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Primary Open Angle Glaucoma Surgery in Sub-Saharan African Setting – Benefits and Challenges

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Abstract

Background: Primary open angle glaucoma is one of the leading causes of avoidable blindness in Sub-Saharan Africa

Medical therapy: Anti-glaucoma medication pose a special challenge due to high cost, non availability, and presence of sub- standard/ adulterated drugs in the region. With wide spread poverty compliance to medication for life is poor.

Trabeculectomy: Although there are various types of glaucoma surgeries, trabeculectomy with use of anti-fibrotic agent is found to offer good intra ocular pressure control among patients in the region. The use of anti-fibrotic agents like mitomycin-C and 5 Flourouracil becomes necessary due to the tendency of pigmented African eye to form scar that results in bleb failure.

Conclusion: Trabeculectomy with intra operative use of anti metabolite is an acceptable choice in treatment of primary open angle glaucoma in sub-Saharan Africa. The key to success is adequate pre operative patient education on the goal of treatment.

Keywords: POAG, Sub-Sahara, Africa, Trabeculectomy, Anti-metabolite, Counselling

1. Introduction

Glaucoma is a group of disorders manifesting characteristic progressive optic nerve damage and is associated with many risk factors such as central corneal thickness, structure of the optic

nerve head, age, genetic factors, race and intraocular pressure (IOP). Primary open angle glaucoma (POAG) is not associated with any other cause. The features include characteristic optic nerve damage, nerve fibre layer loss, visual field changes and an open angle on gonioscopy. The global estimate of glaucomatous optic neuropathy is 60 million and 8.4 million turn blind from the disease. The highest prevalence of POAG occurs in Africans.[1] In the sub-Saharan African (SSA) region there is shortage of population studies on causes of blindness. POAG is under-reported as the mechanism for making a diagnosis is difficult under circumstances in which field surveys are conducted. Local and regional studies have demonstrated the contribution of glaucoma as a major cause of avoidable blindness in SSA.[2-9, 21] There are peculiarities in the way glaucoma is present in the region. These factors are related to the individual, the family, the community and the health-care system. Initially POAG has subtle nature of presentation with symptoms such as pain which is a major driving force for seeking medical help being largely absent. Poor access to health care in general and eye care in particular, superstition and inequity in distribution of human and material resources in eye care result in the largely rural population having minimal access.[10] Even where some level of eye care services are available, basic equipment such as tonometer, visual field analyser, slit lamp and relevant diagnostic lenses are unavailable. The few eye care personnel available are not motivated to work in the rural areas as basic services like good schools; tap water and electricity are not steadily supplied. Patients are left at the mercy of quacks including traditional eye healers (TEH) whose unregulated practices contribute to increase in the burden of avoidable blindness. TEH dispense traditional eye medicine (TEM) of unknown contents, not produced under aseptic conditions and can result in corneal damage and blindness.[11] Patients often present late with advanced optic nerve damage and are visually impaired.[12, 13, 14, 15, 16] One can deduce that only a small fraction of POAG patients make it to the few available centres where quality care can be offered.

2. The argument in favour of POAG surgery

The risk factor most amenable to control is IOP. There are two broad approaches to treatment, which can be surgical or medical. One cannot draw a line between the options, with various permutations and combinations possible in order to achieve success. Even where a decision is reached to do surgery there is need for initial medication to reduce the IOP. Treatment and monitoring is for life. Potent glaucoma medications are expensive with most patients being poor and defendant. Quality and safety is often suspected as adulterated medications float the markets in SSA. Medicines are conveyed in open trucks under the scorching sun or left in the open. Even quality medicine will eventually lose potency before getting to the patients. The few reputable pharmaceutical vendors are located in major cities and townships away from the reach of rural poor. Poverty and illiteracy hinder compliance with treatment. The health insurance scheme is for the regular sectors of the economy, accessible to only civil servants and those working for the organized private sector. Bulk of the population has no health insurance cover and need to pay for eye care at the point of service delivery. Inability to pay results in denial of service. Such denial of access to eye care services is against the goals of

Vision 2020: the right to sight. These multitudes of factors make a case for surgery. As clinicians in the SSA region search for better treatment compliance, they move closer to surgery.[17] Considering the unavailability of potent, cost-effective, long-term acceptable medications, surgery can be a worthwhile option.[18] Successful surgery can be a one off expenses alternative. It ensures reduction in IOP round the clock. The patient needs not to remember that it's time to apply the eye drop and is free from local and systemic side effects. The key to surgical success is proper patient's education and counselling. POAG patients are often admitted to the same ward with blind cataract patients. A day after surgery pseudo-phakic patients move around unaided. Glaucoma patient expects the same outcome. Thus, without proper patient education, the seed of discontentment and dissatisfaction is sown. Glaucoma patients need to be educated on the purpose of surgery and its impact on vision. They need to know that the procedure is not free of complications and may accelerate cataract formation resulting in additional surgery at a later date. POAG patients are to be informed that surgery can fail or be partially successful in IOP control warranting reintroduction of eye medications. Penetrating glaucoma surgery mainly trabeculectomy with antimetabolite is the most common procedure performed with encouraging outcome.[19] Trabeculectomy records various success rates at given time intervals after surgery.[19, 20, 21, 22] IOP control appears to be lower when surgery is performed without antimetabolite.[22] Releasable sutures offer additional advantage in reducing IOP in the early post-operative period.[23] Other non-penetrating procedures such as visco-canalostomy and trabeculoplasty are not done routinely. Laser procedures including argon or diode laser trabeculoplasty generally do not give very encouraging outcomes in pigmented African eyes. Where available, laser can be used to augment medical treatment/surgery on a case by case basis.

3. Preoperative management

Patient education is a crucial step in administration of informed consent. Patient and caregiver need to know the status of the patient's vision, the type of procedure to be performed, the goal to be achieved, post-operative medication/management and the possibility that glaucoma drugs may be reinstated after surgery even if partially. The current visual acuity, visual field, tonometry, retinal nerve fibre layer thickness (RNFL) measurements and gonioscopic finding should be available and form frame work of the counselling. Clinicians are often reluctant to do surgery on those with advanced/end-stage glaucoma characterized by 'tunnel visual fields', severe visual impairment and vertical optic disc cupping of 0.9 or worse. Reluctance is related to risk of further sight deterioration which could be attributed to post-operative inflammation, post-operative complications such as endophthalmitis (though rare) or increase in lenticular opacity and the risk of visual wipe out phenomenon. Patients' and caregivers' knowledge of the goal of controlling IOP and by so doing limiting optic nerve damage will reduce complains that 'doctor you have operated my eyes and yet my sight has not improved'. Preoperative routine includes medical treatment to reduce the IOP to lower teens and trimming of the eye lashes. Blood pressure (BP) and fasting blood sugar (FBS) levels are measured to identify undiagnosed hypertension and those with diabetes mellitus. BP and FBS control are essential

before, during and after surgery. Physicians managing such conditions are involved in the overall care of the patient. Those with high or minimally responding IOP may benefit from systemic carbonic anhydrase inhibitors or osmotic agents to further reduce the pressure before the procedure is performed. Trabeculectomy can be done as an outpatient procedure in selected cases, but, in most instances, due to the nature of the environment (long distance from eye care facility; hostile, dirty and unhygienic situation of the living environment; and illiteracy), patients often require inpatient care and are discharged within a week. POAG surgery is usually performed under local anaesthesia using lignocaine-containing adrenaline in appropriate dilution. General anaesthesia is administered where there is a need to do so.

4. The procedure: Trabeculectomy with anti-fibrotic agent

This is performed in the operating theatre under complete aseptic condition. The surgeon and assistant are fully scrubbed and gowned. The skin around the eye is cleaned with povidone iodine 5% which is also used to wet and subsequently flush the conjunctiva with normal saline; adhesive drapes are placed leaving the globe area exposed. A wire speculum is used to part the lids, the superior rectus muscle is picked with toothed forceps and 4/0 silk suture is passed under it. A conjunctival flap is then raised. This can either be fornix or limbal based. Limbal-based flap reduces risk of fibrosis over the filtration drainage site though some believe it allows a freer connection of the surgical site with external conjunctiva and may in theory increase infection risk. Proponents of fornix flap believe it offers greater wound closure and lower infection risk. A caliper is used to demarcate proposed area to raise the outer sclera flap of 5 by 5 mm size. The area is cleared of tenons and haemostasis secured with bipolar wet field cautery. Ideally a separate trolley is used for administration of antimetabolite. A 5% dilution of mytomycin C or 5-fluorouracil is employed. A piece of cotton wool is soaked with the agent and applied over the sclera flap site for five minutes and then washed with 50 millilitres of normal saline. The trolley is subsequently taken away and the surgeons change gloves. The outline of the outer sclera flap is demarcated gently with a scalpel. The proximal part is gently elevated to form the lip of the partial thickness scleral flap. A chooks knife is then used to bluntly dissect the flap from the base of the cornea. A smaller inner sclera flap of 3 by 3 mm is then raised and excised. This is followed by a peripheral iridectomy. The outer flap is sutured at the two proximal edges. Some clinicians prefer to suture all the 4 edges with 10/0 silk sutures. The knots are buried in the sclera. The anterior chamber (A/C) is reformed with saline via a cannula. Conjunctiva is sutured at the edges in fornix-based flap. A running suture with a knot at the two ends can be used to close the conjunctiva in cases that had a limbal-based flap using absorbable 6/0 vicryl. Subconjunctival dexamethasone 4 mg injection is given and tropicamide eye drops applied before the eye is padded. First-day assessment includes measuring visual acuity, IOP, wound site, bleb size and function. Slit lamp bio microscopy is essential in determining state of the eye, such as cornea clarity, depth of A/C, in addition to fundoscopy. Post-operative medications include steroid/antibiotic combination eye drops, a mydriatic and systemic antibiotic such as amoxicillin. Initial follow-up visit is after one week.

5. Complications of trabeculectomy

Intraoperative complication includes hemorrhage, which can be arrested and bleeding vessels cauterized. Shallow A/C on the table usually reforms; in the event of delayed reformation, saline can be injected after the outer sclera flap is sutured.

Post-operative complications include the following:

- Shallow A/C. This is of varied etiology. In case of excessive filtration, the bleb is formed; there is no aqueous leakage as confirmed by a negative Seidel's test and the IOP is not raised. This can be managed by firm pressure padding and observation. In rare instances an additional transconjunctival suture is applied. Wound leakage results in shallow A/C with hypotony and positive Seidel's test detected by dilution of instilled fluorescein from the bleb site on inspection with cobalt blue light on the slit lamp. This can be managed conservatively by pressure padding and tends to improve. Failure to improve is addressed by applying one or two additional sutures. Pupil block glaucoma arises from a non-functioning peripheral iridectomy. There is shallow A/C, negative Seidel's test, with raised IOP and iris bombe. Laser iridotomy may be required to relieve the pressure. Malignant glaucoma arises from aqueous back tracking behind the vitreous resulting in hypertony with markedly elevated IOP, corneal edema and shallow A/C with flattened bleb. Management involves administration of systemic osmotic agents such as mannitol, or urea and intravenous carbonic anhydrase inhibitors. In some instances Yag Laser is used to disrupt the anterior vitreous face thus allowing the trapped aqueous to pass through the normal channel.
- Post-operative endophthalmitis. Early manifestation is within 24 to 48 hours. Patient has pain and reduced vision with redness. This requires standard protocol of endophthalmitis management such as aqueous/vitreous aspiration for microscopy culture and sensitivity. Common pathogens are staphylococcus species. Relevant antibiotics are commenced immediately topically, systemically and intra-cameral/intravitreal. Antibiotic can be modified based on culture results.
- Other bleb-related complications include bleb failure which could arise from fibrosis or formation of tenon cyst. Management includes ocular compression, suture manipulation needling and, in some instances, injection of diluted 5-fluorouracil within the first two weeks of surgery. Blebitis is characterized by inflammation and debris (exudates). Without intraocular extension, the vision is normal. Treatment involves taking swab for microscopy, culture and sensitivity. Topical ofloxacin and ciprofloxacin can be used. Large cystic acellular bleb can leak. Mild to moderate leakage can be managed conservatively by pressure padding and antibiotic prophylaxis. Persistent or large area of leakage may require bleb revision such as advancing a conjunctival hood over it.
- Trabeculectomy can accelerate cataract formation. Cataract surgery should be through an approach that does not tamper with bleb function.

6. Conclusion

POAG is a common cause of avoidable blindness in SSA. Due to socio-demographic reasons, patients have poor access to eye care and often present late. Trabeculectomy with antimetabolite is an acceptable procedure that offers good IOP control. Proper education of the patient and caregiver particularly on the goal of treatment is an essential component of management.

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