Blindness

Blindness is a common cause of major sensory loss, with an estimated 39 million people worldwide suffering from total blindness in 2010.

The term blindness is used for complete or nearly complete vision loss.

see Cortical blindness.

Treatment

Potential treatment options include neurobionics employing Electrostimulation of the visual pathways.

Retinal stimulation can restore limited visual perception to patients with retinitis pigmentosa, however loss of retinal ganglion cells precludes this approach.

The optic nerve, lateral geniculate nucleus and visual cortex provide alternative stimulation targets, with several research groups actively pursuing a cortically-based device capable of driving several hundred stimulating electrodes. While great progress has been made since the earliest works of Brindley and Dobelle in the 1960s and 1970s, significant clinical, surgical, psychophysical, neurophysiological, and engineering challenges remain to be overcome before a commercially-available cortical implant will be realized.

Selection of candidate implant recipients will require assessment of their general, psychological and mental health, and likely responses to visual cortex stimulation. Implant functionality, longevity and safety may be enhanced by careful electrode insertion, optimization of Electrostimulation parameters and modification of immune responses to minimize or prevent the host response to the implanted electrodes.

Psychophysical assessment will include mapping the positions of potentially several hundred phosphenes, which may require repetition if electrode performance deteriorates over time. Therefore, techniques for rapid psychophysical assessment are required, as are methods for objectively assessing the quality of life improvements obtained from the implant. These measures must take into account individual differences in image processing, phosphene distribution and rehabilitation programs that may be required to optimize implant functionality [1)].

1)
Lewis PM, Ackland HM, Lowery AJ, Rosenfeld JV. Restoration of vision in blind individuals using bionic devices: A review with a focus on cortical visual prostheses. Brain Res. 2015 Jan 21;1595C:51-73. doi: 10.1016/j.brainres.2014.11.020. Epub 2014 Nov 15. Review. PubMed PMID: 25446438.