Eye (2002) 16, 353–358

www.nature.com/eye

Retinal detachment in developing countries

D Yorston[1] and S Jalali[2]

Abstract

Treatment of retinal detachment has been a low priority in developing countries. It is thought to be less common in India and Africa than in Europe and N America. The aetiology and presentation of retinal detachment in the Third World are affected by genetic and environmental factors. In general, patients are more likely to present late, and complex detachments are relatively more common. Despite these problems, the results of surgery are encouraging, with more than 80% final anatomical success, and over 60% of re-attached retinas obtaining vision of 6/60 or better. The management of retinal detachment in developing countries can be improved by strengthening training programmes and by developing and equipping centres to carry out retinal surgery.
Eye (2002) **16,** 353–358. doi:10.1038/sj.eye.6700188

Keywords: retinal detachment; Kenya; Africa; India; blindness; outcomes; vitrectomy; risk factors

Introduction

The World Health Organisation estimated that there were 38 million blind (vision less than 3/60 in the better eye) people in 1995.[1] This is increasing by about one million per year. Of these 38 million, 90% live in the developing countries of Africa, Asia and Latin America. Sub-Saharan Africa contains less than 10% of the world's people, but 20% of the world's blind. In contrast, countries with established market economies account for 15% of the global population, but only 6% of blindness.[1] About 70% of global blindness is caused by cataract, trachoma, and glaucoma. Retinal disease is the major cause of visual loss in wealthy countries, but may be less important in the developing world. However a recent population-based survey in India, found that retinal disease was the primary cause of 12.7% of blindness.[2]

Although most blind people live in the Third World, ophthalmic personnel and services are concentrated in industrialised countries. For example, there are 50 ophthalmologists per million population in N America. In Sub-Saharan Africa there is one ophthalmologist per million people.[3] The level of training and equipment is also much lower in poor countries. The Guinness Eye Hospital in eastern Nigeria is the only vitreo-retinal unit for a population of three million people.[4] Between 1995 and 2000, Kikuyu Eye Unit was the only centre in Kenya, Tanzania and Uganda (total population 75 million) capable of performing posterior vitrectomy. Where facilities do exist, distribution is uneven. Andhra Pradesh state, in southern India, has a population of 75 million. There are approximately 15 clinics equipped to carry out laser photocoagulation, half of them in Hyderabad (population 8 million). The neighbouring state of Orissa (population 35 million) has no clinics equipped with a laser.

Against this background of limited resources, and the pressing problems of untreated cataract, trachoma and refractive error, treatment of rhegmatogenous retinal detachment (RD) in developing countries has a low priority. In this paper we will review what is known about retinal detachment, and the outcome of surgery, in developing countries.

Retinal detachment in the Third World differs from RD in the industrialised countries in a number of ways. The reasons for these differences can be summarised as either genetic—eg ethnic differences, or environmental—eg geographic and socio-economic factors, such as lack of facilities.

Incidence and epidemiology

It is known that there are ethnic variations in the incidence of RD. A study in Singapore noted that patients of Chinese origin were three times more likely to have surgery for

[1]Kikuyu Eye Unit
Kenya

[2]Vitreo-retinal Clinic
LV Prasad Eye Institute
Hyderabad,
Andhra Pradesh
India

Correspondence:
D Yorston FRCOphth
Department of Epidemiology
& International Eye Health
Institute of Ophthalmology
Bath St
London EC1V 9EL, UK
Tel: 020 8368 9359
Fax: 020 7250 3207
E-mail: dhyorston@enterprise.net

RD than patients of Indian origin.[5] It has frequently been reported that black Africans have a low incidence of RD.[6–11] However, these studies are based on hospital or clinic attendances, which can be misleading. In a poor country, with limited facilities for the management of RD, patients may be less likely to attend an eye clinic than patients in a wealthy country, with better health care systems. Because some of these studies are surgical case series, inoperable RD may be excluded. A study based on the use of B-scan ultrasonography detected 71 RD in a 6-month period at Menelik II Hospital in Addis Abeba.[12] This seems high, but does include patients with inoperable detachment. A report from Luanda, in Angola, indicated that, although uncommon, RD was the second most frequent cause of curable blindness, after cataract. [13]

Foos[14] examined the eyes of 2334 subjects (322 of whom were African Americans) at post-mortem. He found no racial variation in the age-corrected prevalence of lattice degeneration, retinal breaks, or posterior vitreous detachment.

Although RD may be rarer in some developing countries, the lack of facilities for treatment means that the risk of blindness due to RD is relatively greater. In SW England, 2% of blind registration is due to retinal detachment.[15] In Andhra Pradesh, 0.5% of blindness is caused by RD.[16] Given that the prevalence of blindness (<6/60) is 1.84% in Andhra Pradesh, and approximately 0.4% in the UK, it is likely that the prevalence of blindness from RD is similar in India and England.

There are no population-based surveys of the incidence of retinal detachment in any developing country. A recent study in Minnesota showed an incidence of nearly 18 per 100 000 per year.[17]

It seems likely that the incidence of RD in Africans is lower than in Caucasians, but how much lower is a matter for speculation. Assuming a much lower annual incidence of two per hundred thousand would yield an annual total of 600 in Kenya. We estimate that no more than 50 receive treatment at present.

Aetiology

Trauma is an important cause of RD in Africa. Trauma was thought to contribute to the detachment in 30% of eyes in S Africa,[11] 23% in Zaire,[10] and 8% in Kenya. In Minnesota, trauma was responsible for 7% of detachments,[17] and in Japan, blunt trauma accounted for only 1.6%.[18] The high incidence of traumatic detachment in S Africa may be due partly to the civil conflict that occurred in KwaZulu-Natal at the time of the study.

Myopia is associated with an increased risk of RD. Myopia is more common in Chinese and East Asians[19] than in Africans.[20] Indians and S Asians appear to have a lower prevalence of myopia than the Chinese, but greater than Africans.[19] The prevalence of significant myopia associated with RD in several different countries is shown in Table 1.

Cataract surgery ratios (number of cataract operations performed per million population per year) are much lower in the developing world (except India) than industrialised countries.[3] Among N American Caucasians, cataract surgery is associated with a 5.5 times greater risk of RD.[17] A study of Medicare patients who had cataract surgery demonstrated a significantly lower incidence (relative risk 0.75) of postoperative retinal detachment in African-Americans compared to Caucasians.[21] It has been suggested that approximately 1% of eyes will develop RD within 5 years of cataract surgery.[17,21] The risk is greater when surgery is complicated by vitreous loss.[21] Although cataract surgery ratios (CSR) in Africa are about one tenth of the CSR in developed countries, aphakia and pseudophakia are implicated in a significant proportion of RD. The proportion of RD that follow cataract surgery in different settings is shown in Table 1. The incidence of RD following cataract extraction may be higher in developing countries if complications are more frequent. For example, in Sierra Leone, 11.4% of extra-capsular surgeries were complicated by capsule rupture,[22] compared to 3.6% in a recent trial in the UK.[23]

The World Health Organisation plans to increase the annual number of cataract operations worldwide from the current level of 10 million to 32 million by 2020. Almost all this increase will take place in developing

Table 1 Preoperative characteristics of retinal detachment in different settings

Country	*No. eyes*	*Macula off*	*Myopia >6 D*	*Aphakia/ pseudophakia*	*Macular hole*
Zaire[10]	79		9 (11.4%)	12 (15.2%)	
S Africa[11]	114		12 (10.5%)	11 (9.6%)	
Kenya	361	332 (91.9%)		87 (24.1%)	38 (10.5%)
Iran[26]	233	190 (81.6%)		64 (27.5%)	
India	434	377 (86.9%)	80 (18.4%)	155 (35.7%)	16 (3.7%)
China[31]	217		76 (35.0%)		39 (18.0%)
UK[36]	153	90 (58.8%)	32 (20.9%)	41 (26.8%)	
UK[27]	348	237 (68.1%)		41 (11.8%)	3 (0.9%)

countries. If this growth is achieved, it will lead to a rise in the incidence of retinal detachment as well.

Presenting features

The mean age of detachment patients in India was 38 years, in Zaire, 40,[10] and in Kenya, 47. In Minnesota it was 54,[17] and in Norway, 59 years.[24] The younger age of Third World patients is partly a reflection of the very different demographics in a developing country. However, it has been reported that retinal detachment occurs at an earlier age in an African-American population.[25]

Because of the scarcity of facilities for treating RD in developing countries, and the absence of an effective primary eye care system, many patients with RD present late. In India, 44% of patients were symptomatic for over a month before presentation, and in Iran, 47%.[26] In Zaire over 62%,[10] and in S Africa 70%[11] of eyes had symptoms for at least one month prior to surgery. Unsurprisingly, this leads to a much greater percentage of macula-off detachments than is found in the UK (see Table 1). It is likely that longer duration will increase the risk of total RD.

Inadequate primary eye care may lead to misdiagnosis and further delay. Out of 306 eyes with a retinal detachment that were referred to the LV Prasad Eye Institute, 66 (22%) were referred with a different diagnosis. A strong emphasis on cataract has substantially improved the delivery of cataract services in India, but this has yet to lead to improvements in other sectors of ophthalmology.[16] We estimate that up to 50% of residency programmes do not teach use of an indirect ophthalmoscope as a routine.

In the US, the most common type of non-traumatic RD in African-Americans was caused by round or atrophic holes, without a posterior vitreous detachment (PVD),[25] and only 15% were due to PVD. However, 28% of RD in S Africa were due to U-tears with a vitreous detachment, and 29% to round atrophic holes.[11] In Kenya, over half of all RD were managed by vitrectomy, and we found PVD to be common.

In Africa, the rate of complicated RD appears to be higher than in the UK. In Kenya, 8.3% of all RD were caused by giant retinal tears, compared to 1.4% in Cambridge.[27] Peters noted that in S Africa, 'breaks tended to be large and multiple'.[11] A UK study noted that giant retinal tears were present in 10% of Afro-Caribbean patients with RD (M Minihan, TH Williamson, presented as poster at Annual Congress of Royal College of Ophthalmologists, 2001).

Proliferative vitreoretinopathy (Grade C1 or worse) was present preoperatively in 33% of eyes in S Africa,[11] 32% in Andhra Pradesh, 18% in Kenya, and 13% in Iran,[26] compared to 4% in Cambridge,[27] and 6% in San Francisco.[28]

At St Thomas's hospital, only 11 cases of full-thickness macular hole associated with RD were found in 14 years,[29] and in Helsinki[30] only 1.7% of RD had a macular hole. Macular hole is much more common in China[31] (see Table 1); where it is associated with female gender and high myopia (at least −8 D).

In S Africa, 37% of RD patients had a vision of <6/60 in the other eye.[11] In Kenya 29% were blind (<3/60) in the contralateral eye. The cause of the blindness in their other eye was retinal detachment in 38% and phthisis in 23%. Retinal detachment is known to be a bilateral condition.[32] In Africa, many patients with RD only present after losing vision in their better eye. Even in Andhra Pradesh, 16% of patients were blind in both eyes at presentation.

The high rates of macula-off and complicated RD in Africa suggest that the results of surgery for RD may not justify the effort and expense of treatment. However, between one sixth and one third of RD patients are blind, and surgery offers the only hope of restoring navigational vision. This constitutes a powerful incentive for Third World ophthalmologists to attempt to re-attach the retina.

Surgery

In Kenya, 42% of primary retinal re-attachment operations used an external approach, and 58% required a vitrectomy. Silicon oil was used in 16% of primary operations. In S Africa, 33% required a vitrectomy as a primary procedure.[11] In Andhra Pradesh, 45% of detachments were treated by an external approach. Silicon oil was used as a primary procedure in 35%, partly because of the large number of children (16% of detachments occurred in patients aged 15 or less). In Zaire, only an external approach was possible, and the success rate was lower than in other series from developing countries.[10]

Because of the relative complexity of RD in the Third World, it is often necessary to use pars plana vitrectomy and internal tamponade. Unfortunately these facilities are rare. Even cryoprobes suitable for retinal cryopexy are uncommon. This means that the patient must travel to a teaching hospital, which could be several days' journey, for even a simple scleral buckle. In Kenya, 11% of patients came from other countries. Where advanced equipment is available, maintaining it in the face of erratic electricity, and high levels of dust, heat and humidity, can be difficult. Breakdowns often mean that the equipment must be returned to Europe or the US for repair.

In Asia, facilities are more likely to be available than

in Africa, but still fall short of most industrialised countries.

Outcomes

Anatomical

Anatomical success rates reported from a number of studies in the developing world and the UK are shown in Table 2.

At Kikuyu Eye Unit, multivariate analysis of possible risk factors did not demonstrate any significant association with primary failure. The leading causes of primary failure were new or missed breaks, PVR, and inadequate buckle or retinopexy. The retina was finally reattached in 87% of eyes. Multivariate analysis showed that preoperative PVR, and giant retinal tear were independently associated with anatomical failure. No other factors were shown to reduce the probability of successful reattachment.

Few of the patients from KwaZulu-Natal returned for follow-up or re-operation, so the final success rate is unknown.[11]

The series from Iran only included eyes treated by primary scleral buckle, and excludes more complex RD.[26]

In Andhra Pradesh, success was less likely in eyes which had PVR preoperatively, or presented more than one month after the onset of symptoms.

Anatomical success rates are generally lower in Third World clinics than in the UK. This reflects variations in the complexity of RD, availability of equipment and facilities, and patients' willingness to return for follow-up, as well as differing levels of training and expertise.

Table 2 Retinal detachment anatomical success rates

Country	*Centre*	*No. of eyes*	*No. with F/U*	*Primary success*	*Final success*
Zaire[10]	Kinshasa	79		28 (35.4%)	37 (46.8%)
S Africa[11]	Durban	114		83 (72.8%)	
Kenya	Kikuyu	361	249 (69.0%)	186 (73.2%)	216 (86.8%)
Iran[26]	Teheran	233	233 (100%)	197 (84.6%)	224 (96.1%)
India	Hyderabad	434	392 (90.3%)	272 (69.4%)	301 (76.8%)
UK[36]	London	153	153 (100%)	123 (80.4%)	148 (96.7%)
UK[27]	Cambridge	348	348 (100%)	302 (86.8%)	339 (97.4%)

Visual

In Zaire, out of 34 eyes that were reattached at the last clinic visit, 21 (62%) achieved a vision of 6/60 or better;[10] however, that represents only 27% of the total number of eyes operated. The authors found that a delay in presentation of more than 6 months did not affect the likelihood of anatomical success, but did reduce the chances of a good visual outcome.

At Kikuyu Eye Unit, 55% of eyes, with a minimum follow-up of 2 months, achieved 6/60 or better. If only successfully re-attached eyes are included, 64% achieved 6/60 or better. Out of 196 successfully re-attached macula-off detachments, 61% had a vision of 6/60 or better. This last group was analysed in more detail, to identify the risk factors for poor visual outcome. Pre-existing macular hole, duration of over one month, and poor preoperative visual acuity were all independent risk factors for a postoperative vision of less than 6/60, despite anatomical success. Seventy four (31%) patients were blind (<3/60 in both eyes) preoperatively, 23 (10%) remained blind at their latest follow-up.

The Iranian study found that 77% of re-attached retinas had a vision of 3/60 or better, and 44% had a vision better than 6/60.[26]

In Andhra Pradesh, 65% of eyes achieved 6/60 or better postoperatively. Among successfully re-attached eyes, 80% could see at least 6/60. In successfully re-attached macula-off RD, good visual recovery was less likely in eyes that had been detached for over a month, if there was preoperative PVR, or if the preoperative vision was CF or less.

These visual results are worse than those reported for successfully repaired macula-off RD in Vancouver, in which only 5% had a final vision of less than 6/60.[33] However, none of these eyes had a retinal detachment of more than one week's duration, and none had PVR, or a macular hole. In a randomised trial of pneumatic retinopexy and scleral buckling, less than 5% of macula-off RD had a final vision less than 6/60.[34] However, patients in this study were selected on the basis of their suitability for pneumatic retinopexy, and eyes with PVR, and large, or multiple, breaks were excluded.

Conclusions

Retinal detachment in the developing world is similar in many respects to RD in the industrialised countries. While rare in comparison to blinding cataract, it is a treatable cause of avoidable blindness worldwide.

However, the presentation of RD in developing countries is different. Lack of both primary eye care,

and specialist retinal centres means that presentation is often delayed. Detachments are more likely to be complex, which means that sophisticated and costly surgery may be required to re-attach the retina.

Despite these problems, the majority of eyes undergoing surgery for RD in suitably equipped centres will regain useful vision, and anatomical success rates approach 90%.

Although improving both quality and quantity of cataract surgery remains the priority for ophthalmologists in developing countries, there should also be improvements in the capacity to detect and manage RD. In view of the projected growth in cataract operations, better facilities are needed to deal with the complications of cataract surgery, including retinal detachment. In order to achieve this, governments, non-government development agencies, and ophthalmologists must collaborate to train ophthalmologists and other health care workers in the detection[35] of retinal detachment as well as its management. Secondly, specialist centres capable of treating all types of retinal detachment should be developed, so that future generations will have better access to skilled personnel, and adequate facilities.

Acknowledgements

The authors would like to thank Drs Taraprasad Das, Ajit Babu Majji, and Mark Wood, for allowing us to report patients under their care.

The authors have no proprietary interests in any of the techniques or treatments described in this paper. DY received financial support from Christian Blind mission, Cambridge, UK.

References

1 Thylefors B, Negrel AD, Pararajasegaram R, Dadzie KY. Global data on blindness. *Bull World Health Organ* 1995; **73**: 115–121.
2 Dandona L, Dandona R, Srinivas M, Giridhar P, Vilas K, Prasad MN *et al*. Blindness in the Indian State of Andhra Pradesh. *Invest Ophthalmol Vis Sci* 2001; **42**: 908–916.
3 Foster A. Cataract—a global perspective: output, outcome and outlay. *Eye* 1999; **13**: 449–453.
4 Nwosu SN. Prevalence and pattern of retinal diseases at the Guinness Eye Hospital, Onitsha, Nigeria. *Ophthalmic Epidemiol* 2000; **7**: 41–48.
5 Wong TY, Tielsch JM, Schein OD. Racial difference in the incidence of retinal detachment in Singapore. *Arch Ophthalmol* 1999; **117**: 379–383.
6 Av-Shalom A, Berson D, Gombos GM, Michaelson IC, Zauberman H. Some comments on the incidence of idiopathic retinal detachment among Africans. *Am J Ophthalmol* 1967; **64**: 384–386.
7 Chumbley LC. Impressions of eye diseases among Rhodesian Blacks in Mashonaland. *S Afr Med J* 1977; **52**: 316–318.
8 Abiose A. Pattern of retinal diseases in Lagos. *Ann Ophthalmol* 1979; **11**: 1067–1072.
9 Gordon YJ, Mokete M. Survey of ophthalmic conditions in rural Lesotho. *Doc Ophthalmol* 1980; **49**: 285–291.
10 Kaimbo K, Maertens K, Kayembe L, Kabuni M, Kikudi H, Missotten L. [Retinal detachment in patients from Zaire: etiological, clinical aspects, surgical treatment]. *Bull Soc Belge Ophtalmol* 1986; **218**: 83–93.
11 Peters AL. Retinal detachment in black South Africans. *S Afr Med J* 1995; **85**: 158–159.
12 Haile M, Mengistu Z. B-scan ultrasonography in ophthalmic diseases. *East Afr Med J* 1996; **73**: 703–707.
13 Carreras FJ, Rodriguez-Hurtado F, David H. Ophthalmology in Luanda (Angola): a hospital based report. *Br J Ophthalmol* 1995; **79**: 926–933.
14 Foos RY, Simons KB, Wheeler NC. Comparison of lesions predisposing to rhegmatogenous retinal detachment by race of subjects. *Am J Ophthalmol* 1983; **96**: 644–649.
15 Grey RH, Burns-Cox CJ, Hughes A. Blind and partial sight registration in Avon. *Br J Ophthalmol* 1989; **73**: 88–94.
16 Dandona L, Dandona R, Naduvilath TJ, McCarty CA, Nanda A, Srinivas M *et al*. Is current eye-care-policy focus almost exclusively on cataract adequate to deal with blindness in India? *Lancet* 1998; **351**: 1312–1316.
17 Rowe JA, Erie JC, Baratz KH, Hodge DO, Gray DT, Butterfield L *et al*. Retinal detachment in Olmsted County, Minnesota, 1976 through 1995. *Ophthalmology* 1999; **106**: 154–159.
18 Sasaki K, Ideta H, Yonemoto J, Tanaka S, Hirose A, Oka C. Epidemiologic characteristics of rhegmatogenous retinal detachment in Kumamoto, Japan. *Graefes Arch Clin Exp Ophthalmol* 1995; **233**: 772–776.
19 Ling SL, Chen AJ, Rajan U, Cheah WM. Myopia in ten year old children—a case control study. *Singapore Med J* 1987; **28**: 288–292.
20 Lewallen S, Lowdon R, Courtright P, Mehl GL. A population-based survey of the prevalence of refractive error in Malawi. *Ophthalmic Epidemiol* 1995; **2**: 145–149.
21 Javitt JC, Vitale S, Canner JK, Krakauer H, McBean AM, Sommer A. National outcomes of cataract extraction. I. Retinal detachment after inpatient surgery. *Ophthalmology* 1991; **98**: 895–902.
22 Cook NJ. Evaluation of high volume extracapsular cataract extraction with posterior chamber lens implantation in Sierra Leone, west Africa. *Br J Ophthalmol* 1996; **80**: 698–701.
23 Minassian DC, Rosen P, Dart JK, Reidy A, Desai P, Sidhu M. Extracapsular cataract extraction compared with small incision surgery by phacoemulsification: a randomised trial. *Br J Ophthalmol* 2001; **85**: 822–829.
24 Krohn J, Seland JH. Simultaneous, bilateral rhegmatogenous retinal detachment. *Acta Ophthalmol Scand* 2000; **78**: 354–358.
25 Weiss H, Tasman WS. Rhegmatogenous retinal detachments in blacks. *Ann Ophthalmol* 1978; **10**: 799–806.
26 Ahmadieh H, Entezari M, Soheilian M, Azarmina M, Dehghan MH, Mashayekhi A *et al*. Factors influencing anatomic and visual results in primary scleral buckling. *Eur J Ophthalmol* 2000; **10**: 153–159.
27 Comer MB, Newman DK, Martin KR, Moore AT, George ND, Torn BD. Who should manage primary retinal detachments? *Eye* 2000; **14**: 572–578.
28 Grizzard WS, Hilton GF, Hammer ME, Taren D. A

multivariate analysis of anatomic success of retinal detachments treated with scleral buckling. *Graefes Arch Clin Exp Ophthalmol* 1994; **232**: 1–7.
29 Riordan-Eva P, Chignell AH. Full thickness macular breaks in rhegmatogenous retinal detachment with peripheral retinal breaks. *Br J Ophthalmol* 1992; **76**: 346–348.
30 Laatikainen L, Harju H, Tolppanen EM. Post-operative outcome in rhegmatogenous retinal detachment. *Acta Ophthalmol (Copenh)* 1985; **63**: 647–655.
31 Zhang CF, Hu C. High incidence of retinal detachment secondary to macular hole in a Chinese population. *Am J Ophthalmol* 1982; **94**: 817–819.
32 Laatikainen L, Harju H. Bilateral rhegmatogenous retinal detachment. *Acta Ophthalmol (Copenh)* 1985; **63**: 541–545.
33 Ross WH, Kozy DW. Visual recovery in macula-off rhegmatogenous retinal detachments. *Ophthalmology* 1998; **105**: 2149–2153.
34 Tornambe PE, Hilton GF. Pneumatic retinopexy. A multicenter randomized controlled clinical trial comparing pneumatic retinopexy with scleral buckling. The Retinal Detachment Study Group. *Ophthalmology* 1989; **96**: 772–783.
35 Wong D, McGalliard J. Are we getting better at treating retinal detachment? Technology, referral pattern or primary care? *Eye* 1997; **11**: 763–764.
36 Sullivan PM, Luff AJ, Aylward GW. Results of primary retinal reattachment surgery: a prospective audit. *Eye* 1997; **11**: 869–871.