MODERN APPROACHES TO THE DIAGNOSIS AND MANAGEMENT OF GLAUCOMA

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Abstract

Glaucoma is a chronic, progressive optic neuropathy and one of the leading causes of irreversible blindness worldwide. The disease is characterized by structural damage to the optic nerve head and corresponding visual field defects, often associated with elevated intraocular pressure. Early diagnosis and appropriate management are essential to prevent vision loss. This article reviews modern diagnostic methods, including optical coherence tomography and visual field testing, as well as current medical, laser, and surgical treatment strategies for glaucoma. Emphasis is placed on individualized patient management and the role of innovative technologies in improving clinical outcomes.

Keywords: glaucoma, intraocular pressure, optic nerve, optical coherence tomography, visual field, ophthalmology

Introduction

Glaucoma represents a group of eye diseases characterized by progressive degeneration of retinal ganglion cells and the optic nerve. According to the World Health Organization, glaucoma is the second most common cause of blindness globally. The disease often remains asymptomatic in early stages, which complicates timely diagnosis. Therefore, understanding modern diagnostic tools and treatment options is of great importance for clinical ophthalmology.

Pathophysiology of Glaucoma

The primary pathogenic mechanism of glaucoma involves increased intraocular pressure (IOP) resulting from impaired aqueous humor outflow through the trabecular meshwork. Elevated IOP leads to mechanical and ischemic damage to the optic nerve head, causing apoptosis of retinal ganglion cells. However, normal-tension glaucoma demonstrates that vascular dysregulation and neurodegenerative mechanisms also play a significant role in disease progression.

Modern Diagnostic Methods

Advances in ophthalmic diagnostics have significantly improved early detection of glaucoma. Optical coherence tomography (OCT) allows precise measurement of retinal nerve fiber layer thickness and optic nerve head parameters. Standard automated perimetry remains the gold standard for assessing functional visual field loss. Additional diagnostic tools include gonioscopy, pachymetry, and confocal scanning laser ophthalmoscopy. The combination of structural and functional assessments enhances diagnostic accuracy.

Treatment Strategies

The main goal of glaucoma treatment is to lower intraocular pressure and prevent further optic nerve damage. First-line therapy typically includes topical hypotensive medications such as prostaglandin analogs, beta-blockers, carbonic anhydrase inhibitors, and alpha-agonists. Laser procedures, including selective laser trabeculoplasty, are effective alternatives or adjuncts to medical therapy. In advanced or refractory cases, surgical interventions such as trabeculectomy or glaucoma drainage devices are indicated.

Discussion

Recent research highlights the importance of individualized treatment approaches based on disease severity, patient compliance, and risk factors. Neuroprotective strategies and minimally invasive glaucoma surgery (MIGS) are emerging as promising directions in glaucoma management. Continuous monitoring and long-term follow-up remain essential to achieve optimal therapeutic outcomes.

Conclusion

Glaucoma is a multifactorial disease requiring early diagnosis and comprehensive management. Modern diagnostic technologies and advanced treatment modalities have improved the ability to detect and control disease progression. An integrated and patient-centered approach is crucial for preserving vision and enhancing quality of life in individuals with glaucoma.

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