• Editorial •

Against premature progress: what is genuine progress in ophthalmology

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Macular hole surgery illustrates what genuine progress looks like. In the 1990s, a full-thickness defect at the center of the retina meant permanent central vision loss; today, vitrectomy with internal limiting membrane peeling closes the hole in most cases, often restoring reading vision. Not every development that carries the label "progress", however, deserves it. We tend to use the word broadly: for a newly approved drug, a refined surgical technique, or a promising phase 2 result. The label is not always wrong, but it is often premature. Distinguishing genuine advancement from incremental change, surrogate improvement, or well-intentioned but unvalidated innovation is one of the most important yet least discussed obligations. We need to recognize genuine advancements and credit interventions with demonstrated efficacy. Anti-vascular endothelial growth factor (VEGF) injections for wet macular degeneration profoundly changed the course of a disease that once meant inevitable loss of central vision. Before these treatments, patients expected progressive visual decline. Now, many maintain or even improve their vision. This represents a substantive shift, validated by large clinical trials, corroborated in real-life practice, and sustained over long follow-up periods[1]. Laser refractive surgery has enabled millions to achieve functional independence from corrective lenses[2]. Gene therapy for RPE65-associated Leber congenital amaurosis, such as Luxturna, has demonstrated that inherited blindness, previously considered untreatable, can be addressed directly[3]. These are not incremental gains—they redefined what our specialty can offer.

Progress is often asserted based on quantitative data: pressure curves, changes in optical coherence tomography (OCT), visual field indices, and statistical *P*-values. Measurement is necessary, but it is not the same as proof of benefit. Ophthalmology illustrates a broader challenge in medicine: the tendency to prioritize easily measured variables over those that are clinically relevant. Intraocular pressure (IOP) reduction is a good example. We can reliably lower and precisely measure IOP, but it serves as a surrogate marker for the clinical goal of preserving retinal ganglion cells and maintaining vision. A therapy may reduce IOP without preventing ongoing neuronal loss. Currently, no neuroprotective therapy exists to stop this degenerative process. Thus, contemporary glaucoma treatments address a single risk factor rather than the underlying disease mechanism[4]. Lowering IOP is demonstrably beneficial. But it reminds us that favorable changes in quantitative parameters don't always translate into meaningful improvements in patient

outcomes. This principle extends to other areas of the field. When researchers identify a new imaging biomarker, modify a surgical technique, or see positive phase 2 trial results for a drug, they should treat these findings as hypotheses rather than definitive conclusions. We can only substantiate progress when results replicate across independent studies and populations and when outcomes are meaningful to patients—like improved vision, slowed vision loss, or reduced impairment.

Ophthalmology faces significant unmet needs. A gap concerns neuroprotection in glaucoma. Despite extensive research, no therapy currently exists that directly protects or regenerates retinal ganglion cells. Glaucoma remains a leading cause of irreversible blindness worldwide, and current interventions target risk factors rather than the underlying disease mechanism[5]. Another gap is geographic atrophy, the advanced stage of dry age-related macular degeneration (AMD). While effective treatments exist for wet AMD, there are no similarly effective therapies for late-stage dry AMD. Recently approved complement inhibitors have shown improvements, but their clinical effects remain modest, and access remains limited[6]. A therapy that can significantly change this condition has not yet been developed. The most significan gap is global equity. Most cases of blindness worldwide are preventable or treatable with existing interventions like cataract surgery, screening, and refraction. Yet approximately 90% of visually impaired individuals live in countries where these interventions aren'*t* consistently accessible[7]. As a result, systemic failures in healthcare delivery undermine scientific and clinical advances. Ophthalmology has advanced scientifically far faster than it has advanced equitably. Practical steps can help address this gap. Training local surgeons creates a multiplying effect that no visiting team can replicate—one skilled cataract surgeon at a district hospital will operate for years. Integrating refraction and screening into primary care removes the specialist bottleneck that prevents millions of people from receiving corrective lenses for a few dollars. Remote retinal imaging, interpreted by specialists elsewhere, has already brought diagnostic capacity to communities where no ophthalmologist will ever work in person. These are not hypothetical solutions; they are proven models being underused. The bottleneck is not knowledge or technology—it is will, funding, and the political priority given to vision care in global health systems. Through such actions, ophthalmologists can help translate scientific advances into tangible improvements in vision care for those who need it most.

Before designating a development as progress, it's necessary to establish clear criteria. This goal is challenging; it has three essential components. First, the supporting evidence must be strong and reliable. This means conducting controlled trials whenever possible, using real-world data when trials aren't practical, and ensuring findings are independently replicated before reaching consensus. One positive study should prompt additional research, not immediate shifts in clinical practice. Second, the benefit must be meaningful to the patient—not just detectable in the data. Statistical significance is a threshold, not an endpoint. The critical questions are: Would patients notice the benefit? Would it affect their daily lives? Finally, we must recognize and openly communicate uncertainty. Acknowledging the limitations of our current knowledge—treatments backed by limited evidence, biomarkers that serve as proxies rather than direct targets, early findings that may not be reproducible—is essential. Clinicians who maintain clarity about these uncertainties are better equipped than those who conflate enthusiasm with scientific evidence.

Ophthalmology is currently undergoing major innovations. Gene therapies are expanding, artificial intelligence is being integrated into diagnostic workflows, novel delivery systems for retinal drugs are under development, and cell-based therapies are advancing toward clinical trials. In this context, clinicians and patients alike tend to assume new developments are validated before comprehensive testing, which can prematurely shape patient expectations. Clinicians play an important role in managing these expectations by communicating transparently about the current evidence supporting new treatments and emphasizing what is known versus what remains under investigation. Acknowledging uncertainty, explaining the stepwise nature of medical progress, and focusing patient conversations on established outcomes helps maintain trust without fostering unrealistic hopes. By grounding discussions in verified information, clinicians can help patients navigate a swiftly changing landscape with care. The better approach is the more demanding one: welcome each development, examine it critically, and reserve the word "progress" for what has truly earned it. Our patients benefit more from careful judgment than from optimistic outlooks. This view doesn't indicate skepticism; instead, it aligns with the highest standards traditionally maintained in our specialty.

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