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EVOLUTION OF KERATOPLASTY OVER THE YEARS

Dr. Imran Ahmad

Damage to the cornea due to injury or inflammation/ infection may result in corneal opacification or cloudiness that can cause loss of vision. Keratoplasty is a surgical procedure that involves the replacement of a diseased cornea with a healthy cornea obtained from a donor. This procedure was introduced by a Czech Surgeon, Dr Eduard Zirm in 1900s who performed a full-thickness corneal transplant using corneal tissue from a deceased donor. This procedure has been used for decades to treat conditions like corneal scarring, keratoconus, and corneal dystrophies etc. As with other scientific and biomedical processes, keratoplasty has also developed remarkably and many newer developments have taken place both in the process as well as the material used.^{1,2}

Rather than using full thickness graft (penetrating keratoplasty), the attention these days has been focused to partial thickness keratoplasty or Selective Lamellar keratoplasty (SLK). Use of SLK has resulted in reduced chances of graft rejection, and also improved visual outcome with shortened recovery time due to improved healing.² Many modifications of the SLK technique are being practiced today, such as DALK (deep anterior lamellar keratoplasty), DSAEK (Descemet's stripping Endothelial Keratoplasty), PDEK (pre-Descemet's Endothelial Keratoplasty) and DMEK (Descemet's membrane Endothelial Keratoplasty).³

In DALK (deep anterior lamellar keratoplasty) the anterior two-thirds of the cornea (stroma) is removed and replaced by donor tissue, while leaving the healthy endothelial layer intact. This technique is used for treatment of keratoconus, an ectatic condition of the cornea resulting in conical protrusion of the latter with visual distortion.

In DSAEK, another new technique, only the endothelial layer of the cornea is removed, while healthy stroma is left intact. This technique is useful in the treatment of endothelial diseases such as Fuchs' endothelial dystrophy, where endothelial cells lose their pumping function resulting in corneal swelling and ultimately visual loss.³

Femtosecond lasers have been used for refractive surgery. But recently, they have also been used successfully in keratoplasty. In fact, these lasers have revolutionized the field of ophthalmology, allowing for precise and controlled incisions, resulting in less tissue damage, little inflammation, and faster visual recovery. The same lasers can also be used for harvesting donor corneal tissue, which results in better tissue integrity and improved surgical outcomes.⁴ The use of modern biomedical techniques like tissue engineering is in experimental phase but is finding its use in keratoplasty too. This technique uses synthetic or biological materials whose structure and function may resemble those of natural tissues. Development of synthetic corneas and the cultivation of corneal cells in the laboratory has already

started. These synthetic corneas may be the answer to the age-old problem of donor shortage, while corneal cell cultivation can lead to the development of personalized corneal grafts.⁵

All the above developments and modifications indicate that keratoplasty is rapidly evolving into a modern and safe procedure for some of the hitherto untreatable causes of blindness due to corneal diseases. With the advent of tissue engineering, very soon dependence on compromised corneas obtained from senile, cadaver donors may be completely abolished and this surgical procedure might become a lot more common.

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AWARENESS REGARDING CORTICAL VISUAL IMPAIRMENT IN CHILDREN AMONG EYE CARE PROFESSIONALS

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ABSTRACT

OBJECTIVE: To determine the level of awareness pertaining to Cortical Visual Impairment (CVI) in children among Eye Care Professionals (ECP).

METHOD: A descriptive cross-sectional study conducted at College of Ophthalmology & Allied Vision Sciences from September to December 2021. An online pre validated questionnaire was sent to Eye Care Professionals and they were asked different questions regarding prevalence, etiopathogenesis, clinical presentation, differential diagnosis, investigations, management and prognosis of CVI in children. SPSS 21 software was used for data analysis.

RESULTS: Total 68 eye care professionals were included in the study. All the participants were aware of the term CVI. 72.1% were aware about the main cause of CVI and 47.1% knew about the leading causes of visual impairment in developing countries. Only 23.5% accurately knew about the clinical features of CVI and 58.8% were aware of the most common risk factor for CVI in children. 54.4% ECP knew about the differential diagnosis of CVI and 83.8% were aware that children with CVI need an eye examination. 80.9% participants were aware that CVI can be managed through multidisciplinary rehabilitative approach and 76.5% had accurate knowledge regarding visual prognosis in CVI.

CONCLUSION: Eye care professionals had fair knowledge of CVI in children i.e., regarding their causes, features, investigations, management and prognosis etc. There is a need to improve awareness regarding CVI among ECP so that future strategies can be planned and implemented for effective management and treatment of CVI.

KEY WORDS: Awareness, Cortical visual impairment, Orthoptics, optometry, Ophthalmology.

INTRODUCTION

Cortical visual impairment in children is a condition in which they have nearly normal globe anatomically, but visual acuity and performance of vision guided tasks is reduced. One of the main causes of low vision in children is CVI as it causes impairment in the prognosis or interpretation of visual input in the brain. In Western countries about 27% of cases of low vision in children are caused by CVI.¹

The prevalence of cortical visual impairment has been reported to be 0.06% and 0.07% among children in United Kingdom. Whereas a high prevalence of 2.4%

has been reported from United States of America.² Recent studies have revealed that about 3 to 4% of children between the ages of 4 and 6 years have distinguishable visual or attentional defect as a continuation to a possible neurological lesion or any other disorder presented around the time of birth.

Survival rates of children who have severe neurological complications during foetal period have increased over the past years because of advancements in medicine and technology.³ The prevalence of cortical visual impairment in children has widened from 36 per

100,000 in late 1980s to 161 per 100,000 in 2003-2004.⁴

CVI is caused by damage to retro geniculate visual pathways and those structures of brain which are responsible for processing of vision.⁵ CVI called as a collective unit of various visual disorders that result from any damage to the cerebral parts of visual system like visual cortex, optic tracts and optic radiations. If any of these structures is damaged either early or later in life, it can lead to lessened vision and even blindness.⁶

It can occur as an isolated condition or as a part of a more widespread clinical picture having association with other conditions like intellectual or learning disabilities, epilepsy, hard hearing etc.¹ It shows a disability spectrum. In CVI the pupillary reactions are mostly normal and there may be bursts of intermittent nystagmus.⁴

CVI is diagnosed when the visual impairment is not explainable by any apparent ocular anomaly which is leading to reduced vision and visual field anomalies. CVI can be acquired, or hereditary, although genetic causes are not widely recognized.

Cortical visual impairment is one of the major causes of low vision in children in developed countries.⁷ Children who have CVI present commonly with a wide range and combination of visual complaints like reduced vision, defects of visual fields, squint and difficulty recognizing objects and faces depending upon the point and degree of impairment.^{8,9}

An early intervention is very important for children with CVI as almost 85% of brain development occurs before 5 years of age and visual system is responsible for about 80% of all learning.⁹ It has also been found that children have much better visual prognosis if the condition is diagnosed before the age of three years than those having a late diagnosis. Also, visual function can be improved in children with the help of early training, quality and facilitation services and programs.¹⁰

Managing children with CVI thus requires combined skills and efforts of eye care professionals and neurologists along with rehabilitative services. A most widely used technique to diagnose CVI can be "diagnosis of exclusion" i.e., when any abnormalities in the anterior visual pathway cannot explain the visual disorder, there is CVI.

Literature showed inadequate basic knowledge like

signs, symptoms, investigations, diagnosis, and differential diagnosis of cortical visual impairment in children among ophthalmologists.²

This study aims to assess and evaluate the level of awareness among all ophthalmic care professionals regarding CVI in children which may later help in development of agreed clinical guidelines for diagnosis and assessment of Cortical Visual Impairment in children which in turn may lead to improved quality care for children with CVI.

METHOD

Ethical clearance was obtained from the College of Ophthalmology and Allied Vision Sciences (COAVS), King Edward Medical University. A descriptive cross-sectional study from September to December 2021 was conducted at COAVS. Sample size was 68, obtained by nonprobability convenient sampling and data was collected online. Pre validated questionnaire was sent to Eye Care Professionals practicing in Lahore. ECP were asked different questions regarding prevalence, etiopathogenesis, clinical presentation, differential diagnosis, investigations, management, and prognosis of CVI in children. SPSS 21 software was used for data analysis.

RESULTS

Total 68 eye care professionals were included in the study. Sixty percent of the participants were female and 39.7% were male. All the participants were aware of the term CVI. Seventy Two percent were aware about the main cause of CVI and 47.1% knew about the leading causes of visual impairment in developing countries. Only 23.5% accurately knew about the clinical features of CVI and 58.8% were aware of the most common risk factor for CVI in children. Fifty nine percent responded that their choice of investigation was MRI brain. Fifty four percent ECP knew about the differential diagnosis of CVI and 83.8% were aware that children with CVI need an eye examination. Thirty eight percent participants said that they see less than 5 cases of CVI in eye opd per month while 22.1% said that they diagnose 5-10 cases of CVI in a month. However, 39.7% individuals said that they rarely diagnose cases of CVI. Eighty one percent participants were aware that CVI can be managed through multidisciplinary rehabilitative approach and 76.5% had accurate knowledge regarding visual prognosis in CVI (Table 1).

Question	Correct Answer	Respondents with Correct Answer
What is the cause of CVI in children	Damage to visual areas of brain	49 (72.1%)
Three leading causes of visual impairment in children in developed countries	ROP, CVI, optic nerve hypoplasia	32 (47.1%)
What is the most common risk factor for CVI in children	Perinatal hypoxia	40 (58.8%)
What are the clinical features of CVI in children	Variable loss of vision, visual field defects and abnormal visual behaviour	16 (23.5%)
Investigation of choice in CVI in children	MRI brain	40 (58.8%)
Which is not a differential diagnosis of CVI in children	Refractive error	37 (54.4%)
Do children with CVI need an eye examination	Always	57 (83.8%)
How often do you diagnose CVI in children in ophthalmology OPD (/month)	<5 cases 5-10 cases >10 cases Rarely	26 (38.2%) 15 (22.1%) 0 (0.0%) 27 (39.7%)
What is the management of CVI in children	Multidisciplinary rehabilitative approach	55 (80.9%)
Does vision improve in cvi	Sometimes	52 (76.5%)

Table-1: Responses about Cortical Visual Impairment in Children

DISCUSSION

This study was conducted to determine the level of awareness among Eye Care Professionals about Cortical Visual Impairment in children. Main objective of the study was to assess how ECP perceive and understand CVI. Eye Care Professionals including ophthalmologists along with trainees, Optometrists, Orthoptists, Ophthalmic technologists, Ophthalmic technicians etc.

Although ECP had some knowledge regarding CVI, still it was not adequate to identify and manage children with CVI effectively. It has been found that dearth of knowledge regarding a specific disease among health care professionals is very common and many reports regarding other disorders also support this finding. The attitude and knowledge level of an ECP plays a very vital role in accurate diagnosis and effective management of the disease, patient presents with.¹²

Visual Impairment has a prevalence of about 17.7% in Pakistan¹³ and there is no accurate statistical data revealing prevalence of CVI in children. Pakistani literature being very scant in this subject gives rise to two possibilities i.e., either frequency of CVI is extremely low in the country or many cases are left undiagnosed or misdiagnosed. The current study was done to determine the knowledge aspect of this entity in a small population of eye care professionals.

According to the previous studies, about 51.7% of the ophthalmologists knew about the important clinical

features of CVI in children like variable vision loss visual field defects and abnormal visual behaviour. In this study 23.5% of the respondents were aware of the clinical features of CVI. The signs and symptoms may either be isolated or may occur in combination with some other disorder.

In previous study, most of the respondents 86.5% were aware that the most common risk factor for CVI in children is perinatal hypoxia. However, their choice of investigation revealed that they had scarce knowledge regarding the actual pathology of the condition as only 39.3% responded that MRI is the correct investigative choice for CVI.

This study showed that 58.8% ECP were aware of the most common risk factor for CVI and more than half of the respondents 58.8% answered that MRI was the correct investigation of choice. On MRI, the most common cause of CVI, perinatal hypoxia is distinguished as periventricular leukomalacia (PVL). While other causes of CVI like hydrocephalus, brain trauma, meningitis etc show very particular findings on brain MRI. Correct choice of investigation is thus MRI.¹⁴

One differential diagnosis of CVI is delayed visual maturation. Children with DVM gain normal vision as soon as they reach 1 year of age while those having CVI do not become normal. Another DD can be autism which can be differentiated by MRI of brain. Amblyopia is another DD which can be unilateral or bilateral while CVI is always bilateral. Also, there is an amblyopic factor associated with amblyopia which is not a feature of CVI.¹⁵

CVI can be managed effectively by the combined efforts and teamwork of eye care professionals, neurologists, paediatricians, radiologists, and physiotherapists depending upon the degree and seriousness of disorder.¹⁶ Previous studies showed that 82% of the ophthalmologists knew that CVI can be managed effectively with multidisciplinary rehabilitative approach. In our study, majority of the ECP 80.9% also knew the accurate management strategy for children with CVI.¹⁷

Significant visual improvement may be seen in children over time, but majority of the children never achieve normal vision. Depending upon the site, severity and extent of damage visual prognosis is variable.¹⁸ A previous study showed that about 52%

ophthalmologists had awareness regarding the management results i.e., visual prognosis. Our study revealed that 76.5% ECP had accurate knowledge regarding the visual prognosis of cortical visual impairment in children.¹⁷

CONCLUSION

In this study, Eye Care Professionals were found to have fair level of awareness and knowledge regarding causes, signs, symptoms, differential diagnosis, and visual prognosis of Cortical Visual Impairment in children. Overall, participants had sufficient knowledge but there is a need to improve awareness regarding CVI among Eye Care Professionals of Pakistan.

RECOMMENDATIONS

Seminars must be organized so that knowledge and awareness regarding CVI, its features and effective management strategies can be increased, adding better clinical approach to CVI. Training programmes and workshops must be organized for health care professionals to guide and ensure coordination and interdisciplinary approach.

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