CASE REPORT

Management of a rhegmatogenous retinal detachment in a low-resource setting: treatment options when there is no vitreoretinal surgeon

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SUMMARY

We discuss the case of a 49-year-old soldier with a macula-on rhegmatogenous retinal detachment in Sierra Leone. The case highlights the challenge of accessing visually preserving ophthalmic specialist care in sub-Saharan Africa (SSA) for vitreoretinal (VR) disease. It highlights a shortage of VR surgeons in SSA, limited examination facilities, the larger issue of accessing specialist care urgently and the costs associated with accessing surgery out-of-country. It also identifies a shortage in epidemiological data on the issue which limits the assessment of the scale of the problem.

CASE PRESENTATION

A 49-year-old male military personnel presented in Freetown, Sierra Leone with a 1 month history of a progressively elevating dark shadow in his right eye. His uncorrected Snellen vision acuity was 20/30 bilaterally. Intraocular pressure was within normal range but 3 mm Hg less in the affected eye. The anterior segment was unremarkable. A tobacco dust appearance was visible in the vitreous humour of the affected right eye. Fundus examination and corresponding ultra-widefield scanning laser ophthalmoscopy (figure 1) demonstrated an extensive superior nasal retinal detachment (RD) extending to the superior retinal arcade. Within the area of RD a large horseshoe retinal tear was present.

Treatment options for this patient in an ideal setting to prevent RD progression and sight loss would include a pars plana vitrectomy/cryoretinopexy or laser retinopexy and gas tamponade or a scleral buckle with cryotherapy. Pneumatic retinopexy with cryotherapy provides an alternative treatment option. Unfortunately, no access to any vitreoretinal trained personnel or vitrectomy equipment currently exists in Sierra Leone. International travel to the nearest facility in Ghana is 2018 km away and beyond the financial means of the patient. Given the lack of treatment options available, the patient was discharged. At review 8 months later, the visual acuity had dropped to 6/36 and the retina had completely detached.

GLOBAL HEALTH PROBLEM LIST

- What is the vitreoretinal disease burden in Sierra Leone and in the region of sub-Saharan Africa (SSA)?

- What is the availability of vitreoretinal surgery in Sierra Leone and SSA?
- How can a non-vitreoretinal surgeon optimise the management of rhegmatogenous retinal detachment in low-resource settings?

GLOBAL HEALTH PROBLEM ANALYSIS

Vitreoretinal disease burden in Sierra Leone and sub-Saharan Africa

In low-income countries like Sierra Leone, where the ratio of ophthalmologists per population is considerably less than higher income countries, ophthalmology services have tended to focus on anterior segment pathology. However, posterior segment eye disease in SSA is becoming increasingly recognised as populations expand, age and encounter an urban shift.¹

Published epidemiological data on the incidence of retinal detachment in Sierra Leone and SSA is limited.² Therefore, determining the scale of the problem is challenging and probably grossly underestimated due to poor detection and limited data collection. Local institutional audits of rhegmatogenous RD (RRD) presentations are variable ranging from a mean incidence of 23 cases per year at both the Department of Ophthalmology at the Chu-Campus and ophthalmology office in Lomé, Togo³ and the King Edward VII Hospital Ophthalmology Clinic in South Africa⁴ to 37 cases per year at the Kikuyu Eye Unit in Kenya⁵ and 112 cases per year at Luanda in Angola.⁶

Comparatively, the incidence of RDD was 0.46 per 100 000 at the King Edward VII Hospital Ophthalmology Clinic in South Africa,⁴ which is significantly lower than the UK which is reportedly 10–15 per 100 000 population.⁷

The major risk factors for developing an RD are myopia, age, eye trauma, previous cataract surgery, proliferative diabetic retinopathy, inflammatory conditions, malignancy, congenital eye diseases and genetic factors.⁷ Rates of myopia in Africa have been reported as being significantly less than Western populations, although barriers to presentation may contribute to this.^{2 8} In addition, the average life expectancy in Sierra Leone is 51.3 years old,⁹ therefore risk factors such as age may be less significant in this setting. RD associated with complicated ocular surgery, posterior uveitis and trauma may be significant in SSA as suggested by studies in Ethiopia, Kenya and Nigeria.^{10–12} Moreover compared

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Figure 1 Widefield fundus image demonstrating an extensive superior nasal retinal detachment extending to the superior retinal arcade. Within the area of retinal detachment is a large horseshoe retinal tear.

with high-income countries, late presentation with advanced disease and secondary complications, such as proliferative vitreoretinopathy and atrophy, make surgical care more challenging in SSA.¹⁰

Vitreoretinal surgical availability in sub-Saharan Africa

Distribution of services and staffing

A total of only 15 subspecialty trained vitreoretinal (VR) surgeons practise in the region of Senegal to Kenya and Ethiopia to Tanzania.¹³ Importantly, VR care is not equally poor across SSA. SSA includes 49 countries, some of which have VR facilities—such as Kenya, Tanzania and Nigeria.¹³ Notably in South Africa, a high standard of VR care is already available, although significant health inequalities, including allocation of resources, still remain.¹⁴ At the current time, no subspecialty expertise exists within Sierra Leone, which emphasises the problem addressed in this report.

The cost of travel to the near facility in Ghana, prior to the cost of surgery is prohibitive to the majority of the Sierra Leonean population, 72% of whom are living on less than US\$1 per day.¹⁵ Within these economic constraints, low-cost interventions capable of being performed in-country, by general ophthalmologists are required to offer an affordable, accessible intervention to patients presenting with RRDs.

Management options of RRDs in low-resource settings

Prevention of RD through the early detection and treatment of retinal tears to prevent the accumulation of subretinal fluid and progression to RD offers the most cost-effective strategy. However, given the small number of eye care providers within the country and the frequently delayed presentations, opportunity to intervene at this stage may be limited to incidental detection.

Retinal laser photocoagulation

Laser retinopexy involves encircling laser treatment around the retinal tear causing heat and local photocoagulation at the target area stimulating a scar formation between the neural retina and the retinal pigment epithelium.¹⁶ In an estimated 95% of cases,

this prevents further fluid accumulation and prevents RD development.¹⁷ Laser retinopexy within settings where pars planar vitrectomy or scleral buckling is available is conventionally used for retinal tears without or with limited surrounding subretinal fluid.

The role of laser retinopexy in the absence of pars plana vitrectomy or scleral buckle may be extended to asymptomatic macula-on RDs and shallow inferior RDs which may be contained by barrage laser photocoagulation.¹⁸ However, in this setting, these RDs are unlikely to be detected and may only present later on or not at all. Thus, the benefit of laser retinopexy in this scenario may be of limited value.

In one study, 19 phakic eyes of 17 patients aged 12–58 years old underwent barrage laser retinopexy for asymptomatic macula-sparing retinal detachments, none of which were bullous.¹⁸ On average, the RD was four clock hours in size circumferentially, and cases included involvement in at least one of the four quadrants.¹⁸ Ninety-five per cent of detachments showed no progression at 20.9 months. One case had a pre-existing supero-temporal RD which extended across the barrier into the macula region 5 months post-treatment.¹⁸ A retrospective study showed a progression of 6 out of 15 RDs treated with laser retinopexy, two of which were symptomatic and one of which was macula-off.¹⁹ The mean follow-up was 4 years and 100% of superior RDs progressed.¹⁹ The current literature shows that asymptomatic inferior RDs are likely to benefit from barrage laser retinopexy. However, superior RDs especially symptomatic cases are unlikely to benefit from this treatment.

Retinal cryopexy

The retina is visualised using indirect ophthalmoscopy and a cryoprobe is placed on the outside of the eye in the region of a tear, inducing local protein denaturation.^{19 20} A chorioretinal scar is induced, adhering the neural retina to the retinal pigment epithelium (RPE), with the establishment of a seal at the edges of the tear.^{19 20} A barrier can be achieved in 7 to 10 days.¹⁹ Cryotherapy generally induces more scarring and if extensive areas are treated, could cause a tractional detachment.²¹ For this reason, laser retinopexy is the preferred option as it results in less scarring. However, cryopexy enables a treatment strategy in cases of a small pupils or media opacity which would compromise the retinal visualisation necessary to deliver laser retinopexy.²⁰

It is useful for retinal breaks with the potential to progress to an RRD (typically U tears) without significant subretinal fluid as well as pre-equatorial lesions which may be inaccessible with other techniques.^{19 20} Cryotherapy technique has the benefit of being a low-cost procedure, with the ability to be performed under local anaesthetic in an outpatient or day-case setting and is easier to teach compared with vitrectomy and scleral buckling. Cryotherapy is also useful in conjunction with other strategies such as pneumatic retinopexy, scleral buckling and pars plana vitrectomy.

Pneumatic retinopexy

Pneumatic retinopexy is a well-tolerated procedure with significant potential to reattach the retina with effective case selection, especially when employed by an experienced clinician.²² It is also a more cost-effective option than scleral buckle or vitrectomy and avoids the complications associated with these procedures such as cataract development.²² It is a minimally invasive procedure useful in patients with a single retinal break or group of breaks that are not exceeding one clock hour (30 degrees), as well as breaks that are located in the superior eight clock hours

of the globe.^{22 23} It is an alternative to scleral buckling and vitrectomy.²³ It can be performed for both macula-on and macula-off RRDs. It can easily be performed under local anaesthetic as an outpatient procedure making it a good option in these settings.

The first step of the procedure is to perform cryotherapy to the retinal break. The second step is to inject an expansile gas (0.3 mL of 100% C₃F₈) into the vitreous cavity. Finally, an anterior chamber paracentesis is performed with a 30-gauge needle to equalise the intraocular pressure. Successful reattachment at 2 months with a single procedure has been achieved in 66.3% of cases, with final anatomical success, including those that had additional operations, being achieved in 99.2%.²⁴ Mandelcorn and colleagues suggest retinal reattachment rates with pneumatic retinopexy vary from 60% to 91% depending on the patient selected.²²

In the absence of expansile gas, comparative studies suggest filtered air can also be efficacious.²⁵ When comparing single procedures, the reattachment rate in the perfluoropropane gas group was 73% compared with 60.3% in the air group, but this difference was not statistically significant.²⁵ When using additional pneumatic retinopexy and/or surgical procedures, the final reattachment rate was 92.1% for those receiving air and 96.8% for those patients being treated with perfluoropropane gas.²⁵ There were no statistically significant differences in final visual acuity between groups.²⁵ However, if using air as the tamponade agent it is challenging to ensure sufficient intravitreal volumes and it may have insufficient longevity.²⁶ Repeated injections may be required.

Pneumatic retinopexy, like cryotherapy is also a low-cost, simple to learn procedure, capable of being performed under local anaesthetic. This would be the ideal treatment option for the case described above in this setting.

Scleral buckling

Scleral buckling represents an efficient and cost-effective method to treat RDs in low-income settings.²⁷ Historically, scleral buckling has been used extensively, and although there has been a transition towards primary vitrectomy for RD, the latter is not necessarily associated with improved visual outcomes.²⁷ Furthermore, it restores vision more quickly than vitrectomy.²⁷ A buckle has been suggested to close a retinal break by increasing the proximity of the RPE to the retina and positioning the retina nearer to the posterior vitreous cortex.²⁸ This may reduce fluid flow through the break and ease vitreous traction on flap tears.²⁸ Scleral buckling is the treatment of choice for simple RRD and dialyses in the absence of pre-existing posterior vitreous detachments.²⁸ Segmental buckles can be used for single or multiple

breaks within a single clock hour.²⁸ Encircling bands are typically used for extensive or multiple breaks, as well as breaks with high-risk features such as aphakia or pseudophakia.²⁸ Anatomical success rate in RRD has been reported as 89.7% in phakic patients and 73.9% in pseudophakia.²⁸

A scleral buckle procedure is more economical than primary vitrectomy.²⁷ However, the technique is challenging to teach and relies on extensive experience. At centres where a basic retinal service is present but VR equipment and consumables may not be accessible, scleral buckling should strongly be encouraged. Senior ophthalmologists from high-income settings with expertise in this area could serve as teachers and encourage the use of this technique in SSA.

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Learning points

- Vitreoretinal facilities are in short supply in sub-Saharan Africa, preventing most patients from accessing appropriate care.
- Low-cost vitreoretinal interventions provide alternative treatment options to pars plana vitrectomy in low-resource settings.
- Training in the treatment of retinal detachments should be incorporated into regional training programmes for general ophthalmologists.
- A retinal laser, cryotherapy equipment, scleral buckling techniques and C3F8 expansile gas should be included in the list of essential national ophthalmic equipment.

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