

Eye Surgery in Africa

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In this edition of the *Annals of African Surgery*, we have several exciting original articles that drew our attention to the challenges of quality health-care service delivery, especially in our part of the world: low- and middle-income countries (LMICs). We shall look at three articles and discuss their implications for the practice of surgery in Africa. The first article discussed corneal transplants in Ghana. The second article also came from Ghana and compared the two most common modern surgical procedures for cataracts: manual small incision and phacoemulsification. Finally, the third article focused on the uptake of prostate cancer screening in rural Kenya.

The first two articles were hospital-based, medical records review, also called retrospective case series. They both carry classic lessons defined by case selection. The third was an explorative qualitative study that utilized focus group discussions with in-depth interviews. This latter study was robust and has immediate implication for policy as well as for reshaping key behavioral change communication messages for overcoming sensitive service uptake challenges.

From the Kwame Nkrumah University of Science and Technology in Ghana, Seth Lartey *et al.* undertook a retrospective case series review that looked at corneal transplants performed at the Komfo Anokye

(pronounced as *comefornokey*) Teaching Hospital in Kumasi between 2014 and 2018. Seventy-five eyes were finally analyzed with a very wide age range (10 to 99 years). The most common indication for corneal transplant in this series was pseudophakic bullous keratopathy, a complication of complicated cataract surgery that damages the corneal endothelium, leading to a persistently opaque, cloudy, and edematous cornea. This edematous cornea develops blisters (bullae) that cause significant discomfort, photophobia, pain, and severely reduced vision. The corneal endothelium is a monolayer of terminally differentiated hexagonal cells that actively keep the cornea in a state of relative dehydration (deturgescence) and thus clear (1). Endothelial cells get damaged during intraocular surgery such as cataract extraction. The remaining cells do not regenerate to replace damaged ones: they stretch in an attempt to fill up the gaps that result, a process called polymegathism (1). Bullous keratopathy from damaged endothelium shall remain for the foreseeable future as long as cataract remains the leading cause of surgically treatable blindness globally.

A brief understanding of the surgical anatomy of the cornea is critical in order to appreciate the importance of corneal transplants in our environment. The cornea is a clear, glass-like avascular structure that forms the anterior part of the eyeball. It is made up of five distinct layers and is responsible for most of the

refractive power of the eye. Being avascular confers some level of protection from immune surveillance. This makes the cornea the most favorable transplant organ. The first successful human allograft corneal transplant was performed by Dr. Eduard Konrad Zirm (1863–1944), an Austrian ophthalmologist from Vienna on December 7, 1905, in the Czech Republic, on a laborer who was blind due to lime eye injuries. The donor cornea came from a boy who lost his eye from a penetrating scleral injury that necessitated an enucleation (2).

The Brightbill (3) classification of corneal graft prognosis graded five levels of the prognosticating diseases. This list is important if we wish to achieve predictably successful transplants. Even though Seth Lartey *et al.* did not give us a grading of their cases according to the Brightbill classification, we know that bullous keratopathy has good prognosis. In these modern times, the best surgical technique for treating bullous keratopathy is direct replacement of the damaged endothelium. It introduced a shift from traditional whole cornea transplantation to utilizing strictly what was needed. This has implications in the maximal and efficient utilization of scarce resources such as donated organs. The shift is about favoring lamellar keratoplasty over penetrating (full-thickness) keratoplasty, whereby the posterior corneal layers are utilized for bullous keratoplasty from whatever cause, while the anterior corneal layers are utilized for mainly corneal dystrophies and scars affecting the superficial anterior layers.

The authors pointed to the paucity of subspecialty-trained cornea surgeons in Ghana. This is not unique to Ghana alone, but is a common human resource for health challenge all over sub-Saharan Africa. However, of note is the high success rate reported in this series, with only 14% failure after 1 year for a mainly Brightbill grade II-prognosticated indication. We (4) found keratoconus to be the leading indication (49%) for penetrating keratoplasty in Kenya, with 90% of grafts remaining clear after 24 months, with 72% of eyes having uncorrected visual acuity of 6/60 or better (4). It is curious to note that the majority of persons who underwent corneal transplant were in the 20–39

age bracket, and keratoconus was not their identified problem.

The common causes of bilateral corneal blindness in sub-Saharan Africa are mainly due to severe vernal keratoconjunctivitis coupled with other infectious causes. Severe vernal keratoconjunctivitis is typified by intensely itchy eyes with eye rubbing. The repeated eye rubbing, especially by young people, leads to corneal ectasia and worsening poor vision as the keratoconus develops. Trachoma, as the leading infectious cause of blindness, remains important in some parts of Africa, but in 2018, Ghana was the first African country to successfully reduce trachoma to a level where it ceased to be of public health significance, thus warranting a World Health Organization (WHO) certification as having reached a trachoma elimination status (5). Therefore, it was not surprising that this Ghanaian series made no mention of corneal opacification specifically attributable to trachoma. Implementation of the WHO SAFE Strategy, with reference to surgery for the cicatricial distortion of the upper eyelids that cause entropion with trichiasis and the consequential corneal opacification that results. Trachoma corneal opacification causes corneal vascularization, which is a poor prognostic indicator for corneal transplant (a Brightbill grade III indication has a poor outcome).

Lastly, organ donation is a major challenge in Africa. Procuring corneas from the USA, Sri Lanka, or Europe is fraught with many hurdles. Transportation and storage to maintain tissue viability are technologically demanding. There are very few eye banks in Africa, and rarely do we hear of organ donations. These systemic challenges will further compound the lack of trained hands to maximally utilize the sporadically available allografts. Our societies need sensitization on the importance of donating organs as well as pushing for more health service funding in order to develop the infrastructure and technical capacities for effective and impactful service delivery that will meaningfully change lives. This approach goes beyond eye services *per se*, as it touches on kidney, liver, bone marrow, heart, and lungs transplant services.

The article comparing manual small incision and phacoemulsification was a highly insightful study

whose results are encouraging as expected. There have been numerous such comparisons from various countries. The earliest such comparative study was a prospective, randomized clinical trial (RCT) done in Nepal, whose two surgeons, Sanduk Ruit and David Chang, without doubt, are among the best cataract surgeons globally. The conclusions from that study were that phacoemulsification is not superior to small incision and that small incision may be the more appropriate surgical procedure for the treatment of advanced cataracts in the developing world (6).

Often, as eye surgeons, we focus a lot on the patient's postoperative measured visual acuity as a way to show off our skill and precision, as opposed to how the patient feels about their cataract surgery. Therefore, the best measure is not a 6/6 (20/20) outcome but a "6/happy patient" (20/happy patient). This realization means the preoperative case selection using ultrasound scan, biometry, specular microscopy, ocular surface status, intraocular pressure, and retinal optical coherence tomography to look for evidence of optic nerve or retinal disease such as diabetic retinopathy, glaucoma, or age-related macular degeneration is critical. Clearly, these investigations must be carefully chosen and properly undertaken and any significant comorbid condition managed appropriately before cataract surgery is embarked. That way and only that way can we predict the desired outcomes as well as the happy patient.

Every ophthalmologist should be able to undertake a simple but sincere surgical audit of their cataract surgeries. The primary driver should be one's patients' expectations. That expectation is defined by their socioeconomic status and trade/craft responsibilities. Phacoemulsification, in the right hands, gives highly predictable visual outcomes, but it can be responsible for so much distress and unhappiness in untrained hands. Finally, there is a transitional growth between small incision and phacoemulsification. That growth requires a mastery of rapid decision making, such as when to convert and rescue an impending disaster. It has been oft repeated during residency training that it only takes 2 years to know when to operate but it takes almost 20 years to know when not to operate. By the

same dictum, it takes 1 year to know when enough trial and error is just too much before disaster strikes. Small incision and phacoemulsification achieve similar results both in the short-term and in the long-term. The different reported results elsewhere lie in the skill level of those other surgeons and not in any inherent part of the surgical procedures or technology. That argument was laid to rest by the prospective RCT performed by the best modern ophthalmic cataract surgeons (Ruit vs. Chang). Besides, retrospective case series have inherent biases and weaknesses. They cannot be weighted similarly to the gold standard - RCT.

The diagnosis of cancer from whatever cause or organ is received with palpable fear. The explorative, qualitative study on the barriers to the uptake of prostate cancer screening by Mbugua *et al.* has increased our understanding of the dynamics surrounding male hesitancy. They successfully identified and summarized factors that encourage screening for prostate cancer, of which two are notable: symptomatology, which may be nonspecific, and community advocacy for screening.

The study identified barriers that typify traditional belief systems and how they shape the African male outlook especially on matters indirectly related to male sexual promiscuity and sexuality. Fatalistic beliefs also lead to various levels and stages of delay toward reaching a decision on screening, and such beliefs also explain why many Africans present very late for a cancer that is fairly curable. We have a fairly good African experience on that hesitant attitude, as it was responsible for the ravaging spread of HIV a few decades ago.

Perhaps, Mbugua *et al.* would have proposed a better strategic approach to popularize screening by using politicians and faith-based organizations. The charisma of politicians in spreading health-related information works like a double-edged sword: lives are saved and political responsibility and leadership stand to gain more currency and popularity. The latter route of advocacy through the churches was clearly captured in one of the focus group discussions, and we believe that, by building consensus with the various denominations,

the message on the rewards of screening could be spread far and wide. *A stitch in time saves nine.*

In summary, these original papers have highlighted the challenges of health service delivery in sub-Saharan Africa. The two ophthalmology papers have a common point of convergence: high-volume cataract surgery carries the risk of bullous keratopathy, a blinding anterior segment (corneal) complication that is totally reversible and could be avoided through a comprehensive health system strengthening. This is an investment that saves the economy and uplifts citizens out of despair due to poor health outcomes such as avoidable blindness.

Screening is absolutely warranted for health events that are curable in their early stages, and thus, they have favorable outcomes. More efforts need to be put in health education through behavioral change communication to dispel societal myths and misconceptions as well empower vulnerable segments and high-risk groups into seeing the benefits of preventive measures, just like how routine automobile maintenance prevents catastrophic (health) events.

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