INNOVATION

GOOD IS NOT GOOD ENOUGH

The search for a better way advances the field of ophthalmology.

BY NIKKI L. HAFEZI, MAS IP, ETHZ

Innovation is a new column focusing on the process of bringing to market technologies and innovations that address unmet medical needs.

Successfully commercializing an idea requires an extraordinary amount of effort, strategy, know-how, expertise, patience, and financial support—not to mention a bit of luck. It is no wonder that many great ideas never reach the market. Most that do solve a problem or improve an existing device, process, or technique. Sometimes, incremental advances produce significant gains. An innovation that improves surgical outcomes, a procedure's predictability, or efficiency can also improve the standard of care.

TWO EXAMPLES

A classic example. For 5 decades, most IOL optics had smooth edges. In 2000, Nishi and colleagues published an experiment using an IOL optic with a square edge.[1] They found that the lens capsule wrapped tightly around the edge of the optic, thereby inhibiting the migration and proliferation of lens epithelial cells and reducing the incidence of posterior capsular opacification. In short, a small design change produced significant benefits. A square optic edge was soon widely commercialized.

A current example. Reliable detection of early keratoconus requires the use of a corneal tomographer (Scheimpflug camera) or Placido disc–based corneal topographer. Both instruments are costly and often not available to general ophthalmologists. In Switzerland, for example, 40% of ophthalmologists lack direct access to a corneal topographer.[2] Another issue is that the devices are not portable.

These hurdles led my group to develop a smartphone-based keratographer (SBK) for the detection of keratoconus and irregular astigmatism. The simple concept addresses a problem in the marketplace: limited access to reliable keratoconus screening technology due to expense and lack of portability. The precision required for an SBK does not have to be as high as for existing devices, which generate data that can be used to plan topography-guided laser treatment. It needs to be sufficient only for the viewer to assess the pathologies present in the cornea. Widespread screening with an SBK device has the potential to identify patients with early disease whose vision could be saved by CXL.

Thus far, industry partners have been supportive of our efforts to transform SBK into a commercial reality.

ROOM FOR IMPROVEMENT

Ophthalmology is a fast-paced, highly technological field of medicine, but modern devices, techniques, and procedures can still be improved upon. Ideas that address problems or make incremental advances are the ones most likely to make it to market.

This new column celebrates the process of bringing to market technologies and innovations that address unmet medical needs, and I am honored to serve as its section editor. ■

1. Nishi O, Nishi K, Wickström K. Preventing lens epithelial cell migration using intraocular lenses with sharp rectangular edges. *J Cataract Refract Surg*. 2000;26(10):1543-1549.
2. Baenninger PB, Bachmann LM, Iselin KC, et al. Mismatch of corneal specialists' expectations and keratoconus knowledge in general ophthalmologists - a prospective observational study in Switzerland. *BMC Med Educ*. 2021;21(1):297.

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