

A REVIEW OF THE ETIOLOGY, VISUAL OUTCOME AND
COMPLICATIONS OF RHEGMATOGENOUS RETINAL DETACHMENT
SURGERY AT KIKUYU EYE UNIT IN P.C.E.A KIKUYU HOSPITAL

A dissertation submitted as partial fulfillment for the degree of
Master of Medicine in Ophthalmology

University of Nairobi

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DECLARATION

This dissertation is my original work and has not been presented for a degree at any other university.

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LIST OF ABBREVIATIONS

TRD	Tractional retinal detachment
BCVA	Best Corrected Visual Acuity
IOP	Intraocular Pressure
KEU	Kikuyu Eye Unit
KNH	Kenyatta National Hospital
ERD	Exudative retinal detachment
PCEA	Presbyterian Church of East Africa
PDR	Proliferative Diabetic Retinopathy
PPV	Pars plana Vitrectomy
PRP	Pan retinal photocoagulation
PVR	Proliferative vitreoretinopathy
VA	Visual Acuity
RRD	Rhegmatogenous retinal detachment
RPE	Retinal pigment epithelium

ABSTRACT

Introduction: Rhegmatogenous Retinal detachment is a treatable cause of blindness. The number of general ophthalmologists trained and working in eye clinics widely spread in Kenya has increased over time leading to early diagnosis and referral of rhegmatogenous retinal detachment cases to centers with vitreoretinal specialists. In view of this there is need to establish etiology of rhegmatogenous retinal detachment, currently used interventions, their outcome and complications arising from such interventions.

Aim: To review rhegmatogenous retinal detachment surgeries done at Kikuyu Eye Unit from 2007 to 2011.

Methods: A retrospective case series of 184 rhegmatogenous retinal detachment cases that underwent vitreoretinal surgeries at the Kikuyu Eye Unit in Kenya from January 2007 to December 2011 was undertaken. Data was analysed and presented in tables and graphs.

Main Outcome Measures: Best corrected visual acuity at 6-months postoperative and complications of surgery.

Results: One hundred and eighty-four (184) cases were analysed. Retinal break was the commonest etiology for rhegmatogenous retinal detachment (34.2%). Pars plana vitrectomy was the main intervention performed at 69%. Those eyes that had combined Pars plana vitrectomy and scleral buckle had better post-operative visual acuity outcome ($p < 0.009$). Post operative visual outcome was better for patients who had better preoperative visual acuity and got early surgery. Vitreous hemorrhage at 4.1% was the commonest intraoperative complication; increased intraocular pressure at 50% was commonest early postoperative complication; and re-detachments at 18.9% and cataracts at 18.1% were the commonest late postoperative complications.

Conclusions: Retinal break, previous intraocular (cataract) surgery and non-surgical trauma were among the leading causes of rhegmatogenous retinal detachment identified. Pars plana vitrectomy with Endolaser was the most frequent intervention performed. This study demonstrated that early surgery leads to good visual outcome for rhegmatogenous retinal detachments. High intraocular pressure, vitreous hemorrhage, cataract and redetachment were common complications associated with vitreoretinal surgical interventions.

Key Words: Rhegmatogenous retinal detachment, pars plana vitrectomy, visual outcome, complications.

1. BACKGROUND

1.1. INTRODUCTION

Rhegmatogenous Retinal detachment is a treatable cause of blindness yet it remains a threat to vision. Between 1995 and 2000, Kikuyu Eye Unit based at PCEA Kikuyu hospital situated approximately 20km from Nairobi was the only centre in East Africa with capacity for surgical intervention for retinal detachment for some years. Since then awareness of retinal detachment has increased due to training of more eye care health workers, adoption of better diagnostic and intervention skills and availability of better instruments. The number of general ophthalmologists trained and working in eye clinics widely spread in Kenya has increased, leading to early diagnosis and referral of retinal detachment cases to centers with vitreoretinal specialists compared to ten years ago. In view of these changes over last ten years, there is need to establish current patterns of presentation of rhegmatogenous retinal detachment, currently used interventions, their outcome and complications arising from such interventions.

1.2 Definition of retinal detachment

Retinal detachment is separation of neurosensory retina from underlying retinal pigment epithelium (RPE). Initially a break in neuronal layers allows fluid to seep from vitreous cavity into the space between sensory retina and RPE causing separation between the two layers. Traction from inflammatory or vascular fibrous membranes which tether to the vitreous also results in pulling of sensory retina from RPE. Exudation of material into subretinal space from retinal vessels leads to separation.

1.3 Classification of retinal detachment

There are 3 types of retinal detachments classified according to causative mechanism. Rhegmatogenous retinal detachment (RRD) is the commonest type deriving its name from rhegma meaning break. Tractional retinal detachment (TRD) follows in frequency, it occurs without an initial retinal break when there is pulling of sensory retina from RPE by fibrous membranes. Exudative retinal detachment (ERD) is the least common among the three types arising when subretinal fluid accumulates and causes detachment without any corresponding break in the retina.¹

2. LITERATURE REVIEW

2.1 Epidemiology

Ethnic variations in the incidence of rhegmatogenous retinal detachment have been documented in various studies. Black Africans have been noted to have low incidence of RRD compared to other populations.^{2,3} However studies on incidence have been hospital based which can be misleading. In the developing world no field surveys on incidence of RRD have been done⁴

2.2 Etiology of Rhegmatogenous Retinal detachment

Rhegmatogenous retinal detachment occurs when retinal breaks develop at sites of firm vitreoretinal adherence. Following cataract surgery, studies have shown the incidence of RRD to range between 0.6 and 1.7% in the first postoperative year, with an overall incidence of 0.7%.^{5,6,7,8} Compared with rates of RRD in the general population of 0.0065–0.0179% cataract surgery increases the risk of RRD at least four fold.^{9,10} Incidence of RRD after ND YAG laser capsulotomy for posterior capsular opacification has been found to be 1.9% world wide.¹¹

Genetic factors have been cited to influence incidence of RRD. Some studies have shown a relatively high incidence of familial retinal detachment among first relatives.¹² Though rare, Pilocarpine has also been implicated as a cause of retinal detachment especially where other risk factors pre exist. Eyes with lattice degeneration have been shown to have an increased incidence.¹³ From studies, the incidence of retinal tears is varied from 0.59% to 27%.¹⁴

Prevalence of retinal tears has been found to be 83 times more than RRD, which means not all tears lead to RRD.¹⁴ Peripheral retinal lesions like Ora bays, meridional folds and complexes, retinal tufts, and lattice degeneration predispose to full thickness retinal breaks. In a study of 1000 autopsy eyes, Spencer et al found that retinal tears were associated with 16.7% ora bays but retinal tears associated with ora bays were present in only 0.5% of all eyes.¹⁵

Byer et al in a study to find out the relationship of cystic tufts to retinal detachment found that 6.5% of retinal detachments are associated with holes that develop with posterior vitreous detachment (PVD) at the areas of cystic tufts¹⁶ Straatsma et al found that the histological incidence of atrophic holes and traction retinal breaks in lattice lesions is 18.2% and 1.4% respectively whereas Byer et al found the incidence of retinal detachment from traction retinal breaks and atrophic holes associated with lattice degeneration to be 0.3–0.5% only.^{17,18}

Retinoschisis findings have been observed in 2.5% of patients with RRD in a study done to establish it as a risk factor to retinal detachment.¹⁹

Myopia has been shown to be a risk factor for retinal detachment. This risk increases with higher degrees of myopia. Studies have shown PVD occurs early, lattice degeneration is more common, and retina is thinner in myopic patients, making breaks and RRD more frequent and bilateral.^{20,21} Trauma has been implicated as a cause of 15% of all retinal detachments with most occurring in young individuals, there is often a latent period between the time of trauma and development of retinal RRD. Studies on location of traumatic retinal breaks revealed 60% are located at the ora, with a similar rate of non-traumatic tears found to be equatorial. The frequent occurrence of retinal breaks, the most important being retinal dialysis, in ocular contusion injury has been documented repeatedly.²²

2.3 Pathogenesis

Rhegmatogenous retinal detachment develops when the forces promoting retinal detachment overwhelm the forces maintaining retinal attachment. Forces that maintain retinal apposition are the RPE pump, intraocular pressure (IOP) and a higher oncotic pressure in choroid. An imbalance between appositional forces and detachment promoting factors lead to holes, tears and breaks leading to RRD.

2.3 Diagnosis

Rhegmatogenous Retinal detachment may be diagnosed by binocular indirect ophthalmoscopy. Scleral indentation makes it possible to visualize retina up to the ora serrata to avoid missing

breaks that may not be obvious. The retina appears grey and may have folds with subretinal fluid accumulated in the subretinal space. Assessment of state of macular to determine if attached or not helps in predicting prognosis.

In eyes with opaque media, ocular B-scan ultrasound is useful for detecting RRD. A prospective observational study on use of ultrasound scans by emergency department physicians in patients with signs of retinal detachment showed a 97% sensitivity (95% confidence interval [CI], 82-100%) and 92% specificity (95% CI, 82-97%) on 92 examinations (29 retinal detachments). Visual acuity assessment anterior segment examination and tonometry are basic baseline evaluations that need to be done.

2.5 Treatment

Treatment goals are to identify and close breaks with minimum iatrogenic damage as soon as possible after the detachment to increase chances of good outcome. Closure of the breaks occurs when edges of retinal break are brought into contact with underlying RPE.

Gitau et al in a study done in Kenyatta National Hospital(KNH) found most of the patients (59.9%) were operated after 3 months from the time the symptoms started with only 27.7% operated within one month and this greatly affected outcome.²³

This could be attributed to the poor referral system and few specialists in the peripheral hospitals in Kenya. Most of those who were operated within a few days were post-traumatic or with hemorrhage both conditions of which cause an acute reduction in visual acuity. The choice treatment method is based on the characteristics of the RRD, the patient as a whole, and the experience and preference of the individual retinal surgeon. The procedures that are used are discussed below.

2.5.1 Pars plana Vitrectomy

Pars plana vitrectomy is effective for primary RRD with or without vitreous hemorrhage or tractional detachment. In a study done in Kenyatta national hospital, Gitau et al found Pars Plana Vitrectomy (PPV) was the commonest vitreoretinal procedure performed (79.8%).²³ It was performed as the first operation and during second operations such as removal of silicon oil

where part of the vitreous had remained especially at the vitreous base during the first operation. Although PPV is indicated for complicated rhegmatogenous retinal detachment e.g with vitreous hemorrhage, proliferative vitreoretinopathy, posterior tears, giant tears and combined tractional detachment with hemorrhage, Gitau et al found the procedure was performed in 72.8% of all cases of RRD even in the absence of above complications.²³ Drainage of subretinal fluid through a break or posterior drainage retinotomy is performed during fluid air exchange. The retinal breaks are treated with Cryotherapy or laser after retina is attached.

Complications that arise during the procedure are varied, they include lens damage, especially in the young where its avoided, from direct iatrogenic trauma leading to formation of cataract, this being the most common complication reported.²⁴ Uveal infusion occurs if infusion port fails to perforate the pars plana, vitreous incarceration in the sclerotomy site may cause peripheral tear due to traction. Early postoperative complications include corneal erosions, bullous keratopathy and filamentary Keratitis. Glaucoma is a frequent and often a refractory complication of PPV with silicon oil tamponade and has a Multifactorial etiology. Up to 35% of eyes within 48 hours have elevated intraocular pressure of more than 30mmHg after pars plana vitrectomy arising due to hemorrhage, inflammation, choroidal edema, pupil block, expansion of gases and silicon oil in anterior chamber.²⁵ Post operative endophthalmitis is rare with incidence approximately 0.07%.²⁶

Long term complications include focal and diffuse corneal opacities, worsening of preexisting glaucoma and nucleosclerotic cataract.²⁷ Late vitreous hemorrhage due to revascularization of sclerotomy sites may occur. Gas or silicone oil injected into the vitreous cavity tamponades the breaks until the retinopexy provides a permanent seal. Silicone oil requires a second pars plana vitrectomy for its removal unlike gas that dissolves. Silicone oil advantages include decreased postoperative positioning requirements, no concern about atmospheric pressure changes, and provide clear optical media immediately following surgery.

Pars plana vitrectomy has distinct indications over scleral buckling or pneumatic retinopexy. Pars plana vitrectomy is the only procedure that directly removes vitreous traction by lysing the vitreous strands adherent to the flap of the horseshoe tear. Scleral buckling only indirectly relieves vitreous traction whereas pneumatic retinopexy does not relieve traction at all. Secondly pars plana vitrectomy directly removes vitreous hemorrhage and pigment, clearing the visual

axis in cases with significant vitreous opacity. This allows for better intraoperative visualization and the potential for faster postoperative visual recovery.

Pars plana vitrectomy can reliably achieve complete, intraoperative retinal reattachment. This is attained either by internal drainage of subretinal fluid or by use of per fluorocarbon liquids to displace the subretinal fluid. In contrast, scleral buckling with subretinal fluid drainage typically achieves only partial reattachment, while scleral buckling without drainage and pneumatic retinopexy never achieves immediate reattachment. Immediate Intraoperative retinal reattachment has improved the prognosis for giant retinal tears.

Anatomic success rates generally are about 85% as found by Lincroft et al.²⁸ A meta analysis showed pseudophakic patients without proliferative vitreoretinopathy have an anatomic success rate of approximately 90% with a single operation.²⁹ Untreated retinal break will cause pars plana vitrectomy to fail. This can be prevented with combined pars plana vitrectomy-scleral buckling procedure. Among the demerits are Postoperative positioning requirements are stricter than for scleral buckling depending on position of the breaks. Pars plana vitrectomy requires the most specialized equipment and support staff, and is by far the most expensive of all reattachment procedures

2.5.2 Scleral Buckling

The three main buckling techniques currently used are the radial sponge, segmental sponge, and encircling band. With one of these options, an anatomic success rate of over 90% can be achieved in treatment of RRD. Haritoglou et al in a study done in Germany found overall primary anatomic success rate was 84.7% and the secondary success rate 96.4% after 1 initial scleral buckling surgery and 1 additional surgery in case of persisting retinal detachment, and 19.1% of the patients with an initially attached retina after 1 scleral buckling surgery experienced a redetachment in the postoperative course. In phakic patients (n = 359) the primary success rate was 89.7%, whereas in pseudophakic patients (n = 165) a primary success rate of 73.9% was obtained.³⁰ Gitau et al at Kenyatta national hospital found scleral buckling was performed in 27.2% of all the PPV surgeries done for RRD which means it can be combined with PPV to achieve higher anatomical success rate.

Encircling scleral buckling has the merit of more extensive support and is more likely to support unidentified breaks or untreated retinal breaks. A properly placed segmental element will support the break(s) and achieve success with a less extensive procedure and a lower risk of complications especially with small breaks or multiple breaks near each other compared to encircling buckling.

During cerclage, external drainage of sub retinal fluid increases single-operation success rate. However, drainage is associated with several vision-threatening complications that may include vitreous incarceration, retinal incarceration, suprachoroidal or subretinal hemorrhage and endophthalmitis.³¹

Typically, segmental scleral buckling is performed without drainage. Complications of scleral buckling include postoperative myopic shift caused by axial elongation, motility and alignment disturbances, the buckle acts as a permanent intraorbital foreign body with a risk of infection, transconjunctival extrusion and trans-scleral erosion. Patients may also get elevated intraocular pressure due to reduction of total globe volume), Ischemia of the anterior segment of eye cystoid macula edema, macular pucker, recurrent detachment and endophthalmitis.³¹

Postsurgical visual outcomes are related to the extent of initial macular involvement. In macula-off detachments (in which the detachment involves the macula), only 40-60% of patients have restored visual acuity of 20/50 or better.³² Visual restoration is much more successful in detachments sparing the macula,³³ with one large series reporting that 90% of such patients had vision of 20/40 or better following surgery.³⁴ Macular detachment 7 days prior to surgery, severe proliferative vitreoretinopathy and intraoperative hemorrhage also have an influence on visual and anatomical outcomes. However, the most reliable predictor for poor postoperative outcome is poor preoperative visual acuity.³⁵

2.5.3 Pneumatic retinopexy.

Pneumatic retinopexy utilizes an intraocular gas bubble to temporarily tamponade the retinal break. Sealing of all retinal breaks by laser or Cryotherapy as a second step is critical for success of this procedure. The best candidates indicated for pneumatic retinopexy have a single retinal break or group of retinal breaks that are not larger than 1 clock hour (30°) and are located in

superior 8 clock hours of the globe. The patient must have the ability to maintain a proper head position for at least 16 hours per day for 5 days or more.

Pneumatic retinopexy offers several distinct advantages; the main advantage of pneumatic retinopexy over scleral buckling is the minimization of complications such as inadvertent scleral perforation by scleral sutures, postoperative refractive error changes, strabismus and complications associated with the drainage of subretinal fluid. It can be performed in the office and is relatively cheaper.

Pneumatic retinopexy is contraindicated for detachments with concomitant vitreous hemorrhage and/or proliferative vitreoretinopathy, in children the mentally handicapped and noncompliant patients. As with pars plana vitrectomy, the use of an expansile gas is associated with a risk of intraocular pressure spike should the patient be exposed to high atmospheric pressures.

Pneumatic retinopexy has a lower single-operation success rate than scleral buckling or pars plana vitrectomy, particularly in pseudophakic patients. Even with careful patient selection, anatomic success rates are in the range of 75-80% with a single procedure. In failed cases, additional surgery improves the success rate to approximately 97%. An initial failure of pneumatic retinopexy does not affect the final visual outcome.³⁶In a comparative trial of eyes with rhegmatogenous retinal detachment involving the macula for 14 or less days, the visual outcomes following pneumatic retinopexy were statistically better than those following scleral buckling.³⁷Pneumatic retinopexy appears to have a greater incidence of new postoperative breaks than scleral buckling or pars plana vitrectomy. Subsequent new retinal detachment following pneumatic retinopexy (PR) has been reported at a rate of 7%-22%.³⁷ Formation of a new break in the inferior quadrants is usually an indication for scleral buckling and/or vitrectomy.

Koch et al found insignificant loss of lens transparency in eyes subjected to pneumatic retinopexy compared with non operated eyes after 2 months of follow-up. However, by 6 months, the opacification of the crystalline lens was more evident, particularly the anterior lens cortex. Delayed subretinal fluid absorption is uncommon and is characterized by long-term persistence of loculated pockets of low-lying subretinal fluid. When involving the macula it causes prolonged postoperative visual symptoms such as decreased visual acuity and

metamorphopsia. The presence of subretinal fluid can persist for several months. No specific management is required, but close follow-up is essential.³⁸

Gas bubbles may migrate through retinal breaks into the subretinal space, particularly in the presence of large breaks. Hilton and Tornambe found that any eye retinal breaks larger than 1 clock hour are associated with an increased risk for such bubbles.³⁹ Patient's head should be positioned in such a way that the bubbles migrate away from the tear. Endophthalmitis as a complication of pneumatic retinopexy is very low. Tornambe and Hilton reported one case of staphylococcal endophthalmitis among the 103 eyes that underwent pneumatic retinopexy.³⁹

2.5.4 Laser photocoagulation and Cryotherapy

Either laser or cryopexy may be used to barricade, or wall off, a limited peripheral macula-on RRD. This is appropriate for a patient who has poor surgical risk. However, barricade does not truly cure the RRD and long-term risks of proliferative vitreoretinopathy, hypotony, and rubeosis iridis remain. If the RRD progresses through a barricade, the laser spots may act as new, multiple retinal holes that may complicate.

Follow up

Gitau et al in a study done in Kenyatta national hospital found visual acuity improved in most of the eyes operated (70.8%) from their pre-operative VA with the range being between PL and 6/6 on the Snellen chart.

Patients with improved VA were followed up for longer period (average 3.7months) compared to those whose VA deteriorated or remained the same (average 2.3 and 2.5 months respectively) this could have been due to those with improved VA being motivated to continue with follow-up.

Patients who were operated between 1-3 months from onset of symptoms were more likely to have an improved VA post-operatively compared with those who presented late (after 12 months) from the onset of symptoms. This is because late presentation is associated with more complications and poor outcome.

Due to use of silicon oil for tamponade, longer follow up was necessary to address complications arising due to silicon oil before its removal.

3. RATIONALE

Retinal detachment surgery is among advanced ophthalmic microsurgical procedures carried out in Kenya within selected centers.

This study evaluated causes of rhegmatogenous retinal detachment, visual outcome after surgical intervention and complications arising from the interventions, done at a time when there is more awareness, better instrumentation, more trained general ophthalmologists and vitreoretinal surgeons.

4. OBJECTIVES

4.1 Main objective

To review the etiology, post surgery visual acuity outcome and complications of rhegmatogenous retinal detachment surgery at Kikuyu Eye Unit from 1st January 2007 to 31st December 2011.

4.2 Specific objectives

- 1) To determine the etiology of rhegmatogenous retinal detachment cases seen at K.E.U
- 2) To determine procedures done for rhegmatogenous retinal detachment at K.E.U
- 3) To determine visual outcomes at 2-weeks, 6-weeks, 3-months and 6-months postoperatively.
- 4) To determine complications of rhegmatogenous retinal detachment surgeries.

5.0 MATERIALS AND METHODS

5.1 Study design:

Retrospective case series

5.2 Case definition:

Rhegmatogenous retinal detachment cases operated on at Kikuyu Eye Unit between 1st January 2007 to 31st December 2011.

5.3 Materials

Records of inpatient number, age and date of surgery were retrieved from the theatre record book at Kikuyu Eye Unit theatre where all surgeries done during the study period were recorded.

The particular files were traced and retrieved within the records library. Cases which could not be traced were noted. The relevant data was entered in a structured questionnaire on perusal of the medical records. A pretest of the questionnaire had been done using five files. Data was analyzed using statistical package for social scientist (SPSS).

5.4 Study time frame:

Study was conducted from 25th February 2013 to 15th March 2013.

5.5 Study setting

The study was done at Kikuyu Eye Unit

5.6 Cases

The case files included all cases of rhegmatogenous retinal detachment on which surgery was carried out at Kikuyu Eye Unit, P.C.E.A Kikuyu hospital from 1st January 2007 to 31st December 2011.

6. ETHICAL CONSIDERATIONS

Patients' names were not on any questionnaire or in any data set or publication. Patients' files were allocated study numbers instead.

Patients' files were not photocopied or names of clinicians/surgeons recorded.

The information on questionnaires was accessible only to the investigators and the statistician.

Consent was sought from **KNH/UON** ethics and research committee and Kikuyu Eye Unit management.

7. RESULTS

A total of 300 rhegmatogenous retinal detachment case files were retrieved from the theatre record book but only 184 cases were analysed. Those not analysed consisted of 67 files that were missing from the records filing store, 29 misreported cases which were not rhegmatogenous retinal detachment cases and interventions and 20 files with missing pages as show in the flow chart below

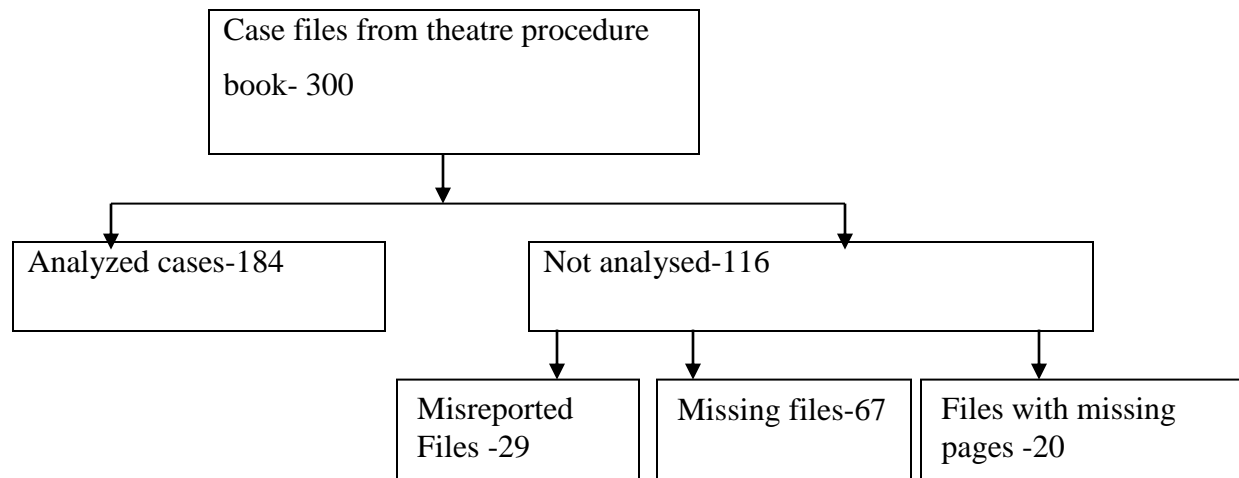


Figure 1: Flow chart 1

Table 1a: Baseline characteristics n=184

Variable	Frequency	Per cent
Sex		
Male	125	67.9
Female	59	32.1
Referral		
Yes	123	66.8
No	61	33.2
Age		
Mean (SD)	49.6years (17.6)	
Range	7-90years	

Majority of the patients had been referred (66.8%) from elsewhere. Most patients were males at 67.9%

Table 1b: Baseline characteristics n=184

Variable	Frequency	Per cent
Symptoms duration before first visit		
Median (IQR)	8.5 weeks(2.0-28.7)	
Range	1 -210days	
Operations per eye		
Eyes operated once	152	82.6
Eyes operated twice	32	17.4
Eye operated		
No of Right eyes	98	53.3
No of Left eyes	86	46.7

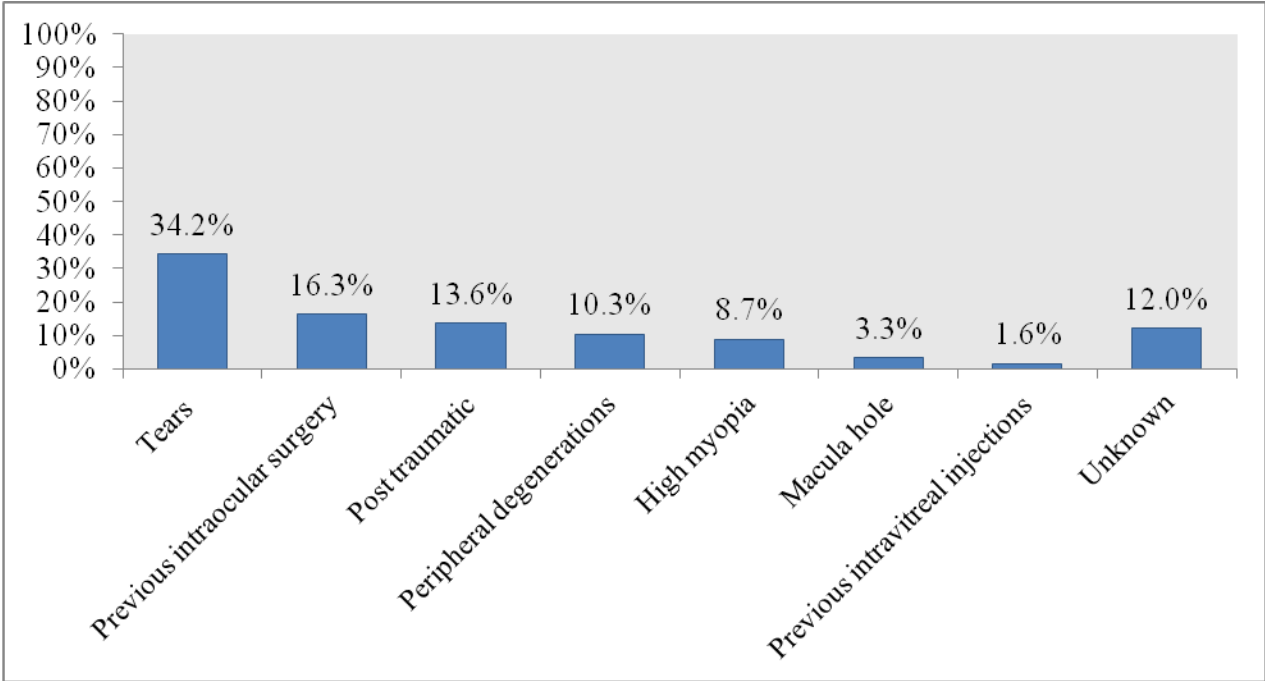
Majority of the eyes had a single surgery at 82.6%.

Table 2: Status of Macula and presence of PVR n=184

Variable	Frequency (%)
Macular detached	139 (75.5)
Macular Attached	45 (24.5)
With PVR	47 (25.5)
No PVR	137 (74.5)

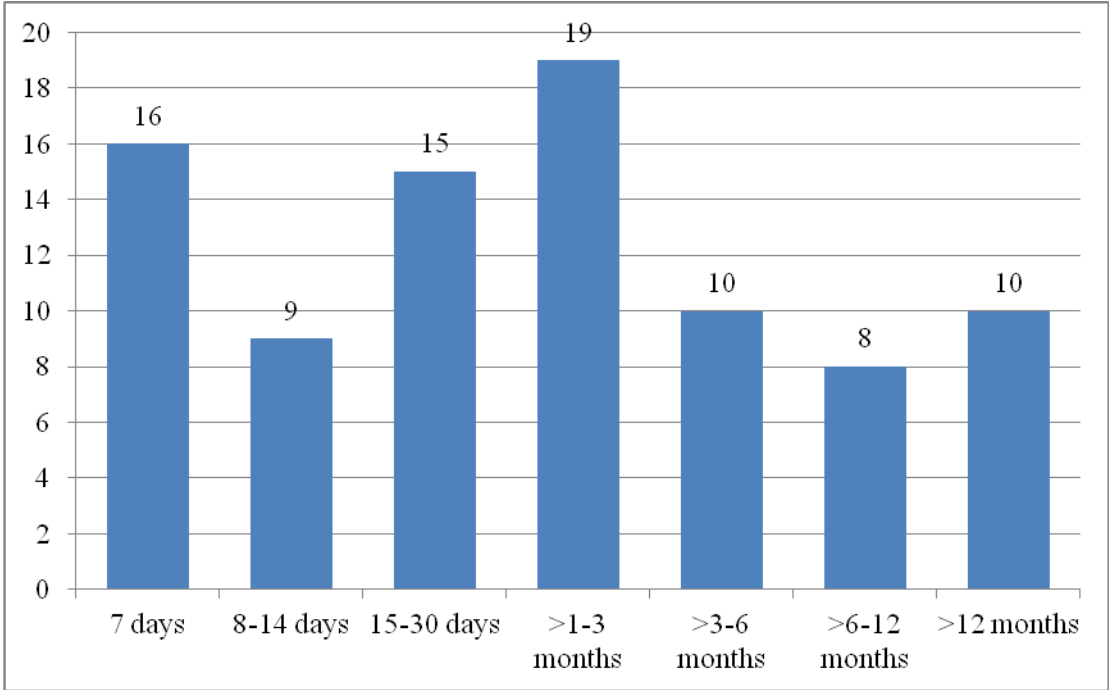
Macula was detached in 75.5% cases. There was proliferative vitreoretinopathy in 25.5% cases.

Figure 2: Etiology of Rhegmatogenous retinal detachment



Idiopathic retinal tears were the commonest cause of rhegmatogenous retinal detachment.

Figure 3: Duration between diagnosis and intervention (n=87)



87 case files had duration between diagnosis and intervention recorded .Only 40 patients, 45.9%, got treatment within the first month after diagnosis.

Table 3: Types of Interventions performed (n=184)

Variable	Frequency	Percentage (%)
PPV	127	69
Scleral buckling		
Encircling	42	22.8
Segmental	49	26.6
Endolaser	114	62.0
Cryotherapy	40	21.7
Pneumatic retinopexy	1	0.5

Pars Plana Vitrectomy (PPV) was the most frequently performed intervention procedure. Some cases had more than one type of intervention.

Table 4: Combined procedures and statistical significance against visual outcome n=184

Variable	p value
PPV only	0.475
Scleral buckling only	0.504
PPV +Endolaser	0.811
PPV +Cryotherapy	0.252
PPV+Scleral buckling	0.009

Post-operative Visual outcome was better for eyes that had combined PPV and scleral buckling.

Table 5: Tamponade agents used for PPV n=127

Tamponade Agents	Frequency	Percentage
Silicon oil	88	69.2
Expanding gases		
SF6	28	22
C3F8	8	6.3
Air	3	2.4

Silicon oil was used frequently at 69.2%, followed by sulfur hexafluoride at 22% for tamponade for PPV.

Table 6: Pre-operative visual acuity n=184

Preoperative BCVA	Frequency	Percentage (%)
6/6-6/18	8	4.3
<6/18-6/60	34	18.5
<6/60-3/60	62	33.7
<3/60	80	43.5

Majority of the patients had preoperative visual acuity less than 6/60

Table 7: Cases with complete postoperative visual acuity data n=57

BCVA	Preoperative	Postoperative			
		2 weeks	6 weeks	3 months	6 months
6/6-6/18	-	-	7 (12.3)	1 (1.8)	3 (5.3)
<6/18-6/60	12 (21.1)	14 (24.6)	11 (19.3)	14 (24.6)	18 (31.6)
<6/60-3/60	24 (42.1)	29 (50.9)	23 (40.4)	26 (45.6)	23 (40.4)
<3/60	21 (36.8)	14 (24.6)	16 (28.1)	16 (28.1)	13 (22.8)

Only 57 cases had complete visual acuity data for the whole post operative period with 127 incomplete. Majority of patients with complete data had preoperative visual acuity of $\leq 6/60$.

Table 8: Dropout rates during postoperative follow up period n=184

Variable	Patients reviewed	Drop outs	Percentage
Preoperative	184	–	100
Review at 2 weeks	160	24	13.0
Review at 6 weeks	159	25	13.6
Review at 3 months	108	76	41.3
Review at 6 months	81	103	56.0

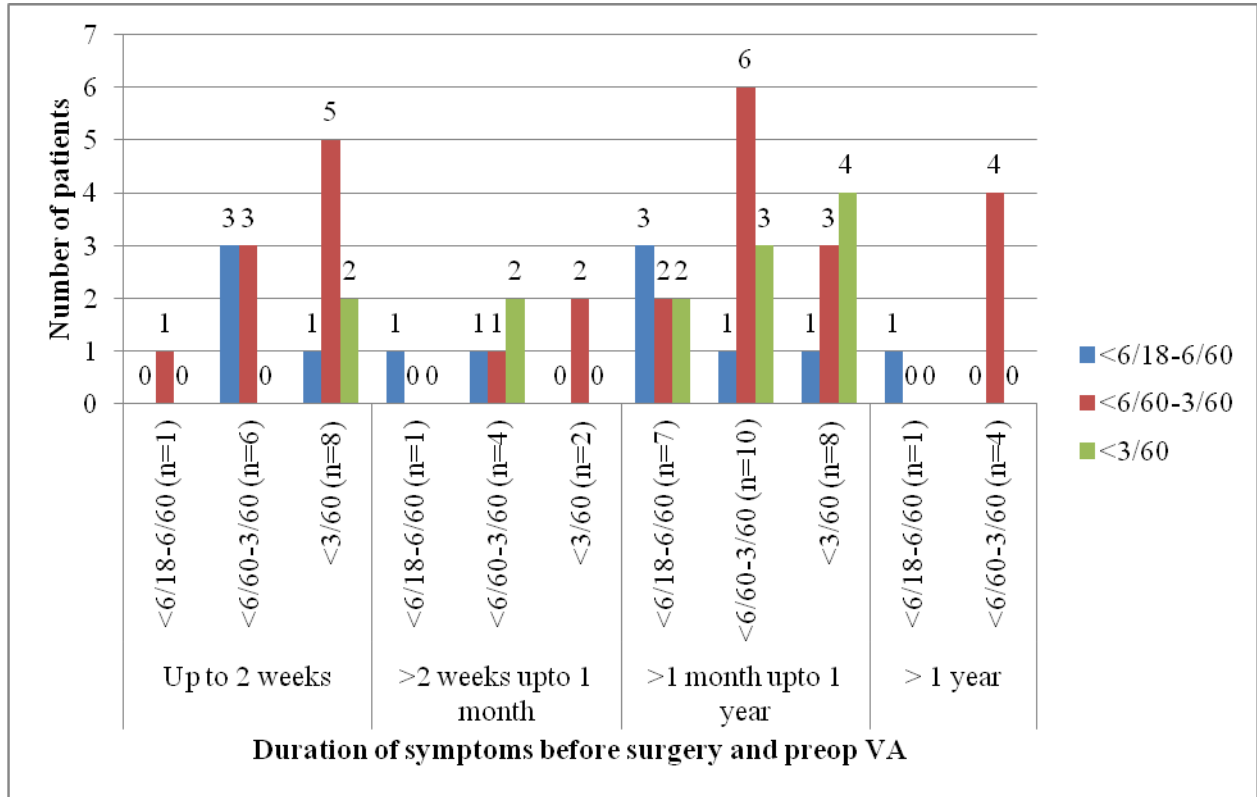
After the sixth week postoperative review a high number of patients did not turn up for subsequent review.

**Table 9: statistical significance between postoperative visual acuity and state of macula
n=184**

Visual acuity		Macula on		Macula off		P value
		n	%	n	%	
Pre-OP	6/6-6/18	5	11.1	3	2.2	0.053
	<6/18-6/60	10	22.2	24	17.3	
	<6/60-3/60	14	31.1	48	34.5	
	<3/60	16	35.6	3	2.2	
2 weeks	6/6-6/18	5	13.2	3	2.5	0.028
	<6/18-6/60	9	23.7	19	15.6	
	<6/60-3/60	12	31.6	53	43.4	
	<3/60	12	31.6	47	38.5	
6 weeks	6/6-6/18	14	37.8	27	22.1	0.248
	<6/18-6/60	6	16.2	19	15.6	
	<6/60-3/60	10	27.0	41	33.6	
	<3/60	7	18.9	35	28.7	
3 months	6/6-6/18	4	17.4	5	6	0.305
	<6/18-6/60	5	21.7	18	21	
	<6/60-3/60	9	39.1	34	40	
	<3/60	5	21.7	28	33	
6 months	6/6-6/18	1	7.1	3	4.5	0.924
	<6/18-6/60	4	28.6	20	29.9	
	<6/60-3/60	4	28.6	24	35.8	
	<3/60	5	35.7	20	29.9	

There was no significant statistical difference in post-operative visual acuity outcome between the eyes that had macula detachment and those with macula attached.

Figure 4: Relationship between visual outcome, duration of symptoms before surgery and preoperative visual acuity.



Patients with better preoperative visual acuity and who had early intervention had better visual outcome after intervention.

Table 10: Intraoperative complications n=184

	Frequency	Percentage
Without complications	171	92.8
With complications	13	7.1

Most of the eyes did not get complications during surgery.

Table 11: Type and frequency of intraoperative complications n=22

Variable	Frequency (%)
Vitreous hemorrhage	10 (45.5)
Iatrogenic retinal tears	6 (27.3)
Choroidal detachment	2 (9.1)
Lens damage	1(4.5)
Hyphema	1(4.5)
Subretinal hemorrhage	1(4.5)
Vitreous in AC	1(4.5)

Vitreous hemorrhage occurred most (45.5%) among the cases with intraoperative complications.

Table 12: Early postoperative complications n=159

	Frequency	Percentage
Cases without complications	120	75.5
Cases with complications	39	24.5

159 are the patients who came for the 6-weeks postoperative review.

Table 13: Type and frequency of early post-operative complications n=52

Complication	Frequency	Percentage
Elevation iop	26	50
Cataract formation	9	17.3
Vitreous hemorrhage	7	13.5
Redetachment	5	9.6
Keratitis	4	7.7
Muscle entrapment	1	1.9

52 is the total number of complications in the 39 eyes that had complications. Some eyes had more than one complication. Increased intraocular pressure was the most frequent early post-operative complication.

Table 14: Type and frequency of late post-operative complications (n=155)

Complication	Frequency	Percentage
Redetachment	46	29.7
Cataract formation	44	28.4
Maculopathy	23	14.8
Glaucoma	13	8.4
Proliferative vitreoretinopathy	8	5.2
Phthisis	7	4.5
Retinal ischemia	7	4.5
Vitreous hemorrhage	5	3.2
New break	1	0.6
Reopen retinal break	1	0.6

Re-detachment and development of cataract were commonest late postoperative complications occurring after 6-weeks to 6months. Some eyes had more than one complication.

Table 15: State of macula and PVR as a cause of re-detachment. n=184

Variable	Redetachment		P value
	Yes	No	
With PVR	12 (28.6%)	35 (24.6%)	0.609
No PVR	30 (71.4%)	107 (75.4%)	
Macular detached	33 (78.6%)	106 (74.6%)	0.603
Macular attached	9 (21.4%)	36 (25.4%)	

There was no statistical difference between state of macula and PVR with occurrence of redetachment.

Table 16: Relationship of etiology with re-detachment n=184

Variable	Re-detachment		OR (95% CI)	P value
	Yes	No		
Post traumatic				
Yes	4 (9.5%)	21 (14.8%)	0.6 (0.2-1.9)	0.382
No	38 (90.5%)	121 (85.2%)	1.0	
High myopia				
Yes	6 (14.3%)	17 (12.0%)	1.2 (0.5-3.3)	0.690
No	36 (85.7%)	125 (88.0%)	1.0	
Previous intraocular surgery				
Yes	7 (16.7%)	16 (11.3%)	1.6 (0.6-4.1)	0.353
No	35 (83.3%)	126 (88.7%)	1.0	
Peripheral degenerations				
Yes	5 (11.9%)	12 (8.5%)	1.5 (0.5-4.4)	0.545
No	37 (88.1%)	130 (91.5%)	1.0	
Previous intravitreal injections				
Yes	0 (0.0%)	3 (2.1%)	-	1.000
No	42 (100.0%)	139 (97.9%)		
After spontaneous vitreous hemorrhage				
Yes	0 (0.0%)	2 (1.4%)	-	1.000
No	42 (100.0%)	140 (98.6%)		
Retinal holes				
Yes	5 (11.9%)	12 (8.5%)	1.5 (0.5-4.4)	0.545
No	37 (88.1%)	130 (91.5%)	1.0	

Type of etiology did not predispose to subsequent redetachment. No statistical significance was found comparing all the etiological factors. ($p>0.05$)

Table 17: Relationship of intervention procedure with re-detachment n=184

Variable	Re-detachment		OR (95% CI)	P value
	Yes	No		
Scleral buckling				
Yes	18 (42.9%)	73 (51.4%)	0.7 (0.4-1.4)	0.330
No	24 (57.1%)	69 (48.6%)	1.0	
PPV				
Yes	30 (71.4%)	97 (68.3%)	1.2 (0.5-2.5)	0.701
No	12 (28.6%)	45 (31.7%)	1.0	

Type of intervention procedure was not statistically significant in influencing re-detachment.
($p>0.05$)

8. DISCUSSION

From the theatre records book 300 case files were identified but only 184 cases were analyzed. Those not analysed consisted of 67 files that were missing from the records filing store, 29 misreported cases which were not rhegmatogenous retinal detachment cases and 20 files with missing pages (Flow chart 1).

The surgeries were performed by two vitreoretinal surgeons. One vitreoretinal surgeon was available at Kikuyu Eye Unit before the year 2011. During the subsequent period two surgeons did the operations. The cases were not grouped and analysed per the surgeon.

Most patients who had surgery were males at 67.9%. Referrals from other centers which did not have the capacity to carry out the operations due to lack of trained vitreoretinal surgeons and appropriate equipment stood at 66.8%, which was thrice the number of cases seen locally for the first time at Kikuyu Eye Unit. The mean age of presentation was 49.6years (17.6%) with the range being 7 to 90 years (Table 1a). This findings were almost similar to those in a study done at Menelik hospital in Ethiopia by Solomon et al, who found more male patients with rhegmatogenous retinal detachment at 68%, mean age at presentation of 41 years and an age range of 7years to 85 years.⁴

Eyes that were operated on once were 152 (82.6%). Second operations in 32 (17.4%) of the eyes were due to re-detachment during the post-operative period and silicon oil removal. More right eyes were operated at 53.3 % (Table 1b).

Majority of the patients were seen at approximately two months after onset of symptoms (median 8.5weeks). This could have been due to poor referral systems, lack of eye care health workers at primary care centers and lack of funds to travel to referral facility (Table 1b).

Clinical evaluation showed a high number of eyes had the macular detached 139(75.5%). This could be due to late presentation after referral. Proliferative vitreoretinopathy was found in 47eyes at 25.5% (Table 2). This is almost similar to Macula detachment in 73.8% of the eyes in the study done by Solomon et al in Menelik Hospital in Ethiopia.⁴

Idiopathic retinal breaks at 34.2%, previous intraocular surgery at 16.3% and accidental trauma at 13.6% were the leading causes of rhegmatogenous retinal detachment in order of decreasing frequency. Aetiology was not documented for 22 eyes (12%). This may be due to failure to identify the cause (Figure 2).

Solomon et al found myopia at 28.3%, previous ocular trauma at 20.7% and previous intraocular surgery at 14.2%. This differed from my study.

Previous intraocular surgery was associated with RRD at 16.3%, compared to 14.2% in Menelik Hospital.⁴ Compared with rates of RRD in the general population of 0.0065–0.0179% cataract surgery increases the risk of RRD at least four fold.^{9,10} Referrals of complicated cataract cases which had developed RRD to Kikuyu Eye Unit may explain the high number of cases.

Duration between diagnosis and intervention was determined in only 87 cases because dates were missing from the rest of the case files. 40 case files which represent 45.5% of the fully documented cases got intervention within the first month after diagnosis. This could be attributed to cost of surgery which the patients were not able to meet immediately (figure 3).

A study done in Kenyatta National Hospital (KNH) by Gitau et al found most of the patients (59.9%) who needed vitreoretinal surgery were operated on after 3 months from the time of onset of symptoms with only 27.7% operated within one month after diagnosis.²³ At Kikuyu Eye Unit the figures could be better because it is a privately run institute thus more efficient.

Pars plana vitrectomy was performed as a first operation in 69% of the cases. Some cases had more than one procedure done (Table 3). PPV is indicated for complicated rhegmatogenous retinal detachment associated with vitreous hemorrhage, proliferative vitreoretinopathy, giant tears and posterior tears. Gitau et al found the procedure was performed in 72.8% of all cases of RRD even in the absence of above complications.²³ PVR was found in 25.5% (Table 2) suggesting this to be unlikely indication for choice of PPV as method of intervention. PPV was done as a single procedure or combined with Endolaser, scleral buckling or Cryotherapy. The choice of combined procedure depended on the clinical findings and surgeon preference. Combining PPV and scleral buckling was found to be significant in terms of better visual outcome $p < 0.009$ (Table 4).

Silicon oil was the most used tamponade agent at 69.2% followed by sulfur hexafluoride at 22%.(Table 5).This was likely due to postural restrictions associated with gases which patients may find difficult to comply with.

Best corrected visual acuity was recorded in the case files. Majority of the patients had low preoperative visual acuity of < 6/60-3/60 at 33.7% and <3/60 at 43.5 % (Table 6).

Postoperative visual acuity data recording for post-operative reviews at 2-weeks, 6-weeks, 3-months and 6-months were complete in 57 case files. This may be attributed to failure of patients to turn up for visits after satisfactory outcome or seeking services elsewhere when not satisfied with the outcome. There was general improvement in visual acuity in the 57 cases at the sixth month post-operative review visit (Table 7). The low number of case files with complete visual acuity data documentation during the review visits was a drawback.

Patients with better preoperative visual acuity and early surgical intervention had better postoperative visual acuity after surgery (Figure 4).There was no statistical difference between postoperative visual acuity between the eyes that had macula detached and those whose macula was attached (Table 9). This was different in a study done in Taiwan by Yang CH. et al who found visual acuity was better in the patients who had macula detached.⁴⁰

During the postoperative visits less patients came for reviews after the sixth week review visit, with less than half the number operated on coming for review at 6 months (Table 8).This could have been due to satisfactory outcome and hence no need for further reviews.

Intra-operative complications occurred in 13(7.1%) eyes,(Table 10) Some eyes had more than one complication. Vitreous hemorrhage at 45.5% and iatrogenic tears at 27.3% were the most frequent intra-operative complications (Table 11). In the early post operative period, 6weeks after surgery, eyes with complications were 39 at 24.5% (Table13). Intraocular pressure elevation formed half the number of total complications at 50 %.(Table 13). This was higher compared to a study done by Gitau et al that showed rise in intraocular pressure was less at 13.8% following PPV.²³ The rise in intraocular pressure may be attributed to post surgical inflammation, expansion of gases or silicon oil related effects.

In the late post operative period, from 6-weeks to 6-months, redetachment and cataract formation appeared to be the most frequent complications at 29.7% and 28.4% respectively (Table 14).

There was no statistical significance on the status of the macula and presence of PVR as factors influencing redetachment postoperatively (Table 15). Redetachment was not influenced by the etiological factors that caused detachment. No significant statistical difference was found in aetiology as a cause of redetachment (p values >0.05). However eyes with peripheral degeneration, high myopia, retinal holes and previous intraocular surgery were more likely to have redetachment after surgery as shown by the ODDS ratio (Table 16).

Type of surgery did not influence the occurrence of redetachment as there was no significant statistical difference (p>0.05) between the methods used. However there was a trend that most of the cases that had redetachment had PPV done as the primary intervention procedure (Table 17).

LIMITATIONS

This being a descriptive study the anticipated sample size of 300 case files could not be achieved for the study period as some files were found missing and incomplete.

Only 57 files had complete post-operative visual acuity recorded at each follow up visit up to sixth month review visit. This reduced the number of case files with complete preoperative visual acuity data for analysis of visual acuity outcomes.

During the post-operative follow up review visits, patients who turned up for review were less than as scheduled after the sixth week postoperative follow up visit, Probably more complications and any changes in visual outcome would have been noted.

Some cards were missing dates of first visit making it difficult to determine duration between diagnosis and intervention.

9. CONCLUSIONS

1. Unexplained spontaneous retinal breaks, previous intraocular surgery and accidental trauma in this order of decreasing frequency were most common causes of rhegmatogenous retinal detachment.
2. Pars plana vitrectomy was the most common intervention procedure used for rhegmatogenous retinal detachment treatment.
3. Visual outcome was better for patients who had early intervention.
4. Visual outcome was better for those who had better preoperative visual acuity.
5. Vitreous hemorrhage was the most frequent complication during surgery.
6. In the early postoperative period, elevated intraocular pressure was the most common complication whereas retinal redetachment was the most frequent long term complication.

10. RECOMMENDATIONS

Awareness campaigns by eye care health workers should be done because early presentation, prompt diagnosis and immediate intervention are determinants of good visual acuity outcome.

A study that will find out the reasons why there is a low turnout for post-operative review visits should be done.

Visual acuity recording is key measure of surgical outcome and should be recorded at every follow up visit.

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APPENDIX I: Questionnaire

1) Patient number: IP NO

2) Operation 1. _____ Operation 2. _____ Operation 3. _____ 4. _____
Other _____

3) Eye operated 1. Right _____ 2. Left _____

4) Sex Male Female

5) Age (at admission) in years year of birth

6) Duration of symptoms at time of surgery days _____
weeks _____ months _____ years _____

7) Etiology of detachment (1 = Yes 0 = No)

i) Post traumatic 1. 2.

ii) High myopia 1. 2.

iii) Previous cataract surgery 1. 2.

iv) Previous intraocular surgery 1. 2.

v) Peripheral degenerations 1. 2.

vi) Previous intravitreal injections 1. 2.

No of injections _____

vii) Others 1. 2.

viii) Unknown 1. 2.

8. Rhegmatogenous (1=yes, 2=No)

i) With PVR No PVR

ii) Macular off 1. 2.

iii) Retinal tear/s 1. 2.

8) Surgery procedure done	(1 = Yes	2 = No)
a) Scleral buckling	1. <input type="checkbox"/>	2. <input type="checkbox"/>
i. Encircling	1. <input type="checkbox"/>	2. <input type="checkbox"/>
ii. Segmental	1. <input type="checkbox"/>	2. <input type="checkbox"/>
b) Drainage of subretinal fluid	1. <input type="checkbox"/>	2. <input type="checkbox"/>
c) PPV		
i. With epiretinal membrane removal	1. <input type="checkbox"/>	2. <input type="checkbox"/>
ii. With planned retinotomy	1. <input type="checkbox"/>	2. <input type="checkbox"/>
iii. With air-gas exchange	1. <input type="checkbox"/>	2. <input type="checkbox"/>
iv. With air-fluid exchange	1. <input type="checkbox"/>	2. <input type="checkbox"/>
d) Endolaser	1. <input type="checkbox"/>	2. <input type="checkbox"/>
e) Cryotherapy done	1. <input type="checkbox"/>	2. <input type="checkbox"/>
f) Removal of silicon oil	1. <input type="checkbox"/>	2. <input type="checkbox"/>

9) Vitreous substitute use	(1 = Yes	0 = No)
a) Expanding gases	1. <input type="checkbox"/>	2. <input type="checkbox"/>
i. C ₃ F ₈	1. <input type="checkbox"/>	2. <input type="checkbox"/>
ii. SF ₆	1. <input type="checkbox"/>	2. <input type="checkbox"/>
b) Perflorocarbon liquids	1. <input type="checkbox"/>	2. <input type="checkbox"/>
c) Silicon oil	1. <input type="checkbox"/>	2. <input type="checkbox"/>
d) Air	1. <input type="checkbox"/>	2. <input type="checkbox"/>
e) Pneumatic retinopexy	1. <input type="checkbox"/>	2. <input type="checkbox"/>
f) Cataract surgery done at same time	1. <input type="checkbox"/>	2. <input type="checkbox"/>

10) Visual acuity (best corrected)

- | | | | | |
|-------------------------------|----|----------------------|----|----------------------|
| a) Pre operative at admission | 1. | <input type="text"/> | 2. | <input type="text"/> |
| b) After surgery | 1. | <input type="text"/> | 2. | <input type="text"/> |
| i. 2 weeks | 1. | <input type="text"/> | 2. | <input type="text"/> |
| ii. 6 weeks | 1. | <input type="text"/> | 2. | <input type="text"/> |
| iii. 3 months | 1. | <input type="text"/> | 2. | <input type="text"/> |
| iv. 6 months | 1. | <input type="text"/> | 2. | <input type="text"/> |

11) Complications (1 = Yes 0 = No)

- | | | | | |
|-----------------------------------|----|----------------------|----|----------------------|
| a) Intraoperative | 1. | <input type="text"/> | 2. | <input type="text"/> |
| i. Choroidal detachment | 1. | <input type="text"/> | 2. | <input type="text"/> |
| ii. Vitreous hemorrhage | 1. | <input type="text"/> | 2. | <input type="text"/> |
| iii. Uveal infusion | 1. | <input type="text"/> | 2. | <input type="text"/> |
| iv. Vitreous incarceration | 1. | <input type="text"/> | 2. | <input type="text"/> |
| v. Lens damage | 1. | <input type="text"/> | 2. | <input type="text"/> |
| vi. Corneal damage | 1. | <input type="text"/> | 2. | <input type="text"/> |
| vii. Retinal tears | 1. | <input type="text"/> | 2. | <input type="text"/> |
| viii. Others | 1. | <input type="text"/> | 2. | <input type="text"/> |
| b) Postoperative immediate 72 hrs | | | | |
| i. Keratitis | 1. | <input type="text"/> | 2. | <input type="text"/> |
| ii. Endophthalmitis | 1. | <input type="text"/> | 2. | <input type="text"/> |
| iii. Exposure of explants | 1. | <input type="text"/> | 2. | <input type="text"/> |

- | | | |
|-------------------------------------|-----------------------------|-----------------------------|
| iv. Infection of explants | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| v. Elevation iop | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| vi. Cataract formation | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| vii. Muscle entrapment | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| viii. Redetachment | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| ix. Others | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| c) Late complications | | |
| i. Cataract formation | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| ii. Glaucoma | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| iii. New break | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| iv. Reopen retinal break | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| v. Late buckle failure | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| vi. Proliferative vitreoretinopathy | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| vii. Redetachment | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| viii. Maculopathy | | |
| a) Premacular gliosis | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| b) Atrophic maculopathy | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| c) Cystoid maculopathy | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| ix) Others | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |
| 12. Case seen as a referral | 1. <input type="checkbox"/> | 2. <input type="checkbox"/> |

APPENDIX II: WHO VISUAL ACUITY GRADING

$6/6 - \leq 6/18$	NORMAL VISION
$<6/18 - \geq 6/60$	MILD VISUAL IMPAIRMENT
$< 6/60 - \geq 3/60$	SEVERE VISUAL IMPAIRMENT
$<3/60$	BLIND



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21st February 2013

Dr. Musyoki Morris
Dept. of Ophthalmology
School of Medicine
University of Nairobi

Dear Dr. Musyoki

RESEARCH PROPOSAL: REVIEW OF RHEGMATOGENOUS RETINAL DETACHMENT SURGERY AT KIKUYU EYE UNIT (P630/11/2012)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above revised proposal. The approval periods are 21st February 2013 to 20th February 2014.

This approval is subject to compliance with the following requirements:

- a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.ke/activities/KNHUoN

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