Surgical Results in Advanced Retinopathy of Prematurity

*Rajvardhan Azad, Parijat Chandra*

1Professor, Department of Ophthalmology, Dr Rajendra Prasad Center for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India
2Associate Professor, Department of Ophthalmology, Dr Rajendra Prasad Center for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India

**Correspondence:** Rajvardhan Azad, Professor, Department of Ophthalmology, Dr Rajendra Prasad Center for Ophthalmic Sciences, All India Institute of Medical Sciences, Ansari Nagar, New Delhi-110029, India, Phone: 91-11-26593187 e-mail: rajvardhanazad@hotmail.com

**ABSTRACT**

**Objectives:** To study the surgical outcomes in advanced stages of retinopathy of prematurity (ROP) in a tertiary eye center in North India.

**Methods:** In a retrospective study, we studied 50 operated eyes of 40 children with advanced ROP (stages 4-5). Scleral buckling was done for stage 4A (five eyes) and stage 4B (six eyes), while vitreoretinal surgery was done for stage 5 (39 eyes) ROP. The surgical results in terms of anatomical success were analyzed.

**Results:** The retina could be reattached in all the five cases of stage 4A following scleral buckling. Anatomical success, as defined by an attached posterior pole after surgery, was seen, at 6 months, in three eyes of stage 4B (50%) and 15 eyes of stage 5 (38.5%).

**Conclusions:** Surgical and visual results are poor following surgery in advanced ROP, especially stage 5. It is essential to promote awareness of ROP, establish effective screening programs and develop more vitreoretinal setups in India to manage such cases.

**Keywords:** Retinopathy of prematurity (ROP), Scleral buckling, Vitreoretinal surgery.

**INTRODUCTION**

Retinopathy of prematurity (ROP) is a vasoproliferative blinding condition affecting premature newborn and low birth weight infants. Effective screening programs have allowed early detection, referral and management of ROP. Cryo-ROP study had given guidelines for the management of threshold ROP by laser or cryo treatment, however, a high failure rate persisted. Results of the ETROP trial have suggested that early treatment of high-risk prethreshold ROP significantly reduced unfavorable outcomes to a clinically important degree. However, due to inadequate awareness of ROP, lack of screening programs and late referrals in India, many children present with advanced stages of ROP, i.e. stage 4 and beyond, and need surgical intervention to reattach the retina and restore visual function. Surgical results in advanced ROP, especially stage 5, are poor and such eyes rarely develop adequate visual function. The present study reports the surgical outcomes in cases of advanced ROP in a tertiary eye care center in North India.

**METHODS**

The study included 50 eyes of 40 children detected with stage 4 and 5 ROP. Scleral buckling was done for stage 4A (5 eyes) and stage 4B (6 eyes) ROP, while vitreoretinal surgery was performed for cases with stage 5 (39 eyes) ROP where surgical attempt seemed possible. The cases underwent detailed anterior segment examination, indirect ophthalmoscopy and B scan ultrasonography (for funnel configuration). All surgeries were performed by a single experienced vitreoretinal surgeon under general anesthesia after obtaining a detailed informed consent from the parents.

**Surgical procedure for stage 4A/B ROP:** Following conjunctival peritomy, a 2.5 mm wide encircling band (#240) was passed underneath the recti and sutured (Ethibond 5/0, spatulated needle). Indirect ophthalmoscopy was done to achieve minimal indentation, i.e. just visible indentation on the retina. The encircling band was removed in each case, when required, after 3 to 6 months.

**Surgical procedure for stage 5 ROP:** Following limited conjunctival peritomy, a pediatric infusion cannula was placed within 1 to 1.5 mm from the limbus, with an attempt to insert the cannula into the lens to avoid subretinal entry of instruments. All surgeries were carried out by a standard 3 port closed vitrectomy.

Lensectomy and pupilloplasty were necessary to approach the periphery satisfactorily and avoid future closure of the pupillary area due to reproliferation of membranes. A retrolental membrane was observed in all cases and was opened in a cruciate fashion using two 26G needles from the upper sclerotomies. These membranes were dissected, facilitated by viscoelastics, to relieve the traction on the posterior pole of the retina. No attempt was made to drain the subretinal fluid. At the end of the surgery, air fluid exchange was done. Associated
abnormalities like corneal opacities, shallow anterior chamber, posterior synechiae with/without occlusio pupillae, microcornea and hypotony were observed in few cases, which contributed to the surgical difficulty.

Regular follow-up was done at 1 week, 2 weeks and then every month. The encircling buckle was removed in stage 4 ROP cases between 3 and 6 months to facilitate ocular growth, and then regularly followed-up every month. Detailed indirect ophthalmoscopy and relevant ocular examinations were done at all visits.

RESULTS

We studied 50 eyes of 40 children having advanced ROP. The average birth weight was 1520.7 gm (862-2120 gm) and the mean gestational age was 30.2 weeks (27-34 weeks). Five of the 40 cases were one of twins. Males constituted a larger group [70% (28/40)] compared to females. The average age at time of surgery was 9.3 months (range 2-14 months). 57.5% (23/40) of children received oxygen supplementation postdelivery—ranging from 1 to 4 weeks.

Scleral buckling was done in all cases with stages 4A (5 eyes) and 4B (6 eyes), while vitreoretinal surgery was done in eyes with stage 5 ROP (39 eyes). Two eyes had previously undergone cryotherapy and 10 eyes had earlier undergone laser photocoagulation for threshold ROP. On ultrasonography of stage 5 eyes, about 50% (19) eyes had an open-open funnel configuration, 30% (11) had open-narrow, 15% (6) had narrow-open and 5% (3) had narrow-narrow configurations (Table 1).

At six-month follow-up, the posterior pole of retina stayed attached with persisting minimal peripheral traction in the five eyes (stage 4A) that underwent scleral buckling (Figs 1 and 2). Of the six eyes with stage 4B, in one eye the retina totally settled, in two eyes the posterior pole settled with persisting peripheral tractional RD, in three eyes while a retinal tractional fold with posterior pole involvement persisted (Figs 3 and 4). No further surgical intervention was done as further benefit was not anticipated.

Of the 39 eyes with stage 5 ROP, in one eye the retina was totally attached and in 14 eyes the posterior poles was attached although the periphery had persistent traction (Figs 5 and 6) while in 24 eyes the retina was still detached. Of these 24 eyes, eight eyes were detected to be inoperable on table after removal of the retrolental membrane. Thus, overall anatomical success, defined as an attached posterior pole, was seen in 35.8% (14/39 eyes) of stage 5 ROP, 50% (3/6 eyes) of stage 4B and 100% (5/5 eyes) in stage 4A ROP (Table 2). Of the 14 eyes with stage 5 ROP that had anatomical success, 12 had an open-open funnel configuration, while most of those with narrow configurations had persistent RD postoperatively or were found inoperable during surgery.

Scleral buckle, when placed was removed in all cases between 3 and 6 months after surgery and none had re-detachment. During follow-up, three cases of stage 5 ROP that had initially attached posterior poles after surgery, re-detached. We believe this could be due to postoperative reproliferation. No further surgical intervention was done as further benefit was not anticipated.

Visual assessment revealed that all operated eyes of stage 4A (5 eyes) ROP could fix and follow light, while only three eyes (50%) of operated stage 4B could fix and follow light. Visual results were poorer in operated stage 5 ROP and revealed 20 eyes (52.2%) did not fix and follow light, and only 12 (30.7%) eyes could fix and follow light. The mean follow-up was for 1 year (range, 6 months to 2 years).

DISCUSSION

ROP is a potentially blinding condition and is preventable by adopting effective screening programs, timely diagnosis, referral
and prompt management. ETROP study\(^2\) has given clear criteria for early management of high-risk eyes at prethreshold stage. However, despite the best efforts, some cases are either detected late or progress in spite of management by cryotherapy or laser delimitation. In India, usually these children present late when the parents notice leukocoria, by which time the prognosis is already very poor. There is low degree of awareness regarding ROP among ophthalmologists and pediatricians in peripheral areas in India, which accounts for late diagnosis and late referral to tertiary centers. Moreover, there are inadequate tertiary care centers to successfully manage these cases in developing countries.

Scleral buckling is a recommended treatment for stage 4 ROP with good success rates\(^3\)\(^-\)\(^6\) as we have also observed in our series. It is essential to remove the scleral buckle after a few months to allow ocular growth. No redetachment was observed as was also reported by other observers.\(^7\) Recent reports have indicated good results with small gauge lens sparing pars plana vitrectomy in cases of stage 4 ROP.\(^8\)

Poor surgical and visual results are reported in advanced ROP, especially stage 5 ROP.\(^9\)\(^-\)\(^14\) We also observed poor results, with only 14 eyes (35.8\%) of stage 5 having attached posterior poles postoperatively and only 12 (30.7\%) could fix and follow light. Further visual assessment would be possible at an older age.

### Table 2: Surgical results in different stages of advanced ROP

<table>
<thead>
<tr>
<th>Surgical results (retinal status)</th>
<th>IVA (n = 5)</th>
<th>IVB (n = 6)</th>
<th>V (n = 39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total retinal attachment</td>
<td>5 (100%)</td>
<td>1 (16.6%)</td>
<td>–</td>
</tr>
<tr>
<td>Posterior pole attached, residual peripheral traction</td>
<td>–</td>
<td>2 (33.3%)</td>
<td>14 (35.8%)</td>
</tr>
<tr>
<td>Posterior pole detached, partial attached retina</td>
<td>–</td>
<td>3 (50%)</td>
<td>–</td>
</tr>
<tr>
<td>Total retinal detachment</td>
<td>–</td>
<td>–</td>
<td>25 (64.1%)</td>
</tr>
</tbody>
</table>

Fig. 3: Fundus photo of right eye with stage 4B ROP and extensive subretinal exudates

Fig. 4: Postoperative photo showing reduction in retinal traction and exudates with formation of retinal falciform fold

Fig. 5: Fundus photo of left eye with stage 5 ROP and leukocoria

Fig. 6: Postoperative photo showing areas of attached posterior retina with persisting peripheral tractional retinal detachment
age in these children. In another study from India, Gopal et al.\textsuperscript{14} had observed an anatomical success rate (defined as attached posterior pole) in 22.9\% cases of stage 5 ROP with total reattachment in 10.4\% cases, posterior pole reattachment in 12.5\% cases and better results in cases of open funnels. They also attributed the poor postoperative outcome mainly to late disease identification and presentation, lack of prior treatment in the form of cryo or laser, narrow configurations of the RD and associated ocular abnormalities, like cataract, glaucoma, etc.

Open-open funnel retinal configuration in stage 5 ROP allows ease of dissection with better release of tractional membranes and leads to better surgical results. These were the majority of cases with attached posterior poles (see Table 1). As surgical success is well correlated with preoperative configuration of retina, i.e. open-funnel type, it is necessary to operate early in stage 5 ROP when the retinal funnel is still open.

The commonly associated ocular conditions which contribute to surgical difficulty and poor outcomes in stage 5 ROP are posterior iris synechiae, shallow anterior chamber, microcornea, cataract, glaucoma and corneal opacities. Knight-Nanan et al reported cataract, microphthalmos and glaucoma as the most frequent complications requiring surgical intervention.\textsuperscript{15} Evaluating stage 5 ROP eyes for surgery with these associations in mind is essential.

Although it is evident that surgery in advanced stage 5 ROP has disappointing outcomes, it nevertheless offers hope to those affected with this blinding disorder. More stress is needed on regular screening programs, early detection, regular follow-up, timely referral and management. It is essential to promote awareness about ROP and need for screening programs and timely referral among ophthalmologists and pediatricians, especially in peripheral areas of India. With improved neonatal setups, development of advanced vitreoretinal surgical units and ROP screening programs, the outlook for a child suffering from advanced ROP maybe brighter.

REFERENCES