR Rural (%)</th>
<th>DR Urban (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>31 (38.3)</td>
<td>31 (40.8)</td>
<td>3 (3.7)</td>
<td>6 (7.9)</td>
<td>25 (30.9)</td>
<td>29 (38.2)</td>
<td>2 (10.0)</td>
<td>11 (52.4)</td>
</tr>
<tr>
<td>41-50</td>
<td>59 (36.0)</td>
<td>75 (45.5)</td>
<td>4 (2.4)</td>
<td>12 (7.3)</td>
<td>41 (25.0)</td>
<td>82 (49.7)</td>
<td>9 (33.3)</td>
<td>25 (46.3)</td>
</tr>
<tr>
<td>51-60</td>
<td>47 (43.5)</td>
<td>56 (49.6)</td>
<td>1 (0.9)</td>
<td>9 (8.0)</td>
<td>31 (28.7)</td>
<td>56 (49.6)</td>
<td>7 (33.3)</td>
<td>24 (60.0)</td>
</tr>
<tr>
<td>61-70</td>
<td>72 (63.2)</td>
<td>47 (56.0)</td>
<td>3 (2.6)</td>
<td>6 (7.1)</td>
<td>31 (27.2)</td>
<td>26 (31.0)</td>
<td>4 (19.0)</td>
<td>8 (42.1)</td>
</tr>
<tr>
<td>&gt;70</td>
<td>34 (63.0)</td>
<td>38 (58.5)</td>
<td>2 (3.7)</td>
<td>2 (3.1)</td>
<td>10 (18.5)</td>
<td>21 (32.3)</td>
<td>2 (28.6)</td>
<td>7 (43.8)</td>
</tr>
</tbody>
</table>

Table 2: (Awareness of cataract, glaucoma, diabetes and diabetic retinopathy with gender)

<table>
<thead>
<tr>
<th>Sex</th>
<th>Cataract Rural (%)</th>
<th>Cataract Urban (%)</th>
<th>Glaucoma Rural (%)</th>
<th>Glaucoma Urban (%)</th>
<th>Diabetes Rural (%)</th>
<th>Diabetes Urban (%)</th>
<th>DR Rural (%)</th>
<th>DR Urban (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>114 (49.6)</td>
<td>116 (54.2)</td>
<td>6 (2.6)</td>
<td>16 (7.5)</td>
<td>65 (28.3)</td>
<td>103 (48.1)</td>
<td>14 (30.4)</td>
<td>39 (48.8)</td>
</tr>
<tr>
<td>Female</td>
<td>129 (44.3)</td>
<td>131 (45.3)</td>
<td>7 (2.4)</td>
<td>19 (6.6)</td>
<td>73 (25.1)</td>
<td>111 (38.4)</td>
<td>10 (20.0)</td>
<td>36 (51.4)</td>
</tr>
</tbody>
</table>

Table 3: (Awareness of cataract, glaucoma, diabetes and diabetic retinopathy with education)

<table>
<thead>
<tr>
<th>Educat</th>
<th>Cataract Rural (%)</th>
<th>Cataract Urban (%)</th>
<th>Glaucoma Rural (%)</th>
<th>Glaucoma Urban (%)</th>
<th>Diabetes Rural (%)</th>
<th>Diabetes Urban (%)</th>
<th>DR Rural (%)</th>
<th>DR Urban (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>77 (44.3)</td>
<td>33 (44.6)</td>
<td>1 (0.6)</td>
<td>-</td>
<td>24 (13.8)</td>
<td>9 (12.2)</td>
<td>2 (15.4)</td>
<td>-</td>
</tr>
<tr>
<td>Element</td>
<td>43 (44.3)</td>
<td>33 (42.9)</td>
<td>4 (4.1)</td>
<td>1 (1.3)</td>
<td>19 (19.6)</td>
<td>17 (22.1)</td>
<td>1 (7.1)</td>
<td>1 (10.0)</td>
</tr>
<tr>
<td>High School</td>
<td>102 (49.3)</td>
<td>116 (46.0)</td>
<td>4 (1.9)</td>
<td>16 (6.3)</td>
<td>74 (35.7)</td>
<td>116 (46.0)</td>
<td>14 (26.9)</td>
<td>38 (50.7)</td>
</tr>
<tr>
<td>Higher second/Diploma</td>
<td>12 (41.4)</td>
<td>40 (67.8)</td>
<td>-</td>
<td>7 (11.9)</td>
<td>11 (37.9)</td>
<td>43 (72.9)</td>
<td>5 (55.6)</td>
<td>22 (62.9)</td>
</tr>
<tr>
<td>Graduat.</td>
<td>6 (60.0)</td>
<td>15 (55.6)</td>
<td>2 (20.0)</td>
<td>5 (18.5)</td>
<td>7 (70.0)</td>
<td>20 (74.1)</td>
<td>1 (16.7)</td>
<td>9 (50.0)</td>
</tr>
<tr>
<td>Post grad. &amp; Above</td>
<td>3 (75.0)</td>
<td>10 (71.4)</td>
<td>2 (50.0)</td>
<td>6 (42.9)</td>
<td>3 (75.0)</td>
<td>9 (64.3)</td>
<td>1 (50.0)</td>
<td>5 (71.4)</td>
</tr>
</tbody>
</table>

Post Graduates and above had good knowledge about eye diseases
Table 4: Awareness of glaucoma

<table>
<thead>
<tr>
<th>What is Glaucoma</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>High pressure in the eye</td>
<td>10 (76.9)</td>
<td>27 (77.1)</td>
</tr>
<tr>
<td>Disease where nerve of the eye becomes weak</td>
<td>1 (7.7)</td>
<td>2 (5.7)</td>
</tr>
<tr>
<td>Damage to the nerve of eye because of high pressure</td>
<td>-</td>
<td>5 (14.3)</td>
</tr>
<tr>
<td>Age related process leading to decrease in vision</td>
<td>2 (15.4)</td>
<td>1 (2.9)</td>
</tr>
<tr>
<td>How did you come to know about Glaucoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ophthalmologist</td>
<td>8 (61.5)</td>
<td>16 (45.7)</td>
</tr>
<tr>
<td>Eye Camp</td>
<td>-</td>
<td>1 (2.9)</td>
</tr>
<tr>
<td>Family / Relatives / Friends</td>
<td>2 (15.4)</td>
<td>2 (25.7)</td>
</tr>
<tr>
<td>Television / Magazine / Other Media</td>
<td>3 (23.1)</td>
<td>9 (25.7)</td>
</tr>
<tr>
<td>Will the vision be affected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10 (76.9)</td>
<td>30 (85.7)</td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>2 (5.7)</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>3 (23.1)</td>
<td>3 (8.6)</td>
</tr>
<tr>
<td>According to you, can it be treated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5 (38.5)</td>
<td>28 (80.0)</td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>8 (61.5)</td>
<td>7 (20.0)</td>
</tr>
<tr>
<td>Can the vision be reverted back after treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (30.8)</td>
<td>4 (11.4)</td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>7 (20.0)</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>9 (69.2)</td>
<td>24 (68.6)</td>
</tr>
</tbody>
</table>

Safety and efficacy of manual small incision cataract surgery for phacolytic glaucoma

Investigators: Rengaraj Venkatesh, MD1, Aravind - Puducherry
Colin S.H. Tan, MBBS, MMed (Ophth), MRCSed2,
Thangavel Thirumalai Kumar, MD1, Aravind - Puducherry
Ravilla D. Ravindran, MD1, Aravind - Puducherry

Aims
To evaluate the safety, visual outcome and complications of Manual Small Incision Cataract Surgery (MSICS) in the treatment of patients with phacolytic glaucoma.

Methods
In a nonrandomized interventional case series, 33 consecutive patients with phacolytic glaucoma underwent cataract extraction by MSICS, with staining of the anterior capsule by trypan blue.

Results
The mean preoperative IOP was 46.2mmHg. No significant intraoperative complications such as posterior capsule rupture or expulsive hemorrhage occurred. In 31 patients (93.9%), an intraocular lens (IOL) was implanted in the posterior chamber. In 2 of 33 patients (6.1%), the posterior capsule was removed and the patient was left aphakic because of severe pre-existing zonulysis. The postoperative best-corrected visual acuity was 20/60 or better in 29 cases (87.9%). The IOP was 22mmHg or less in all 33 cases without the use
of anti-glaucoma medications and the mean IOP was 15.1mmHg (range, 7-22, SD + 3.9). Postoperative corneal edema occurred in 11 cases (33.3%) and anterior chamber inflammation was present in 9 cases (27.3%). Both conditions resolved with standard medical therapy.

Conclusion

Manual Small Incision Cataract Surgery with trypan blue staining of the anterior capsule is a safe and effective method of cataract extraction for patients with phacolytic glaucoma.

Self-reported barriers and strategies to better follow-up among glaucoma patients in South India

Investigators: Dr. P. Sathyan, Aravind - Coimbatore
Dr. Alan Robin, Wilmer Eye Institute, Baltimore
Mr. Bradford Lee
Dr. M.B. Madhuri, Aravind - Coimbatore
Mr. Rajesh K. John, Aravind - Coimbatore
Dr. Kuldev Singh, Aravind - Coimbatore

Purpose

To identify the key barriers contributing to poor attendance for follow-up glaucoma examinations (FGEs) in South India

Design

Prospective non-interventional case-control study

Methods

300 patients with primary glaucoma of whom 150 who did and 150 who did not attend follow-up glaucoma examinations (FGEs) were first asked to identify all significant barriers that prevented them from attending their FGE and then asked to identify the most important barrier to attending follow-up.

Results

Of the 300 patients enrolled in the study, 226 (75.3%) patients failed to attend at least one FGE and collectively cited 405 barriers for an average of 1.8 barriers per person. Figure 1 & 2 shows the barriers for not attending FGS. 192 (64.0%) patients reported visit by mobile van to their area of residence, 133 (44.3%) patients reported a vision station in their local district, and 99 (33.0%) said a reminder a week before their FGE would be helpful.

Fig 1. Barriers/Reasons for not attending FGEs

Fig 2. Most important barrier/reason for not attending FGE
Conclusion

Despite current counselling efforts, many patients still fail to appreciate the importance of regular FGEs in preventing disease progression and irreversible vision loss. Attention should be given to providing more effective counselling, which may provide additional benefits in reducing other classes of barriers, such as incidental obligations and time/inconvenience barriers. Medical fees, lost wages, and transportation difficulties were reported to be less important reasons for FGE non-attendance.

Consensual Ophthalmotonic Reaction (COR) following trabeculectomy/phacotrabeculectomy

Investigators: Dr. P. Sathyan, Aravind- Coimbatore
Dr. S. Guhapriya, Aravind- Coimbatore
Dr. Ganesh V Raman, Aravind- Coimbatore
Dr. V. Parag, Aravind- Coimbatore

Purpose

To analyze the intraocular pressure change of the contralateral eye of patients undergoing trabeculectomy / Phacotrabeculectomy.

Design

Prospective comparative observational study.

Methods

Fifty eyes of patients with POAG (84%) and PXFG (10%) and NTG (6%) undergoing trabeculectomy / phacotrabeculectomy were included.

Results

Right eye was operated in 21 (42.0%) cases. The preoperative mean baseline IOP among the operated eye was 21.7 ± 7.6 mmHg corresponding to 18.0 ± 4.5 mmHg in the other eye. In the operated eye a decrease in IOP was noted in 41 (82.0%) eyes, no change in 3 eyes, increase in 6 (12.0%) eyes. The reduction in the intraocular pressure was statistically significant (p<0.0001). The reduction in the IOP in the contralateral eye however was not statistically significant (p=0.645) when analyzed separately. Of the contralateral eyes 22 (44.0%) eyes had a reduction in IOP, 24 (48.0%) eyes had increase in IOP while 4 (8.0%) eyes did not show any change. When the magnitude of change of IOP was compared between the operated and their corresponding un-operated eyes, the difference was statistically significant (p<0.0001).

Conclusion

Although COR leads to a reduction in IOP in the other eye our study did not observe such an event in all patients; therefore the un-operated eye should also be closely monitored.

Macular thickness variability in primary open angle glaucoma patients using optical coherence tomography

Investigators: Dr. P. Sathyan, Aravind- Coimbatore
Dr. Anjali Sharma, Aravind- Coimbatore
Dr. Ganesh V Raman, Aravind- Coimbatore
Dr. V. Parag, Aravind- Coimbatore
Dr. M.B. Madhuri, Aravind- Coimbatore

Purpose

To evaluate the structural asymmetry of macula using OCT in primary open angle glaucoma patients and normal subjects.

Design

Prospective observational case controlled study.
Methods
Of 36 subjects recruited 19 were POAG and 17 controls. Subjects underwent fast macular thickness scan ocular imaging with dilated pupil using the commercially available STRATUS OCT MODEL 300 OCT.

Results
The mean age was 50.1 ± 5.4 years. 66.7% of patients were male. The study groups were balanced in terms of age and gender. The macular thickness was statistically significantly reduced in the POAG group (p<0.0001). The average inner macular thickness was 236.7±16.1µm among the POAG eyes corresponding to 256.2±9.6µm among the control eyes. The outer macular thickness in temporal, superior, nasal and inferior is given in Table 1 below.

Table 1. Comparison of outer macular thickness between the study groups

<table>
<thead>
<tr>
<th>Outer Macular Thickness</th>
<th>Group</th>
<th>POAG</th>
<th>Control</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Temporal</td>
<td>199.74</td>
<td>12.4</td>
<td>223.84</td>
<td>14.8</td>
</tr>
<tr>
<td>Superior</td>
<td>217.03</td>
<td>14.0</td>
<td>235.52</td>
<td>13.3</td>
</tr>
<tr>
<td>Nasal</td>
<td>231.68</td>
<td>18.0</td>
<td>253.45</td>
<td>11.6</td>
</tr>
<tr>
<td>Inferior</td>
<td>203.58</td>
<td>22.8</td>
<td>230.68</td>
<td>14.5</td>
</tr>
</tbody>
</table>

Reduction of macular thickness at the inferior and outer macular region was statistically significant (p<0.0001) between POAG eyes (203.6±22.8mm) and control eyes (230.7±14.5mm).

Conclusion
The macular thickness was statistically reduced significantly in the POAG eyes (p<0.0001) in all regions and mean macular thickness were found to be significantly reduced.

ORBIT SERVICES

Comparative study of the success rate of laser DCR with or without use of aluminum foil coated protectors for middle turbinate

Investigator : Dr. Usha Kim, Aravind - Madurai
Co-Investigator : Dr. Shiva Yogi, Aravind - Madurai
Duration : 2007-2008

Purpose
The purpose of this study is to compare the success rate of laser DCR with or without use of aluminium foil coated protectors for middle turbinate.

The use of trans-canaliculcular laser DCR (DIODE) for chronic dacryocystitis treatment has been recently tried. However, the success rate of this laser DCR procedure compared with the gold standard external DCR are quite low (<50%). This low success rate has been attributed to hypertrophy of middle turbinate at the osteotomy site which closes the small laser osteotomy. We propose to use an endo-nasal approach to cover the middle turbinate with aluminum foil protectors. This will be done after packing the nasal cavity and before the laser burns are applied. By the use of this modification, we expect to improve the surgical outcome of the laser DCR procedure.

Use of proven materials only will be allowed for coating the middle turbinate. Surgical method chosen for study purpose is well established in human subjects.

Clinical study conducted
Dacryocystorhinostomy: A comparision of external versus transcanaliculcular endolaser DCR
Aims and objectives
- To compare external dacryocystorhinostomy with endoscopic assisted endolaser (diode, 980nm) dacryocystorhinostomy in terms of success rate and complications
- To evaluate the outcome of the two procedures on a subjective and anatomical basis

Materials and methods
- A prospective non-randomised clinical intervention study which was carried out in the department of Orbit and Oculoplasty, Aravind Eye Hospital and Post Graduate Institute of Ophthalmology, Madurai.
- The duration of the study was from May 2007 to October 2007.
- Twenty five consecutive patients for each procedure were offered the respective surgery based on inclusion and exclusion criteria.

Discussion
Our study shows that the DCR done externally has a higher success rate of 100% (92%-full success and 8%-partial success), while the DCR done internally using laser has a success rate of 88% (84%-full success and 4%-partial success), but the difference was statistically significant. Injection Botox A for facial dyskinesia

The efficacy of botulinum toxin (type A) in the management of facial dystonias. This is a prospective interventional analysis of efficacy of Botulinum toxin (type A) in the management of facial dystonias from May 2006 - August 2007. A total number of 25 patients were included in the study. The botulinum toxin type A (100 IU) was reconstituted with sterile, non-preserved 0.9% saline. 100 IU was mixed with 4ml of NaCl to get 2.5IU in 0.1 ml. It was stored in a refrigerator at 4°C. Peak action of the drug in 92% of the patients was before 10 days. According to the Jankovick grading that was used in our study there were 22 (88%) moderate cases, 2 (8%) were mild and 1 (4%) were severe. Duration of action of the drug was between 3-4 months after which a repeat injection in needed. In our study 2 (8%) had ptosis, 1 (4%) had lower lid sagging and 22 (88%) had no complications.

National retinoblastoma registry
Investigator : Dr. Usha Kim, Aravind - Madurai
Co-investigator : Dr. R. Kim, Aravind - Madurai
Funded by : Indian Council of Medical Research (ICMR)
Duration : 36 months

Purpose
The purpose of this study is to have a uniform, national, hospital based registry which will have a reliable database for all patients of retinoblastoma. The various parameters like age, sex, area, and staging of the disease, histological typing, uniform treatment protocol and response to treatment will be assessed.

Pediatric tumours are emerging as a national priority as they are curable in nature. The importance of this research proposal is that retinoblastoma is a treatable disease. The epidemiology of the disease has to be studied and this will enable us to identify the research areas in retinoblastoma and plan strategies to decrease the mortality and increase the globe salvage rate. The overall aim of the research is to start a National Retinoblastoma Registry where retinoblastoma cases will be uniformly recorded from various centres treating retinoblastoma.

Inclusion of all patients will be after taking informed consent from the parents. Standard protocol of management will be followed after receiving informed consent. In so doing all centres involved in retinoblastoma management will be able to share and gain in all aspects of management of this potentially curable childhood cancer.
PAEDIATRIC OPHTHALMOLOGY SERVICES

How valid (sensitive and specific) is teacher’s screening for refractive errors as compared to that done by trained refractionists?

Principal Investigator : Dr. P. Vijayalakshmi, Aravind - Madurai
Field co-ordination, training, data collection : Dr. Muralidhar, Aravind - Madurai

Objectives
- To determine the agreement, sensitivity and specificity of screening for refractive errors by teachers, using that done by refractionists as the gold standard.
- To compare agreement, specificity and sensitivity of screening using ETDRS 6/9.5 versus Snellens 6/9 tumbling E optotypes.
- Determine the sensitivity and specificity of the screening test versus objective cycloplegic refraction in identifying children with refractive errors.

Sample (selection and recruitment)
All children at the school between 5-10 years of age are included; the children who require atropinization for cycloplegia, those unwilling or uncooperative for the complete examination, and those absent from the school on the day of screening are excluded.

To detect a 5% difference between the proportion of children deemed ‘passed’ among each pair of the 3 arms, with 95% confidence and 80% power, we need to study 1000 children. The ‘Phase 2’, where we intend validating screening for refractive errors against objective cycloplegic refraction require 655 children to be examined to detect a 5% difference in ‘passes’ with 95% confidence and 80% power.

Dissemination plan
- Feedback on the usefulness of snellen’s tumbling E for screening will be provided to all teachers who participated.
- Results of the study will be provided to all refractionists, doctors, school authorities and teachers involved in school screening through AECS.

Screening for 1000 children in for the blind schools (one year project)

Principal investigator : Dr. P. Vijayalakshmi, Aravind - Madurai
Co investigator : Dr. Ilango, Aravind - Madurai

Major objectives
- To identify children having low vision with potential sight who are under curriculum for the blind.
- To provide low vision devices
- To facilitate and transfer these children into integrated education schools

Methodology
To survey the blind schools and collect data from the Madurai service area using standard WHO format Inclusive/exclusive criteria.

Expected outcome
- Avoiding needless childhood blindness

Optic atrophy in children in South India

Potential Collaborators : Dr. Shashikant Shetty, Aravind - Madurai
                       Dr. Mahesh Kumar, Aravind - Madurai
                       Dr. P. Vijayalakshmi, Aravind - Madurai

Sample : (Selection and recruitment) Retrospective
OBJECTIVES
Proposal

Optic atrophy is atrophy of the optic nerve seen as a pale or white disc on fundus examination. It usually corresponds to a fall in visual acuity, which may be marked, and irreversible, making the patient permanently blind. Hence, it is important to detect and treat cases which may lead to optic atrophy, and also detect optic atrophy in its early stage, so that any treatable causes are tackled effectively and at an early stage with the hope of preserving the remaining vision.

A study on optic atrophy in children only has not been done in India, especially in South India. A study on optic atrophy involving all age groups was done about 35 years ago in North India.

A study on optic atrophy in children in South India was felt useful because
- Such a study focusing solely on children in South India has not been done so far.
- Though a study on optic atrophy involving all age groups was done, it was done in North India 35 years ago.
- It is well known that different geographical areas have different prevalence of various diseases. The incidence of the various diseases responsible for optic atrophy may be different in South India as compared to that in North India, as the two areas are separated by a large land mass.
- The previously mentioned study was done 35 years ago. The incidence of various diseases even at the same place changes over time. Diseases such as smallpox, which were once rampant, have become either rare or extinct. New diseases, such as AIDS, have made their appearance.
- Neuro-imaging was not done routinely in the past due to limited availability and limited development of technology. The scenario in this respect has also changed now.
- In view of all this, a fresh study on the incidence of various diseases and factors leading to Optic atrophy, especially in a tertiary care hospital in South India was felt useful.
- Through such a study, we will know which are the most common diseases and factors currently responsible for optic atrophy in children, and accordingly, when a new case is seen, we will be able to focus on the important aspects during history taking, clinical examination and requisitioning the appropriate laboratory and neuro-imaging tests for optimal patient care.

Clinical profile with ocular and oculocutaneous albinism at a tertiary care center

Investigators : Dr. Jothi Prakash, Aravind - Madurai
            Dr. Muralidhar, Aravind - Madurai
            Dr. P. Vijayalakshmi, Aravind - Madurai

Duration : March 2007 - August 2008

Purpose

To document the various clinical features in patients with ocular and oculocutaneous albinism presenting in our outpatient department from March 2007 to August 2008, in a tertiary care hospital.

Methods

A prospective observational study carried out in a group of 40 patients of ocular and oculocutaneous albinism taking into account the visual acuity, family history, anterior and posterior segment examination, ocular movements, presence or absence of foveal hypoplasia confirmed by 3D OCT, cutaneous involvement (if present) and treatment taken in the form of surgery or spectacle correction.

Results

The results of the study would be interpreted on the basis of the following parameters like gender predisposition, presence or absence of family history, age group affected, cut off visual acuity, anterior segment findings, normal or abnormal ocular motility, fundus showing presence or absence of albinoid fundus with or without foveal hypoplasia, presence or absence of cutaneous involvement.
Role of patient counselling on visual experiences in patient's undergone phacoemulsification under topical anaesthesia

Investigators: Aravind Haripriya, Aravind - Madurai
Colin S.H. Tan
Venkatesh Rengaraj
Srinivasan Aravind, Aravind - Madurai
Anand Dev, Aravind - Madurai
Kah Guan Au Eong

Objective

To determine whether preoperative counselling on the potential intraoperative visual perceptions during cataract surgery under topical anaesthesia (TA) helps reduce the fear experienced by patients during the surgery.

Methods

Prospective, double-masked, randomised controlled trial. Prior to surgery, patients were randomised by a random number table to one of two groups in a 2:1 allocation ratio - those who received additional counselling and those not counselled. The counselled group received additional counselling on potential visual experiences during cataract surgery.

Results

Of the 851 patients, 558 (65.6%) were randomized to receive preoperative counselling while 293 (34.4%) were not counselled. For all patients, a lower proportion of the group which received additional preoperative counselling were frightened by the perception of light, colors, movement, flashes and instruments compared to the group of patients who were not counselled. The difference was statistically significant for light perception, colors and movement (Table). In addition, the mean fear score for every visual sensation was lower in the group that was counselled compared to those without preoperative counselling, although the difference was significant only for light, colors and movement.

In summary, our study demonstrates that preoperative counselling on the possible intraoperative visual sensations during cataract surgery under topical anaesthesia reduces both the proportion of patients who are frightened as well as the mean fear score.

Evaluation of a capsule cleaning device on lens epithelial cells in rabbits

Investigators: Aravind Haripriya, Aravind - Madurai
Chandrakanth Reddy, Aravind - Madurai
Sankarananda, Aravind - Madurai
Kavitha Vadi, Aravind - Madurai

Objectives

To evaluate the capsule cleaning device meant for human use.

Methods

Animals were assigned to treatment or control groups as presented in Table.

<table>
<thead>
<tr>
<th>Group (Treatment)</th>
<th>Capsule Cleaning OS</th>
<th>Capsule Cleaning OD</th>
<th>IOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 rabbits</td>
<td>Standard I/A and capsule washing</td>
<td>Standard I/A</td>
<td>None</td>
</tr>
<tr>
<td>3 rabbits</td>
<td>Standard I/A</td>
<td>Standard I/A and capsule washing</td>
<td>None</td>
</tr>
<tr>
<td>5 rabbits</td>
<td>Standard I/A and capsule washing</td>
<td>Standard I/A</td>
<td>Yes</td>
</tr>
<tr>
<td>5 rabbits</td>
<td>Standard I/A</td>
<td>Standard I/A and capsule washing</td>
<td>Yes</td>
</tr>
</tbody>
</table>
In groups 1 and 2 the animals were euthanized immediately following surgery and groups 3 and 4 were followed for 9 weeks post op. The effect of the capsule cleaning device on posterior capsule opacification was assessed by histopathologic evaluations (done at Moran Eye Centre, Utah) and PCO scoring using the EPCO software. The EPCO software was used on slit lamp pictures to evaluate posterior capsule opacification.

**Results**

At the fourth postoperative week, the mean PCO score in the washed group was 0.034 and unwashed group was 0.173. The washed group thus had a significantly lower PCO score at the fourth week (p=0.017). On histopathological evaluations, overall the treated eyes showed less lens epithelial cell proliferation but the broad variation in each of the eyes made a statistically valid comparison between the groups difficult.

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**Comparative study of surgical and visual outcome in coaxial phacoemulsification, bimanual phacoemulsification and microincision coaxial phacoemulsification using alcon infiniti (Ozil) vision system**

**Investigators**

Aravind Haripriya, Aravind - Madurai
Ankush Kawali, Aravind - Madurai
Kavitha Vadi, Aravind - Madurai

**Objective**

To compare
1. Intra-operative parameters
2. Post-operative visual outcome
3. Change in central corneal thickness

between co-axial Phacoemulsification (A), bimanual phacoemulsification (B) and microincision Phacoemulsification (C) using The OZil™ Torsional Handpiece on Alcon Infiniti vision system.

**Methods**

Randomised, controlled trial. 50 patients were enrolled in each group. Follow up was on day 1 and day 30.

**Results**

The patients operated from Group B had a significantly higher phaco time (p=0.001) and cumulative delivered energy (p=0.002) compared to A and C. The phaco tip time in the eye and amount of BSS used was also higher in Group B compared to A and C (p value <0.001). The visual outcome was comparable in all 3 groups both at 1 day and 1 month post op. Corneal pachymetric changes were not significantly different between these 3 groups at 1st post-op /day (P=0.105).

Bimanual phaco technique demands more phaco energy and BSS compared to coaxial phaco but microincision coaxial phacoemulsification was found to be as safe as standard coaxial phacoemulsification.

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**CORNEA SERVICES**

An evaluation of the safety and efficacy of moxifloxacin AF ophthalmic solution 0.5% for the treatment of bacterial conjunctivitis in India

**Sponsor**

Alcon Research Ltd

The primary statistical objective of the study was to demonstrate the non inferiority of moxifloxacin AF ophthalmic solution 0.5% relative to VIGAMOX ophthalmic solution 0.5% in the treatment of bacterial conjunctivitis in patients of one month of age or older. The primary efficacy had two components - clinical cure and microbial eradication. This was a randomised, double masked, multicenter parallel group study which included 25 centres in India.
Status
A total of 50 cases were enrolled at Aravind Eye Hospital, Madurai and Coimbatore. Enrollment was stopped in December 2007 and the closeout visit was in October 2007.

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A study to evaluate the clinical and microbial efficacy of 0.6% ISV 403 compared to VIGAMOX in the treatment of bacterial conjunctivitis

Sponsor: Bausch and Lomb

This was a multicentre, randomised double masked, parallel group clinical trial conducted across 6 centres in India. Enrollment was on a competitive basis and stopped when 180 patients were enrolled. The objective of the study was to evaluate the efficacy of 0.6% ISV 403 (a fourth generation fluoroquinolone) administered tid for 5 days compared to VIGAMOX 0.5% tid for 5 days.

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Status

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Steroids for Corneal Ulcers Trial (SCUT)

Principal Investigator: Dr. M. Srinivasan, Aravind - Madurai
Project: Dr. Thomas Lietman
Sponsor: NEI
Centres: Aravind- Madurai, Tirunelveli and Coimbatore
          Francis I. Proctor Foundation UCSF Dartmouth Medical School

Study objectives
This study was initiated at 4 centres in September 2006 and at Aravind Eye Hospital, Coimbatore from March 2007. The specific objectives of the study are to determine whether adding topical steroids to the treatment regimen of culture proven bacterial corneal ulcers improves the outcome. The primary outcome of this trial will be the best spectacle corrected log MAR three months after enrollment. This is a randomised, double masked placebo controlled trial. Five hundred ulcers are randomized to receive antibiotics and steroids or antibiotics and placebo. The patients are closely followed until re-epitheliasation and rechecked at three weeks, three months and one year.

Present status
Patient recruitment is on at all 5 centres.

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Mycotic Ulcer Treatment Trial (MUTT)

Principal Investigator: Dr. N. Venkatesh Prajna, Aravind - Madurai
Project: Dr. Thomas Lietman
Sponsor: NEI
Study centre: Aravind Eye Hospital (Madurai, Puducherry)
            Francis I. Proctor Foundation UCSF

Study objectives
The objectives of the MUTT study are to determine which topical antifungal treatment, Voriconazole or Natamycin, results in a better visual acuity and in better clinical outcome for a subgroup of organisms. The study also aims to determine whether there is a co-relation between antifungal susceptibility and clinical outcome in fungal keratitis. The primary outcome is best spectacle corrected visual acuity three months after enrollment. This is a fixed block, randomized double masked controlled trial. 300 cases of fungal keratitis will be randomized to receive either topical natamycin or voriconazole. They will be followed closely until re-epithelialisation and then rechecked at 3 weeks and 3 months of 1 year after enrollment.

Present status
The pilot study has commenced and recruitment of patients is on.
RETINA SERVICES

DRUG TRIALS

Efficacy and safety of posterior juxtascleral administrations of anecortave acetate for depot suspension (15 mg or 30 mg) versus sham administration in patients at risk for progressing to exudative age-related macular degeneration (AMD)

Principal investigator : Dr. R. Kim, Aravind - Madurai
Co- Investigators : Dr. Anand Rajendran, Dr. Sathya J. Kakade, Aravind - Madurai
Funding Agency : Alcon Research Ltd
Duration : Four years and 6 months (2006-2010)

Objectives
The primary objective of this study is to demonstrate that Anecortave Acetate for depot suspension (15 mg or 30 mg) is safe and effective in arresting the progression of non-exudative (dry) AMD in patients who are at-risk for progressing to exudative (wet) AMD.

A six-month, phase 3, multicenter, masked, randomized, sham-controlled trial (with six-month open-label extension) to assess the safety and efficacy of 700 µg and 350µg dexamethasone posterior segment drug delivery system (DEX PS DDS) applicator system in the treatment of patients with macular edema following central retinal vein occlusion or branch retinal vein occlusion

Principal Investigator : Dr. R. Kim, Aravind - Madurai
Co-Investigators : Dr. Dhananjay Shukla, Dr. Naresh Babu, Aravind - Madurai
Funding Agency : Allergan India Private Ltd
Duration : Two years (2006-2008)

Objectives
To evaluate the safety and efficacy of the 700µg DEX PS DDS Applicator system (700µg dexamethasone) and 350µg DEX PS DDS Applicator system (350µg dexamethasone) compared with a sham DEX PS DDS applicator system (needle-less applicator) in patients with macular edema due to branch retinal vein occlusion (BRVO) or central retinal vein occlusion (CRVO).

A safety and efficacy assessment of vitreosolve® for ophthalmic intravitreal injection for inducing posterior vitreous detachment in non-proliferative diabetic retinopathy subjects

Principal Investigator : Dr. R. Kim, Aravind - Madurai
Co-Investigator : Dr. Somnath Chakraborty, Aravind - Madurai
Funding Agency : Alcon Research Ltd
Duration : 1 year

Objective
The objective of this study is to evaluate the safety and efficacy of Vitreosolve® Ophthalmic intravitreal injection for inducing a posterior vitreous detachment in non-proliferative diabetic retinopathy subjects.

A randomized, double masked, active controlled, phase 3 study of the efficacy, safety, and tolerability of repeated doses of intravitreal VEGF trap-eye in subjects with neovascular age-related macular degeneration (AMD)

Principal Investigator : Dr. R. Kim, Aravind - Madurai
Co-Investigators : Dr. Anand Rajendran, Dr. Umesh Chandra Behera, Dr. Anuradha, Aravind - Madurai
Funding Agency : Alcon Research Ltd
Duration : 4 Years
OBJECTIVES

Primary objective

To assess the efficacy of intravitreally (ITV) administered VEGF Trap-Eye compared to ranibizumab (in a non-inferiority paradigm) in preventing moderate vision loss in subjects with all subtypes of neovascular AMD.

Secondary objectives

To assess the safety and tolerability of repeated ITV administration of VEGF Trap-Eye in subjects with all subtypes of neovascular AMD for up to 2 years. To assess the effect of repeated ITV administration of VEGF Trap-Eye in Vision-Related Quality of Life (QOL) in subjects with all subtypes of neovascular AMD, as assessed using the NEI VFQ-25. To describe systemic exposure to study drug.

CLINICAL STUDIES

Unusual presentations of posterior scleritis

Principal Clinician : Dr. Dhananjay Shukla, Aravind - Madurai
Team : Dr. Anuradha Dhawan, Dr. Deepak Agarwal, Aravind - Madurai

Objective

To describe and document key features of diagnosis and management of patients presenting without classical symptoms or signs of posterior scleritis

Post pan retinal photocoagulation (PRP) serous macular detachment in patient with nephropathy

Principal Clinician : Dr. Dhananjay Shukla, Aravind - Madurai
Team : Dr. Mahesh Chandargi, Dr. Bharat Ramchandani, Aravind - Madurai

Objective

To spread awareness among treating physician about serous macular detachment as a relatively common cause of severe visual loss following PRP. Authors enlist the recommended management and salient tips to prevent the same.

Serous macular detachment (SMD) as a novel marker in diagnosing accelerated hypertension

Principal Clinician : Dr. Dhananjay Shukla, Aravind - Madurai
Team : Dr. Bharat Ramchandani, Aravind - Madurai

Objective

To highlight SMD as an ominous sign being often missed in the diagnosis of accelerated hypertension against disc edema

Featureless retina: Diagnosing the under-addressed clinical entity and its implications

Principal Clinician : Dr. Dhananjay Shukla, Aravind - Madurai
Team : Dr. R. Maheswari, Dr. B. Ramchandani, Aravind - Madurai

Objective

The study aims to put forward guidelines for clinico-investigational clues to diagnose featureless retina in diabetic retinopathy patients while at the same time it documents natural history Vs outcome with Pan Retinal Photocoagulation.
Serous macular detachment as a predictor of resolution of macular edema with intravitreal triamcinolone injection

Principal Clinician: Dr. Dhananjay Shukla, Aravind - Madurai
Team: Dr. Umesh C Behera, Dr. Somnath Chakraborty, Aravind - Madurai

Objective
To analyse and conclude the visual outcome and anatomical changes as on OCT, following treatment with intravitreal triamcinolone acetate in macular edema with serous detachment from varied etiologies.

Transpupillary thermotherapy (TTT) for chronic central serous chorioretinopathy (CSC): a case control study

Principal Clinician: Dr. Dhananjay Shukla, Aravind - Madurai
Team: Dr. Anand Rajendran, Dr. T.P. Vignesh, Aravind - Madurai

Objective
To evaluate TTT as a potential treatment for subfoveal and juxtafoveal leaks in chronic CSC as compared to observation in a prospective non-randomise controlled trial.

Occult pigment epithelial detachments (PED) in chronic central serous retinopathy (CSCR)

Principal clinician: Dr. Dhananjay Shukla, Aravind - Madurai
Team: Dr. Jay Kalliath, Dr. Sangamitra Kanungo, Aravind - Madurai

Objective
To describe and document the presence of atypical PEDs with OCT in chronic CSCR in the absence of typical fundus appearance or FFA characteristics.

Silicone oil tamponade in 23 gauge sutureless vitrectomy: Long term anatomical and functional outcome

Principal Clinician: Dr. Naresh Babu, Aravind - Madurai
Team: Dr. R. Kim, Dr. Bharat Ramchandani, Aravind - Madurai

Objective
To describe the feasibility of silicon oil tamponade as an option with sutureless 23 gauge vitrectomy system in varied vitreo-retinal etiologies.

Yag hyaloidotomy with gas tamponade as a viable option for pre macular haemorrhage in PDR against surgical intervention by pars plana vitrectomy

Principal Clinician: Dr. Naresh Babu, Aravind - Madurai
Team: Dr. Bharat Ramchandani, Aravind - Madurai

Objective
To put up a viable and equally successful minimal intervention procedure for pre macular haemorrhage in PDR patients.

Retino choroidal coloboma (RCC): Role of laser barrage

Principal Clinician: Dr. Anand Rajendran, Aravind - Madurai
Team: Dr. Bharat Ramchandani, Dr. R.Kim, Dr. Satya Kakade, Aravind - Madurai

Objective
To analyse the role of laser barrage of RCC without retinal detachment when compared to observation.
Isolated intravitreal bevacizumab therapy for choroidal neovascular membranes of multiple aetiologies

Principal Clinician: Dr. Anand Rajendran, Aravind - Madurai
Team: Dr. Bharat Ramchandani, Dr. Jay Kalliath, Dr. Shashank Rai Gupta
Aravind - Madurai

Objective
To report an angiographic and tomographic analysis of intravitreal bevacizumab monotherapy on choroidal neovascular membranes of various aetiologies.

Intravitreal bevacizumab as a preoperative adjuvant for diabetic macular tractional detachments with active new vessels

Principal Clinician: Dr. Anand Rajendran, Aravind - Madurai
Team: Dr. R. Kim, Dr. Deepak Agarwal, Dr. Anuradha Dhawan, Aravind - Madurai

Objective
To determine the visual and anatomic outcome of intravitreal bevacizumab as a preoperative adjuvant for diabetic macular tractional detachments with active new vessels.

Symptomatic diabetic papillopathy and rapid progression of diabetic retinopathy to high risk PDR – a clinicopathological study

Principal Clinician: Dr. Umesh C. Behera, Aravind - Madurai
Team: Dr. Bharat Ramchandani, Dr. Shashank Rai Gupta, Aravind - Madurai

Objective
To find the incidence and mean duration of high risk proliferative diabetic retinopathy onset after a symptomatic presentation of diabetic papillopathy and to correlate the imaging findings with its pathogenesis.

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- Early closure of macular hole secondary to rhegmatogenous retinal detachment with internal limiting membrane peeling.

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- Contribution of HIV/AIDS to global blindness.

**HUMAN MOLECULAR GENETICS**
FU, L; GARLAND, D; YANG, Z; DHANANJAY SHUKLA; ANAND RAJENDRAN, PEARSON, E; STONE, EM; ZHANG, K AND PIERCE, EA.
- The R345W mutation in EFEMP1 is pathogenic and causes AMD-like deposits in mice.
Clinical Trials: Aurolab Products

Posterior capsular opacification after implantation of square edge PMMA, round edge PMMA and Acrysof intraocular lenses: A prospective, randomised comparative trial

Principal Investigator: Dr. Haripriya Aravind
Setting: IOL Clinic, Aravind Eye Hospital, Madurai

Objective

To compare posterior capsule opacification (PCO) with Square edge PMMA, Round edge PMMA and Acrysof intraocular lenses after in-the-bag implantation. Study design is prospective, double blinded, Randomized Controlled Trial (RCT). This study is registered at www.clinicaltrials.gov. 50 patients received square edge PMMA in one eye and round edge PMMA in fellow eye. In another group, 50 patients received square edge PMMA in one eye and Acrysof in fellow eye. Patients are followed up 6th month, 1st year, 2nd year, 3rd year, 4th year and 5th year post operatively. Outcome measures are visual acuity and PCO. PCO is assessed during each follow up. PCO is analysed using EPCO software. 95 enrolled patients underwent bilateral eye surgeries. 93 patients came for 1st year follow up. There was no statistically significant difference in PCO between acrysof and square edge PMMA. But statistically significant difference was found between square edge and round edge PMMA IOLs. Second year follow up will be started on May, 2008.

Clinical evaluation of hydrophobic foldable IOLs

Principal Investigator: Dr. Haripriya Aravind
Setting: IOL Clinic, Aravind Eye Hospital, Madurai

Objective

To evaluate the safety and efficacy of Hydrophobic Foldable Intraocular Lenses in cataract surgery. Study design is unilateral, prospective, open label clinical trial. This IRB approved study is being carried out in compliance with ISO, GCP and FDA standards and is registered at www.clinicaltrials.gov. Pilot study was completed with the sample size of 20. Aurovue lens was implanted by phacoemulsification. Patients are followed up 1st day, 2nd day, 3rd day, 7th day, 15th day, 1st month, 2nd month, 3rd month, 6th month and 1st year post operatively. Main study is going on and the sample size is 120 subjects. Enrollment was started on 29th March, 2007 and completed on 23rd July, 2007. The accrual enrollment period was 18 months. Patients are followed up 1st day, 10th day, 40th day, 120th day and 1st year post operatively. As of now, 118 patients have completed 120th day follow up.

Safety and effectiveness of yellow intraocular lenses

Principal Investigator: Dr. Haripriya Aravind
Setting: IOL Clinic, Aravind Eye Hospital, Madurai

Objective

To examine safety and effectiveness of blue light filtering yellow PMMA intraocular lens. Study design is prospective, open label, feasibility study. Sample size is 10 senile cataract patients. Manual SICS with Yellow PMMA (Auro gold) implantation was done in all patients. Patients are followed up at 1st day, 15th day, 30th day, 90th day, 180th day and 360th day post operatively. Enrollment was started on 27th October, 2006 and completed on 5th February, 2007. The accrual enrollment period was 3 months. 10 patients have completed 180th day follow up. 5 patients have completed 360th day follow up. Visual acuity is tested using ETDRS protocol. Contrast sensitivity is tested in mesopic and scotopic conditions using CSV 1000E chart of vector vision. Colour perception is tested with D15. No severe adverse event has been reported so far. Visual acuity is good. No one has IOL induced IOP increase or iritis. Decentration of IOL is not significant. Tilt, discoloration or opacity of IOL has not been seen with any of the patients. Corneal and retinal status is normal and no one has hypopyon or endophthalmitis. Patients’ satisfaction is good. Based on the interim analysis, AuroGOLD is found to be safe and effective with better functional visual acuity.
Comparative study of indigenous green Laser with already available green laser

Principal Investigator : Dr. K. Chandramohan
Setting : Retina Clinic, Aravind Eye Hospital, Madurai

Objective
To demonstrate that indigenous green laser produces similar treatment effects on the retina when compared with commercially available green laser. Study design is prospective, double blinded, Randomised Control Trial (RCT).

Methodology: In the present study, we decided to compare indigenously developed green laser with already available green laser in proliferative diabetic retinopathy. Twenty four patients of diabetic retinopathy needing pan retinal photocoagulation (high risk PDR, early PDR) were selected in the vitreo-retinal service of Aravind Eye Hospital. Laser for inferior half was decided based upon the statistical random table using sequence generation. The sequence was concealed until interventions were assigned to prevent bias.

An approval of the Institutional Review Board was obtained to undertake this study. This study is registered at www.clinicaltrials.gov. Informed consent was obtained from all the patients before initiating the treatment. In all patients following parameters were evaluated before laser photocoagulation: best corrected visual acuity (BCVA) on Snellen’s acuity chart, anterior segment evaluation by slit lamp for corneal opacities, location and extent of opacities, iris new vessels, dilation of pupil and lens, slit lamp biomicroscopy for pigmentation of the fundus and Fundus Fluorescein Angiography (FFA) or FF.

Pan retinal photocoagulation was done according to ETDRS protocol. A single retinal surgeon did all laser photoagulations. FF was taken immediately after each sitting of laser photocoagulation. Montage photograph was prepared by taking all areas of laser.

As it was double blind study investigator and surgeons were different. 30 minutes after laser photocoagulation slit lamp biomicroscopy examination was done by retinal surgeon. Laser burn reaction, extent of coverage, gap between burns, uniformity of each burn either uniform or central heavy with peripheral light reaction and complications were assessed. Second sitting for superior half was done after 15 days with fellow laser.

Patients were followed up at 1st day, 60th day, 120th day and 180th day post laser. During follow up following examinations were done: Fundus photography, FF for montage and slit lamp examination for pigmentation, gap between spots, adequacy of coverage and complication. Primary end points were pigmentation of burn, lateral spread of burn and regression of new vessels. Secondary end points of the study were choroidal detachment (CD), Retinal detachment (RD), tractional retinal detachment (TRD) and bruch’s membrane rupture.

Enrollment was started on December 21, 2005 and completed on January 18, 2006. 22 patients completed 180th day follow up. Analysis was done comparing the two types of green lasers with regard to pain perceived by the patients, laser scar progression and laser parameters required to achieve the optimal retinal treatment. There is no significant difference between indigenous Green Laser with already available Green Laser.

Evaluation of auro-tube in conjunctivodacryocystorhinostomy (CDCR)

Principal Investigator : Dr. Usha Kim
Setting : Orbit Clinic, Aravind Eye Hospital, Madurai

Objective
To evaluate the safety and effectiveness of Auro-tube in CDCR. Study design is prospective, open label study. Inclusion criteria were Epiphora, Proximal Canalicular Obstruction, Punctal Agenesis/Atresia, Canalicular Agenesis/Atresis, Failed DCR + Intubation, Functional Epiphora. Enrollment was started on 6th February, 2007. Follow up period is 1st day, 15th day, 30th day, 60th day and 90th day post operatively. Outcome measures are tube patency, tube migration and symptom relief.
Effect of square edge PMMA IOL in preventing lens epithelial cell migration in pediatric cataract surgery: A randomized controlled trial

Principal Investigator : Dr. P. Vijayalakshmi
Setting : Paediatric Clinic, Aravind-Madurai

Objective
To compare posterior capsule opacification (PCO) with Square edge PMMA and Acrysof intraocular lenses in pediatric cataract surgery. Primary posterior capsulotomy with or without anterior vitrectomy has become the standard treatment in very young children. However, in older children, the best surgical alternative needs better definition. Improved IOL material and design have significantly reduced the incidence of PCO in adult cataract. Aurolab extrapolated these observations in pediatric IOLs. It has developed square edge PMMA intraocular lenses for pediatric population. Study design is double blinded, randomized controlled trial. Pediatric patients with bilateral cataract of 5 to 10 years of age willing to participate in the study are enrolled into this study. PCO will be evaluated using EPCO software.

Randomised controlled trial of Aurolas 532-I-1 with already available green laser in Proliferative Diabetic Retinopathy

Principal Investigator : Dr. K. Naresh Babu
Setting : Retina Clinic, Aravind Eye Hospital, Madurai

Objective
Ingeneus, Australia has designed a new frequency-doubled Nd:YVO4 green laser for Aurolab. System specifications, Control parameters and Safety & security features have been upgraded. Objective of this study is to demonstrate that green laser of Aurolab produces similar treatment effects on the retina when compared with commercially available green laser. 28 Diabetic retinopathy patients needing pan retinal photocoagulation (High risk PDR, Early PDR) for both eyes who are visiting the vitreo-retinal service of Aravind Eye Hospital, Madurai are taken for the trial. Exclusion criteria are Advanced PDR, Clinically Significant Macular Edema (CSME), Nephropathy (Creatinine >2.0 mgs%, Urea >55 mgs), Uncontrolled hypertension (160/100mmHg), Media opacities and prior laser. Study design is double blinded, two arm, Randomised Controlled Trial (RCT). Primary outcome measures are visual acuity and burn characteristics, secondary endpoint is regression of retinopathy. A separate retina specialist masked for the treatment areas will compare the laser reaction in treated areas at each visit, by looking at the fundus photographs. Final analysis will be done comparing the two types of green lasers with regard to subjective pain perceived by the patients, Laser scar progression and Laser parameters required to achieve the optimal retinal treatment.
**Identification of candidate genes and screening for polymorphisms of genes associated with type 2 diabetic retinopathy**

Principal Investigator: Dr. P. Sundaresan  
Co-Investigators: Dr. P. Namperumalsamy  
                       Dr. R. Kim  
                       Dr. Anand Rajendran  
Collaborator: Dr. J. Fielding Hejtmancik, NEI / NIH, Bethesda, USA.  
Research Scholar: Ms. B. Suganthalakshmi  
Funded by: TIFAC-CORE & NIH Visiting Fellowship, National Institute of Health, Bethesda, Maryland, USA.  
Duration: 2007-2010

Diabetic retinopathy is a most frequent microvascular complication in the retina due to diabetes mellitus and the leading cause of blindness worldwide. It is a major cause of visual morbidity in India. Diabetic retinopathy is multifactorial and its pathogenic mechanism remains unclear. Many risk factors are involved in the progression of diabetic retinopathy and evidences suggest that genetic factor might play a role in diabetic retinopathy. Various candidate genes have been shown to be associated with diabetic retinopathy in different ethnic groups worldwide. However, the association of these candidate genes in the development of DR is not yet understood fully and it warrants further investigation of new candidate genes to reveal the molecular mechanism behind DR.

Therefore, the objective of this study is to screen the polymorphisms of candidate genes, reported in different ethnic groups and look into its association with diabetic retinopathy in Indian population. In addition to that, we would like to perform whole genomewide association studies between diabetic patients with retinopathy and diabetic patients without retinopathy. This would help us to identify the novel loci associated with the disease.

So far, we have screened two SNPs like rs35839483 in Aldose reductase gene and rs1617640 in EPO gene in 211 diabetic patients with retinopathy and 237 diabetic patients without retinopathy. The alleles and genotypes were evaluated using the techniques M13 labeled sequencing through ABI3100 genetic analyzer and Taq Man SNP genotyping assay using ABI 7900HT Fast Real-Time PCR System. Statistical analysis was performed to analyze the genotype and allele frequencies. The results indicate that there is no association of these two polymorphisms with disease. We are in the process of screening other polymorphisms of known candidate genes and whole genome wide association study to identify the novel loci for diabetic retinopathy.

**Understanding the molecular genetics of inherited congenital cataract**

Principal investigator: Dr. P. Sundaresan  
Co-investigator: Dr. J. Fielding Hejtmancik (NEI)  
Research Scholar: Ms. R. Ramya Devi  
Collaboration: National Eye Institute, NIH, Bethesda, MD, USA  
Duration: 2006 - 2008

Cataracts as lens opacities have been recognised as a group of well-known diseases for centuries. Pediatric cataract is the most common treatable form of childhood blindness and is heterogeneous both clinically and genetically. To date at least 34 loci in human genome have been reported to be associated with various forms of congenital cataract and infantile cataract, this includes genes encoding crystallins (CRYAA,
CRYAB, CRYBA1, CRYAB4, CRYBB1, CRYBB2, CRYBB3, CRYGC, CRYGD, CRYGS) cytoskeletal protein (BFSP2), membrane proteins (GJA3, GJA8, AQP0, LIM2), transcription factors (PITX3, MAF, HSF4) and glucosaminyl (N-acetyl) transferase 2 (GCNT2).

**Objectives**

1. To investigate the spectrum and frequencies of crystalline and connexin gene mutations in South Indian families affected with inherited congenital cataract
2. To map and identify the candidate genes for the disease in families with no mutation in crystallin and connexin genes.

- In this study the first simultaneous clinical and genetic characterisation of families affected with congenital and childhood cataract in a large panel of samples of the same population, represented by 60 unrelated south Indian families was performed. The study investigated the spectrum and frequencies of crystallin gene and connexin mutations in the 60 families. Mutations were identified in 14 families; of the 13 different mutations found 8 were novel. The identified mutations co-segregated with the diseases phenotype and were found to be absent in 100 - 200 normal control chromosomes analysed. Crystallin genes might account for as much as 16.6% and connexins for 6.6% of inherited congenital cataracts in the Indian population.
- Among the 46 families with an unidentified genetic cause for the diseases, eight large families were chosen for linkage analysis with 382 microsatellite markers. Of these families identified 4 inherited autosomal dominant and 4 autosomal recessive cataract. Whole genome scan revealed linkage of two families, one to a known loci on chromosome 16 (HSF4) and another to a novel loci on chromosome 20 (BFSP1).
- An autosomal recessive cataract in an Indian family was mapped to a 5.43Mb interval on chromosome 20q flanked by markers D20S852 and D20S912 and including the BFSP1 gene. Sequencing of BFSP1 shows deletion of exon 6 in all affected members of the family, demonstrating for the first time association of human cataracts with a mutation in the gene encoding Bfsp1.

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**Congenital rubella syndrome – an eye hospital based investigation**

Investigators : Dr. P. Vijayalakshmi  
Dr. VR. Muthukkaruppan  
Dr. P. Sundaresan  

Research Scholar : Ms. T. Amala Rajasundari  

Funding : World Health Organisation, Geneva, Switzerland  
ORBIS, New York, USA  
Indian Council of Medical Research, New Delhi  

Duration : 2002 - 2008

Rubella is a mild disease mainly of infants, involving a rash and a fever. However, when women who have no immunity to rubella are infected during the early stage of pregnancy, their babies are often born with Congenital Rubella Syndrome (CRS), which is characterized by a few disorders including cataracts, heart malformations, and deafness. In India, the prevalence of rubella is endemic as vaccine is not mandatory in the National Immunization schedule and there is no routine surveillance for rubella or CRS. However, there is no data reported on the serological diagnosis and genetic characteristics of RV circulating in the Indian population (Vijayalakshmi et al., 2002).

**Objectives**

i. To establish the burden of CRS based on hospital-based surveillance for CRS related ocular defects in children of 0-59 month’s age
ii. To demonstrate the seroprevalence of Congenital Rubella Syndrome (CRS) in children with suspected CRS Ocular defects
iii. Isolation and Genotyping of Rubella virus from infants with CRS
Totally, 1135 children of age 0-59 months were recruited based on suspected CRS ocular defects. Clinical specimens such as serum, oral fluid, throat swab and lens material if the children had cataract was collected after getting the consent form from the parents. CRS was clinically confirmed in 29.4% of the suspects; Cataract (78.4%) was the most common ocular sign observed associated with cardiac defect (54.1%).

CRS was serologically confirmed in 9.0% of the suspects and 70% of children were found susceptible with the absence of any rubella specific antibodies. An evaluation of saliva sample for IgM antibody detection carried out in 157 matched serum and oral fluid samples suggests the use of oral fluid samples for CRS diagnosis in infants with severe disease burden.

By the molecular study, out of 84 children tested, 24 were positive for real-time and PCR-E317. In vitro isolation of RV in 10 cases confirms the viral growth in 6 cases of 0-11 month’s age group. High percentage of positivity was observed in lens and oral fluid when compared to other serum and throat swab in both PCR assays and in culture. The viral load quantification demonstrated higher viral copy numbers in lens suggesting that lens could be the main location of RV persistent in CRS patients with ocular defects. The genetic characterisation of RV revealed the circulation of 2B genotype among the south Indian population. This is the first molecular report demonstrating the circulation of wild type RV in south Indian population. Isolation of rubella from lens material of sero-confirmed CRS cases is under culture. The growth of RV has to be confirmed by PCR and Immunofluorescence assay.

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**Genetic and functional dissection of FOXL2 gene involved in the pathogenesis of blepharophimosis syndrome (BPES)**

**Principal Investigator**: Dr. P. Sundaresan  
**Co-Investigators**: Dr. Reiner A. VEITIA  
Institute Cochin  
Paris, France  
Dr. Usha Kim  
**Research Scholar**: Mr. Nallathambi  
**Funding**: French embassy New Delhi and EGIDE France, ICMR-INSERM  
**Duration**: 2006 - 2008

The blepharophimosis syndrome or BPES is a rare genetic disease occurring sporadically or as an autosomal dominant disorder. In type I BPES a complex eyelid malformation is associated with premature ovarian failure, while in type II BPES the eyelid defect occurs isolated. Mutations in the forkhead transcription factor FOXL2 have shown to be responsible for both type I and II BPES. Screening the FOXL2 gene mutation in Indian BPES cases revealed that the several novel and reported mutations in FOXL2 and the genotype/phenotypes are exactly matched with other studies (Nallathambi et al.2007a). Interestingly, the first homozygous FOXL2 mutation leading to a polyAla expansion of +5 residues (FOXL2-Ala19) (Nallathambi et al., 2007b) was identified. This novel mutation segregates in an Indian family where heterozygous mutation carriers are unaffected whereas homozygous individuals have the typical BPES phenotype, with proven POF in one female. This case shows that the phenotype-genotype correlation is complex and that further studies are needed to correctly predict the ovarian phenotype of young female BPES patients. Hence it is important to carry out the genetic study in expanding number of BPES cases, especially in populations not previously studied (ongoing). Transfection analysis was carried out in known cellular model (COS7) to see the disease causing mechanism of identified FOXL2 gene mutations.
Studies on the proangiogenic and vascular growth factors in relation to the pathogenesis of Eales' disease and diabetic retinopathy

Principal Investigator: Dr. VR. Muthukkaruppan
Co-investigators: Dr. P. Namperumalsamy
Dr. D. Shukla
Research Scholar: Ms. P. Murugeswari
Funded by: Department of Science and Technology
Duration: 2005 - 2008

Retinopathy is one of the most frequent chronic microvascular complications associated with diabetic retinopathy and Eales’ disease. The former is characterised by hyperglycemia and pericyte loss, manifested as microaneurysms, macular edema and subsequently retinal neovascularization, vitreous hemorrhage and tractional complications. Eales’ disease is an idiopathic inflammatory venous occlusion that primarily affects the peripheral retina of healthy young adult men (20-30 yrs).

The purpose of this study is to determine the levels of pro-inflammatory cytokines interleukin-6 (IL-6), IL-8, chemokine-monocyte chemoattractant protein-1 (MCP-1); angiogenic factor- vascular endothelial growth factor (VEGF) and anti-angiogenic factor - pigment epithelium derived factor (PEDF) in the vitreous humor of 25 Proliferative Diabetic Retinopathy (PDR), 10 Eales’ Disease (ED) and 25 Macular Hole (MH) patients. The concentration of the pro-inflammatory cytokines, chemokine, angiogenic and anti-angiogenic factors were estimated by sandwich enzyme linked immunosorbant assay (ELISA).

IL-6, IL-8, MCP-1 and VEGF levels in the vitreous were significantly higher in PDR (P<0.0001) and ED (P<0.0001) than in MH patients. Conversely, the vitreous level of PEDF was significantly reduced in PDR (P<0.0001) but not in ED. A significant correlation was observed between VEGF and IL-6 in ED patients.

We demonstrate for the first time the importance of VEGF in retinal neovascularisation in ED and a definitive association of inflammatory cytokines in DR patients. Further study is required to understand the interrelationship between VEGF and inflammatory cytokines in PDR and ED.

Identification, characterisation and quantification of human buccal epithelial stem cells for corneal surface reconstruction

Principal Investigator: Dr. VR Muthukkaruppan
Co-investigators: Dr. N.V. Prajna, Dr. Gowri Priya, Dr. Usha Kim
Research Scholar: Ms. Arpitha Parthasarathy, Ms. S. Vaishali
Funded By: Defence Research and Development Organisation (DRDO)
Duration: 2006 - 2009

Bilateral severe loss of vision occurs as a result of complete loss of corneal epithelial stem cells (SCs). Since autologous limbal transplantation is not feasible, due to total SC deficiency in both eyes, there is a need to use appropriate alternative source of epithelial SCs for corneal surface reconstruction. Therefore, the objectives of the study are to (1) to characterise the cellular profile of buccal mucosal epithelium and (2) to determine the presence of SCs in the bio-engineered graft and (3) to demonstrate that the autologous stratified non keratinised buccal mucosal epithelium would be an ideal source for corneal surface reconstruction.

A gradient of p63-positive cells was observed in buccal mucosal epithelial cells. Two-parameter (p63 levels and N/C ratio) analysis revealed the presence of a distinct population of 4-5% small cells with higher levels of p63 and a large N/C ratio. Such buccal mucosal epithelial cells were positive for melanoma-associated chondroitin sulphate proteoglycan and negative for connexin 43 and K3.

The isolated buccal mucosal epithelial cells cultured for 15-20 days on human amniotic membrane and 3T3 feeder layer showed a distinct population of small cells with a large N/C ratio expressing high levels of p63, thus indicating the generation of small cells with SC phenotype. The ex vivo expanded buccal epithelial sheet was transplanted on to defective cornea in limbal SC deficient patient. The recovery was assessed on the basis of prevention of conjunctivalisation and improved visual acuity after several weeks of transplantation.
Clinical appearance before and after transplantation of cultivated autologous buccal mucosal epithelium

The above pictures show that the best corrected visual acuity has improved by 3 lines at the last follow-up visit (March 2008). Post operatively, the corneal surface showed complete epithelialisation with minimal peripheral vascularisation.

Will cytoskeletal drugs prevent Posterior Capsular Opacification (PCO)?

Principal Investigators: Dr. VR. Muthukkaruppan
Dr. Baohe Tian
Department of Ophthalmology and Visual Sciences, University of Wisconsin - Madison (UW), USA

Co-Investigator: Dr. Hari Priya
Research Scholar: Ms. S. Jeyalakshmi
Funded by: National Eye Institute, NIH, USA
Duration: 2006 - 2008

The objective of the project is to determine if the perturbation of the actin cytoskeleton induced by latrunculin B (LAT-B) or H-7 facilitates clearance of residual lens epithelial cells (LECs) during lens surgery and/or inhibits proliferation and migration of the residual LECs in cultured human lens capsules.

Human donor eyes underwent extracapsular lens extraction and the eyes were treated with LAT-B (2µM), DMSO (0.25%), H-7 (300µM), and BSS (1%). After the drug treatment, capsular bag was dissected out and the lens capsules were prepared, fixed and photographed. The remaining LECs on the capsule were evaluated by cell area measurements. H-7 or LAT-B at this concentration had no effect on the clearance of LECs.

Fig. 1. A sterile polymethylmethacrylate petri dish was used and 6 to 8 entomological pins were inserted through the edge of the capsular bag. The latter was maintained with supplemented Eagle Minimum Essential Medium with drug/vehicle solution at 37°C in 5% CO2 atmosphere.
Following cataract surgeries with donated human eyes, lens capsules were prepared and cultured by the standard technique and they were treated with H-7 (300µM) BSS(1%), LAT-B (2µM), or DMSO (0.25%) in culture. The capsule cultures lasted 4 weeks and PCO formation was photographed and scored by a 4-point scale. All 5 capsules receiving H-7 showed no capsule wrinkling or PCO, while the capsules receiving BSS, DMSO or LAT-B showed apparent capsule wrinkling and diffuse and thick PCO. The human lens culture shows that H-7 prevents PCO probably by inhibiting proliferation and migration of LECs and capsule contractility. This study indicates that pharmacological perturbation of the actin cytoskeleton may inhibit PCO.

Fig. 2. Phase micrograph pictures of 2 human lens capsular bags from an eight - months old donor. A - before and C - after 30 days treatment in culture with 300µM H-7. B and D - control cultures with BSS. Note the aggressive proliferation and wrinkle formation in D, compared to the absence of LEC migration in C. AC=anterior capsule; PC=posterior capsule. Arrow indicates capsulorhexis.

The isolated human limbal basal cells with high levels of p63 expression and large N/C ratio possess slow – cycling property

Principal Investigator : Dr. VR. Muthukkaruppan
Co-Investigators : Dr. M. Srinivasan
                  Dr. N. Venkatesh Prajna
Research Scholar : Ms. Arpitha Parthasarathy
Funded by : Aravind Medical Research Foundation

We have earlier identified a subset of limbal epithelial cells with a large nucleus/cytoplasm (N/C) ratio, expressing high levels of a transcription factor p63 (Invest Ophthalmol Vis Sci. 2005 Oct; 46(10):3631-6; Microsc Res Tech. 2008 Feb 25). The objectives of the present study were to develop a method to isolate viable human limbal basal cells in order to enrich this subset and to demonstrate the slow-cycling label retaining property of this subset.

The isolated limbal basal cells were highly positive for ΔNp63α mRNA but expressing low Cx43 mRNA. They gave rise to large colonies with compact morphology and possess higher colony forming efficiency, in
contrast to the colonies derived from isolated limbal suprabasal/superficial (LS/S) cells. Furthermore, a subset with a large N/C ratio expressing high levels of p63 was observed as much as 25% among the limbal basal cell fraction, in contrast to only about 4% in the total limbal epithelial cells and was absent in the LS/S fraction. Such cells were positive for K5 and negative for Ki67, Cx43 and 14-3-3σ. Limbal explant cultures and their outgrowth showed a distinct population of small cells with a large N/C ratio expressing high levels of p63, retaining the BrdU label after 21-day chase (slow cycling property). This is correlated with the ability of the outgrowth to form holoclone colonies, indicating the migration of SCs from the explant under these culture conditions.

The above evidences indicate the significance of these two parameters in combination as a SC marker and confirm that the two-parameter analysis is a useful method to quantify corneal epithelial SCs. This will be useful to develop xenobiotic-free culture system to generate SC rich epithelial sheet for therapeutic application.

Pathogenic mechanism of uveitis associated with Leptospiral infection

Investigators : Dr. SR. Rathinam
Dr. Gowri Priya Chidambaranathan
Dr. VR. Muthukkaruppan

Uveitis develops as a late complication of the systemic leptospirosis and has been reported even one year after acute illness. The aetiology of leptospiral uveitis was confirmed by demonstrating the presence of specific anti-leptospiral lipopolysaccharide (LPS) antibodies in the serum and pathogenic leptospiral DNA in the aqueous humor (AH) of leptospiral uveitis patients. A selective infiltration of neutrophils as well as a significant increase in the levels of protein and cytokines - IL-12p70, TNF, IL-6, IL-8 and IL-10 was observed in AH of leptospiral uveitis patients, indicating that leptospiral uveitis is endotoxin mediated. This was confirmed by demonstrating a significant level of L. icterohaemorhagiae LPS (Using specific monoclonal antibody) in AH of leptospiral uveitis patients, who were seropositive for the same serovar. These results indicate that leptospiral uveitis is a distinct entity, different from other forms of uveitis.

Molecular genetic analysis of corneal endothelial dystrophies

Principal Investigator : Dr. P. Sundaresan
Co-Investigators : Dr. M. Srinivasan
Dr. J. Arun Kumar
Research Scholar : Ms. B. Hemadevi
Funded by : Department of Science and Technology
Congenital Hereditary Endothelial Dystrophy (CHED) and Fuchs Endothelial Corneal dystrophy (FECD) are categorized under the corneal endothelial dystrophies, affecting corneal transparency and refraction, leading to visual impairment and blindness. Autosomal Recessive CHED (CHED2) occurs at or soon after birth. SLC4A11 has been identified as a novel candidate gene for CHED2, which encodes for BTR1, a member of the bicarbonate transporter family. FECD is usually a sporadic condition but familial forms showing Autosomal dominant inheritance are also recognized. COL8A2 which encodes the alpha-2 chain of type VIII collagen was identified as a candidate gene for FECD.

Analysis of CHED2 family 1. a) Four-generation CHED2 family involving a consanguineous marriage. b) Electropherogram of affected individual IV:1 showing the 698 bp deletion [c.654 (-97) _c.778 (-1488) del698] and normal sequence (sequence of 990 bp product) for the probands’ father (II:2) at the 5’ end of the deleted segment and the 3’ end of the deleted segment c) Agarose gel electrophoresis of PCR products of exon 6. Affected individuals show only the 292 bp product due to homozygous deletion of 698 bp. The unaffected heterozygous individuals show the respective 990 bp product and the 292 bp mutated product. d) Schematic diagram of the topology of BTR1 protein. The numbers indicate predicted transmembrane spans and novel mutations are marked at the corresponding position.
Objectives
1. Screening for mutations in COL8A2 gene in Fuchs’ Endothelial Corneal Dystrophy (FECD)
2. Detection of SLC4A11 gene mutations in Congenital Hereditary Endothelial Dystrophy (CHED2)

Results
Thirty patients with Fuchs’ dystrophy, twenty five families with CHED2 and fifty normal individuals were recruited for the study. We have screened for mutations in COL8A2, SLC4A11 genes in patients with FECD, CHED2 respectively. Genomic DNA was isolated from peripheral blood leukocytes. Mutations in COL8A2, SLC4A11 coding regions were screened using Polymerase Chain Reaction, SSCP analysis and Bi-Direc- tional Sequencing. RFLP analysis was used to identify the previously reported mutations in COL8A2 in association with FECD.

A reported silent variation in COL8A2 (G495G) was identified in five FECD patients. Among them one patient had the variation in homozygous state and none of the fifty controls had the change. Two novel polymorphisms Asn548Ser, Asp537Asn were also identified in this study. The previously reported mutations in different ethnic groups, presumed to play a pathogenic role in cases of FECD (Leu450Trp, Arg155Gln, Arg304Gln, Arg434His, and Gln455Lys) were not identified in any of the present study subjects.

In SLC4A11 screening, in total fifteen mutations were identified, among them one involves a complete deletion of exon 6 identified for the first time in SLC4A11. The mutations co-segregated with the disease phenotype and were found to be absent in 200 ethnically matched control chromosomes analysed. At present 50 FECD families were recruited and being screened for mutations in both the COL8A2, SLC4A11 genes.

Proteomic study of the tears of patients with fungal keratitis
Principal Investigator : Dr. N. Venkatesh Prajna, Aravind Eye Hospital
Co - Investigator : Dr. K. Dharmalingam, Madurai Kamaraj University
Research Scholar: Dr. S. Lalitha, Aravind Eye Hospital
Research Associate : Dr. Santhosh
Funded by : Department of Biotechnology, New Delhi
Duration : 2007 - 2009

Infectious keratitis is a major public health programme worldwide. In India and other developing countries, fungi are the most common cause of infectious keratitis. However, not much is known about the nature of inflammatory response associated with this disease. The purpose of this study was to study the alterations in the tear proteins of fungal keratitis patients, which might ultimately help in devising a novel therapeutic regimen.

Tear 2D analysis

Green spots are matched sets and red spots unmatched
In a related previous study, we had highlighted the importance of using the tear as a surrogate sample to understand the presence of infiltrating cells and cytokine levels in patients with fungal keratitis. During the initial stages of fungal infection, levels of interleukin 6 and 8 (IL-6 and IL-8) were found to be increased in the tear samples. Once the infection was controlled, the elevated levels of interleukin also came to normal levels. This study showed that the inflammatory process in the tears mirrors that of the keratitis.

Based on this finding we proceeded to study the alterations in the tear proteins of fungal keratitis patients, which may have a bearing on pathogenesis. Tears from the fellow eye and from other healthy individuals served as controls. Two-dimensional (2D) electrophoresis was used for separation of fractionated infected tear proteins and control tear proteins. Matrix assisted Laser desorption and Ionisation (MALDI-TOF) based detection of selected protein spots were performed from the gels. A MASCOT search engine was used for further identification of proteins.

The protein profiling of the tear from the patients of fungal keratitis differed from those of normal controls. 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. Glutaredoxin related protein was expressed only in the tears of fungal keratitis patients. This 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 is of considerable interest.

At present, we are also trying to establish the ideal way of processing the tear sample to be used for protein analysis and we are evaluating 4 different protocols currently.

Ocular infection and multiplex PCR

Principal Investigator: Dr. Lalitha Prajna
Co-investigator: Dr. Ratinam Sivakumar
Dr. Kim Ramasamy
Research Scholar: Mr. M. Lalan Kumar Arya
Funded by: Indian Council of Medical Research, New Delhi
Duration: 2007 - 2010

The most common intraocular infections are caused by Herpes simplex virus, Cytomegalovirus, Varizalle zoster virus, Toxoplasma gondii, Mycobacterium tuberculosis, P acnes etc, These infections often lead to diagnostic dilemmas due to low index of suspicion and significant overlapping of clinical features leading to misdiagnosis. The initial diagnosis of these infections is very important to determine the choice of drug. Rapid molecular diagnostics methods like polymerase chain reaction have greatly accelerated the diagnostics methods. Multiplex PCR, in which more than one target sequence is amplified using more than one pair of primers, has been developed which will offer more rapid and cost effective methods and to improve the diagnostic capacity of the test.

The objective of our research project is to standardise and apply multiplex PCR technique for the rapid detection of Herpes group of viruses and Toxoplasma gondii in the intraocular fluids (vitreous humor and aqueous humor) of patients clinically suspected with infectious retinochoroiditis.
A genetic component to the INDEYE study of cataract and age-related macular degeneration in India

Investigators : Dr. P. Sundaresan, AMRF, Madurai  
Dr. R. D. Ravindran, AEH, Puducherry
Senior Technician : Ms. Aswini Shankar
Junior Technician : Mr. Saravanan
Collaborators : Dr. Astrid Fletcher, London School of Hygiene & Tropical Medicine, London  
Dr. Dorothea Nitsch, LSHTM, London  
Prof. Liam Smeeth, LSHTM, London
Duration : 2008 - 2010
Funding Agency : Wellcome Trust

Objective
1. To investigate genetic variants as possible contributors to the high rates of cataract in India, complementing the ongoing research on environmental factors being undertaken in the INDEYE study
2. To assess variant frequency and gene-disease associations in the Genetic loci shown to be strongly associated with AMD in non-Indian populations.

Corneal surface reconstruction using cultured human limbal epithelial cells

Investigators : Dr. VR. Muthukkaruppan  
Dr. M. Srinivasan  
Dr. N.V. Prajna  
Dr. Gowri Priya Chidambaranathan
Research scholar : Mr. P. Prabhu
Funded by : NAB (National Association for Blind)

The main objective of this study is to cultivate autologous limbal biopsy from unilateral stem cell deficiency patients and transplant Ex-vivo generated epithelial sheet for reconstruction of corneal surface.

The limbal biopsies were obtained from 12 patients with unilateral Limbal stem cell deficiency (LSCD). After getting proper consent from patients, the limbal biopsy was obtained in operation theatre, their ages ranged from 7-30 years. The pre-operative diagnosis was chemical injury (Grade IV) in 10 patients, progressive defective vision (1 patient) and Grade III chemical injury (1 patient). The ex-vivo expanded limbal epithelial cell sheet was transplanted on to the cornea of patients with unilateral LSCD. The recovery was assessed on the basis of prevention of conjunctivalisation and improved visual acuity after several weeks of transplantation.

Clinical appearance before and after transplantation of autologous limbal epithelial cell sheet

1. Pre op (VA 1/60)  
2. Three days Post op  
3. First follow up (After 40 days of post op) (VA 6/36)

The above pictures show that the visual acuity has improved by 1 line (6/36) at 40 days post op and 5 lines (6/12) at the last follow up visit being four months. The cornea is clear with no conjunctivalisation.
Identification of genetic defects occurring in Indian oculocutaneous (OCA) and ocular albinism (OA) families

Principal Investigator : Dr. P. Sundaresan
Co-Investigator : Dr. Vijayalakshmi Perumalsamy
Research Scholar : Ms. K. Renugadevi
Duration : 2006 - 2009

Albinism represents a group of inherited abnormalities related to lack of melanin synthesis produced by melanocytes. Albinism is grouped into two categories oculocutaneous (OCA) and ocular albinism (OA). A total of eighty three study samples were collected and among them forty samples were screened for mutations. Four different SNPs were observed in three different genes (described in table 1) of albinism.

Fig. 1: Tyrp1 gene (OCA 3) - Exon-2 (One of the variant among the SNPs identified)

Table 1: List of SNP with corresponding gene

<table>
<thead>
<tr>
<th>S.No</th>
<th>OCA Type</th>
<th>Gene</th>
<th>Exon</th>
<th>SNP</th>
<th>Amino acid change</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>OCA 3</td>
<td>Tyrp1</td>
<td>3</td>
<td>p.87 CGG/AGG</td>
<td>(Arg-Arg)</td>
</tr>
<tr>
<td>2</td>
<td>OCA4</td>
<td>MATP</td>
<td>4</td>
<td>p.329 ACA/ACG</td>
<td>(Thr-Thr)</td>
</tr>
<tr>
<td>3</td>
<td>OCA4</td>
<td>MATP</td>
<td>5</td>
<td>p.374 TTG/TTC</td>
<td>(Leu-Phe)</td>
</tr>
<tr>
<td>4</td>
<td>OAX</td>
<td>GPR143</td>
<td>Intron 6</td>
<td>rs3788938</td>
<td>Nil</td>
</tr>
</tbody>
</table>
OPERATIONS RESEARCH

Investigating gender equity in the uptake of cataract surgeries in Aravind Eye Hospitals, Madurai - SEVA Canada

The main objectives of the research is to assess the existence of gender equity in the uptake of surgeries in each of the 3 arms (camp, direct free and paying) of Aravind Eye Hospital Madurai and, to quantify & qualify the gap in utilisation, to use the results to bring about desirable changes in the uptake pattern.

This is a prospective study of patients undergoing cataract surgery separately for paying, direct free and camp sections of AEH, Madurai. The study duration is for 7 months (from November 2007 to May 2008) including literature survey, data collection & analysis and documentation of the findings. The sample size is 6600 patients recruited from all the three sections together (2200 per arm) so as to be able to detect a difference as small as 6% between the proportion of men and women undergoing cataract surgery in each of the three sections allowing 5% alpha error with 80% power.

HR practices which influences employee satisfaction and patient satisfaction

Introduction

This study aims to understand the human resource practices which attempts to understand the patient satisfaction as well as employee satisfaction. This will provide direction to human resource practices which can ensure high levels of customer satisfaction, both internal and external. An comparative exploration of these factors within the cataract departments of stand alone eye hospitals; a public sector eye hospital, two NGO hospitals - one mainly catering to the free patients, and the predominantly to paying clientele in Tamilnadu.

Objectives of the study
- To develop an instrument for measuring patient satisfaction
- To validate an instrument for measuring employee satisfaction in the hospital context
- To use the instruments developed to measure patient and employee satisfaction in the organisation planned
- To map the overlap of domains and thereby, to enumerate HR policies that could maximize customer delight

Current status

This study is currently testing the questionnaires following the finalisation of which the data collection will be completed.

External Guide : Dr. V. R. Muraleedharan, Professor and Head of Department, Humaniities and Social Sciences, IIT Madras
                     Dr. T. J. Kamlanabhan, Professor, Department of Management Studies, IIT Madras

Internal Guide : MR. R. D. Thulasiraj

Research Scholar : Ms. Preethi pradhan
The overall objective of this epidemiological research is to assess the prevalence and socioeconomic burden of near visual impairment caused by uncorrected presbyopia. Demographic and socioeconomic characteristics should be taken into account in identifying broadly representative study populations.

Estimation of the prevalence of near vision impairment in adults >35 years of age. Assessment of participant-reported near visual functioning, Assessment of spectacle usage and work impact associated with near vision impairment. Assessment of disability weights associated with near vision impairment.

With clusters containing an average of 100 persons >35 years of age, it would be necessary to select approximately 20 study clusters from the sampling frame to ensure a study sample of 1825. If 40% of the overall population is 35 years of age, a sample of 1825 individuals > 35 years of age is equivalent to a total population (all ages) of 4562.
PRODUCT DEVELOPMENT

Products to be launched in the near future

Aspheric IOL

In a standard IOL, the surfaces of the optic are spherical in shape. Due to this, the light rays passing through the central portion focus farther than the rays that pass through the periphery. Here the quality of vision is poor for pupil greater than 3.0 mm due to positive spherical aberration of IOL added to that of the cornea. To address this Aurolab plans to launch Aspheric IOL. In this lens either one or both surfaces will be aspherical, conic or modified conic in shape. Light rays passing through the central portion and the periphery will focus at one point. Here the quality of vision for pupil size greater than 3.0 mm will be improved due to the negative spherical aberration of IOL which can compensate the positive spherical aberration of the cornea. This IOL will enhance the patient’s night vision and increase their visual acuity.

Absorbable sutures

Absorbable sutures are made of materials which will break down in tissue after a given period of time. In most cases, three weeks is sufficient for the wound to close firmly. Since the suture disappears after wound closure there will be no foreign material left inside the body, thus eliminating the need to have the sutures removed.

There are various types of absorbable sutures and Aurolab plans to supply PGA a braided synthetic absorbable multifilament made of polyglycolic acid and coated with polycaprolactone and calcium stearate, which render the thread extremely smooth, soft and knot safe.

Aurolab will supply these sutures in 6-0, 7-0, 8-0 and 10-0 USP sizes. These sutures will find their application in the following surgeries: Trabeculectomy, Conjunctival suturing, Lacrimal Surgery, Lid and Socket Reconstruction, Retinal Detachment, Vitreous Surgery, Squint Correction, Pterygium, Orbit & Oculoplasty, Ptosis, Membranectomy, Scleratomies, Vitrectomy, Lensectomy and cataract.

Frontalis suspension set

Frontalis suspension set is a 40 cm silicon rod with 6.3 cm stainless steel needles on both ends. This product is useful for frontalis suspension in patients with significant ptosis & poor levator function. Since this product is available only at a very high cost, Aurolab plans to produce this to make it affordable to all.

Ocublue Plus

This dye having “Brilliant Blue G” as its molecular name with 0.05% W/V concentration has the optimum qualities of superior staining ILM at lower concentrations as compared to the more expensive and toxic alternatives like ICG.

Internal limiting membrane (ILM) peeling is a delicate adjuvant maneuver in several vitreoretinal surgical procedures for conditions like macular hole, vitreomacular traction and macular pucker. ILM is a delicate transparent membrane, which is very difficult to peel unless stained by a bio-compatible dye. Indocyanine green (ICG) and trypan blue (TB) are two of the most commonly used dyes to assist ILM peeling. However, numerous reports have emerged cautioning against retinal damage caused by ICG and TB in both experimental models and clinical use. The search continues for an optimum dye with both satisfactory staining ability at low concentrations and minimal toxicity for effective membrane staining.

Recent clinical studies have confirmed the safety and efficiency of BBG for selective staining and peeling of ILM with excellent visual outcomes. This dye, which appears to have the optimum qualities of superior staining ILM at lower concentrations as compared to the more expensive and toxic alternatives like ICG, is currently not manufactured in India for ocular use. Its availability to the Indian vitreoretinal surgeons is likely to make this delicate maneuver much safer and efficient, with superior functional outcomes for the patients.
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P. MURUGESWARI; DHANANJAY SHUKLA; ANAND RAJENDRAN; R. KIM; P. NAMPERUMALSAMY AND VR. MUTHUKARUPPAN
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- A Method to Isolate Human Limbal Basal Cells Enriched for a Subset of Epithelial Cells with a Large Nucleus/ Cytoplasm Ratio Expressing High Levels of p63
MAJOR CONFERENCES & TRAINING PROGRAMMES ATTENDED

Indian Eye Research Group (IERG) Meeting
L.V. Prasad Eye Institute, Hyderabad, July 28-29, 2007

DR. P. SUNDARESAN
- *In vitro and In vivo study on the secretion of Gly367ARG mutant myocilin protein*

MR. R. VIJAYAKUMAR
- *Antibiogram of Methicillin Resistant Staphylococcus aureus (MRSA) in ocular infections*

Ms. P. Vasanthi, Ms. Renugadevi and Ms. Jeyalakshmi also attended the meeting

Advanced statistical genetics workshop
Sankara Nethralaya, Chennai, December 19-21, 2007

Dr. P. Sundaresan, Senior Scientist and K. Renugadevi, Junior Research Fellow, AMRF attended the Advanced Statistical Genetics Workshop at Sankara Nethralaya, Chennai.

Training course on molecular genetic methods in diabetic retinopathy
LAICO, February 4-14

TIFAC-CORE Training Course on Molecular Genetic Methods in Diabetic Retinopathy was held from February 4-14 at AMRF, organised by Dr. G. Venkataswamy Eye Research Institute, Aravind Medical Research Foundation and TIFAC-CORE. The PG students, PhD scholars and faculty members of various colleges and Universities participated in the above training. Dr. VR. Muthukkaruppan, Director-Research, AMRF welcomed the participants. The Inaugural address was given by Dr. P. Namperumalsamy, Chairman and Dr. R. Kim, Co-ordinator, TIFAC-CORE gave a brief introduction on TIFAC-CORE. Dr. P. Sundaresan, Organizing Secretary of the training course, explained in detail about the hands on training Programme and AMRF research scholars taught the molecular techniques to the participants.

During the training course, many guest lectures were organized with national and international speakers such as Dr. Dorothea Nitsch, London School of Hygiene & Tropical Medicine, London; Dr. Daniel Otzen, Aarhus University, Denmark; Dr. G. Kumaramanickavel, Sankara Nethralaya, Chennai; Dr. Radha Venkatesan, Madras Diabetes Research Foundation, Chennai; Dr. Karutha Pandian, Alagappa University, Karaikudi; Dr. K. Dharmalingam, MKU; Dr. S. Krishnasamy, MKU along with Aravind faculty members. The Programme ended with the assessment of knowledge gained by the participants during the course and with their feedbacks about the training course. Director-Research

Dr. Muthukkaruppan distributed certificates to the participants.
VISITS ABROAD

USA AND UK TRIP
September-October 2007

**Dr. VR. Muthukkaruppan** visited various labs, attended seminars on Stem cells and met the following scientists to develop collaboration.
- Dr. Paul Kaufman, University of Wisconsin, USA
- Dr. Robert Lavker, Department of Dermatology, North Western University, USA
- Dr. Ahmed Waseem and Dr. Harry Navsaria, Institute of Cell and Molecular sciences, Queen Mary’s School of Medicine and Dentistry, London.
- Dr. Julie Daniels, Director Cell for sight Tissue Bank UCL Institute of Ophthalmology, Moorfields Eye Hospital, London
- Dr. Peggy Zelenka, Dr. Fielding Hejtmancik and Dr. Paul Sieving at National Eye Institute, USA.

**PREDOCTORAL FELLOWSHIP AT NATIONAL EYE INSTITUTE, USA**

**Ms. Ramya Devi**, Aravind Medical Research Foundation was awarded the pre-doctoral fellowship to work at the National Eye Institute, NIH, Maryland, USA from January 2006 to February 2007. During this period she worked on the project “Understanding the genetic basis of hereditary cataract in Indian families” under the guidance of Dr. J. Fielding Hejtmancik and was trained in carrying out positional cloning of genes involved in inherited diseases. This visit has been a benefit to our ongoing research activity and will also be helpful in establishing many of the methodologies learned in the AMRF work setting and in building other collaborative projects.

**Ms. B. Suganthalakshmi**, Senior Research Fellow, Aravind Medical Research Foundation (2007-2008) has been awarded a predoctoral fellowship under the guidance of Dr. J. Fielding Hejtmancik, Chief of Ophthalmic Genetics & Visual Function Branch, NEI, Bethesda, USA. She is working on the project of Polymorphism of candidate genes associated with Type 2 Diabetic Retinopathy and Genome wide association studies on Diabetics with retinopathy and without retinopathy using DNA samples from Aravind.
AWARDS

YOUNG INVESTIGATOR AWARD – ASIA-ARVO

The Young Investigator Award in Basic Science was given to Ms. Murugeswari for the best poster presentation at the ASIA-ARVO 2007 meeting conducted at Singapore from March 2-5.

PH.D AWARDED

1. Mr. G. Neethirajan, April 2007 - Molecular Analysis of PAX6 gene in Indian aniridic patients.
4. Ms. Arpitha, February 2008 - Identification, Characterisation, Enrichment and in vitro maintenance of Human Corneal Epithelial Stem Cells”.

OVERSEAS ASSOCIATESHIP AWARD

Dr. P. Sundaresan, Senior Scientist was selected by Ministry of Science and Technology, Department of Biotechnology, Government of India for the Overseas Associateship award. He went to Molecular Ophthalmic Research Laboratory, University of Iowa, Iowa city, Iowa, USA for three months (April to June 2007) and worked with Dr. Edwin Stone on Molecular genetics on Leber Congenital Amaurosis. He visited several institutes, attended ARVO 2007 meeting and met several eminent senior researchers and ophthalmologists.
VISITORS

Dr. Irene Hussels Maumenee, MD, Professor of Medicine and Pediatrics, Wilmer Eye Institute, Baltimore visited to have discussion on Clinical Genetics.

Dr. Dorothea Nitsch, London School of Hygiene and Tropical Institute, London to discuss on starting a project on genetics of age related eye diseases, funded by Wellcome Trust.

Prof. Astrid Fletcher, Department of Epidemiology and Population Health London School of Hygiene and Tropical Medicine, England visited Aravind-Madurai from February 3-8, for the INDEYE collaborative project between Aravind Medical Research Foundation and London School of Hygiene and Tropical Medicine.

DR. ABDUL KALAM IS VISITING PROFESSOR OF OUR EYE RESEARCH INSTITUTE

It is great delight that we announce that Dr. A.P.J. Abdul Kalam, Professor of Technology & Technical Education, Anna University, Chennai, formerly the Honorable President of India has consented to be the Visiting Professor and Advisor of Dr. G. Venkataswamy Eye Research Institute from 30th July 2007.
DR. G. VENKATASWAMY EYE RESEARCH INSTITUTE - NEW FACILITY

- Space - 33,000 sq ft.
- Laboratory for basic research
  - Microbiology
  - Clinical Genetics/Research
  - Molecular Biology/Functional Genomics
  - Molecular Genetics
  - Cell Biology
  - Immunology
  - Proteomics
  - Ocular Pathology
- GLP facility

Major Equipments
- Leica Confocal Microscope
- Flow Cytometry
- ABI3130 Genetic Analyzer
- MicrOTOF-LC-MS/MS System (Proteomics)
- Fast Real Time PCR-7900 HT
- Liquid Handling System
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DR. L. THAYUMANAVAN
Gastro Enterologist
Vadmalayan Hospitals, Madurai

DR. K. ANANDA KANNAN
Former Vice Chancellor
The TN Dr. MGR Medical University, Chennai

MR. G. SRINIVASAN
Director – Finance
Aravind Eye Care System, Madurai

DR. N. Venkitesh Prabhu
Chief-Dept of Medical Education
Aravind Eye Care System, Madurai

DR. S.P. Thiyagarajan
Director – Research
Ramachandra Medical College
Chennai
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