

Refractive surgery – the 20/happy game changer

Three adages attributed to the iconic science fiction writer Arthur C. Clarke are known as Clarke's three laws:^[1]

1. When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong.
2. The only way of discovering the limits of the possible is to venture a little way past them into the impossible.
3. Any sufficiently advanced technology is indistinguishable from magic.

The magical blooming of refractive surgery in the twenty-first century meets Clarke's laws head-on. Rapid advances and paradigm changes much beyond what could have been predicted by the most hopeful of soothsayers, and spectacular technological developments making the impossible, possible, have resulted in unprecedented growth and expansion of refractive surgery in the recent past. From being much-maligned, stemming out of the unpredictable imperfections of radial keratotomy in the 1980s and 90s, refractive surgery has emerged to be one of the most exciting and rapidly developing specialties in ophthalmology. The catalyst perhaps was the FDA approval of photorefractive keratectomy in 1995. Refractive surgery is no longer limited to laser procedures and includes eight forms of vision correction: laser-assisted *in situ* keratomileusis, photorefractive keratectomy, small-incision lenticule extraction, corneal inlays, phakic intraocular lens, refractive lens exchange, refractive cataract surgery, and collagen cross-linking.^[2] It is interesting to note that the evolution of pertinent diagnostics has outpaced the technological developments in surgical aspects, vastly impacting the quality of preoperative evaluation, planning of the procedure, and assessment of the outcome. The new understanding of the biomechanical and optical properties of the cornea has fed to customization and improvisation of the surgical procedures and development of logical algorithms to optimize the outcome.

How Vast is the Potential?

Uncorrected refractive errors are the leading cause for moderate to severe vision impairment globally (116 of 216 million), and the second most common cause for preventable blindness (7.4 of 36.0 million).^[3-5] Moderate to severe vision impairment caused by uncorrected refractive errors is expected to rise by about 10% to 128 million, and blindness attributable to uncorrected refractive errors is expected to increase by about 8% to 8.0 million by the end of 2020.^[5] Recent global estimated pool prevalence (EPP) of myopia is 11.7% in children. The EPP of myopia ranges from 4.9% in South-East Asia to 18.2% in the Western Pacific region. In adults, the EPP of myopia is 26.5%. It ranges from 16.2% in the Americas to 32.9% in South-East Asia. Meta-regression shows that the prevalence of myopia increased from 1993 (10.4%) to 2016 (34.2%).^[6]

India and China account for approximately 50% of global vision impairment and blindness due to uncorrected refractive errors.^[3,7,8] The recently estimated prevalence of uncorrected

refractive errors in India is 10.2% and the prevalence of uncorrected presbyopia is 33%.^[9] In absolute numbers, the estimated prevalence of uncorrected refractive errors is 54.5 million and presbyopia is 177 million – a staggering problem.^[9] The potential is indeed vast, considering almost 50% dropout rate among spectacle and contact lens users,^[10,11] and the benefits that such patients would derive by being rendered spectacle or contact lens independent. The global demand for refractive surgery is expected to grow at a compound annual rate of 4% from 2019 to 2024, with annual surgical volume increasing from 4.7 million to 5.7 million procedures.^[12] The argument that at least some forms of refractive surgery and several of its indications be considered as “functional” (thus subject to reimbursements and insurance coverage) and not just “cosmetic” (implying financial burden entirely on the patient) is now beginning to sound logical.

How to Build a Refractive Surgery Practice

Refractive surgery is currently on the threshold of becoming a standalone subspecialty. The College of Refractive Surgery is being conceptualized.^[13] While the goals of curriculum-based training and accreditation are highly laudable and are much required, building a firewall between ophthalmology and refractive surgery, however, may be counterproductive. It may be best to take the middle path and plan and weave in the unique elements of refractive surgery carefully into current ophthalmological training and practice. Refractive surgery is still in the realm of a contemporary ophthalmologist, who has the right mindset and is keen to invest time and resources into training and up gradation. The fruits of such a timely investment can be rewarding. Some of the ingredients that go into becoming a consummate practitioner of refractive surgery are listed below.^[14]

Develop a mindset – Vision is both an objective and a subjective experience

Mindset and soft skills to understand and act upon the unique requirements of the patient for refractive surgery are the most essential elements. Vision, being both an objective and a subjective experience, carefully moderating the patient-desired outcome versus what is scientifically possible can be challenging.

Appropriate training – Deep-dive into the science and art of refractive surgery

Refractive surgery is a serious business and is no longer a see-and-do technical skill or a one-cap-fits-all approach that one can acquire by a few days of casual observation. Understanding of the principles of optics of vision, corneal anatomy and physiology, ocular surface and dry eye covariates, biomechanics, wound healing and modulation, appropriate use and interpretation of diagnostic tools, understanding of the refractive requirements of a patient, psychological profile of the patient, identifying a problem patient, the decision-making algorithm, customization, microsurgical skills in performing the entire range of diverse laser refractive and surgical procedures, and finally, understanding of the potential complications and their appropriate management needs a deep dive into the subspecialty, and nothing short of a full-fledged fellowship.

Investment – in time, technology, and a team

Refractive surgery can not be relegated to the status of just an “additional revenue stream”. To capitalize on the potentially vast dividends of refractive surgery, the ophthalmologist has to be committed to invest time to get trained and build the practice brick-by-brick, acquire robust technology to support and deliver what the patients expect, and build a team that understands and harmonizes the surgeon, technology and the patients, and provides an enriching patient experience at all the touchpoints. Investment in technology can be daunting, but the concept of a refractive surgery group practice or a multi-user Refractive Surgery Centre can help share the resources, reduce the extent of initial investment, optimize the use of the equipment and thus, the returns, and finally make the procedures more affordable.

Conclusion

Refractive surgery is a rapidly evolving subspecialty of ophthalmology that aims at “restoration of visual function to ametropes without the aid of traditional prosthetics”.^[13] With the burden of uncorrected refractive errors as the major cause for visual impairment and avoidable blindness, and a significant proportion of spectacle and contact lens dropouts adding to the problem, there is a convincing argument that refractive surgery is considered medically essential for several specific indications. Presbyopia, if conquered, can be a huge growth engine. Ophthalmologists interested in developing a rewarding refractive surgery practice must develop a conducive patient-centric mindset and invest in appropriate training, technology, and a team to reap the fruits that the specialty has to offer. The safe and scientific practice of refractive surgery seems to have immense potential, is indeed a fertile field to focus on, and can be a game-changer for ophthalmology.

“There is a no heavier burden than an unfulfilled potential.”- Charles Schulz

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Access this article online	
Quick Response Code:	Website: www.ijo.in
	DOI: 10.4103/ijo.IJO_3503_20

Cite this article as: Honavar SG. Refractive surgery – the 20/happy game changer. *Indian J Ophthalmol* 2020;68:2639-40.