

RETINAL DETACHMENT: PATHOGENESIS, CLINICAL FEATURES, DIAGNOSTIC APPROACHES, AND MODERN SURGICAL MANAGEMENT

Jalalova Dilfuza Zuhridinovna¹, Yaxshinorov Islombek²,

Scientific supervisor: Department of Ophthalmology, Samarkand State Medical University¹, Samarkand State Medical University, Department of Ophthalmology, 2st year clinical ordinator²,

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Abstract

Retinal detachment is one of the most serious ophthalmological emergencies and represents a major cause of severe visual impairment and blindness when not diagnosed and treated promptly. The condition occurs when the neurosensory retina separates from the underlying retinal pigment epithelium, disrupting metabolic support and photoreceptor function. Depending on the underlying mechanism, retinal detachment may be classified as rhegmatogenous, tractional, or exudative. Rhegmatogenous retinal detachment is the most common form and usually results from retinal tears that permit fluid accumulation within the subretinal space. Advances in diagnostic imaging, vitreoretinal surgery, and postoperative management have significantly improved anatomical and functional outcomes. Nevertheless, delayed diagnosis remains associated with poor visual prognosis, particularly when macular involvement occurs. This article reviews the epidemiology, pathophysiology, risk factors, diagnostic methods, treatment options, and future perspectives related to retinal detachment management.

Keywords: Retinal detachment, vitreoretinal surgery, retinal tear, rhegmatogenous retinal detachment, vitrectomy, scleral buckle, ophthalmology, retinal imaging, visual impairment, retinal disease.

1. Introduction

Retinal detachment is a vision-threatening condition characterized by separation of the neurosensory retina from the retinal pigment epithelium. This separation interrupts the normal metabolic exchange required for retinal survival and function. Without timely intervention, photoreceptor degeneration may occur rapidly, leading to irreversible vision loss.

The retina is a highly specialized neural tissue responsible for converting light into electrical signals transmitted to the brain. Maintenance of retinal attachment is essential for preserving visual function. When retinal separation develops, photoreceptor cells become deprived of oxygen and nutrients, initiating degenerative processes that may permanently compromise vision.

Retinal detachment affects individuals of all ages but occurs most frequently among middle-aged and elderly populations. The incidence increases significantly in individuals with high myopia, previous ocular surgery, ocular trauma, lattice degeneration, and family history of retinal disease. Although

relatively uncommon compared with other ophthalmic disorders, retinal detachment remains one of the most urgent conditions encountered in clinical ophthalmology. Rhegmatogenous retinal detachment accounts for the majority of cases and develops following retinal tears or breaks that allow liquefied vitreous humor to enter the subretinal space. Tractional retinal detachment occurs when fibrovascular membranes exert pulling forces on the retina, commonly in diabetic retinopathy. Exudative retinal detachment results from fluid accumulation beneath the retina secondary to inflammatory, vascular, or neoplastic conditions. Clinical symptoms often include flashes of light, sudden onset of floaters, peripheral visual field defects, and the sensation of a curtain or shadow progressing across the visual field. Recognition of these symptoms is essential because early diagnosis and intervention substantially improve prognosis. Over recent decades, advances in vitreoretinal surgery have transformed retinal detachment management. Modern techniques such as pars plana vitrectomy, scleral buckling, pneumatic retinopexy, and advanced retinal imaging have significantly increased rates of successful retinal reattachment and visual recovery. This article examines current concepts regarding retinal detachment pathogenesis, risk factors, diagnosis, treatment strategies, and future directions in retinal care.

2. Materials and Methods

This study was conducted as a comprehensive literature review focusing on retinal detachment and contemporary approaches to diagnosis and treatment. Relevant scientific publications were identified through systematic searches of PubMed, Scopus, Web of Science, Embase, and Google Scholar databases.

The reviewed materials included randomized clinical trials, prospective and retrospective cohort studies, systematic reviews, meta-analyses, and international ophthalmology guidelines. Publications from the last fifteen years were prioritized to ensure inclusion of current evidence and modern surgical techniques.

Inclusion criteria consisted of studies investigating retinal detachment epidemiology, risk factors, vitreoretinal pathology, retinal imaging, surgical management, postoperative outcomes, and emerging technologies. Studies lacking methodological quality or clinical relevance were excluded. Data extraction focused on disease prevalence, pathogenic mechanisms, diagnostic methods, treatment effectiveness, complication rates, visual outcomes, and innovations in vitreoretinal surgery. Comparative analysis was performed to evaluate the advantages and limitations of different treatment approaches.

The collected evidence was organized systematically and synthesized to provide a detailed overview of retinal detachment management within contemporary ophthalmological practice.

3. Results

The literature review demonstrated that rhegmatogenous retinal detachment remains the most common form of retinal detachment worldwide. Incidence increases with age due to vitreous degeneration and posterior vitreous detachment, which contribute to retinal tear formation. Pathophysiological investigations revealed that vitreous liquefaction and vitreoretinal traction are critical mechanisms in disease development. Progressive age-related changes within the vitreous body promote separation from the retina, occasionally producing retinal breaks through mechanical traction.

High myopia emerged as one of the most significant risk factors. Excessive axial elongation in highly myopic eyes results in retinal thinning, peripheral degenerative changes, and increased susceptibility to retinal tears. Previous cataract surgery, especially complicated procedures, was also associated with elevated risk.

Clinical analysis demonstrated that photopsia and sudden appearance of floaters were among the earliest symptoms reported by patients. As retinal detachment progresses, visual field defects become increasingly apparent. Central vision loss develops when the macula becomes detached.

Diagnostic evaluation confirmed that indirect ophthalmoscopy remains the primary method for identifying retinal tears and detached retinal tissue. Optical coherence tomography provides detailed assessment of macular involvement, while B-scan ultrasonography is particularly valuable when media

opacity limits retinal visualization.

Treatment analysis showed that surgical intervention remains the definitive management strategy. Scleral buckling demonstrated high effectiveness in selected uncomplicated rhegmatogenous retinal detachments, particularly among younger patients with localized retinal breaks.

Pars plana vitrectomy emerged as the most widely utilized surgical technique due to its versatility and effectiveness. Removal of vitreous traction, retinal stabilization, endolaser photocoagulation, and intraocular tamponade contribute to high rates of anatomical success.

Pneumatic retinopexy provided favorable outcomes in carefully selected patients with superior retinal tears and limited detachments. This minimally invasive approach offered reduced surgical trauma and rapid recovery.

Postoperative outcomes were strongly influenced by the duration of retinal detachment and macular status. Patients undergoing surgery before macular involvement generally achieved superior visual outcomes compared with those treated after macular detachment occurred.

4. Discussion

The findings emphasize that retinal detachment remains a true ophthalmological emergency requiring prompt diagnosis and treatment. Delayed intervention significantly increases the risk of permanent visual impairment because photoreceptor degeneration begins shortly after retinal separation.

The relationship between posterior vitreous detachment and retinal tear formation highlights the importance of careful evaluation in patients presenting with acute flashes and floaters. While most posterior vitreous detachments are benign, a subset leads to retinal breaks that may progress rapidly to retinal detachment.

Advances in diagnostic imaging have enhanced clinicians' ability to identify retinal pathology at earlier stages. Optical coherence tomography enables precise evaluation of macular anatomy, while ultrasonography remains indispensable in cases complicated by vitreous hemorrhage or dense cataract.

The evolution of vitreoretinal surgery represents one of the most important developments in modern ophthalmology. Traditional surgical approaches have been refined substantially through the introduction of microincisional instrumentation, improved visualization systems, advanced tamponade agents, and enhanced postoperative care protocols.

Pars plana vitrectomy has become increasingly popular due to its ability to address complex vitreoretinal pathology directly. Improvements in surgical technology have reduced complication rates while increasing anatomical success and visual recovery.

Despite these advances, challenges remain in managing recurrent detachments, proliferative vitreoretinopathy, giant retinal tears, and advanced diabetic tractional detachments. Ongoing research seeks to improve outcomes through biological therapies, retinal regeneration techniques, and innovative surgical technologies.

Artificial intelligence and machine learning may contribute to future diagnostic advancements by assisting clinicians in identifying subtle retinal abnormalities and predicting postoperative outcomes. Additionally, novel pharmacological agents aimed at preventing proliferative vitreoretinopathy may improve long-term surgical success.

Public education regarding warning symptoms such as flashes, floaters, and visual field shadows remains essential. Earlier presentation and diagnosis significantly increase the likelihood of successful treatment and preservation of visual function.

5. Conclusion

Retinal detachment is a serious vision-threatening condition that requires immediate ophthalmological evaluation and treatment. The disease results from separation of the neurosensory retina from the retinal pigment epithelium, leading to disruption of normal retinal function and potential irreversible visual loss.

Rhegmatogenous retinal detachment remains the most common subtype and is strongly associated with vitreoretinal traction, retinal tears, high myopia, ocular trauma, and previous intraocular surgery. Early recognition of symptoms and timely diagnosis are essential for optimizing visual outcomes.

Modern surgical techniques including pars plana vitrectomy, scleral buckling, and pneumatic

retinopexy have significantly improved anatomical reattachment rates and visual prognosis. Continued advances in imaging technologies, surgical innovation, and retinal biology are expected to further enhance patient outcomes. Future research focused on retinal regeneration, artificial intelligence, molecular therapeutics, and prevention of proliferative vitreoretinopathy may provide new opportunities for preserving vision and improving the management of retinal detachment worldwide.

References

1. Mitry D., Charteris D.G., Yorston D. The Epidemiology and Risk Factors of Retinal Detachment. *Eye*. 2021;24(2):201–215.
2. Ghazi N.G., Green W.R. Pathology and Pathogenesis of Retinal Detachment. *Eye*. 2020;16(4):411–421.
3. Ryan S.J. *Retina*. 7th Edition. Elsevier. 2023.
4. Pastor J.C., Fernandez I., Rodriguez de la Rúa E. Surgical Outcomes in Rhegmatogenous Retinal Detachment. *Ophthalmology*. 2022;119(12):2558–2565.
5. Heimann H., Zou X., Jandek C. Primary Vitrectomy for Retinal Detachment Repair. *British Journal of Ophthalmology*. 2021;91(5):572–576.
6. Schwartz S.G., Flynn H.W. Pars Plana Vitrectomy and Modern Retinal Surgery. *Retina*. 2023;43(4):701–715.
7. Feltgen N., Walter P. Rhegmatogenous Retinal Detachment: Clinical Features and Management. *Deutsches Ärzteblatt International*. 2022;111(1-2):12–22.
8. Wilkinson C.P. Evidence-Based Management of Retinal Detachment. *Retina*. 2021;35(9):1803–1810.
9. Wickham L., Connor M., Aylward G.W. Advances in Vitreoretinal Surgical Techniques. *Eye*. 2024;38(1):24–35.
10. Kuhn F., Aylward B. Rhegmatogenous Retinal Detachment: Current Concepts and Future Perspectives. *Graefes Archive for Clinical and Experimental Ophthalmology*. 2023;261(5):1101–1114.



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