MODERN METHODS OF TREATING EYE DISEASES IN PREMATURE BABIES

Fotima Khayitova
E-mail: fotimaxayitova1@gmail.com
Phone: +998903386005

Annotation: *Premature infants are at high risk of developing various eye diseases due to incomplete retinal and vascular development. One of the most common and serious conditions is retinopathy of prematurity (ROP), which can lead to vision impairment or blindness if not detected and treated in time. This article reviews modern approaches to the diagnosis and treatment of eye diseases in premature babies, focusing on advanced screening technologies, pharmacological therapies, laser photocoagulation, and anti-VEGF (vascular endothelial growth factor) treatments. The paper also highlights the importance of early detection, neonatal care, and interdisciplinary collaboration among ophthalmologists and neonatologists to improve visual outcomes and reduce long-term complications.*

Keywords: *premature infants, eye diseases, retinopathy of prematurity, laser photocoagulation, anti-VEGF therapy, neonatal care, early diagnosis.*

Premature birth is a major global health concern, affecting millions of infants each year. Advances in neonatal care have significantly improved the survival rates of preterm babies; however, these infants remain vulnerable to a range of developmental complications, including ocular disorders. Among these, retinopathy of prematurity (ROP) is the most common and potentially blinding condition caused by abnormal retinal vascular growth. Other visual problems such as myopia, strabismus, and amblyopia are also frequently observed in premature infants.

Early detection and appropriate treatment are crucial for preventing permanent vision loss. Modern ophthalmology offers a variety of diagnostic and therapeutic methods, including digital retinal imaging, laser photocoagulation, cryotherapy, and intravitreal anti-VEGF injections. Recent research has also emphasized the role of careful oxygen management, nutritional support, and multidisciplinary cooperation between neonatologists and ophthalmologists in reducing the incidence and severity of eye diseases in premature babies.

This paper aims to analyze and summarize current modern methods of treating eye diseases in premature infants, highlighting their effectiveness, safety, and outcomes in improving the quality of life of affected children.

Retinopathy of Prematurity (ROP) – The Main Cause of Vision Problems in Preterm Infants

Retinopathy of prematurity (ROP) is a developmental vascular disorder of the retina that primarily affects premature infants with low birth weight. The disease occurs due to incomplete retinal vascularization followed by abnormal neovascularization after birth. Risk factors include oxygen therapy, respiratory distress, anemia, and sepsis. If left untreated, ROP can progress to retinal detachment and irreversible blindness.

Modern screening programs using digital fundus photography and wide-field imaging systems have significantly improved early diagnosis. Regular ophthalmologic examinations are now considered an essential part of neonatal intensive care.

Laser Photocoagulation Therapy

Laser photocoagulation remains the gold standard in the treatment of threshold and pre-threshold stages of ROP. This technique involves applying precise laser burns to the avascular retina to prevent further abnormal blood vessel growth. Compared to older cryotherapy methods, laser treatment is less invasive, causes minimal pain, and has fewer complications. Studies have shown that timely laser therapy can reduce the risk of blindness by more than 70% in affected infants.

Anti-VEGF (Vascular Endothelial Growth Factor) Therapy

In recent years, anti-VEGF drugs such as bevacizumab and ranibizumab have revolutionized ROP treatment. These medications inhibit abnormal vessel growth by blocking VEGF, a key protein responsible for neovascularization. Intravitreal injection of anti-VEGF agents is particularly effective for posterior and aggressive forms of ROP where laser therapy is less effective. However, long-term safety concerns remain, as VEGF also plays a role in the normal development of other organs. Therefore, careful patient selection and follow-up are required.

Supportive and Preventive Care

Beyond direct ocular interventions, the prevention of eye diseases in premature infants depends on optimal neonatal care. Controlled oxygen supplementation, adequate nutrition (especially omega-3 fatty acids and vitamin A), and infection prevention are crucial for reducing ROP incidence. Collaboration between neonatologists, ophthalmologists, and nurses ensures a multidisciplinary approach that leads to better visual and developmental outcomes.

Emerging Technologies and Future Directions

Recent advances in telemedicine and artificial intelligence have opened new perspectives for ROP screening and monitoring. AI-based image analysis can automatically detect early signs of retinal abnormalities, enabling faster diagnosis even in remote or resource-limited areas. Gene therapy and stem cell research are also being explored as future treatment strategies for retinal regeneration.

Conclusion

Eye diseases in premature infants, particularly retinopathy of prematurity (ROP), remain one of the leading causes of preventable childhood blindness worldwide. However, continuous progress in neonatal medicine and ophthalmology has significantly improved the prospects for early diagnosis and effective treatment. Modern techniques such as digital retinal imaging, laser photocoagulation, and anti-VEGF therapy have revolutionized the management of ROP, offering safer and more precise options for preserving vision.

Prevention remains the most effective strategy. Careful control of oxygen therapy, proper nutrition, and regular ophthalmic examinations are essential components of neonatal care. Furthermore, multidisciplinary collaboration between ophthalmologists, neonatologists, and pediatricians plays a crucial role in optimizing visual outcomes.

In the future, innovations in telemedicine, artificial intelligence, and biomedical research are expected to further enhance screening, diagnosis, and treatment, making advanced eye care more accessible even in low-resource settings. Ensuring early detection and timely intervention will continue to be the key to preventing blindness and improving the quality of life for premature babies worldwide.

REFERENCES

1. Fierson W. M., American Academy of Pediatrics Section on Ophthalmology. Screening examination of premature infants for retinopathy of prematurity // Pediatrics. – 2022. – Vol. 150, No. 3. – P. e2022058468. – DOI: 10.1542/peds.2022-058468.

2. Chen J., Smith L. E. H. Retinopathy of prematurity: Pathophysiology and treatment // Progress in Retinal and Eye Research. – 2021. – Vol. 83. – P. 100923. – DOI: 10.1016/j.preteyeres.2020.100923.

3. Mintz-Hittner H. A., Kennedy K. A., Chuang A. Z. Efficacy of intravitreal bevacizumab for stage 3+ retinopathy of prematurity // New England Journal of Medicine. – 2011. – Vol. 364, No. 7. – P. 603–615. – DOI: 10.1056/NEJMoa1007374.

4. Stahl A., Lepore D., Fielder A., Fleck B., Reynolds J. D., Chiang M. F., Smith L. E. Pathophysiology and treatment of retinopathy of prematurity: Current understanding and future directions // Acta Ophthalmologica. – 2022. – Vol. 100, No. 4. – P. e730–e744. – DOI: 10.1111/aos.14991.

5. Quinn G. E. Retinopathy of prematurity: The role of oxygen, risk factors, and prevention strategies // Current Opinion in Pediatrics. – 2020. – Vol. 32, No. 6. – P. 740–745. – DOI: 10.1097/MOP.0000000000000951.

6. Wu W. C., Lien R., Liao P. J., Chen Y. H. Artificial intelligence in retinopathy of prematurity screening and diagnosis // Frontiers in Pediatrics. – 2023. – Vol. 11. – P. 1130248. – DOI: 10.3389/fped.2023.1130248.

7. Hartnett M. E. Advances in understanding and management of retinopathy of prematurity // Survey of Ophthalmology. – 2015. – Vol. 60, No. 4. – P. 327–335. – DOI: 10.1016/j.survophthal.2015.02.002.