

## CORTICAL VISION IMPAIRMENT - A CASE REPORT

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### **Abstract**

Cortical visual impairment (CVI) is a brain-based visual impairment. The eyes can see, but the brain can't interpret the visual world.

CVI in children is most commonly caused by peri- or postnatal hypoxia-ischemia, but may also occur following other insults, e.g., trauma, epilepsy, infections, drugs or poisons, and certain neurologic diseases. Case report: A case of a 9-year-old child, girl who was referred with Dg. epilepsy et CVI by a specialist doctor, pediatric neurologist from the University Pediatric Clinic for fundus examination and ophthalmological investigation and evaluation. Children with CVI have different levels of severity of visual impairment. There is no one-size-fits-all model, and every child is unique.

**Keyword:** cortical visual impairment, fundus, encephalitis

### **Introduction**

Cerebral visual impairment (sometimes called cortical visual impairment or CVI) is a disorder caused by damage to the parts of the brain that process vision. It is most often registered in infants and young children, but it can also appear in later years. Cortical or cerebral visual impairment can be defined as "visual dysfunction, which cannot be attributed to disturbances of the anterior visual pathways or any potential concomitant ocular impairment"<sup>[1]</sup>. This definition covers a wide range of damage or dysfunction of neural pathways, centers, and networks involved in the processing of visual information. Children with CVI are subclassified into those with selective visual perception and visual-motor deficits, those with more severe and wider visual perception with visual-motor deficits, and those with profound visual impairment<sup>[1,2]</sup>.

Cortical visual impairment (CVI) is temporary or permanent visual impairment caused by obstruction of the posterior visual pathways and/or occipital lobes of the brain. The degree of visual impairment can range from severe visual impairment to complete blindness. The degree of neurological impairment and visual impairment depends on the time of onset as well as the location and intensity of the impairment. It is a condition showing that the visual systems of the brain do not consistently understand or interpret what the eyes see. The presence of CVI is not an indicator of the child's cognitive ability. A child with CVI has vision problems caused by his brain, which cannot be explained by eye problems. Normally, the eyes send electrical signals to the brain, and the brain converts those signals into images that we see. If a child has CVI, the brain has problems processing and understanding these signals.

CVI is the leading cause of vision loss in children in the United States. In some children with CVI, vision improves over time, but every child is unique<sup>[3]</sup>. CVI is the leading cause of severe visual impairment in industrialized countries<sup>[4,5]</sup>. It is associated with improving

the survival of premature babies and/or those with neurological impairment, as well as preventing visual deficits of ocular origin. CVI in children is common, potentially affecting at least 3.4% of children, but a large proportion of children remain unidentified<sup>[5-7]</sup>. The ratio of children with learning disabilities who attend special schools and who have a CVI is high<sup>[8]</sup> and can be higher than 50%<sup>[7]</sup>.

CVI can cause a variety of visual problems that can range from mild to severe.

Children with CVI may have problems:

1. By looking only at certain parts of what is in front of them
2. By recognizing persons and objects
3. By recognizing things in crowded spaces
4. They reach for something while watching it
5. By understanding what they see.

Parents may also notice that their child with CVI:

1. Reacts slowly to visual cues/stimuli
2. Prefers to look at things that are moving
3. Some children with CVI tend to stare at light (such as light bulbs or the sun), while others are sensitive to light.

Children with CVI often have other disabilities or health problems, including:

1. Developmental disabilities
2. Cerebral palsy (brain disorder that causes movement problems)
3. Epilepsy (a brain disorder that causes seizures)
4. Hearing loss<sup>[9]</sup>.

### **Case report**

A 9-year-old child, a girl, was referred to the Department of pediatric ophthalmology at the University Clinic for Eye Diseases in Skopje with Dg. epilepsy et CVI by a specialist doctor, pediatric neurologist from the University Clinic for Pediatric Diseases for fundus examination.

During the clinical examination by the pediatric neurologist, it was concluded that the girl had altered consciousness, lost swallowing, lost speech, visual contact, responds to sound stimuli, and moves with help. A slight degree of limb spasticity was present, but on the other hand, when manipulations were performed the child presented with defensive movements with both hands, with extrapyramidal movements.

The anamnesis taken from the girl's parents revealed that the pregnancy was normal and it was a twin pregnancy. The child was born on time. The girl suffered from encephalitis some time ago and was hospitalized at the University Clinic for Pediatric Diseases, in the Intensive Care Unit for a one-month period.

MRI of the brain was performed and it showed cerebellum and brainstem without focal lesions. The MRI showed small hypersignal lesions in the right occipital, temporal and parahypocampal lobes, as well as in cortical region and hippocampus, which may indicate recent epileptic seizures, but can not exclude viral encephalitis.

During the examination, the child was visibly upset and it was not possible to determine the visual acuity of both eyes and to examine the fundus.

Due to the age of the child, it was decided to examine the fundus under complete anesthesia in the operating room with the help of an indirect ophthalmoscope.

On examination of the fundus under anesthesia, a normal finding of both eyes was diagnosed.

Bottom of the right eye: *papilla nervi optici* is at the level of the retina with clear borders; blood vessels with normal lumen and fullness; *macula lutea* has a clear reflex.

Left eye: *papilla nervi optici* is at the level of the retina with clear borders; blood vessels with normal lumen and fullness; *macula lutea* has a clear reflex.

### Discussion

The main causes of CVI are asphyxia, perinatal hypoxia, ischemia, developmental brain defects, head injury, hydrocephalus, and infections of the central nervous system, such as meningitis and encephalitis<sup>[10]</sup>.

Five facts you need to know about CVI:

1. It is the most common cause of visual impairment in children.
2. It is the leading cause of congenital blindness (loss of vision at birth) in the United States.
3. It causes children with healthy eyes to have difficulty processing what they see.
4. It causes children to show some unique visual behaviors that are usually seen when there is damage to the visual system of the brain.
5. It is usually diagnosed when abnormal visual responses cannot be attributed to eye problems alone<sup>[11]</sup>.

The treatment of any underlying neurological disease is essential and should be organized by a pediatric neurologist. A pediatric ophthalmologist can diagnose cortical vision impairment.

Some children with CVI have other related visual disturbances such as structural eye disease, misaligned eyes, or significant refractive error. A pediatric ophthalmologist can assess the eyes to see if they are healthy or if there is an abnormality in the eye that contributes to vision problems. Treatment of these related conditions may include glasses or eye muscle surgery and may help maximize visual function<sup>[12]</sup>.

### Conclusion

Cortical visual impairment (CVI) is temporary or permanent visual impairment caused by obstruction of the posterior visual pathways and/or occipital lobes of the brain. The degree of visual impairment can range from severe visual impairment to complete blindness. The degree of neurological impairment and visual impairment depends on the time of onset as well as the location and intensity of the stroke. It is a condition showing that the visual systems of the brain do not consistently understand or interpret what the eyes see. The presence of CVI is not an indicator of a child's cognitive ability.

Some children see the world as a rotating kaleidoscope of color and light. While those with better visualization may show some focus, they still struggle to understand what they are seeing.

Children with CVI have different levels of severity of visual impairment. There is no one-size-fits-all model, and every child is unique.

Dr. Gordon Dutton says: "*If you meet a child with CVI, you meet a child with CVI.*"

*Conflict of interest statement.* None declared.

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