ARTICLE

Role of laser refractive surgery in cross-subsidization of nonprofit humanitarian eyecare and the burden of uncorrected refractive error in Nepal: Pilot project

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Purpose: To establish a refractive surgery unit at Tilganga Institute of Ophthalmology through support from international donations and provide knowledge transfer for doctors and management to make the unit self-sustaining, nonprofit laser refractive surgery, and financial support for other eyecare projects at Tilganga.

Setting: Tilganga Institute of Ophthalmology, Kathmandu, Nepal.

Design: Retrospective study.

Methods: A foundation was created to establish a refractive surgery unit using a cost-recovery model; that is, patients are charged according to their financial status to cover running costs, patients without funds to pay for surgery, and other eyecare projects for the underprivileged population of Kathmandu, Nepal. Donations were obtained to fund refurbishment within Tilganga Hospital and purchase equipment and technology. A Nepalese surgeon was selected from Tilganga and completed an 8-month fellowship and proctorship of the first series of surgeries. The refractive surgery unit was opened in January 2012, and the cost-recovery model was evaluated up to December 2016.

Results: During the period evaluated, 74.8% of patients were treated at full cost, 17.2% at subsidized cost, and 8.6% free of charge. The refractive surgery unit generated a profit representing 28% of the running cost in this period, which was used to reduce the deficit of the main hospital. Surgical outcomes achieved were comparable to those reported by groups in the developed world.

Conclusion: A self-sustaining nonprofit laser refractive surgery clinic, operating with high quality, was successfully implemented supported by international donations for initial setup costs and a cost-recovery model thereafter.

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Approximately 246 million people worldwide have low vision (moderate or severe visual impairment), the majority (43%) of which is caused by uncorrected refractive error. This accounts for 105 million people with low vision,[1] which is now being recognized as the largest problem we face in avoidable visual impairment worldwide. The Vision 2020 project was founded in 1999. The goal of this joint program of the World Health Organization (WHO) and the International Agency for the Prevention of Blindness is to eliminate preventable blindness by 2020. The original focus was on blindness; however, this was extended in 2006 to include visual impairment, including that caused by uncorrected refractive errors.[2] The latest update was adopted in 2013 as part of WHO resolution 66.4,[3] in which the target was defined as a "reduction in prevalence of avoidable visual impairment by 25% by 2019." Refractive error is more prevalent than cataract and other causes of low vision in the younger

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working-age population and is therefore responsible for a greater economic burden to individuals, their families, and the overall economic development in poorer countries.

To achieve this ambitious goal, it is necessary to look at all the options available and consider what each can contribute. Laser refractive surgery is now a well-tested procedure with high efficacy and safety. A recent review[4] showed that an uncorrected distance visual acuity (UDVA) of 20/40 or better is achieved in 99.5% of eyes, a level of vision that would be life-changing for those living with low vision resulting from uncorrected refractive errors. The question arises whether laser refractive surgery can be incorporated into the Vision 2020 project and what role it could play. This could serve as a source of funds to assist local ophthalmic hospitals and outreach programs in becoming self-sustaining, as an alternative solution to spectacles and contact lenses for uncorrected refractive error, or a combination.

Over the past 30 years, there has been significant progress in addressing global low vision, in particular with respect to cataract. As an example of this, the Tilganga Institute of Ophthalmology, Kathmandu, Nepal, was founded in 1994 as the first outpatient cataract surgery facility in the Himalayan region. It is run as a not-for-profit, community-based, nongovernment organization. The following year, the United States–based Himalayan Cataract Project was founded as a charitable foundation to support the work at Tilganga. Since then, Tilganga has expanded every year and has been providing nonprofit eyecare to thousands of patients, in particular through outreach cataract camps, using the manual sutureless small-incision extracapsular cataract technique, which had reduced the cost, time, and technology dependence of cataract surgery[5,6] while achieving safety and efficacy similar to what phacoemulsification provides.[7]

We had been considering how laser refractive surgery might be applied in the developing world. A chance meeting at the 2009 American Academy of Ophthalmology annual meeting led to a discussion about the possibility of a joint project to set up a refractive surgery unit within the already existing infrastructure at Tilganga Institute of Ophthalmology. The intention was to use this as a pilot project to determine whether a laser refractive surgery clinic could be implemented in a cost-effective manner in the economic environment of Nepal, among the poorest countries in Asia. If successful, the refractive surgery unit would provide a revenue stream to support the activities of the main hospital and reduce the reliance on international donations.

At the same time, it would be possible to test whether laser refractive surgery is a viable alternative to spectacles and contact lenses in the indigent population of patients with uncorrected refractive errors. Understandably, the focus in the developing world has been on creating local infrastructure and initiatives for providing primary eyecare and dispensing spectacles. However, laser refractive surgery offers significant advantages over spectacles and contact lenses. First, refractive surgery offers a permanent solution, whereas spectacles and contact lenses have a relatively short expected lifespan. In these environments, glasses last on average for approximately 2 to 5 years,[8] while contact lenses are associated with the challenges of patient education, hygiene, and regular follow-up. Second, refractive surgery represents a 1-time cost, whereas spectacle and contact lens correction requires continued funding.

This situation was summarized in a November 2016 editorial in the *Journal of Refractive Surgery*,[9] which described the formation of a Humanitarian Refractive Surgery Project Committee within the International Society of Refractive Surgery. The aim of this committee is to activate interest in the development of cost-effective models to address the global problem of uncorrected refractive errors. In the present paper, we describe our experience with a pilot model for a possible approach for implementing corneal laser refractive surgery in the developing world. Specifically, the questions to be answered were whether there would be reasonable consumer demand for an expensive elective procedure in such an economic environment, whether it could become self-sustaining, whether the quality level could be maintained, and whether it might be possible to scale this up in the future.

MATERIALS AND METHODS

Cost-Recovery Model

By teaming up with Tilganga, the risks, complexities, and costs associated with starting a refractive surgery clinic were greatly reduced, given the unknowns of how or whether it would succeed. The London Vision Clinic Foundation (LoVCF) was founded in 2010 with the mission statement of to "establish a refractive surgery unit at Tilganga Institute of Ophthalmology through direct-aid and provide knowledge transfer for doctors and management to make the unit self-sustaining and to provide nonprofit laser refractive surgery and profits that will support other eyecare projects at Tilganga."

Through the partnership with Tilganga, it was possible to take advantage of Tilganga's experience in providing nonprofit eyecare, in particular the cost-recovery model that had been so successful for cataract surgery, based on the Aravind Model.[10] In this model, a trained hospital interviewer sees the prospective patient to determine his or her financial status. Those who can afford to pay the full cost, those of more limited means pay what they can afford, and those who cannot afford to pay anything have surgery for free. This system means that the organization generates income to cover its running costs, free and subsidized surgery for the poor, and funding much of its charitable work, such as national and international eye camps, without relying solely on international donations and support.

The plan for the refractive surgery unit was therefore to emulate this cost-recovery model. The aim was to implement high-quality surgery to attract paying patients to generate enough profit for the refractive surgery unit to be self-sustaining and, as a result, be able to offer subsidized or nonpaying surgery to 30% of patients. The profits from the refractive surgery unit could also be used to further reduce the reliance on international donations for Tilganga Hospital as a whole and fund other new charitable projects. The decision on how to distribute profits generated by the refractive surgery unit would be made by the management of Tilganga according to the institute's financial requirements.

Sources of Funding

The initial challenge was to cover the start-up costs associated with setting up a high-quality refractive surgery infrastructure, including purchasing the equipment, training the surgeon and