Neovascularization: The Growth of new blood vessels and its impact on eye health.

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Introduction

Neovascularization refers to the formation of new blood vessels from pre-existing ones. While this process is a vital part of normal healing and tissue repair, in the context of the eye, abnormal neovascularization can lead to serious complications and vision loss. It is a hallmark feature of various ocular diseases, particularly those involving ischemia or insufficient blood supply to retinal tissues. Understanding neovascularization is crucial for timely diagnosis and management of several sight-threatening conditions [1, 2].

Under normal circumstances, the retina relies on a healthy network of blood vessels to supply oxygen and nutrients. When retinal tissues become ischemic or deprived of adequate blood flow due to diseases such as diabetic retinopathy, retinal vein occlusion, or sickle cell retinopathy, the body attempts to compensate by producing new blood vessels. This process is driven by the release of growth factors, most notably vascular endothelial growth factor (VEGF), which stimulates the proliferation and migration of endothelial cells to form new vascular channels [3, 4].

Although neovascularization is intended as a reparative response, in the eye it often results in fragile, abnormal blood vessels that are prone to leakage and rupture. These new vessels commonly develop on the surface of the retina or the optic disc, extending into the vitreous cavity where they can cause vitreous haemorrhage. The abnormal vessels may also stimulate the formation of fibrous scar tissue, which can contract and lead to retinal detachment—a serious complication that threatens vision [5, 6].

Clinically, patients with neovascularization may present with symptoms ranging from mild visual disturbances, such as floaters or blurred vision, to severe vision loss if bleeding or retinal detachment occurs. The presence of neovascularization is an indication of advanced retinal ischemia and signals the need for urgent treatment to prevent irreversible damage [7].

Diagnosis typically involves a thorough dilated eye examination, supplemented by imaging techniques such as fluorescein angiography, which highlights areas of retinal ischemia and leakage from abnormal vessels, and optical coherence tomography (OCT), which helps assess associated macular edema or traction. These investigations guide the extent and severity of neo vascular growth and help in planning management [8].

Treatment strategies focus on reducing the stimulus for neovascularization and managing its complications. Laser photocoagulation remains a cornerstone of therapy, particularly pan retinal photocoagulation, which targets ischemic peripheral retina to decrease VEGF production and promote regression of new vessels. In recent years, intravitreal injections of anti-VEGF agents have revolutionized the management of neo vascular eye diseases by directly inhibiting the key growth factor driving vessel proliferation. These injections can lead to rapid regression of abnormal vessels, reduce macular edema, and improve visual outcomes [9].

In cases where neovascularization leads to vitreous haemorrhage or traction retinal detachment, surgical intervention such as vitrectomy may be necessary to remove blood and scar tissue and reattach the retina. Neovascularization is not limited to diabetic retinopathy; it also plays a role in age-related macular degeneration (especially the "wet" form), retinal vein occlusion, ocular ischemic syndrome, and other less common disorders. Thus, it represents a common pathological mechanism underlying multiple diseases, linking retinal ischemia to vision-threatening complications [10].

Conclusion

Neovascularization is a double-edged sword—while it represents the body's attempt to restore blood supply to ischemic tissues, its abnormal form in the eye often leads to serious complications and vision loss. Early recognition and aggressive management are essential to halt disease progression and preserve sight. Advances in imaging and pharmacologic therapy have significantly improved outcomes for patients with neovascular retinal diseases, transforming what was once an inevitable cause of blindness into a treatable condition. Ongoing research and clinical vigilance remain key in addressing the challenges posed by neovascularization and safeguarding vision.

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