Commentary

Are intraocular lenses the solution to cataract blindness in Africa?

In 1994, the World Health Organisation estimated that there were 38 million blind people in the world.[1] This total probably increases by another million every 12 months. The average prevalence of blindness is about 0.7%, ranging from 0.3% in Western Europe and North America, to more than 1% in parts of sub-Saharan Africa.[1]

The leading cause of blindness in most countries is cataract—approximately half of all blindness is caused by cataract. At present it is thought that there are seven million blind people in Africa, of whom 3.5 million are blind from cataract. Precise figures for the incidence of cataract blindness in Africa are not available, but it is estimated that at least 600 000 Africans become blind from cataract each year.[2] By 2030, it is estimated that the population of Africa will have grown to 1380 million.[3] If current trends in the prevalence of blindness in Africa are maintained, the number of cataract blind people will double. However, the population is not merely growing, it is also aging. By 2030 the number of people aged 60 or above, will have increased by 150%.[3] As this age group is at greatest risk of cataract, it is likely that there will be a corresponding increase in the incidence of cataract blindness.

Despite the enormous need, relatively few cataract operations are performed in Africa. In the industrialised countries, the cataract surgery rate is about 2500–3500 cataract operations per million population per year, whereas in most African countries it is 100–500. Most ophthalmologists in Africa carry out less than 300 operations per year.[2]

Why are so few operations performed when so many people need surgery?

There are a large number of barriers that limit the access of blind people to cataract surgery. These can be divided into patient related and provider related factors. Broadly speaking, provider related factors can be overcome by improving the efficiency with which human and material resources are used, and by increasing these resources. Barriers related to patients' isolation, ignorance, and impoverishment are much more difficult to overcome.

Probably the most important barrier to cataract surgery is poor motivation. Many cataract blind patients in Africa are not aware that their condition may be cured by surgery. Some people may be frightened by the thought of going to hospital. Others may simply be unimpressed by the results of cataract extraction. Most cataract surgery in Africa has taken the form of simple intracapsular cataract extraction followed by the provision of aphakic glasses. There is increasing evidence to suggest that this approach is of limited value. A population based study in northern Transvaal found that 9% of all blindness was due to uncorrected aphakia.[4] Out of 33 patients who had cataract surgery, 13 (39%) had no glasses and were functionally blind. Another study in KwaZulu compared the prevalence of blindness in a district before and after a series of free eye camps, during which 113 cataract operations were carried out.[5 6] This showed that the number of people blind from cataract was reduced, but the number blind from uncorrected aphakia increased by almost the same amount, despite the provision of free aphakic spectacles. If bilateral cataract and uncorrected aphakia are both regarded as "cataract related" blindness, then performing 113 cataract extractions resulted in a total decline in "cataract related" blindness of only 16 people (Table 1). A similar pattern has been observed in Nepal, where long term follow up of 235 aphakic patients revealed that 30% of them had no glasses at all, and only 23% were wearing glasses in good condition.[7]

Table 1 Results of community based survey of blindness in KwaZulu[5 6]

Year of study	*Total blind*	*Cataract*	*Uncorrected aphakia*	*Cataract related blindness**
1990	819 (1.0%)	322 (0.39%)	27 (0.03%)	349 (0.42%)
1993	786 (0.96%)	240 (0.29%)	93 (0.11%)	333 (0.41%)

*Cataract related blindness = number blind from cataract + number blind from uncorrected aphakia.

Aphakic glasses, in addition to causing the well known problems of magnification and distortion, are also heavy, uncomfortable, and fragile. When they are lost or broken, patients rarely feel that it is worth the cost and inconvenience of returning to the eye clinic to obtain another pair. Even when patients have their glasses, and a satisfactory visual acuity, they may well believe that their quality of life is significantly impaired by the necessity of wearing spectacles, and by the adverse optical effects of aphakic correction.

A second barrier to cataract surgery is poverty. In Africa, people who gradually become blind from bilateral cataract are usually destitute. What little savings they had will have been spent on food and other essentials. There will be no money to spare for surgery whose outcome is uncertain, and possibly unsatisfactory. At the same time, the macroeconomic policies pursued by many Africa countries, under the direction of the World Bank and the International Monetary Fund, dictate that patients must bear an increasing proportion of the costs of medical care. Many cataract blind patients are simply unable to afford surgery.

Thirdly, physical isolation hinders access to eye care. On average, there is only one ophthalmologist per million population in Africa.[2] Given the low population density in much of the continent, this means that many blind people will live more than 100 km from the nearest eye clinic. Roads are poor or non-existent, and public transport inconvenient, infrequent, and unsafe. For a blind person to travel in the face of such difficulties requires great commitment, and the assistance of at least one other family member.

Provider related barriers include a shortage of trained eye care personnel; lack of essential drugs, materials, and equipment; and poor management of existing resources. These barriers can be overcome by training more eye workers, both physicians, and non-physicians; by making use of inexpensive locally produced materials and equipment; and by improving management.

How will these barriers be affected by the introduction of intraocular lenses as the routine treatment for aphakia?

Firstly, the use of lens implants is likely to lead to an improved outcome. In South Africa, 98% of patients had a best corrected postoperative acuity of 6/24 or better,

following extracapsular cataract extraction (ECCE) and posterior chamber intraocular lens implant (PC-IOL). An uncorrected vision of 6/24 or better was achieved by 87.5%. Only 3.9% had an uncorrected vision of less than 6/60.[8] In our own audit of ECCE and PC-IOL for uncomplicated age related cataract at Kikuyu Eye Unit, 90.2% have a best corrected acuity of 6/18 or better, at 2 months after surgery, and 73.1% have an uncorrected acuity of 6/18 or better. Recent clinical trials in Asia, which compared intracapsular cataract extraction (ICCE) and anterior chamber IOL (AC-IOL) with ICCE and glasses, suggest that 90% of patients will achieve a best corrected acuity of 6/18 or better following ICCE and AC-IOL, with no significant increase in postoperative complications.[9 10]

Two studies from West Africa also produced encouraging results, showing that in both studies approximately 70% of patients had an uncorrected vision of 6/60 or better.[11 12] Of some concern is the fact that 25% of patients in the Ghanaian study had a best corrected vision of less than 6/60. In most cases this was due to pre-existing eye conditions, but some eyes lost vision as a result of corneal decompensation. These results emphasise that, to obtain the full benefits of intraocular lens implants, there must be careful case selection, and high quality surgery.

In south India, a recent study examined the patient's perception of the improved vision obtained following ECCE and PC-IOL. In terms of daily activities, only patients with a vision of 6/6 or better with aphakic glasses could perform as well as those with a pseudophakic vision of 6/18 (Thulasiraj RD, personal communication).

Secondly, the use of intraocular lenses permits earlier intervention. When the treatment for cataract is ICCE and glasses, surgery cannot be undertaken until the patient has significant visual impairment in both eyes. In practice many cataract patients have been blind for years by the time they seek help. The use of an intraocular lens allows the surgeon to operate earlier, while the patient may still have good vision in one eye. This means that surgery can be carried out before patients become destitute and before they are too blind to travel. Furthermore, the patients are more likely to be economically productive, and able to contribute to the cost of their care. Earlier intervention should help to remove or reduce many of the patient related barriers to cataract surgery.

Most important of all, early intervention *prevents* cataract blindness rather than curing it. This means that patients maintain their independence, which leads to a faster and more complete rehabilitation following surgery.

The combination of improved outcome and earlier intervention should lead to larger numbers of operations. This has two advantages. In most African eye clinics a high proportion of the costs of surgery are fixed costs. The best way of reducing the unit cost of surgery is to increase the numbers of operations.[13] The second advantage is that the best advertisement for cataract surgery is a satisfied patient. As more patients are operated, so more people are likely to be motivated to come for surgery.

In the past the cost of intraocular lenses was a major barrier to their use in developing countries.[14] However, high quality single piece PMMA lenses are now manufactured in India, Nepal, and Eritrea. These lenses may cost as little as £5, which compares favourably with the cost of a pair of aphakic spectacles. Viscoelastics and other intraocular fluids are now available for a fraction of their former cost. The total cost of consumables used in cataract surgery with a lens implant can be kept to around £10.

Apart for these consumables, additional equipment needs to be purchased. However, the cost of this has also fallen substantially during the past few years. For example, coaxial operating microscopes can be purchased for £2000 or less. Although preoperative keratometry and biometry are desirable, in order to calculate the ideal power of intraocular lens, most patients will get a satisfactory result with a standard power lens implant. A Nd:YAG laser may also be desirable; however, the problem of posterior capsule opacification may be avoided by performing ICCE and AC-IOL; or a surgical capsulotomy can be performed with a needle introduced through the pars plana.

Currently the major limitation to the widespread use of lens implants in Africa is the lack of trained personnel. Many ophthalmologists in Africa have little or no experience of using intraocular lenses. They frequently work in difficult conditions, with limited resources and inadequate equipment. With only one ophthalmologist per million people, several countries in eastern and southern Africa have trained non-physicians to carry out simple ICCE.[2] These cataract surgeons now carry out the majority of cataract surgery in some countries. However, almost none of them have been trained in lens implant surgery.

Should non-physicians be trained to use intraocular lenses? At a recent WHO workshop on training eye care personnel in lens implant surgery for Africa, there was unanimous agreement that, in countries where non-physicians are trained to deliver cataract surgery, they should be trained in lens implant surgery as well.[3] Early indications from an audit at Kikuyu Eye Unit suggest that non-physician cataract surgeons can achieve good results (90% best corrected vision 6/18 or better) with ECCE and PC-IOL.

In the industrialised countries ECCE and PC-IOL is the treatment of choice. However, in this situation, Nd:YAG lasers are available, and patients can return for follow up visits. In Africa there are few Nd:YAG lasers, and patients are frequently unable to return for follow up. Under these circumstances ICCE and AC-IOL may have some advantages. It has been shown that modern designs of flexible open loop anterior chamber lenses are associated with few long term complications,[15] and the results of studies in India and Nepal suggest that ICCE and AC-IOL are not associated with significantly more complications than ICCE alone.[9 10]

There have been no prospective studies to address the question of whether ECCE and PC-IOL or ICCE and AC-IOL is better in Africa. What evidence there is suggests that either procedure would be substantially better than simple ICCE and aphakic glasses.

Cataract blindness remains a major public health problem in Africa. The numbers of cataract blind are increasing, and will probably increase even more rapidly in future. Simply increasing the number of cataract extractions will lead to only a marginal reduction in the number of blind people, unless the operations are accompanied by good long term visual results. Although the use of intraocular lenses may be associated with slightly increased costs, this is more than outweighed by the improved outcome of surgery, the opportunity for earlier intervention, and the resulting increase in the number of operations.

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