Buckling procedures for retinal detachment caused by retrolental fibroplasia in premature babies

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SUMMARY  Three premature babies with advanced stages of retrolental fibroplasia underwent retinal surgery by buckling procedures, with satisfactory results. The indications and surgical technical problems are discussed.

Retrolental fibroplasia (RLF) is not infrequently diagnosed today, despite our increasing knowledge of its pathogenesis. For years the main aim of ophthalmologists was directed toward the prevention of this disease by restriction of oxygen therapy. It is only recently that surgical treatment of the active stages of RLF has been reported. The treatments included argon laser and xenon arc photo-coagulation (Oshima et al., 1971; Payne and Patz, 1972; Nagata and Tsuruoka, 1972; Vemura, 1975; Yoshida et al., 1975; Tsumura et al., 1976; Soejima et al., 1976) and cryopexy (Payne and Patz, 1972; Harris, 1976; Kingham, 1977).

There is no well established policy for treating active RLF, and the indications for such treatment have not been clearly defined. Payne and Patz (1972) applied argon laser photo-coagulation and cryopexy in cases showing active progressive proliferative disease and significant vitreous haemorrhage, and others have been using these forms of treatment in similar cases, including ourselves who, since 1975, have treated 25 cases with progressive active proliferation by cryopexy.

The severe forms of the cicatrical stages, where traction retinal detachment and dragging of the optic discs and vessels exist, afford a great challenge to the surgeon and we are not aware of any published report dealing with the surgical correction of this form of retinal detachment in premature babies. In this report we shall describe in detail the surgical procedures and results in 3 cases with advanced cicatrical RLF, including traction retinal detachment, where the retinas were successfully reattached by buckling procedures.

Case reports

CASE 1
A premature baby boy, born after a 28 weeks pregnancy, weighing 1000 g, received oxygen therapy for 43 days because of respiratory distress syndrome. The maximal oxygen concentration was 80% and the maximal Po2 measured was 241. Retrolental fibroplasia was diagnosed at 2 months of age. The baby did not follow light, and nystagmoid movements were observed.

In the left eye a total traction retinal detachment was found and considered inoperable at that time—cicatrical stage V according to Patz's classification (Patz, 1969). In the right eye a traction retinal detachment was found, starting at the temporal periphery, including the macula and extending up to the disc, with some active neovascular proliferation (cicatrical stage IV).

A local buckling procedure was performed on the right eye. This consisted of an invaginated lamellar flap of sclera rolled on itself (Stallard, 1973), (Fig. 1). This flap was two-thirds the thickness of the sclera and was located around the equator temporally from 1 to 6 o'clock. Cryotherapy was applied to the detached area. No release of sub-retinal fluid was performed. The retina reattached immediately postoperatively, except at the extreme temporal periphery.

In a follow-up examination 3 years after this procedure the boy showed good fixational reflexes and no nystagmus. He could perform normal visual tasks using his right eye only, which was −13-00 D. The fundus showed a subalbinotic myopic flat retina with a buckle on the temporal side, the retina anterior to the buckle showing a shallow...
detachment. A good macular reflex was observed. The angle between the temporal vessels of the disc was 100°, and a number of pigmented chorioretinal scars in the area of the previously detached retina could be seen. The left eye showed a total retinal detachment with a retrolental mass.

CASE 2
This premature baby, born after a 31 weeks pregnancy, weighing 1650 g, received oxygen therapy for 6 days because of respiratory distress syndrome. The maximal oxygen concentration was 50% and the maximal Po2 measured was 118.

Active proliferative and cicatricial stage III disease was first detected at the age of 10 weeks and was found in both eyes. A thick active proliferative fibrovascular ridge was seen in the temporal periphery with retinal and vitreous haemorrhages, causing a marked dragging of the vessels of the optic disc, with an angle of 80° between the temporal vessels and a shallow retinal detachment in the temporal periphery. Cryopexy was performed in the temporal periphery of both eyes. Two weeks later the right eye showed an arrest of the proliferative process with pigmented chorioretinal scars temporally.

In the left eye a total retinal detachment was found. A buckling procedure was performed on this eye, consisting of an equatorial encircling Lincoff sponge of 1·5 mm, with release of subretinal fluid. The retina flattened immediately postoperatively. One month after this procedure the retina was flat, with a moderate buckling effect all around. Dragging of the vessels of the disc (80° angle) and macula persisted. The right eye, which only underwent cryopexy, showed a more marked dragging of the disc with an angle of 50° between the temporal vessels and a heterotopic elongated macular reflex.

At a follow-up examination 18 months after surgery the child's fixational reflexes in each eye were normal, and no nystagmus was seen. Refraction in the right eye was -6·0 D and in the left eye -10·0 D. The child seemed to have good vision in both eyes. The ophthalmological picture remained unchanged.

CASE 3
This premature baby, born after a 30 weeks pregnancy, weighing 1280 g, received oxygen therapy for 8 days. The maximal oxygen concentration was 40% and the maximal Po2 measured was 150.

Active proliferative disease was first detected when the baby was 2 months old. The left eye showed a thick fibrotic vasoproliferative band with retinal and vitreous haemorrhages in the temporal periphery, causing an elevated traction retinal detachment comprising two-thirds of the retina. Surgery was performed on this eye in order to stop the neovascular proliferation and to treat the traction retinal detachment. The surgery consisted of a local buckling procedure with a Lincoff sponge 1·5 mm wide, located along the equator from the 10 to 8 o'clock meridia, and cryopexy to the tem-

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**Table 1 Background data of the 3 reported cases**

<table>
<thead>
<tr>
<th>Weeks of pregnancy</th>
<th>Birth weight (gm)</th>
<th>Age at diagnosis (days)</th>
<th>Days in oxygen therapy</th>
<th>Highest incubator O2 concentration</th>
<th>Highest Po2 measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>28</td>
<td>1000</td>
<td>60</td>
<td>43</td>
<td>80%</td>
</tr>
<tr>
<td>Case 2</td>
<td>31</td>
<td>1650</td>
<td>75</td>
<td>6</td>
<td>50%</td>
</tr>
<tr>
<td>Case 3</td>
<td>30</td>
<td>1250</td>
<td>60</td>
<td>8</td>
<td>40%</td>
</tr>
</tbody>
</table>
poral retina. No release of subretinal fluid was performed, and the retina flattened postoperatively. In follow-up examinations up to 12 months later the eye showed an attached retina, a moderate buckle with less dragging of the vessels of the optic disc and macula, and a number of pigmented chorioretinal scars.

At the first examination the right eye showed marked traction of the temporal retina, causing dragging of the disc with an angle of 100° between the temporal vessels. There was an abnormal macular reflex and a shallow retinal detachment temporally. One month after this examination a further narrowing of the angle of the vessels to 80° was noticed, while the area of detached retina remained unchanged. Ten months later the retinal detachment disappeared spontaneously, but the marked traction on the disc and macula remained.

Discussion

The main process that leads to the formation of retinal detachment in cases of acute and cicatricial RLF is the formation of a thick fibrovascular band in the temporal half of the peripheral retina. The contraction of this band produces a marked traction on the retina, causing dragging of the vessels of the optic disc, heterotopia with elongation of the macula, and a traction retinal detachment. This traction retinal detachment can appear with the regression of the vasoproliferative stage or some years later.

We believe that it is important to prevent the formation of the fibrovascular band in cases showing progression of the neovascular process. Cryopexy over the new vessels and the avascular peripheral retina produces a complete regression of neovascular activity. This procedure may prevent the development of retinal detachment in later years. In our experience cryopexy is a safe and effective method of treatment, though a longer follow-up period is necessary before final conclusions can be reached.

A shallow retinal detachment in RLF can reattach spontaneously. When a high traction retinal detachment is present (cicatricial stages IV and V), it is our experience that spontaneous regression is no longer possible, and the same criteria for treatment which are applied in cases of retinal detachment in adulthood should be considered. A prompt attempt to flatten the detachment is mandatory, for damage to the retinal neuronal structures depends directly upon the time elapsing until a reattachment is obtained, either spontaneously or by surgical means.

This time factor is particularly important when dealing with a retinal detachment of the macular area, and for this reason we performed surgery in those cases where a spontaneous rapid reattachment did not occur. A local buckling procedure by an invaginated lamellar flap of sclera has several advantages: a circumferential shortening of the eye, a local indentation under the detached retina, and a decrease in the ocular volume are obtained by this technique, without causing a marked constriction of the growing eye. Since no foreign materials are used, the dangers of extrusion, infection, and ocular penetration are minimal. Whenever possible an encircling buckling procedure was avoided, since the effects of such a constricting foreign body on the growing eye are not known. An encircling procedure was performed in case 2 because we believed that a local buckling procedure would not be sufficient to alleviate the marked traction on the retina. In this case we suspected that the detachment was caused both by an exudative process and by traction. When after 2 weeks we did not observe any tendency to reattachment, we proceeded with surgery.

Retinal surgery in small babies presents several technical difficulties. The relatively small volume of the orbits in comparison with the size of the eyeball may produce serious difficulties when trying to work on the equatorial area or posterior to it. The implantation of foreign material into the relatively small orbits may increase temporarily the intraocular pressure and, if not carefully monitored, may lead to closure of the central retinal artery. Another serious technical problem results from the thin sclera of these premature babies, which may present difficulties with regard to intrascleral procedures.

In the 3 cases presented the retina was reattached successfully immediately after surgery, and remained attached in follow-up examinations. Although accurate determination of visual acuity is impossible at this age, all the children can perform normal visual tasks with the eyes that underwent surgery. Only a long follow-up period will show if this kind of surgery in premature babies is effective in the long term. It is still to be determined whether such buckling procedures prevent later development of traction retinal detachment, a common complication in the first and second decades of life in children with RLF.

References


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