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Sankara Nethralaya – The Temple of the Eye.

It was in 1976 when addressing a group of doctors, His Holiness Sri Jayendra Saraswathi, the Sankaracharya of the Kanchi Kamakoti Peetam spoke of the need to create a hospital with a missionary spirit. His words marked the beginning of a long journey to do God's own work. On the command of His Holiness, **Dr. Sengamedu Srinivasa Badrinath**, along with a group of philanthropists founded a charitable not-for-profit eye hospital.

Sankara Nethralaya today has grown into a super specialty institution for ophthalmic care and receives patients from all over the country and abroad. It has gained international excellence and is acclaimed for its quality care and compassion. The Sankara Nethralaya family today has over 1400 individuals with one vision – to propagate the Nethralaya philosophy; the place of our work is an Alaya and Work will be our worship, which we shall do with sincerity, dedication and utmost love with a missionary spirit.

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During the recent 3rd ESO's International Vision Science and Optometry conference organised by Elite School of Optometry, one of my friends, who is also an optometrist, from Tripura shared with me the documents of 1920s which carried the information about the first school of optometry (Indian College of Optics) in Calcutta by Mr K. D. Dutta in the year 1927. Until 1978, the focus of 2-year optometry programme was to prepare refractionists for the country. In the year 1985, the visionary Dr S.S. Badrinath started the first modern school of optometry called Elite School of Optometry (ESO) which started offering degree programme. Since then the extended role of optometrists started evolving and today we could see indispensible role of optometrists in eye hospitals and optical showrooms. The first masters programme was started in the year 1996 and later on opening for doctorate and fellowship also were started. Today, to the best of my knowledge, there are 30 universities all over the country offering optometry programmes either as undergraduate or along with postgraduate programme. Many of the optometrists with higher degrees take up academic and research roles in many of the universities and the leading eye research centres in the country.

This special edition will be an opportunity to introduce to the readers, the comprehensive role of optometrists in eye hospitals, status and innovations of socially accountable optometric education, upcoming technologies in estimating refractive errors, unique role of occupational optometrist in the industries, update information about ophthalmic lenses and an interesting case report by optometrist in collaboration with ophthalmologist.

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Role of Optometrist in Eye Hospitals

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Optometrists are important members of the eyecare team in an eye hospital. They take care of a predominant portion in the outpatient services. The role of the optometrist in the hospital set-up has expanded since its inception. In the early 1980s, the principal role of the optometrist in the hospital set-up was the performance of clinical refraction, while the ophthalmologist would prescribe the glasses. The period from mid-1980s to the early 1990s saw the evolution of optometry education into a degree programme that looked beyond basic refraction into other aspects of outpatient management. Today, optometrists play a complementary role to ophthalmologists in the tertiary eye care setup. With the addition of many more dimensions, it has developed into a multi-faceted role with ever increasing scope and responsibility.

In a recent study in UK, the extended role of the optometrists in eye hospital was found to be significant in the areas like glaucoma, macula, medical retina/diabetes, cataract and corneal services.[1] A wide variety of clinical procedures are undertaken as part of these services with relative autonomy.[1] Moorfields eye hospital employs optometrists who are employed in roles involving refraction, low vision, contact lenses and clinical trials. Extended roles involve service in departments such as cataract, external diseases, glaucoma, medical retina including diabetic screening and management and paediatric services.[2]

As a frontline service provider in tertiary eye hospital

Optometrists are the frontline service providers in a tertiary eyecare hospital. They document history, perform clinical refraction, evaluate basic components of binocular vision, examine the anterior structures of the eye using the slit lamp biomicroscope, and measure intraocular pressure using the applanation tonometer and finally advise the patients for dilatation. This first level of evaluation aids the ophthalmologist in diagnosis and arriving at an appropriate treatment plan following retinal evaluation. The optometrist therefore not only performs a detailed ocular examination but also facilitates diagnosis, management of more patients by a single ophthalmologist and accurate documentation of the entire procedure.

Optometrists are spread across the hospital in different clinics, namely general ophthalmology, glaucoma, neuro-ophthalmology, paediatric ophthalmology, uvea, vitreo-retina, cornea, LASIK, and oculoplasty. In each of these clinics, the role of the optometrists as the first-line service providers varies. In the glaucoma clinic, in addition to doing routine procedures, optometrists are engaged in additional diagnostic procedures such as gonioscopy using Goldmann 4-mirror gonioscope and indicate or perform any additional tests that may be needed. A study at the Moorfields Eye Hospital of four resident optometrists and three medical clinicians showed that of the 50 patients examined, agreement between optometrists and consultants in glaucoma clinical decision making was at least as good as that between medical clinicians and consultants.[2] The study opined that within an appropriate environment, optometrists can work safely as part of hospital glaucoma team in outpatient clinics.[2] Similarly, in patients showing signs such as strabismus, ptosis, red eyes, watery eyes, etc. the relevant clinical evaluation performed by the optometrist to document the findings enables accurate diagnosis.

Optometrists in the diagnostic arena in tertiary eye hospital

Optometrists play more than a technician's role in handling various instruments in a tertiary eye care hospital. They handle almost all the diagnostic instruments in the clinics. The advantage of adding their interpretation in all diagnostics reports is a useful contribution in busy set-ups such as the tertiary eye care hospitals in India. Presently they handle automated perimeter, ultrasound biomicroscope, electrophysiological instruments and various imaging devices from anterior to posterior aspects of the eye. Given that their education includes an understanding of the pathophysiology of ocular diseases, their ability to perform the test and interpret the reports is unparalleled. Highly qualified and passionate optometrists have contributed enormously by enhancing the quality of the services in these set-ups on many occasions.

As a biometrist in tertiary eye care hospital

Patients who are advised for cataract surgery are referred to the biometrist. Biometrists measure corneal curvature and axial length and calculate intraocular lens power using appropriate formula for the surgeon's targeted refractive outcome. The challenges of adopting appropriate procedures to arrive at the right IOL power among patients who have a history of corneal refractive surgery, silicone oil in-situ or a corneal opacity is one of the major ways in which optometrists contribute to the success of cataract surgery. In addition, they also play a supporting role in selecting premium intra ocular lenses like multifocal and toric lenses that would be appropriate for the patient.

As an independent vision care provider in tertiary eye care hospital

Independently, optometrists evaluate patients requiring a regular eye check-up and prescribe glasses. In case of no indication for a dilated eye examination, the central "retina" is evaluated using a direct or non-mydriatic ophthalmoscope. Patients are further appropriately referred to ophthalmologists or other appropriate health care professionals when required.

As a contact lens care practitioner

Optometrists also independently counsel, fit prescribe and dispense contact lenses in a tertiary eye care hospital. The patients are generally referred by ophthalmologists from various internal clinics and/or from outside hospitals. The uniqueness of contact lens practitioners in such centres lies not only in handling patients with simple refractive error but also in fitting contact lenses for the specialized and complicated cases. Prescription of various contact lens types such as toric lenses (for astigmatism), multifocal lenses, contact lenses for irregular corneas, myopia control contact lenses etc. are commonly handled in this clinic by the optometrist trained in this specialty.

As a low vision care practitioner

This is a core area for the optometrist in the area of vision rehabilitation. With the advent of newer technologies, optometrists play a significant role for people with irreparable vision loss by understanding their day-to-day visual needs and provide them with appropriate low vision care interventions and/or other forms of rehabilitation. They also teach, educate the patient about the usage of these novel devices and therefore enable patients to use their existing vision in accomplishing daily visual tasks. Children with multiple disabilities and vision impairment need special attention from optometrists specialized in vision development to attend to the assessment and management of visual issues.

As an occupational optometry practitioner

Occupational optometrists in the industrial set-up are vital in pre-employment vision care services, provision of periodic eye care and in the development of vision standards for various occupations. The step-by-step clinical approach for this specialization is discussed in another article in this issue.[3]

As a binocular vision care provider

The advent of technology has caught up with the growing needs of every individual from birth. On the one hand, this has brought updated information to fill the dearth of knowledge, but on the other hand it has placed additional demands on the visual system to retain its efficient functionality. Recent epidemiological and clinical data show the prevalence of binocular vision anomalies to be at an alarming 30%,[4] almost six-fold more than the need for refractive correction. This emphasizes the need for a trained team of optometrists to diagnose and manage these non-strabismus binocular vision anomalies. These optometrists would focus on enhancing the visual skills necessary for reading, learning, sports and all visually demanding tasks requiring binocular vision and stereopsis.

The scope of binocular vision care is not just limited to the clinic. It can be taken to the community at the level of work place of an individual or to the school set-up of children. Occupational vision care specific to binocular vision demands[4] requires optometric expertise. Models of vision care have been developed to establish this set-up in a comprehensive, feasible and structured way. Children with special needs such as reading and learning disability are highly vulnerable to the development of various visual issues. Binocular vision anomalies are highly predominant in this population, thus demanding the role of optometrists in the thorough assessment and management of these anomalies. The optometry team have an ever expanding and never ceasing demand in these arenas of clinical and community care of binocular vision.

Vision therapy, the art of training the accommodation, vergence, oculomotor and deficient visual functions requires the care and attention of optometrists. This is because they understand the complex functionality of the binocular visual system and the scientific basis of vision therapy so as to customize the vision therapy for every individual.

Neuro-optometry care

Neuro-optometry clinic is the brain child of an advancing era of binocular vision clinic. This clinic comprising of the multidisciplinary team of neuro-ophthalmologists, neurologists, neuro-optometrists and vision therapy team seeks to advance the art and science of visual rehabilitation of the neurologically challenged population. 60% of traumatic brain injuries in India is attributed to road traffic accidents (RTA), with mortality and morbidity rates of 0.12 million and 1.27 million, respectively.[5] Binocular vision anomalies such as convergence insufficiency (CI), accommodative insufficiency (AI) and saccadic dysfunction are commonest sequelae after the injury.[6] In such a scenario, neuro-optometry care is essential to serve this neurologically challenged population in aspects of diagnosis, optometric management and rehabilitation.

Amblyopia clinic

The understanding of amblyopia has moved on from simple visual acuity deficit to deficits of higher levels of visual processing. It is now termed a syndrome, rather than a condition. With better characterization of the deficits, there is enhanced understanding of the plasticity of the visual system and options in the treatment of amblyopia. Optometrists as vision scientists along with paediatric ophthalmologists can effectively tackle this by comprehensive assessment of visual functions and by laying out an appropriate structure of treatment to restore the visual functions of the amblyopic visual system. Does this pertain only to a child's visual system? Definitely not. Recent researches suggest that matured brain of an amblyopic visual system also has the potential and plasticity to respond to treatment through perceptual learning.[7] Perceptual learning modifies the receptive fields of cells of the visual cortex in the brain through a stronger stimulation. Our clinical experience at the Srimathi Sundari Subramanian Department of Visual psychophysics at Sankara Nethralaya has aided in better understanding of this new treatment for adult amblyopia. After 20 h of a first person action videogame play, we observed improvements in visual acuity, contrast sensitivity of the amblyopic eye and also in the stereo acuity in anisometropic amblyopes. Improvement in visual acuity in the amblyopic eye ranged between 1 and 1.5 lines of log MAR visual acuity.[8] Through their in-depth understanding and by application of current findings in vision research, optometrists could make a difference in the assessment and management of amblyopia.

Myopia clinic

The sweepingly increasing prevalence of myopia worldwide has resulted in a corresponding interest in myopia research. The amount of research has steadily progressed with myopia progression and prevalence compared to a decade-old data. This trend warrants the need to understand the ethnicity-specific mechanisms behind myopia in our population. Optometrists' contribution in this specialty does add a lot of value in planning a future template for myopia treatment. Literature reports contain strong evidence that reduced outdoor exposure is one of the causes of increasing prevalence of myopia worldwide. The optometrist's role in bringing in awareness among the parents for their children on this aspect is indispensable. There are various myopia control interventions which are coming into practice in which the optometrist serves as a key player in offering the clinical services to children.

Understanding the mechanisms of binocular vision anomalies as a researcher

In a tertiary eye care set-up, optometrists as vision scientists contribute to the understanding of binocular vision anomalies through research thus paving the way for structured treatment protocols. As detailed above, binocular vision anomalies such as convergence insufficiency, amblyopia, eye movement disorders due to neurological damage and myopia require the attention and care of the specialty optometry team in a tertiary eye care set-up. The clinical care of these anomalies when backed up by scientific evidence from the research team would bear testimony to the benefits of evidence based practice in eye and vision care. Optometrists should utilize the tertiary eye care platform to expand, spread and explore these pathways thus strengthening the role of optometrists in the eye/vision care spectrum.

Concept of review clinics in tertiary eye care hospital

In the clinical set-up, a review clinic run by an optometrist can cater to individuals who are coming for review or follow-up check-up, so as to accommodate new patients in the outpatient department. In the review clinic, the optometrist can review the previous records of the patient and evaluate the ocular status as per the protocol of the respective clinic and if found to be clinically stable can counsel the patient accordingly. Only for those patients, who have clinical findings significantly different (as per the clinical protocol) from the previous visit, referral to the appropriate ophthalmology specialist would be required. This would help the system to accommodate new patients who seek consultation with the specialized ophthalmologist to a large extent. Glaucoma review clinic and Amblyopia clinic are some of the clinics which appropriately fit into the review clinic systems of a tertiary eye care system.

The role of optometrist in pre- and post-surgical procedures and counselling in hospital set-up are evolving as an extended role of the profession. With the advent of many types of intraocular lenses, the optometrist can be an appropriate professional to explain in detail the various types of the lenses to help in decision-making of the patient. They would also be good choice to explain about the advantages and limitations of various interventions suggested by the ophthalmologists.

Another upcoming extended role of optometrists is in the area of dry eye. Optometrists could administer the ocular surface disease (OSD) questionnaire, do appropriate eye tests and arrive at the diagnosis. If diagnosis is confirmed, the optometrists would refer to the ophthalmologists for appropriate intervention.

As a dispensing optician

Optometrists play a very important professional role in the optical services in tertiary eye care hospital.

Once the patient brings the glass prescription, the optometrist guides the patient through the process of selecting appropriate lens and frame materials as well as the type or design that would suit the individual cosmetically and fit adequately. This is an art by itself and the role of optometrist is undoubtedly important in such a set-up. Optometrists are also needed to ensure the quality of the glasses that come from the dispensing workshop before being delivered to the patient. In such a set-up, the optometrist ensures that the vision with the new spectacle is as per the prescription. If the vision is not as desired, the process of identifying the reason within the optical set-up becomes easy and avoids unwarranted delay for the patients. Moreover, optometrists are better suited to play an administrative role in the optical services of tertiary eye care hospital due to their know-how.

As an ocularist

Optometrists with an inclination to art, especially to drawing and painting, are found to be contributing immensely in this clinic. This is a clinic wherein the one-eyed patients get custom-made artificial eyes that match with the fellow eye cosmetically. Usually this clinic is run in association with oculoplasty and ocular trauma clinics of tertiary eye care hospital.

As a community outreach optometrist

Optometrists in tertiary eye care hospitals also play a significant role in the outreach activities of the tertiary eye care hospital. From coordinating, supervising and executing the outreach programme, they are the part of the vision care team in a variety of outreach programmes – school vision screening, cataract screening, diabetic retinopathy screening, glaucoma screening, tele-screening, mobile eye surgical unit, etc., Optometrist innovate in the outreach activities. For example, the "One-Day Mass Vision Screening" concept is one such innovation.[9] The idea of including exclusive binocular vision screening among the school children to screen for binocular vision anomalies that could possibly interfere with reading and therefore impact academic performance was also the contribution of the optometrist. Apart from screening, creating awareness among the public on common eye ailments through innovative methods like installation of vision charts in public places and door to door awareness sessions are also part of outreach. Training volunteers, school and college children as "vision ambassadors" on basic vision screening are a worthwhile initiative. Optometrists will have a huge role to play in mobile eye clinics which can provide comprehensive eye care services at the doorstep of the patient and especially for those who are bed-ridden.

As a vision science researcher

Optometrists in tertiary eye care hospital also play a role as a vision science researcher. They collaborate with other vision scientists and do fundamental, clinical and public health-related researches. Their contributions in glaucoma, cataract, refractive error, amblyopia, occupational health, contact lens care, low vision care, binocular vision care, community care, diabetic retinopathy and other retinal conditions are routine. Optometrists are also stepping into integrated research with basic science researchers thus paving the way for translational research – the need of the hour.

As educators in tertiary eye care hospital

Optometrists with adequate clinical experience usually involve in teaching new comers and the students. They actively participate in clinical grand rounds and regular classes for the students. They also are part of the team, organizing scientific conferences and regular continuous medical education.

As administrative personnel

Optometrists' play the administrative role of managing various optometry clinics within a tertiary eye care hospital. In addition to the clinical services, they head specialty clinics such as low vision care, binocular vision care and contact lens clinic. They are capable of donning an administrative role and help in planning further expansion in an eye care hospital.

In conclusion, the role of optometrist in tertiary eye care hospital ranges from predominant clinical roles in refraction, low vision care and binocular vision care, to extended roles in various clinics, education, research, training and administration and furthermore up to changing the scenario of tertiary eye care services in the country. This integrated role of optometrists catering to the vision care needs and ophthalmologists attending to medical needs of the patient within a tertiary eye care set-up establishes a healthy foundation for the expansion and development of the eye care profession for the betterment of the needy at large.

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Social accountability in optometric education

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Medical education needs to be socially responsible, socially responsive and accountable according to Global consensus for social accountability of medical schools document.[1] Social responsibility is to be aware of the needs of the society. Social responsiveness is aligning the education, research and service arenas with the needs of the community. Social accountability is aiming for the better health of the society through partnerships with the Government initiatives, non-government organizations and community partnerships.

Based on these expectations from the medical education, vision of optometric institutions should realign with these needs. Keeping up with this goal, Elite School of Optometry (ESO) defined its 'Vision' as:

Be always a foremost and distinguished leader with social responsibility, responsiveness and accountability in optometric education, vision care service and vision science research in India.

This article aims to project the model by which outreach initiatives of ESO are intertwined with academics and research environment to provide an integrated solution to the society's needs and its march towards social accountability.

Integrated approach of outreach activities with the optometry curriculum

Its implementation at ESO

Education should understand the developmental priorities of the nation and align the curriculum with the promotion and development of communities' needs specifically in health care. Societal needs are constantly increasing. Elimination of poverty, improved quality of life, disease prevention and health promotion are few of the needs faced by the society. To provide a solution to these needs, institutions should provide a platform for development and application of expertise. Education should also ensure participatory learning through authentic experience.[2]

With easy availability of knowledge, access to information to all the societal members, and expectation of lifelong learning from the health care providers, the role of institutions becomes important in realizing the critical needs of the society, upgrading knowledge, dissemination of knowledge, application of knowledge and partnering with organizations for sustaining knowledge application.[3] Outreach activities are such platforms where scholarly expertise are generated, extended, applied and shared. It is an extension of the expertise to the society's needs with social responsibility and responsiveness.

On the other hand, it is not always one sided, knowledge also has to flow into the institution from the society.[3] Outreach activities need to be evaluated to understand its success and impact. The outcome measures of the impact or success of the research and service must be acceptable to the society and therefore should come from the society, which makes knowledge inflow crucial. Hence the broad areas of outreach are not limited only to service but also include academic and research initiatives.

Institution, faculty, students and community are all part of the integrated approach in outreach. Though exact data on the proportion of contribution of each faculty and participation of students in these three areas are yet to be measured, faculty and students contribute to the entire three arenas with the dominance of clinical service owing to the attachment of ESO to the tertiary eye care centre, Sankara Nethralaya. Keeping in mind the needs of the society, projects were designed in all the three fields, which are briefly outlined.

Academics

The need for primary eye care in India is ever increasing and robust training is essential in the delivery of such services. Early clinical experience and bed side learning are emphasized to achieve it. Evaluation of the training process and examination of the adequacy of the training warrants special attention. Competency standards extended by the associations of the profession also clearly elaborates the objectives of the courses, enumerates the hours of clinical training, planning for evaluations, and expectations from the candidates at the end of the programme.[4]

With the intent of complying with the objectives required of the profession, curriculum of the institution is revisited to make sure of its relevance to the context needed for the society. Scope and objectives are laid down not only for the lecture courses but also for the clinical training sessions. Target numbers to be achieved in each of the clinical specialties are enumerated for all the undergraduate courses. Maintenance of log books and continuing medical education is mandatory to ensure systematic learning and constant updating of knowledge. Visit to industries related to the optical and contact lens fields, industries for understanding occupational health set-ups, rehabilitation centres adds value to the knowledge acquired in those courses and also paves way for real life understanding. New initiatives like "Basic Clinical Optometry skills Training" (BCOST) was introduced to initiate early learning of the optometry procedures. It is an attempt wherein senior undergraduate students teach the juniors and vigorously practice the enumerated procedures. Teaching ensured that the senior students understand the procedures and pass it on to the juniors and the activity is monitored by the post-graduate students and faculty. Clinical evaluations are made rigorous by methods like OSPE/OSCE [Objective Structured Practical Examination/ Objective Structured Clinical Examination]. OSPE/ OSCE, a common evaluation tool in medical education, has been in use at ESO for 4 years, ensuring every component of the skills to be evaluated for each student within a short span without any bias.

Attempts are not limited to providing education to the students of the institution but also extended to the community, where in interested students of the schools, colleges and volunteers from the companies are given training for Basic Vision Screening and also given awareness. These volunteers help not only in screening for vision impairment but also act as ambassadors of the institution to the society on eye care. Vision ambassadors who underwent such training are an asset to the institution and help partner with other organisations and also carry forward the vision of the institution to a wider audience.

Research

Research activities should aim at identification of the needs of the society and development of a response to the need. If not, the results of the research might not be appealing to the society and the connect between the institution and the society will be at stake.[3] Sankara Nethralaya, our alma mater has always been in constant support of India centric research, appealing to the masses of the country.

Research initiatives of ESO are introduced right from the undergraduate level and extend as post graduate and Doctorate programmes. Identification of research projects are done with the objective of India centric research in mind. Needs in the society like lack of vision standards for various occupations, lack of compliance to management strategies in school vision screening, lack of man power resources in community service, lack of validated charts for assessment of vision impairment, lack of understanding about the preferences of the beneficiaries about the management strategies has led to various projects like vision standards of various occupations like watch-repairers and goldsmiths, innovative approaches in improving spectacle and referral compliance in school screening, role of optometry students in single day school screening, understanding about eye care seeking behaviour and construction and validation of various visual acuity charts in the vernacular languages. ESO has also considered knowledge-sharing to the extended nation and the world with other optometric fraternity through its national and international conferences.

Service

Service is a platform encompassing the four areas of outreach: identification of a need, developing a response, planning a strategy and implementation. Knowledge gained through the academic curriculum and insights from the research need a platform to be extended and implemented so that the benefits accrued are shared with the community to whose needs these results were aimed at. Outreach activities aim at such implementation with the design of a strategy and present or carry out the implemented plan. Optometry curriculum combines various courses classified as Basic sciences, core optometry courses, applied optometry courses and support courses. Though the learning objectives of all these courses aim at delivery of knowledge in the relevant fields, it requires an interdisciplinary approach to converge it to achieve the aims of the outreach. Community also provides avenue for new research ideas and open up opportunities for funding.

Service programs of ESO include school screening, comprehensive eye camps, awareness campaigns on health promotion and disease prevention. When the need for elimination of refractive error arose, ESO started its school screening initiatives partnering with the Government's initiatives under the "National programme for Control of Blindness". Designing a protocol for the school screening, introducing novel methods like involving optometry students in the screening, formulating cost-efficient strategies like single date screening, upgrading the protocol like binocular vision anomalies screening are all responses to the identified needs in the school screening programme.

ESO also partners with non-governmental organizations to provide comprehensive eye camps and ensures a sustained model for the benefit of the public through the partnership. Ensuring the support of infra-structure and running the camps through the NGOs have ensured sustenance. An added advantage is the involvement of volunteers in such service initiatives from the partnering institutions. This has also helped in fund-raising and infrastructure building of the institution.

In a unique delivery design strategy awareness initiatives have employed innovative models like door-to-door awareness campaigns, installation of vision charts in the public places and creation of calendars with vision tests for use by public. Such strategies ensure exploring new ideas to be implemented, new strategies to be designed, aid in public exposure initially, enlighten the students of their role as primary care provider in health education and disease prevention, help in applying concepts learnt and Integrate the learning from various streams to implementation.

A unique initiative by ESO on the service delivery is the utilization of all academic faculty and non-academic staff into the service initiatives. Aptly named "Aikya" which means integration, it imparts the idea of social accountability and responsibility among everyone in the institution and therefore makes an inspiring model for the students. Such initiatives stimulate the students to be naturally responsive to the needs of the society and the nation at large. This also provides opportunity for sharing other subject matter faculty's expertise with community partners. Session on improving communication among students and teachers was held by the communication faculty in a school where the screening activity took place.

Such activities motivated the students to show their commitment to the society through Rotaract Club activities like arranging guest lectures on diverse topics, visit to orphanage and spending a day with them, and visit to a home of HIV affected children for Diwali celebration.

Benefits earned

It is essential that such benefits are analysed and spread to the society at large to ensure the widespread reach of the importance and need of outreach initiatives to the community.

STUDENT BENEFITS

Academic benefits

Outreach provides an opportunity for holistic approach, understand relevance of academic course work, apply research skills in community, able to adapt to limited technology to address issues, gain newer knowledge which are not confined to text books and understand the limitations of academics and ability to face real-life scenarios.[6]

Skill-based benefits

It also ensures adequate practice of skills under supervision, improvement in language ability, learning to work as a team and explore different places through travel to service sites.

Impact on attitudes

Students feel great having helped the needy, gain advantage of enhanced critical thinking, develop inter-personal relationships, ability to socialize, can overcome conflicts, understand adjustments needed in real-life practice, get rid of fear of facing people, ability to face problems, develop sensitivity to critical and pressing societal issues and understand needs, change in mind-set for future career and enhanced empathy, patience, tolerance and confidence.

Professional benefits

Experience gained through the outreach initiatives add to the curriculum vitae and enhances employment or higher education opportunities.

FACULTY BENEFITS

Outreach also opens up possibilities for new research in a resource limited setting, way for limited budget projects and also provides an opportunity to interact and understand the students better.

BENEFITS TO THE INSTITUTION

It helps in fulfilling mission and vision of the institution, aids in institution-community partnering, increases publicity and visibility and thereby in enrolling quality students.

COMMUNITY BENEFITS

Motivated individuals are usually part of satisfying the needs of the community and volunteer for such initiatives. It ensures completion of target actions, emergence of sensitised individuals to community needs, who will be able to deliver better to the community. Innovative, creative thinking brought about by diverse players and volunteers brings about a new outlook of the needs and "out of the box" ideas to face the challenges and provide solutions. Increased awareness on potential issues is an added benefit.

"A mediocre teacher tells. A good teacher explains. A superior teacher demonstrates. A great teacher inspires." As this famous saying goes, outreach programmes not only pave way to explain and demonstrate what was taught in the class rooms but also inspire the students towards value-based education. It forms the platform on which the knowledge and skill gained by the student is rightly implemented with the necessary attitude.

In the long run, institutions will have to play a bigger role in contributing to the better of the society and the nation. Looking at a broader picture, a new outlook on the curriculum reflecting the needs of the nation, redefining our scopes and objectives, recognizing teaching strategies and planning for country-centric research is essential. This should aim at preparing the student for the world through streamlined educational experience and kindle him for life-long learning and contribute to a global outreach.

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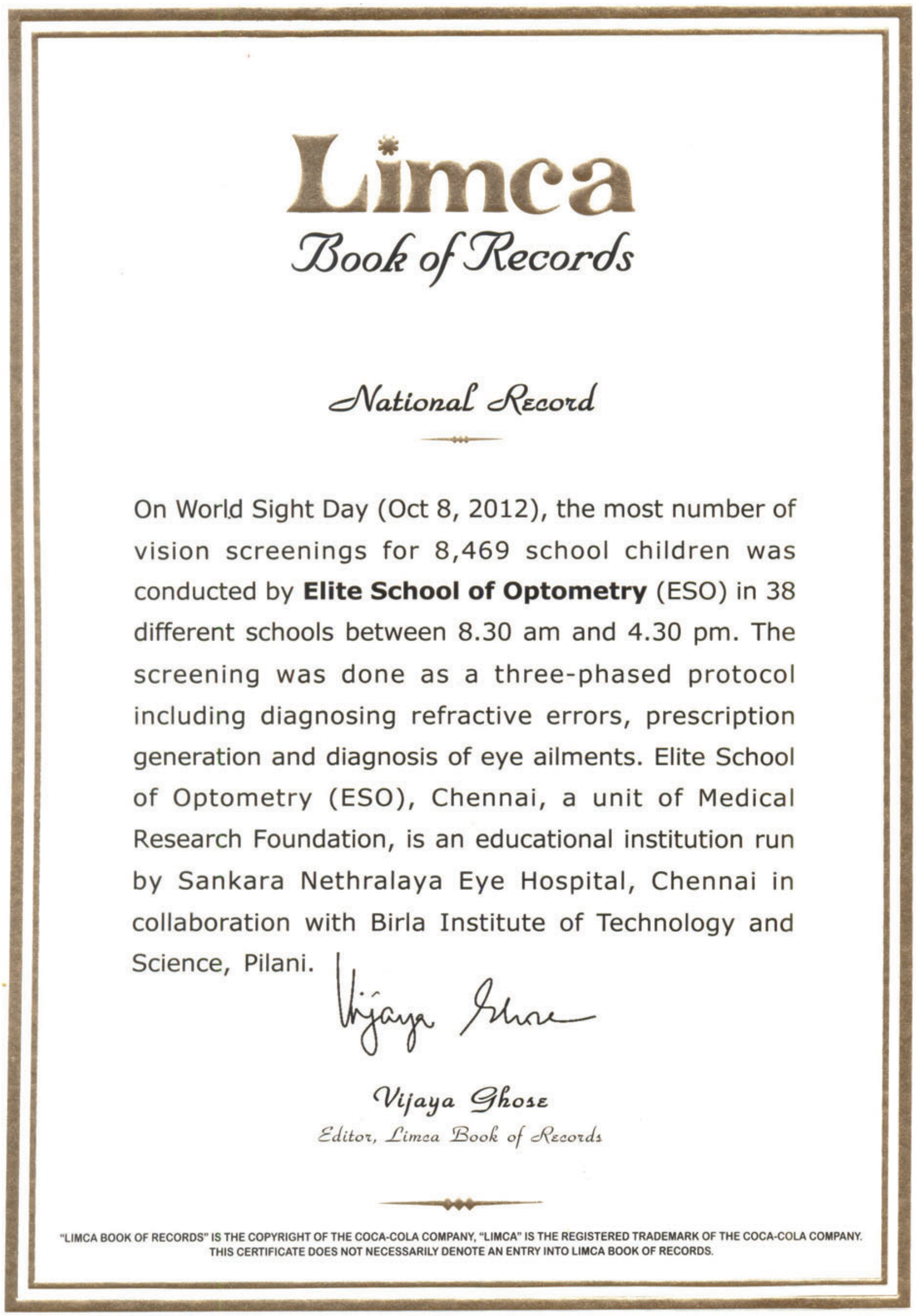

Limca
Book of Records

National Record

On World Sight Day (Oct 8, 2012), the most number of vision screenings for 8,469 school children was conducted by **Elite School of Optometry** (ESO) in 38 different schools between 8.30 am and 4.30 pm. The screening was done as a three-phased protocol including diagnosing refractive errors, prescription generation and diagnosis of eye ailments. Elite School of Optometry (ESO), Chennai, a unit of Medical Research Foundation, is an educational institution run by Sankara Nethralaya Eye Hospital, Chennai in collaboration with Birla Institute of Technology and Science, Pilani.

Vijaya Ghose
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Innovations in Optometric Education

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If you want something new, you have to stop doing something old – Peter F. Drucker

Innovations start with creativity. Imagining new things and exploring the ideas into the real world. Education system, being creative, has explored into many paths and now has taken this stage of virtual learning. In this article, we will see the paths taken by optometric education.

OPTOMETRY AND COMPETENCY

World Council of Optometry defines Optometry as a healthcare profession that is autonomous, educated, and regulated (licensed/registered) and optometrists are the primary healthcare practitioners of the eye and visual system who provide comprehensive eye and vision care, which includes refraction and dispensing, detection/diagnosis and management of disease in the eye and the rehabilitation of conditions of the visual system.[1]

Schools and colleges of optometry train the students to achieve this goal. The common minimum optometry curriculum intends to build the course in such a way that the outgoing optometrists are well equipped for clinical care, specialty care, diagnostics and community eye care.[2] The education system revolves around the curriculum. In the 4 years of optometric education at the undergraduate stage, the curriculum is built in such a way that the training makes the student to evolve as an equipped optometrist. The conventional method of teaching is prevailing in many schools and colleges of optometry which is evolved in 19th century. Though there are many technological innovations and fast forward computational skills, optometry still in schools are thought in traditional way. New innovative models of teaching methods are adopted in few institutes.

CONVENTIONAL METHOD OF TEACHING AND ASSESSMENT

The conventional mode of teaching includes didactic lectures, presentations, practical sessions etc. With these methods students have to follow the teaching notes of the lecturers and write the examinations. In this way they do not link the connections between the clinical skills and basic science.

In the conventional method of teaching, basic sciences are taught first followed by clinical sciences. Students are not found to be applying the concepts of basic science into their clinical practice. Traditional assessment of students consists of the yearly system of assessments.[2] In most institutions, assessments consist of internal and external assessments, and a theory examination at the end of the year or semester. This basically assesses knowledge instead of assessing skills or competencies. This may not give us the holistic understanding about students' knowledge. To fill the gaps in conventional teaching and assessment methods innovative models were evolved.

Innovative models of teaching[3]

1. Vertical integration

Integrating the clinical and basic science will help the students understand the importance of learning each process.[4] By this method the knowledge and the skill are interlinked from the first year till they go in for independent practice in internship. What, why and how? These are the questions which are asked by the students at the entry of their curriculum. Thus each subject or the process is learnt with those questions. The curriculum has to be structured so that the link of subjects is done horizontally for each batch of students and taken up throughout the years.

Vertical integration – our experience

Vertical integration through student centred self-learning was initiated for the subjects of clinical refraction and binocular vision for the second- and third-year students, respectively. In this integrative model, basic science courses taught in the first year of the programme were revisited while teaching applied sciences of clinical refraction and binocular vision. Students were briefed about the method of self-learning. Three of the five modules of clinical refraction, namely Basics of refractive error II (*integrating visual optics + instrumentation*), Classification and clinical examination of refractive error (*visual optics + clinical examination of visual system*) and Management of refractive error I (*visual optics + optometric optics + dispensing optics*)] and three modules of Binocular Vision which includes Esotropia, Exotropia and Incomitant deviations (*integrating anatomy, physiology, clinical examination, clinical refraction, epidemiology, primary eye care, pediatric optometry and pharmacology*) were done through vertical integration. The components of each module were clinical scenario, learning objectives, proficiency related to the objectives, study material and trigger questions. Students were grouped and faculty facilitated the learning. Assessment was done at the completion of every module. The feedback from the students and the faculty were documented at the end of the semester.

The faculty and student feedback were positive towards this approach. Self-learning methods should be combined with conventional teaching methods. Skill-level acquisition and case analysis was faster and better compared to knowledge-level using this approach. Based on the faculty's observation, this method enhances the practical skills of the student compared to traditional approach.

2. Basic Clinical Optometry Skill Training (BCOST)

Bed side learning is the concept used in medicine from early centuries.[4] The trainees be along with the mentors in clinics and learn the techniques of examination. Such training starts at the later stage of education, i.e. during third or final year, thus students lack confidence in performing the skills. We evolved a model of teaching the skills before the knowledge is imparted to the students. This makes the students more competent in performing the skills thus when they learn on the purpose and indications for the skills their understanding is like written on a rock which is going to be there life long.

3. Problem-based learning

Other than the knowledge and clinical training, students also need analytical skills for assessing the case. The students have to be more skilful in analysing a case which makes the outcome more fruitful. This can be imparted by the problem-based learning (PBL). PBL[5] is a group learning environment that involves a radical change in the way students learn and the role that academic staff play in facilitating learning. In this type, the case or a situation is given to the students and they discuss about it in a group. The mentors facilitate the discussion, thereby the learning process and the analytical ability is increased. At Deakin University, they have well-established PBL curriculum. They have mentioned that in PBL, identifying the groups also play a major role, as there is strong influence of behaviour of one student on the other in the team.

Innovative models for assessment[2,3,6]

Assessment is traditionally done as written examination or practical assessment on clinical skills. Several new methods and tools are now readily accessible, the use of which requires special training. Some of these are given below:

- **Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OSPE), Objective Structured Long Examination Record(OSLER)**

  These methods give the faculty the flexibility of testing the knowledge skill and attitude of the students towards any given scenario. This is usually a time-based evaluation. OSCE and OSPE are used these days in a number of allied and healthcare courses, e.g. optometry, physiotherapy and radiography. It tests the performance and competence in communication, clinical examination and medical procedures/ prescriptions. It uses observation check lists or rating scales for scoring to emphasize on frequent assessment of learning outcomes. This provides a feedback to the students as where they lack and gives an opportunity for improvement unlike the traditional method. This OSCE and OSPE can be used to assess clinical skills and also the knowledge any given process. For example, in case of subjective refraction, with OSCE the student has to perform the technique over a subject and in the next station he has to respond to the questions on subjective refraction. This gives the faculty on the level of knowledge the student has on subjective refraction.

  This process needs a lot of time and support from the faculty members. The stations are fixed according to the number of students to be assessed. The response station (Knowledge Assessment) and the performance station (Skill Assessment) are planned and the equipment's needed for the stations are arranged well ahead. The faculty or the examiners are placed at each station with the checklist for that particular station. This way the bias in eliminated. The OSCE and OSPE also have an advantage of providing the feedback to the students at the end of the assessment. The response station answers are also displayed to the students so that they get to know the answers.

- **Short case evaluation**

  Evaluating the students with short clinical scenario will help us know their analytical ability. The case can be given to students and assessment on the management process is done. This gives the holistic approach on any type of cases. For example, a case on presbyopia can be given to the student and the processes of providing addition lenses along with his refraction skills are assessed. His ability to relate the visual demand and the need of the patient can be assessed by this process.

- **Rubrics-based assessment**

  A rubric[7,8] is a ‘‘scoring tool that lays out the expectations for an assignment.'' "Rubrics generally have 4 parts: (1) description of the task, (2) the scale to be used, (3) the dimensions of the task, and (4) the description of each dimension on the scale." Established competency standards are used as performance criteria and indicators are planned for students to know where they stand. This system gives the feedback and also provides information on the gaps. The students know from the descriptors their goal and strive hard to achieve it.

- **Case-based discussion (CBD)**
  This is a part of theoretical and practical assessment. Cases can be simulated and the students are asked to discuss about the cases. The faculty facilitate about the case and analyse the thought process of the students.
- **Portfolio**
  Creating students portfolio is a new technique. All the students' assessment and performance throughout the year is recorded and provided to the student. This gives the track of their performance and also guides the faculty to know the level of training to be given to that particular student.

WHAT NEXT?

The above-mentioned techniques are practiced in few colleges and institutes. Now let us see the emerging trends in education to enhance the teaching and learning technique with the use of technology.

- **Technology-based online learning**
  The use of learning management system in the curriculum will help to facilitate the online learning. Many on campus and also off campus distance education programs take the course management system such as Moodle for their programs.[9,10] These systems save time and make the course materials available to the students for ready reference. The advantages of these online systems are the students need not come to regular classroom sessions. They can fix time with the faculty members for any contact sessions if needed. This gives more flexibility to the students for their time management.
- **Blended learning**
  Blended learning is a hybrid of online and face-to-face teaching.[3,11] The students get to access the online teaching modules and also lecture by the faculty. This technology enhances teaching and also increases interaction between faculty and students. The online system provides the platform for the students to learn on the techniques or the course in a better way. They can access the material at any point of time. Goodwin et al. reported that blended learning allowed for more flexibility in that the students could do the assignments at any time of the day. It allowed more active student involvement. He also added that optometric faculty need to meet the expectations of the students while delivering difficult material in an effective way. Thus there is a scope of blended learning to be introduced in the curriculum for effective learning process by the students.
- **Evidence-based practice**
  The process of evidence-based practice (EBP) is based on the pre-requisite that clinicians acquire, locate, evaluate and apply relevant high-quality medical information to a clinical question. EBP[4,12] should comprise collection, interpretation and integration of valid and applicable patient-oriented, clinician-controlled and research-derived knowledge (evidence). Still further, the best available evidence is "brushed up" by patient circumstances and, in particular, preferences to be finally applied to improve the quality of clinical decision-making and facilitate cost-effective care.
- **Simulators for clinical skills**
  Simulators can be of use in teaching the clinical skills to the students. Instead of practising on to each other, the simulator training would be more beneficial. This has been a proven method in medicine on the surgical skills. Father of Surgery Susrutha,[13] the ancient Indian physician, taught the surgical skills to his students on various experimental modules, for instance, incision on vegetables (like watermelon, gourd, cucumber etc.), probing on worm eaten wood, and preceding present day workshops by more than 2600 years. Thus simulators for teaching skills like retinoscopy or fundus evaluation can enhance the education.

Conclusion

As said in the beginning, let us come out of old to start the new. Let us adopt the new modes of teaching and with the lessons from the new modes, create further innovative models. The faculty members of schools of optometry can initiate the innovative models in their classes and make learning process as an easy task to students.

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Innovations and Advancements in Refractive error measurements

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Introduction

Glasses have been part and parcel of our life, be it sunglasses that we wear when we go to the beach or the power glasses which help us to read our favourite book, glasses overall have helped us to see the world around us with great clarity and precision. But I always wonder how people around the world used to see before the advent of glasses. According to the tales and fables from the Roman Empire, a Roman Tragedian born about 4 B.C. was alleged to have read "all the books in Rome" by peering at them through a glass globe of water. Around the same time Nero from the Roman Empire used an emerald held before his eyes when he watched gladiators fight. The oldest lens was made of polished rock crystal and was used for burning holes in the parchment was found in the ruins of ancient Nineveh. Over the centuries that followed, glass lenses started being widely used as a form of correction for people facing difficulty in seeing and the world began to see different designs of frames and lenses come into the trade market.

In the late 19th century, Sir William Bowman noted a peculiar linear fundus reflex through an ophthalmoscope, and this finding eventually helped Cuignet to come up with a method which was later known to the world as Retinoscopy. This led to a great revolution worldwide as people started practising retinoscopy to help provide the patient with a more appropriate spectacle correction.

In the following sections we will look as to how this concept of retinoscopy has taken form in the machinery of the modern era.

AUTO REFRACTORS

After the introduction of retinoscopy which provided a starting point for the objective refraction, it was soon followed by an instrument called the Phoropter (or refractor). Where instead of placing the lenses with our hands into the trial frame, the lenses automatically fell into place with the touch of a button. The additional time required to manipulate trial lenses and their limitations in regards to binocular vision testing makes their routine use impractical in a busy practice.

In 1973, based on the principle of Scheiner's disk, an auto-focussing system based on patient fixation in the closed field was invented to measure objective refraction. It has been commonly used and in a single click the measurements are projected on the screen. Following this, in 1987, Canon came out with the Canon RK-1, which combined an Autokeratometer and an Autorefractor. As the closed field autorefractors had fixation target inside the instrument, it was found to cause "Instrumental Myopia" which has been overcome by the foundation of open field autorefractors (Figure 1). Open field autorefractors are currently used for research purposes, where natural fixation targets are given and accommodation measurements can also be measured simultaneously.

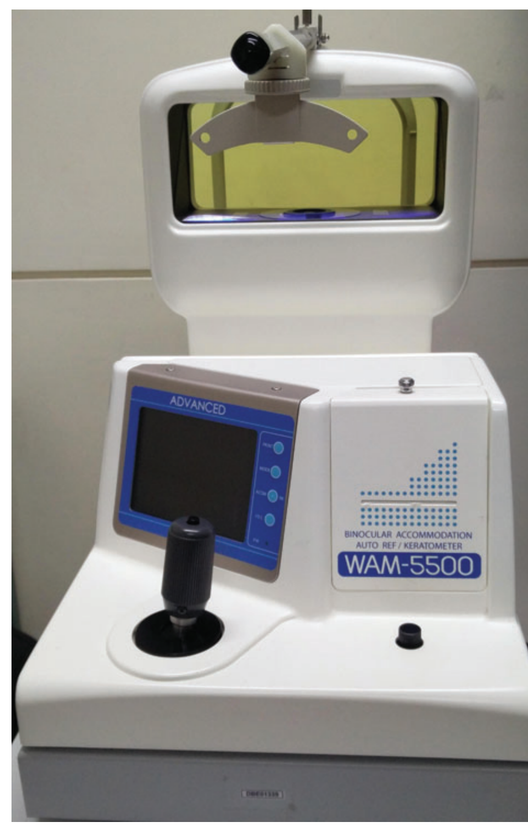

Figure 1:

SPOT VISION TESTERS

Though autorefractors have found its way in the routine clinical practice, its limitations in the assessment of pre-school children, has led to the invention of hand-held vision tester and Welch Allyn spot vision tester is one such model (Figure 2) which is based on the principle of photorefraction. There are many such hand-held devices and a few to mention would include

Figure 2:

plus-optix mobile autorefractor and Nidek hand-held auto-refractor. These can be used in paediatric age group of 6 months and above. Spot vision tester is of lightweight, hand-held and easily transportable with auditory alignment cues for objectively determining refractive error at a working distance of 40 cm. Refractive error assessment is done within seconds of capture time and the information can be transferred through inbuilt Wi-Fi connectivity. Apart from refractive error measurements, it also helps in determining binocular vision anomalies (strabismus, anisometropia, etc.).

SMART PHONE AND ONLINE-BASED TESTING

With the availability of inexpensive microprocessors and development in technology, researchers from Massachusetts Institute of Technology developed the world's first smart phone-based diagnostic tool for human eyes known as NETRA. It is based on the inverse principle of Shack–Hartmann wavefront sensor with a clip on device that can be attached to the cell phones. Here the patient is asked to manipulate patterns on the screen so that the he perceives only a single dot at the end (Figure 3). The number of clicks he takes to align in each direction gives the complete spherical and cylindrical refraction parameters. Since the testing is completely patient dependent, it cannot be performed by individuals who cannot reliably perform the task, such as young children and also the accuracy of the measurement is limited by the focal length of the micro-lens array.

With improvement in technology and increase in use of gadgets, Aaron Dallek and Steven Lee in 2012 founded the world's first online eye exam service "Opternative" to provide an option for healthy patients who may not require a yearly check-up but may still need a new prescription. Once registered in its website, a link is sent to the smart phone and instructions are given in the form of audio. The examination takes about 25 min. An

Figure 3:

ophthalmologist verifies the prescription and it is provided digitally to the patients within 24 h.

ADJUSTABLE EYEWEAR

Manual adjustable eyewear corrects different refractive errors using the same spectacle design. These lenses are built by sandwiching a layer of optical fluid between two lenses. By adjusting the amount of fluid between the two lens types, the curvature of the lenses varies which in turn changes the optical power of the lenses (Figure 4). The available ranges are +0.50DS to +4.50DS in hyperopic lenses and −1.00DS to −5.00DS in the myopic lenses. Electronic adjustable focus eyeglasses are the recent development of the adjustable glasses. These eyeglasses work by electronically altering a thin layer of liquid crystal located inside each lens, which then alters the corrective power of the lens. It can be made in more stylish form compared to the manual adjustable eyewear.

Figure 4:

Through the years we see that although the basic concept of retinoscopy and spectacle correction have remained the same, the method of objective refraction has taken a huge step such that providing a person with the ideal glass prescription is no longer a tedious process and it has been refined to the utmost level. Hence in the years to come we can expect the process of getting a new pair of glasses would be as easy as getting a picture clicked on your phone.

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15th Dr E Vaithilingam Memorial Scientific Session-Invite

Elite School of Optometry welcome you all for the Fifteenth Dr E Vaithilingam Memorial Scientific Session after an exciting EIVOC 2015. An annual scientific session providing a knowledge platform for research interests & works, Dr E V memorial has been the one and only of its kind in this country in its unique ways.

Every year we make deliberate efforts to upgrade the session with unique themes and sessions. Theme based sessions, Clinician to researcher, posters in a different outlook were the highlights of the yester years. This year, a new team has geared up, to give you many such exciting opportunities. Fifteenth Dr E Vaithilingam Memorial Scientific session will be held during **August 6–7, 2016 at Sri V D Swami Auditorium, Sankara Nethralaya, Nungambakkam, Chennai.** The theme of the conference, details of the sessions and the dates for the submission of abstracts will be announced shortly.

We urge the eye care fraternity to get ready with zeal to submit your abstracts and be ready for being present. Till then, have a wonderful year!

Best,

Organising team

15th Dr E Vaithilingam Memorial Scientific Session

Update on Spectacle Lens

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Majority of the advances in spectacle lens continue to occur in the area of progressive lens design by most of the spectacle lens manufacturers. Since the introduction of progressive addition lenses (PALs) in 1959 by Essilor, it has gained worldwide acceptance for the treatment of presbyopia. While progressive lens design, manufacturing and dispensing techniques have grown at a good pace in the last decade or so, recent progress in "free-form" has made possible to fabricate progressive lenses with much more precision. In this edition, optical designs of progressive lenses with emphasis on "free-form" progressive lenses, occupational progressive lens, effects of harmful blue-violet light will be reviewed.

INTRODUCTION

Conventional bifocal has two distinct areas separated by a ledge. Due to this discontinuity, there is an abrupt change in image size and location, which is commonly referred as image jump, as the line of sight passes from distance into the segment region. On the other hand, the lens power in a progressive lens gradually increases from distance to near (Figure 1), and is achieved by increasing the radii of curvature in a progressive surface. In the last two decades, the usage of progressive lens has increased rapidly as developments of progressive lens continue to dominate among the researchers among lens manufacturers.

The distance zone has the distance prescription and the lower portion has the specified power for reading. These two are connected by a corridor of progressive power that provides intermediate zone. Progressive lens provide desired add power without any ledge in-between allowing wearers to focus from distance to near without any disruption. This is achieved by incorporating various amounts of surface astigmatism in the lateral region of the lens. So, for the wearer there is an area of blur and distortion towards the periphery. So, this is one of the disadvantages of progressive lenses and the lens manufacturers have been working on this area to minimize the blur and distortion. Earlier progressive lenses were primarily divided into hard and soft based on the distribution of power and surface astigmatism. In the hard design, the blur and distortion in the periphery was higher as the power progression was rapid. In the softer design, the unwanted astigmatism spreads across larger area of the lens surface, thereby reducing the overall peripheral blur. The current generation of progressive lens combines the advantages of both soft and hard lens. Also earlier progressive lenses were symmetrical where the lenses were rotated clockwise towards nasal direction for each eye to obtain a clear near zone, whereas the modern progressive lenses are asymmetrical which ensures wider binocular fields of view. Though the traditional progressive lens works well for majority of the wearers, with the advent of new gadgets the need for visual demand is constant changing. So, the one size or design may not fit all progressive lens wearer. Fortunately, with free form technology, the manufacturers are able to fabricate the desired design on a progressive surface.

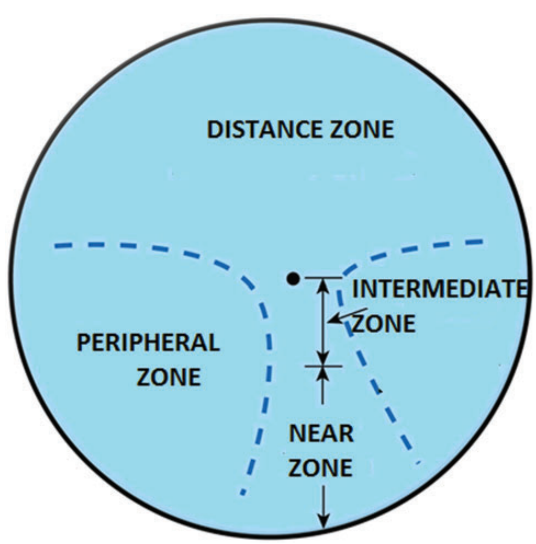

Figure 1: Anatomy of a progressive lens

Each prescription in free form is customized based on the wearer's specifications to eliminate optical aberrations such as surface astigmatism.[1] As the power changes with each position of wear, it is important to consider the effects of vertex distance, tilt of the lens, which may influence the final power of the lens. Fortunately, with the free form technology all these factors are considered while dispensing a progressive lens and a new compensated prescription is provided. For prescription optimization, the wearer's vertex distance, pantoscopic tilt, face-form wrap, dominant eye and the preferred reading distance is considered to improve the optical performance of a lens. Along with the above measurements, the behavioural pattern of the wearer is captured automatically using some of the sophisticated devices as shown in Figure 2 and the information is transferred to the processing lab. With increasing number of frame styles including the wrap

Figure 2: Visioffice® (Courtesy: Optical Services, Sankara Nethralaya)

around, where a complex atoric lens surface is needed, application of free form technology is becoming more relevant.[1]

One such lens is varilux® S series: 4D technology which incorporates all the above parameters measured using Visioffice® device to dispense a customised prescription.

OCCUPATIONAL PROGRESSIVE LENS

The stress from the usage of computer or other gadgets especially at a closer distance may contribute to variety of symptoms which is collectively termed as "computer vision syndrome". Occupational progressives are designed in such a way that it reduces the strain of the wearers while viewing at mid-range and near working distances. This is achieved by wider intermediate and near zones, with a marked reduction in surface astigmatism at the expense of distance zone. Since these lenses have a wider intermediate and near zone and little of distance zone, these lenses are usually prescribed along with progressive lenses as add on lens for wearers whose needs are more for intermediate and near. These lenses are referred as degressive lenses as the power from wider reading area decreases from near to distance area.

PROTECTION AGAINST HARMFUL BLUE-VIOLET LIGHT

There have been developments on coating of lenses to reduce the effects of harmful radiations from blue-violet spectrum (415–465 nm) apart from UV radiation itself. Long-term exposure to blue-violet may affect the sensitive retinal cells and lead to serious eye conditions like age-related macular degeneration (AMD),[2] leading cause of visual impairment in the western world.

To minimize the stress induced from the exposure of digital devices, Essilor tested three new additional refractive powers (+0.4, +0.6 and +0.85) on 76 subjects, comprising (young adults aged 20—34 years; pre-presbyopes aged 35–44 years and presbyopes 45–50 years). 90% of the wearers have reported that the visual discomfort with digital devices has minimized with Eyezen lens along with Crizal prevencia.[2]

Driving lens

Zeiss has introduced a new lens, optimized for drivers especially when driving on rainy days, and at night. This "Drivesafe" lens has a special anti-glare coating when driving in poor light conditions. This lens is available both in single vision and progressive lens category.

CONCLUSION

Latest advancements in progressive lens and coating technology have further improved wearer's satisfaction. Progressive lenses will continue to dominate the research among lens manufacturers as the visual demand is constantly increasing with increasing exposure to digital devices.

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Occupational Optometry Service – An Overview

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INTRODUCTION

Occupational optometry service is the new discipline of optometry in India. It was initiated as a subject in the undergraduate optometry programme for the first time in India in 1987 by Dr P.P. Santanam, an eminent occupational health professional at Elite School of Optometry. It got into exclusive clinical optometry practice in the year 2012 when the first occupational optometry services were initiated by Elite School of Optometry/Sankara Nethralaya, a unit of Medical research foundation.

WHAT IS OCCUPATIONAL OPTOMETRY?

Occupational optometry is the branch of optometric practice that is concerned with the efficient and safe visual functioning of an individual at work.

ROLE OF OCCUPATIONAL OPTOMETRIST

The role of optometrists in occupational optometry services includes primary eye care, eye safety consultation and vision consultation.

In our conventional service, anyone who is working in an industry will go for eye examination to either an optometry or ophthalmology clinic. The limitation in this system is that most of the time the understanding of the visual demand and work environment of the person at work is not taken into consideration in counselling or when optical prescriptions are given.

In Dr Santanam's *Text book of Occupational Optometry*, the role of the occupational optometrist is described as follows:

a) Diagnosis of visual deficiency and correct where necessary and possible.

b) Identify occupational causes of vision and eye problems. In indicated cases referral to the eye hospital.

c) To help establish the visual requirements or standards for jobs.

d) Be able to advice on eye protection.

e) Visual Impairment assessment.

Vision Screening for the employees – preferably using various occupational vision screeners available in the market. For example, Titmus vision screener, Keystone Vision Screener, Essilor Ergomax.

Seven-step approach

An occupational optometry service includes the following seven steps:

1. **Visual Task analysis of different jobs in work area**

   It aims at acquiring the information on visual demand each job creates on the individual; assess the need for the visual function required for the job. This process of visual task analysis needs visit of the occupational optometrist to the work or job site/station to understand the process, therefore enhance the understanding of visual demand at work site for the individual. For example, to arrive at the visual acuity demand for a job, it is essential to measure the working distance between the individual at work and the task, and the minimum size of the task itself. If the job involves more of near working distance, the need for the understanding the efficiency of the accommodation and convergence is critical for the job. If the job demands colour vision, for example in the dyeing industry, then knowledge of the colours or the hues that are used in the work environment, will decide on the colour vision demands of the individual at work.

2. **Determination of the visual capability and defects of an individual**

   Based on the visual task analysis, the battery of the visual functional tests that need to be done can be decided. These tests will help the optometrist in addition to routine eye examination to know the visual capability of the individuals at work and therefore know about whether they are visually competent; matching with the visual demand arrived from the visual task analysis. This step will help the optometrist to plan the intervention required to achieve the goal of matching the visual demand and the visual capability of the individual – a step in fulfilling the ILO/WHO aim of occupational health.

3. **Management and referral**

   Effort will be taken to decide on the appropriate intervention in the form optical and/or protective eyewear in this step based on the outcome of the first two steps. The instructions of usage and maintenance of the protective eyewear should be given in this step. If the individuals are found to have any ocular pathology, they should be referred to the respective specialized ophthalmologists.

4. **Indoctrination and education of employees**

   Awareness on how to safeguard one's eye

sight in the work environment, advising on appropriate eye protection wear, the maintenance of the protective eyewear, appropriate reasons for which the protective eyewear need to be replaced or repaired, on the common eye diseases and the need for regular eye check-up are the essential components in this step.

5. **Report to the employer**

   A report about the visual demand in various work- stations and the visual capability of the individuals in those work stations should be submitted to the employer. This report should also carry information about the relevant recommendations which might enhance the visual performance of the individuals and therefore consequent improved productivity. For example, the ideal protective eye wear, appropriate lighting in the work environment will be provided in the report.

6. **Follow-up**

   Usually the follow-up services need to be provided to see the impact of the service provided. This involves the visit to the work areas, interaction with the supervisors, employees and the employer.

7. **Pre-placement evaluation**

   In addition to the above steps, optometrists can contribute to the pre-placement and periodic medical examination of employees and give input in case of compensation evaluation.

CASE STUDIES

Tannery industry

Occupational optometry service was offered to a tannery industry. Since most of the products supplied to the clients were rejected, the employer was concerned about the mismatch of the original colour planned of the Tannery goods as against that was supplied. The occupational optometry team visited the manufacturing set-up to understand the process and the environment. All the employees were advised to undergo colour vision test (Farnsworth Munsell 100 Hue test). The occupational optometrist suggested the employer, the possibility of segregating the employees based on their ability to discriminate colours (Hues). Based on the colour vision testing, the employees were classified into superior, average and low colour discrimination ability. The occupational optometry team gave recommendation to match the people with superior colour vision ability and the work which demands more of colour matching and colour arrangement. In addition, the occupational optometrists also recommended the use of light source which do not distort the colour vision. The employer expressed satisfaction with the outcome which helped him to resolve the problem of rejection of the products.

Iron and steel industry

Occupational optometry service in a sector of this large size was always challenging. The team of occupational optometrists visited the manufacturing set-up and understood the process involved in such industry. Based on the observation and interactions with the occupational safety personnel and the supervisor in various departments of the industry, the departments were classified into visual demanding and the visually hazardous departments. Visual task analysis was done to all the visual demanding departments. The occupational optometry team also discussed about the need for appropriate *safety eyewear* among employees in the hazardous departments and for people who were exposed to chemicals about the need for monitoring the colour vision to rule out neurotoxicity. The employer was provided with the *vision standards* for different departments which they can use for recruitment purposes and for annual monitoring of the employees. In addition, occupational health centre was recommended to use *vision screening device* for the periodical evaluation. A survey on visual symptoms among the computer users of the industry, and awareness on visual hygiene were given. A detailed report on our observations, findings and recommendations was given to the employer.

Petrochemical refinery

The objective of the occupational optometry service in the refinery was to know the visual function status of the employees who were exposed to various organic solvents. FM 100 Hue test was done to the employees and relative dyschromatopsia was calculated. In a controlled environment, the colour vision defect was not noted. However, the recommendation was provided to monitor the colour vision using appropriate colour vision tests. Instead of routine ishihara pseudoisochromatic test, the recommendation to use tests like D- 15 or FM 100 Hue was advised during periodic review.

Conclusion

Proper prescription of glasses and other visual interventions enhances the visual ability, improve visual comfort and enhances morale for better productivity – achievable through proper occupational optometry services.

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A Tale of Intermittent Exotropia and Amblyopia – Does Vision Therapy Help?

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Among the types of exotropia in childhood, intermittent exotropia (IXT) has been reported to be the most common type. In a population-based cohort,[1] the prevalence of exotropia has been reported to be 1%, with convergence insufficiency and intermittent exotropia being the commonest of the subtypes. A recent large population-based cohort[2] of 5831 preschool children reports a prevalence of 3.2% of intermittent exotropia, with the basic and divergence excess being the most common of the subtypes. In a long-term follow-up[3] of 184 paediatric patients over 9 years, 3.6% of children resolved; and over a 20-year period, 52.8% of the subjects had an increase in the angle of deviation by more than 10 prism diopters.

In the management of IXT, surgery plays an important role in subjects who tend to increase in their angle of deviation and have associated visual and quality of life issues. The role of conservative management options like vision therapy still remains equivocal and no substantial evidence is available for the same.

This case report emphasizes the role of vision therapy in the management of intermittent exotropia. Ms. H.V. a 6-year-old female with a diagnosis of intermittent exotropia and amblyopia was successfully managed with vision therapy. The child improved in aspects of both visual acuity and visual efficiency.

HISTORY

H.V., a 6-year-old female was brought by her mother with complaints of intermittent outward deviation since 2 years of age with increased frequency and difficulty in viewing far objects since the past 2–3 months. There were no other specific complaints. The child had been advised to use eye glasses by the local optometrist and was also advised to undergo ocular surgery for strabismus by the local ophthalmologist. Birth history was insignificant except that the mother had tuberculosis during the fourth month of pregnancy and was on treatment for the same. The child's developmental milestones were normal and academic performance was good. There was a family history of exotropia in the maternal aunt. The child had not started to use any eyeglass prescription. The diagnostic data are provided in Table 1.

PROGNOSIS AND GOALS

This patient has amblyopia secondary to anisometropia and an added component of intermittent exotropia. Treatment of amblyopia and divergence excess were sequenced with amblyopia therapy first. While in some cases refractive error correction alone is considered to treat amblyopia, at times additional treatment is required. Glasses were prescribed based on the subjective acceptance after the cycloplegic refraction and a follow-up visit was scheduled for 1 month. The visual acuity in the left eye improved to 20/50 and the right eye visual acuity remained the same. The parent felt that the deviation was reduced with glasses. Since the visual acuity did not improve to 20/20 with refractive adaptation alone, part time patching of OD for 4 h/day with near visual activities was advised.

Based on the study regarding effectiveness of refractive correction alone by the PEDIG investigators,[4] it has been reported that 75% of their sample improved by two lines with only refractive correction over a 25-week follow-up. Our subject had amblyogenic risk factor of both strabismus and anisometropia and hence, patching was initiated after 4 weeks of refractive adaptation. The child returned for a follow-up examination 2 months later and visual acuity improved to 20/25 in the right eye and 20/30 in the left eye. The refractive error remained stable when assessed at this point of time. A trial of vision therapy was decided to be administered in discussion with the ophthalmologist considering the age and the control of deviation. The parent was explained the need for surgical management in the absence of improvement in sensory and motor fusion with vision therapy. The general recommended therapy sessions are between 24 and 36 visits as recommended by Scheiman and Wick (2008).[5] Vision therapy was initiated after the second follow-up. Binocular vision assessment was done at the beginning of vision therapy and the relevant details are as listed below (Table 2).

The primary goal in the presence of normal retinal correspondence in Divergence excess is to eliminate suppression, train diplopia awareness, and to sequence fusional training, beginning from third-grade stereopsis to first-grade simultaneous macular perception. Based on this approach, the four general goals for vision therapy were to

1. Eliminate suppression, developing the awareness of physiological diplopia and development of third degree fusion
2. Incorporate techniques to train vergence amplitudes and second degree fusion skills

Table 1: Visual efficiency testing at baseline

Diagnostic data	Findings
Uncorrected visual acuity (with Snellen chart)	OD: 20/40, Near: 6/6 at reading range 20–45 cm OS: 20/200, N6/6 at reading range 20–30 cm
Dry refraction	OD: −0.50 DS OS: −3.50 DS/− 3.50 DC X180
Cycloplegic refraction	OD: −0.50 DS/− 1.00 DC X180 OS: −3.00 DS/− 3.00 DC X180
Subjective acceptance	OD: −0.50 DS/− 1.00 DC X180 (20/30) OS: −3.00 DS/− 3.00 DC X180 (20/60) Binocular visual acuity −20/30
MEM retinoscopy	OD: +0.50 DS OS: +0.75 DS
Ocular motility (ductions and versions)	Full and free (OU)
Stereopsis	Unable to appreciate using random dot stereopsis 400 arc seconds (Wirt circles in Randot stereopsis)
Worth four dot test	Fusion for near, and left suppression for distance (33 cm and 6 m) (in both dark and ambient lit room)
Cover test	Intermittent exotropia – left exotropia (IXT) for distance and near Breaks spontaneously for distance; poor control for distance. New Castle Score: 4/9 (Home control + Clinic control)
Alternate Prism Cover Test	40 Δbase In for distance
(APCT)	25 Δbase in for near Patch test: S/O True divergence excess (since the distance angles remained the same and near angles increased by only 5 prisms)
APCT with cycloplegic prescription in trial frame	30 Δbase in for distance 15 Δbase in for near
Fixation (with accommodative target)	Central, Steady and maintained for distance and near (OD) Central, steady and unmaintained for distance (OS); maintained for near
Anterior segment and posterior segment examination	Within normal limits based on Slitlamp Bio-microscopy and Indirect Ophthalmoscopy
Diagnosis	Anisometropic amblyopia (OS) Intermittent left exotropia True divergence excess Astigmatism (OU) Myopia (OU)

3. Develop first degree fusion skills and the dynamics of vergence
4. Train eye-hand coordination skills, accommodation and oculomotor skills (incorporated during every phase of the vision therapy) along with the other training.

The sequential phases of therapy used for these patients include

1. Refractive adaptation for distance
2. Anti-suppression training for amblyopia combined with Monocular accommodation, fixation and ocular motility training
3. Gross vergence and training to appreciate physiological diplopia
4. Smooth and Jump vergence training
5. Binocular accommodation training
6. Integration of procedures

The details of vision therapy provided in phase 1 are given below.

Phase 1 (20 sittings over a month period)

- Anti-suppression training with red-green bar reader
- Cheiroscopic tracings
- Pen light and red filter along with prism dissociation
- Computer Orthoptics (Anti-suppression and vergence)
- Brock string
- Accommodative rock therapy (Monocular and binocular)

Table 2. Visual efficiency assessment before vision therapy

Review after 2 months	Visual acuity (with glasses) OD: 20/25, Near: 6/6 @20–45 cm OS: 20/30, Near: 6/6 @20–30 cm
Binocular vision assessment	Stereopsis: 500 arc sec (RDS targets); 30 arc sec (with circles) Worth four dot test: fusion for near and alternate suppression for distance MEM retinoscopy: OD and OS: +0.50 DS Near point of convergence (NPC): With red filter and penlight: 25/30 cm (break/recovery) With accommodative target: Subjective & Objective: 15/20 cm (break/recovery) Amplitude of accommodation (AA) (push-up method): – OD: 17 D OS: 17 D OU: 18 D – NRA: +2.00 DS PRA: −2.00 DS – APCT (with glasses): 30 ΔBI for distance and 15 Δ BI for near – Gradient AC/A ratio: 7/1 – Calculated AC/A ratio: 10.4/ 1 (IPD: 55 mm) – Binocular accommodative facility testing (+2.00/− 2.00 DS accommodative flippers with N8 Word rock card): 7 cpm (difficulty with plus lenses) – Vergence Facility Testing (12 BO/3 BI vergence flip prisms) at 40 cm: 6 cpm (Difficulty with BO prisms) – Fusional vergence range (using RDS targets at 40 cm) – PFV: 12Δ / 4 Δ(Break/ Recovery) – NFV: 20Δ / 14Δ (Break/ Recovery) – Saccades and Pursuits: Within Normal Limits – Step vergence – Blur / Break / Recovery – NFV Distance: X / 10 / 4 – Near: X / 25 / 20 – PFV Distance: 10 / 12 / 10 – Near: 8 / 10 / 4
Diagnosis	Divergence excess Reduced PFV amplitudes Receded NPC Reduced vergence facility

– Home reinforcement opaque Life Saver cards, Eccentric Circles and Brock string

Follow-up:

– Visual acuity - 20/25 in OD and OS

After the first phase, review of findings suggested improvement in visual acuity, improvement in fusion and binocularity, no change in stereopsis and improvement in near positive fusional vergence. While the binocular visual acuity was assessed, the child exhibited a small face turn towards the left and also occasional blur for distance especially while performing distance fusional vergence activities. Though the deviation was comitant, the face turn could not be explained. An over refraction did not reveal a change of refraction and dynamic retinoscopy revealed normal accommodative response. Ocular motility was full and cover test was repeated with a −1.00 DS above the patient's glasses. The distance angles reduced by 8 prisms diopters in primary gaze and for near the child had an insignificant small exophoria. With adaptation for about 30 min, the face turn almost disappeared. Binocular visual acuity also improved to 20/15 with the over minus lenses. The near visual acuity, amplitude of accommodation and the working distance ranges were normal. The calculated accommodative convergence/accommodation (AC/A) ratio is high in divergence excess due to the difference in exodeviation between distance and near, but the response AC/A ratio is typically found to be normal. In IXT, when patients tend to use their excessive convergence accommodation in an attempt to converge that results in distance blur. In such cases, high convergence accommodation/convergence (CA/C) ratio is considered to be an indicator to prescribe minus lenses for distance.[5] Though we do not routinely measure this in the clinical set-up, complaints of distance blur while trying to fuse is an indication of inability to inhibit accommodation due to high CA/C ratio. Based on these factors, an over minus prescription of OD: −1.50 DS/− 1.00 DC X180 OS: −4.00 DS/− 3.00 DC X180 was given. The second phase of vision therapy was initiated with the new refractive correction.

The goals of second phase included

- Train second and third grade fusion at intermediate and far distance
- Train binocular accommodative and vergence facility
- Train eye movements of saccades and pursuits

The details of vision therapy provided in phase 2 is given below.

Phase 2 (15 sittings over a month period)

- Vergence therapy with major amblyoscope, Bernell O'Scope and Aperture rule
- Distance vergence training with computerized vision therapy system (VTS4)
- Oculomotor skills (VTS4 and Pegboard)
- Brock string
- Accommodative rock therapy (Monocular and binocular) using VTS 4

At the end of second phase of vision therapy, the angle of deviation for distance was well controlled (NCS – Control score 2/9) and reduced to 20ΔBI (with the −1.00 DS over-minus prescription). The patient achieved desirable levels of improvement using the Aperture Rule, Bernell O Scope, Variable Tranaglyphs (could work with more central targets) and the VTS 4 system using second-degree fusion targets. Vergence facility still remained poor and hence the next phase focused on phasic training and vergence facility. Home reinforcement was prescribed at this stage and a follow-up after 6 months was advised. During follow-up, the vergence parameters and the angle of deviation remained stable and the third phase of vision therapy was initiated.

GOALS FOR THIRD PHASE OF VISION THERAPY

Move from tonic to phasic training in vergence to emphasize vergence facility at all distance of training.

Phase 3 (10 sittings over a 2 weeks period)

- Jump vergence training (variable/ non-variable Tranaglyphs/ Vectograms)
- Jump vergence training with VTS4, vergence flippers and prism trainers
- Home reinforcement using computerized vision therapy software, Distance large eccentric circles

Follow-up (key parameters):

- Vergence Facility Testing: 10 cpm
- Step Vergence:

		Blur	Break	Recovery
NFV	DISTANCE	X	10	4
	NEAR	X	35	30
PFV	DISTANCE	20	25	20

OUTCOME OF CASE

The distance angle was well controlled and other parameters were consistent with the re-assessment done following the second- phase of vision therapy. The distance NFV was satisfactory, though not perfect. A cycloplegic refraction was done at the end of the final session which revealed OD: −1.75 DS/−1.00 DC X180 and OS: −4.25 DS/−3.00 DC X180. The child also preferred the new correction and change of glasses were advised.

FOLLOW-UP CARE

Home reinforcement was advised using the HTS, and free space fusion techniques (large eccentric circles for distance, Brock string with vergence and accommodative flippers) were prescribed during the third phase. A re-assessment after 1 month showed stable parameters and visual acuity. Need for constant reinforcement and the possibility of a recurrence of the deviation if vision therapy was abruptly stopped, were explained. At 1-year follow-up, the refractive error in the right eye had progressed to OD: −2.25 DS/− 1.00 DC X180 and left eye remained stable with no progression of myopia. Over a 3-year follow-up, there has been no specific visual symptoms with stable parameters of ocular deviation and vergence.

DISCUSSION

This is an unusual presentation of intermittent XT in which the IXT was also associated with anisometropic amblyopia. The result was resolution of the amblyopia along with a significant improvement in the vergence parameters with good control of angle of deviation.

The uniqueness of this case include the protocol of vision therapy adopted for amblyopia and IXT customized based on the clinical parameters, and the long-term follow-up with successful maintenance of the achieved improvement. This opens up a new option in the conservative management of IXT, when surgery is not indicated or not attempted due to patient/ parental factors as in our case. Another uniqueness is the prescription of over-minus lenses to improve the control of IXT for distance, based on the assumption that an elevated CA/C ratio caused distance blur and an associated AHP to clear the image. As clinical measurement of CA/C is complicated by the measurement protocol in itself, there are no guidelines as to how much over-minus should be prescribed, and how long it should be prescribed. It could be argued that the over-minus resulted in the progression of myopia, but there is no scientific basis to this argument. We consider that the progression of myopia was coincident to the case, and not related to the over-minus prescription. Also the refractive error remained stable during the follow-up periods. In the management of IXT, surgical correction has been recommended as a standard approach in patients with deteriorating control and increase in the angle of deviation. In a randomized controlled trial for IXT,[6] that compared patching with observation of children between 3 and 10 years of age, both the approaches have been reported to show comparable outcomes in the deterioration of angle in children with previously untreated IXT. In younger children between 12 and 35 months of age, part time patching did not show any advantage over observation on the control of angle of deviation.[7] The angle of deviation and the control scores remained stable in both the patching and observation group over a 6-month follow-up in this recent RCT.[7] Systematic reviews reporting the success of surgical outcomes point out to the absence of lack of standardized outcomes to prove the efficacy of surgery over other treatment modalities.[8] Orthoptic intervention through vision therapy has been recommended as one of the conservative management options for IXT by many authors.[5,9] Some of the compiled findings in a recent review suggests surgical management combined with vision therapy as an appropriate option.[9] All these findings point to the lacunae in the literature for standardized clinical trials proving the efficacy of these treatment options.

Vision therapy in the management of non-strabismic binocular vision anomalies like convergence insufficiency has gained increasing evidence in the past decade. Convergence insufficiency (CI) is a common binocular vision anomaly resulting in symptoms of eyestrain, blurred vision and asthenopic symptoms associated with near task. The convergence insufficiency treatment trial (CITT) showed the efficacy of Office-based vision therapy as against conventional pencil push-up exercises and home-based vision therapy in convergence insufficiency over a 12-week period.[10] Sustained improvements in signs and symptoms were reported in 73% of study subjects. In this study, home-based pencil push-ups was not efficacious in improving the signs and symptoms and was comparable to the placebo treatment. The mechanism of vergence therapy in CI was established in a recent study, where apart from improvements in clinical signs and symptoms, the neural substrates using fMRI revealed an increase in the percent signal change of functional activity in the frontal eye fields, posterior parietal cortex and the cerebellar vermis.[11] These results strengthen the role of vision therapy in the management of binocular vision anomalies, though there is scarce data specifically on vision therapy for IXT.

Through this case report, we emphasize the role of vision therapy as a conservative management in the long-term follow-up of patients with IXT, for whom surgical management is not advocated or postponed.

CONCLUSION

This case report proposes vision therapy as a conservative management option in the management of intermittent exotropia. Vision therapy also plays a significant role in the amelioration of patients' symptoms and improvement of binocular vision parameters.

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A Sreelatha
Srihari N
V Srinivasa Rao

Year: 1991
Bhavani Ramanathan
Bhuvaneswari R
Biswa Prakash Samal
Blessy Mary Oommen
Eunice Wilson
Ganesh K
Goldy George
Jayashree R
Lavanya M
Meera Mariam Jacob
Mohan Sundaram
Poongothai M
Pravesh Kumar Sahoo
Rakhi Sehgal
Rituraj Khanna
Saradha T S
Saraniya A S
Senthil Murugappa M
Shoba S
Veena R

Year: 1992
Nandhini P Shah
Shobana S
Mahalakshmi R
Preethi A S
Ajitha G
Latha C
Shabeena Begum K
Ananth V S
Subhadra P
Radhika P
Kiran Kumari V
Veeramani S
Kavitha Vasudevan
Swapna S
Fareed Ali Dosani
Veshal Madan
Vandana Rajaram

Year: 1993
Kamala Santanam
Jayaragini S
Vanitha P S
Sally Mary Abraham
Manovidhya B
Suren Kumar A
Premsudhakar L
Ajay Kumar V
Ashok Kumar Chendur
Aaesha Khatoon
Rathidevi Rajaram
Mhaske Balasaheb Dhansingh
Gare Rajesh Ramlal
Mhaske Prema Dhansingh
Khandelwal Amritraj Pannalal
Maneesha Varma

Year: 1994
R Dharani
Brinda P
Mahalakshmi M
Nalini V R
Syed Nadeemullah
Ahalya Subramanian
Sumithra Mohanraj
Faiza Fathima
Sangeetha S
Anitha R
Rajaraman
N Anuradha
N Santana Lakshmi
Aparna Raghuram
Ganesh Babu T M
Anuja C M
Sandhya V
Sangeetha Pallavi
Kallakuri Sumasri
Ramkumar S
Rajeswari M
S Subhash
Srividhya H
Srinivas Abhiram Villupuru

Year: 1995
Irene Sophia Joseph
Farzana Zia
Deepa C
Nidhi Ashwani
Shiney Sebastian
Jemima Oyan
Madhavan Renjini
Radha M
Manoj Subbaram V
Jayashree S
Indu V
Prema Raju
Varuna Padmanabhan
Sujatha G
PremNandhini S
Ramkumar R
Veena Adusumilli
Pinakin G
Swati Kulkarni Dinkar

Year: 1996
Rajni R
Balamurali V
Vidhya S
Lakshmi T E
Subha T V
Valarmathi A
Chitra P
Shenbagam N
Sanjeev Rangan K
Krishna S
Humera Bulkis G
Maheswari S
Jaikishan
Venkataramanan
Hema R
Amudha Oli A
Aruna S Rajagopalan
Aman Anup Kumar
Mitalee Choudhury
Manoj Chandrakant Jadav

Year: 1997
Sangeetha V
Kunal P Shah
Preetha Sampat
R Shivapriya
K T Ramprasat
Mehul K Gosalia
H Abrez

(Continued)

Gitanjali Madan
Ravikanth Metlapally
Raiju Jacob Babu
Shrikant Rajangam Bharadwaj
Sowmya R
S. Ve. Ramesh
Richa Verma
Nithyalakshmi
Shankaran R
Bantu Sunil Kumar Sailoo
Jain Ujjwal Parasnath
Deepika T K

Year: 1998
S Chitra
Rishi Bharadwaj
Girish kumar
S Vidhya
Gunjan kaushik
Padmasri R
Kishore kumar choudhury
N Sathyasri
Ratan kalita
Vidhyapriya S
Lakshman N S
Sruthi srinivasan
Baskar babu P T
Pancham kulkarni pramod
Deepa B M S
Abhijeet Saxena
Archana Bora
Revathy M
Arathy G
Wattamwar Raghavendra
Ramesh Rao

Year: 1999
Tumpa Roy
Purabi Das
K Karthikeyan
Ushaa G
Premlatha J
R Kowsalya
N Mohana divya
Srijaya O V
Ramya C
Charanya R
Bijoy K Nair
Subam B S
Rahjee P
Suganya G
M M Preetha
Sowjanya G
A L Sivagami
V Bhuvaneswari
Tamilchudar Raju
M D Hemalatha
K Rajitha Reddy

Year: 2000
Priya R
Annie Joseph
Sheth Jishnu Ashwinbhai
Vahini V
Linda Gomes
Radhika K
C.V. Sivaramakrishna
Padma Priya R
Karthikeyan B
Ambika M
Jameel Rizwana H
Ramya C
Saranya M
Ria Marian James D
N R Dhanya
Krithika Nandakumar
T. Preethi
Saritha Pillai
Ram Bahadur K C
G. Aparna
Lakshmi Kalita
L. Yamuna Devi
R. Kalpana
Aristotle Rabha
Ms Deepa Sonney Thachil

Year: 2001
M Sasirega
K Archana
S Madhumathi
Archana Babu
P Kavithavalli
A Kannamma
M Anitha
J Salai Dhavamathi
Rashima A
Sonal Kaushik
S Jayasree
V Lokapavani
Rajalakshmi G
A R Saradha
Jitumoni Rajkumar
Anupam Deka
B Vijayalakshmi
Madhavendra B
Nabin Baral
Anupama
S Gayathri

Year: 2002
Divya N
Premal M. Soni
Vandana G
Ujjwal Kumar Roy
M. Krithiga
J. Subha Priya
Lakshmi Priya R
P. Sridevi
Abinaya priya V
Kripa Nagarajan
Aiswaryah R
Sherin Mercy S
M. Jabeen
Palaniappan. L
Sindhu. C
Reehana Yasmin. I
Ayeswarya. R
K Spandhana
Ranjay Chakraborty

Year: 2003
M Naganathan
Annapurani. K
Subhashini S
Nivedha S
Deepika vasudevan
Kalpa. N
Sreenagamugila M
Vijaya Anandan
S Farida
J Elango
S Kaleemunnisha
Kabilan P
Shonraj. B. G
R Siddhart Srivatsav
Sekar U
Malini V
Krithica S
Savita B. S
Sharavanan. G
Daksha G
K. Brindha
Rahul Chintamaneni
Arunkumar. K
Gayathri S
R Srilakshmi

Year: 2004
E. Bhagyalakshmi
Yamuna devi G
Mahalakshmi R
Pavithra C
Vaishnavi O V
K R Swathi
G Sarika
Ashika Verghese
S Chandrashekar
Sailaja M V S
M.B. Aruna Janaki
Pavthra.K S
R. Revathy
N P Leelaa priaya
M. Sarasa
Manju J
R. Dhivyapriya
Sailakshmi.S
Mohana. K P
E. Julia Keren
D.R. Devi
Swapna Elizabeth Mathew
S. Aparna
H. Uma nandhini
Meenakshi S
S. Ramya
Anju susan Cherian
C. Sripradha
Aishwarya V

Year: 2005
C. Vijayalakshmi
Sanjana K
Sheela Evangeline K
Ashwini M
D. Sandeep
Amritha. S
J Varadharajan
Sakunthala .P
M. Karthiga
Poornimadevi. S
Neenu rose Lawrence
Anshika Shah
Neelam kumari
B. Seetharaman
Kolisetty anusha
Abhinav maharwal
B. Vijayanadh reddy
Juthika talukdar
Divya S
Ayisha Atiya
Monica R
Sayantan biswas
Sheeba S
Raj kumar. N. R
M Jayasree

Year: 2006
Deepom Sarah John
H Amitha Vikram Rugvedi
Indhushree. R
Bhargavi. J
Faresh V
M. Akila
S. Janani
G. Hemavathy
Shwetha. C.S
Revanth Kumar T
G. Mahalakshmi
Dheeraj Gupta
S. Veena
Shaj Shakila Banu s
Ramya D
Nandhini G
N. Yogalakshmi

Saranya S
Sri Devi. M
K. Manju Parkavi
Shraddha R
R. Sasikala
Lijo Ben Henry
Kowser Ilahin R Z
A.M.S. Hameeda Bibi
Silpa Mary Paul
Deepa K Vijayan
Sabarrish Srinivasan
Hiteswar Saikia

Year: 2007
R. Nithya
M. Rahima Mumtaz
P Subramaniya Raj
V Srileka
S Karpagavalli
J Bhargavi
Farveena Saleem T
H. Praveen Singh
Malarvizhi M
D Dipthi Krishnan
Madhumitha S Mahadevan
G Jothi
Abhay D Shah
M Kavipriya
B Mahalakshmi
K Mahalakshmi
Pallavi Shaji
Leobin Francis
A Jayashree
B Manju
P B Archana
T Janani

Year: 2008
P. S. Shobha
C Hemalatha
S Prerana
K Geetha
Sonal A. Vyas
M Bharani
J. Nivetha
A Essakimathy
Anjana Gopan
Dorcas W. Marbaniang
Najiya Sundus K M
Nigin C. Philipose
Pathan Jameer
T Suganthi

Year: 2009
Aishwarya Sekar
Hashmath Sultana T
Vidyalakshmi J
Ashwini K
Mithra A
Sivasankari G
Swaathi B
Malini B
Swathi K
Shrilekha V
Bavithra K
Gopinath M
Nikhil N
Nayana Jose
Supraja K
K Meenakshi
Arishiya Kauser V T
Nadhiya Sultana A
A Kanimozhi
Yamini C
Sabiha Afroz U
Bhuvaneshwari G
Karpagam A
Karthick T G
Rekha S
Priyadarshini D
Janani S

Year: 2010
Murugeshwari R
Krithika A
Jayapriya S
Jayalakshmi L
Jaikumar Jain M
Vasanth T M
Karthiga M
Nandhini R
Vaishaali G
Durgasri J
Geethanjalai G
Nihar N Davey
Varalakshmi K
Leenaa D
Greeshma G
Praveen Kumar P
Banumathi D
Pavithira A R
Girija M
Chitra S
Midhun P Mathew
Sumeer Singh H
Priya K
Rajesh N
Roopashree K
Riya Jose
Jayashree U
Abinaya M
Naveen Antony
Aishwarya M
Ashwini V C
Bijuna P Jose
Daleena Dalan
Rinu Thomas

Year: 2011
P.A. Melba dhanamary
R. Santhiya
Nihama
Kousalya
A. Vennila
Maria Shaji
Jayashree K
T.M.A. Rehana khan
D. Asma Thabassum
Neethu sara mathew
R. Rupa
R. Hephziba blessy
J. EJeba cynthia
T. Nomitha baanu
S. Al. Ashra
S. Priyadharshini
R. Sujitha
P. Vasanthi
L. Kharthiyaa
Fathima Junaida. K M
Dhanya. S
R Jayashree
Madhumita
A.C. Sahana
A. Deepika

Post Graduates

Jan 1996 – July 1999
Dr. Krishnakumar R

Aug 1997 – July 1999
Dr V S Ananth

Aug 1998 – July 2000
Maneesha Varma

Aug 1999 – July 2001
M Rajeswari
Ganesh Babu
S Syed Nademullah
S Subash

Aug 2000 – July 2002
S Jayarajini

Aug 2001 – July 2003
P Chitra
M Radha

Aug 2002 – July 2004
S Ve Ramesh
B V Nithya Lakshmi
T K Deepika
H Abrez

Aug 2003 – July 2005
Mitalee Choudhury
G Arathy
B M S Deepa
S Chitra

Aug 2004 – July 2006
V Kiran Kumari
M M Preetha
B S Subam
Rahjee Perumal
R Kowsalya

Aug 2005 – July 2007
A Valarmathi
R Padmasri
Bijoy K Nair

Aug 2006 – July 2008
M Sasirega
A Amudha Oli
R Priya
S Sangeetha
Anton Decruse Wannbah
V Abinaya Priya

Aug 2007 – July 2009
Gella Laxmi
H Jameel Rizwana
M Naganathan
G Muneeswar Gupta Nittala
Sekar U
S Krithica
V Lokapavani
R Rajni
A Rashima
G Sharavanan
B G Shonraj
Madhavendra Bhandari
P Kabilan
R Siddhart Srivatsav
S Kaleemunnisha

Aug 2008 – July 2010
Brindha K
Arijit Chakraborty
Police Shailaja
Vandana G
S Aparna
Anju Susan Cherian

(Continued)

Aug 2009 – July 2011

M Revathy
Sayantan Biswas
Ayisha Atiya
Divya S
Leelaapriaya N P
Sheela Evangeline K
Ramya S
Damkondwar Deepali Ramesh
Monica R
G Aarthy

Aug 2010 – July 2012

Priyanka Modi
S. Jaya Sowjanya
Sailaja M V S
Amritha S
Anshika Shah
Nandhini G
Jothi Balaji J

Aug 2011 – July 2013

Deepom Sarah John
Mohana K P
Divya Jagadeesh A K
Ananya Datta
Deepmala Mazumdar
Ashraf Banu A
Asra Fatima

Aug 2012 – July 2014

Dinesh V
Barsha
Indhushree R
Sheeba S
Prerana S
Ashim Dey
Aditya Chaitanya A

Aug 2013 – June 2015

Pradipta Bhattacharya
N Srividya
Shenbagam N
Neeraj Kumar
Archayeeta Rakshit
Ann Mary Thomas
Najiya Sundus K.M

Doctorates from ESO

Dr R Krishnakumar
Dr Dharani
Dr S Ve Ramesh
Dr Rajeswari M

COLLABORATORS

- BITS, Pilani
- Anglia Ruskin University, UK
- Essilor International
- Indiana University, USA
- University of Melbourne, Australia
- IIT, Madras
- SASTRA University, Tanjavur
- Transitions, India
- University of Alabama, USA
- Linnaeus University, Sweden

MILESTONES of ESO

- 1985 – Birth of ESO at Sankara Nethralaya
- 1987 – ESO gets a new home at St Thomas Mount, Chennai
- 1994 – Affiliation to Birla Institute of Technology and Science, Pilani
- 1992 – First World Optometry Day celebration in India
- 1994 – Conducted first All India workshop on Clinical refraction
- 1996 – Started M.Phil optometry degree program
- 1998 – Conducted first National workshop on Ophthalmic dispensing
- 2001 – Conducted First international conference on low vision
- 2002 – First Dr. E Vaithilingam Memorial scientific session
- 2002 – Started Doctorate Programme in Optometry
- 2002 – Elite School of Optometry Alumni Association formed
- 2003 – Started Doctorate Programme in collaboration with Anglia Ruskin University
- 2005 – First Distance Learning Program in dispensing optics in collaboration with Silmo Essilor Trust
- 2005 – EIVOC – First international optometry conference in India commemorating 20 elite years of Optometric education
- 2007 – Award of first PhD Optometry-India, from ESO
- 2008 – Campus named after Dr. V.G. Appukutty
- 2008 – ESO evolved and initiated first meeting for Common Minimum Optometry Curriculum(CMOC) in the presence of Prof. Jay M Enoch
- 2008 – ESO aided The Palkhivala Foundation for the oration on "The need for Recognition, Regularization and Regulation of eye and vision care practices in India" by Prof Jay M Enoch, USA
- 2008 – ESO-SN Pediatric Optometry Fellowship was started
- 2008 – Smt. Sundari Subramanian Department of Visual Psychophysics Laboratory
- 2010 – EIVOC – International optometry conference in India with Specialty Optometry workshops by eminent professionals
- 2012 – Initiated Doctorate Programme in collaboration with SASTRA University, Thanjavur, India
- 2012 – LIMCA book of record for vision screening 8469 children in one day
- 2013 – Initiated first Occupational Optometry Services in India
- 2013 – Signing of MoU with University of Alabama, USA
- 2013 – Awarding of Indo-US science and technology forum (IUSSTF) grant for exchange of clinical and research scholars
- 2015 – The 3rd ESO's International vision science and Optometry conference EIVOC 2015
- 2015 – Signing of MoU with University of Melbourne, Australia
- 2015 – Signing of MoU with Linnaeus University, Sweden
- 2009–2015 – Screened 210550 people for vision problems
- 2015 – Screened 54000 children under the Titan happy Eyes in a record time of 15 days
- 2016 – Endeavour Fellowship for two faculty members for training at University of Melbourne

Pillars of Elite School of Optometry (ESO)

Founders

Dr S S Badrinath, Prof S R Govindarajan, Prof Jay M Enoch

Our founders Prof.Jay M. Enoch, (Late) Prof. S.R. Govindarajan and Dr. S.S.Badrinath

Patrons

Dr T S Surendran, Dr K Ravishankar

Principals of ESO

Dr P P Santanam (1987–1991)
Dr E Vaithilingam (1991–2001)
Dr (Maj.) S Srinivasan (2001–2003)
Dr R Krishnakumar (2003– present)

Administrative executives

Mr T S Thiagarajan, Mr Rajan, Mr Panth, Mr Velayudhan, Ms Padma, Ms Uma Paramesh

Librarian

Ms Geetha, Ms Nirmala Krishnan, Ms Jayasri