

# Myopia in premature babies with and without retinopathy of prematurity

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**SUMMARY** One hundred and fifty-five premature infants weighing 600–2000 g were followed up during 1974–80 for the presence of retinopathy of prematurity (ROP) and for the existence of myopia. 50% of the premature infants who had ROP were myopic, while only 16% myopic premature infants were found among those who did not have ROP. There was a positive correlation between the degree of myopia and the severity of cicatricial ROP. No difference existed in the frequency and degree of myopia between premature infants in which ROP cicatrised spontaneously and in those where it cicatrised after cryopexy.

Myopia is a frequent finding in premature babies.<sup>1-6</sup> Comparative studies<sup>2-6</sup> showed that premature infants tend to develop myopia and that there is a close relationship between myopia and retrolental fibroplasia. However, the relationship has not been clearly established.

In the present study we investigated the prevalence of myopia in premature infants and its relation to the cicatricial stages of ROP in untreated eyes and in eyes treated by cryopexy.

## Material and methods

One hundred and fifty-five premature babies weighing from 600 to 2000 g, born in 1974–80, were examined for the presence of ROP and for the existence of myopia at the age of 2 weeks; they were followed-up for 2–8 years, the mean follow-up time being 3 years. The family history was taken, and the premature babies with one or both parents myopic above  $-6.0$  dioptres were excluded from the study. The examination included indirect ophthalmoscopy and retinoscopy, and in 10 out of 26 eyes in which the myopia exceeded  $-3.0$  dioptres a measurement of the axial length of the globe was performed by A-mode ultrasound. Cycloplegia for retinoscopy was achieved by instilling cyclopentolate 0.5% (tropicamide) at intervals of 10 minutes, and retinoscopy was performed after 40–45 minutes. All the children were examined and followed up by the same 2 examiners, who were senior paediatric ophthalmologists.

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To obtain a complete view of the retinal periphery phenylephrine 5% was also instilled into the eyes of the premature babies. In eyes with ROP its cicatricial

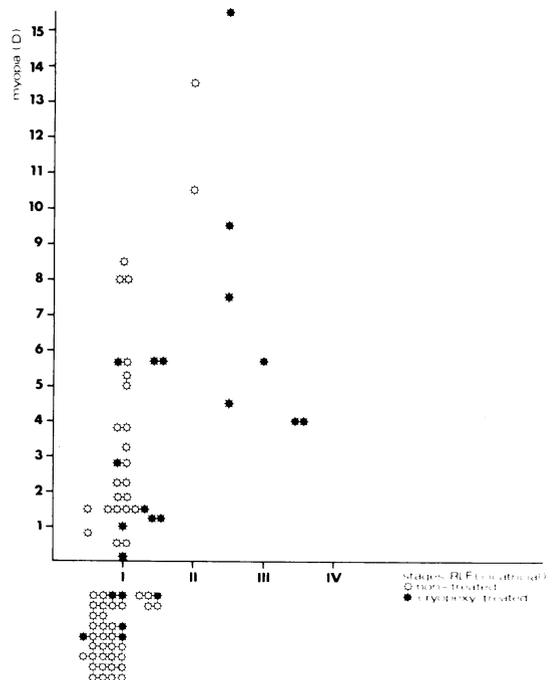


Fig. 1 Relation of ROP cicatricial stage and degree of myopia in untreated and in cryopexy-treated eyes. The cases below the line represent the eyes which were emmetropic and hypermetropic.

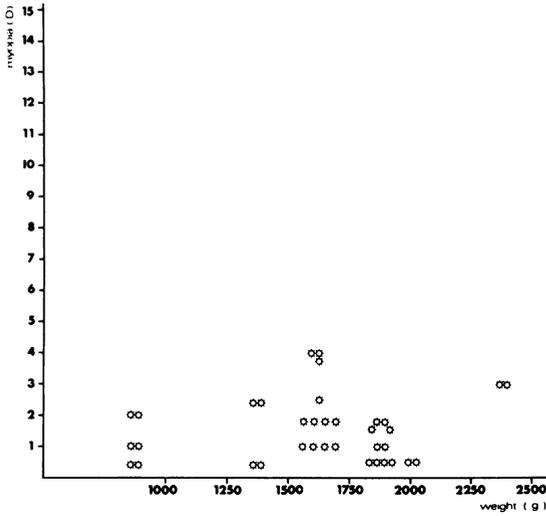


Fig. 2 Relation between birth weight and degree of myopia in premature babies without ROP.

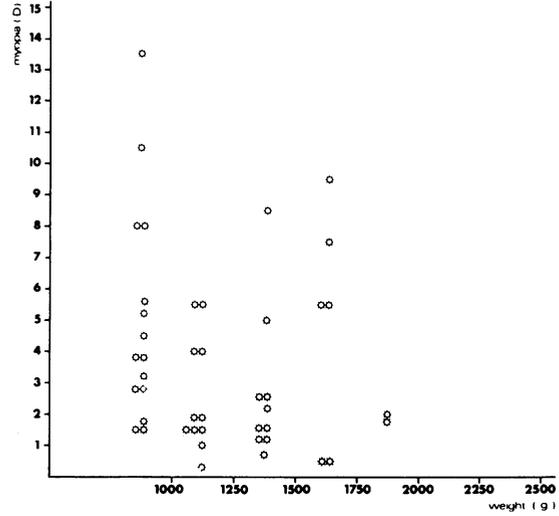


Fig. 3 Relation between birth weight and degree of myopia in premature babies with ROP.

Table 1 Myopia among the premature infants with and without ROP

	Myopia	No myopia	Total
ROP	21	21	42
No ROP	18	95	113
Total	39	116	155

state was periodically correlated with the degree of myopia.

Sixteen patients (22 eyes) were treated by cryopexy, the criterion for treatment being ROP active stage II or more, according to Patz's classification.<sup>7</sup> Seven treated eyes had ROP active stage II and 4 treated eyes had ROP stage II-III; in 3 treated eyes the ROP stage was more than active stage III (Fig. 1). One premature infant underwent retinal detachment operation in one eye.

**Results**

Of the 155 premature infants 42 had ROP and 113 did not. Of the 42 premature infants with ROP 21 (50%) had myopia between -0.25 and -15.5 dioptres, with an average of -4.0 dioptres. Of the 113 without ROP

only 18 (15.9%) had myopia, which varied from -0.25 to -4.0 dioptres, with an average of -1.5 dioptres.

There was a significant correlation between the prevalence of myopia and ROP ( $\chi^2=17.11, p<0.001$ ). The degree of myopia in the eyes which had ROP was greater than in the eyes which did not have ROP, and this was also statistically significant ( $t=2.64, p<0.001$ ) (Table 1).

As to the correlation between myopia and birth weight, most of the cases of myopia among children without ROP (Fig. 2) were distributed among those with a birth weight of 1000-1500 g (with an average myopia of -1.5 dioptres). In this group no statistically significant relationship was found between the extent of myopia and the birth weight (Table 2).

Among children with ROP (Fig. 3) most cases of myopia were in infants with birth weights between 750 and 1350 g (the average myopia being -4.0 dioptres). Again, there was no difference from this point of view between untreated and cryopexy-treated ROP eyes (Tables 3, 4, 5). In this group of children with ROP, treated and untreated, there was a statistically significant correlation between the birth

Table 2 Degree of myopia in premature infants without ROP according to birth weight (median, -1.00 D)

Birth weight (g)	<1251	1251-1500	1501-1750	1751-2000	2001-2500	Total
Number of eyes	6	4	12	12	2	36
Mean myopia (dioptres)	1.08	1.25	1.92	0.79	2.75	

Table 3 Degree of myopia in cryopexy-treated and in untreated eyes with ROP (median, -2.00 D)

	Cryopexy-treated	Untreated	Total
Below median	5	11	16
Above median	4	12	16
Total	9	23	32
Mean (D)	2.72	3.15	

Table 4 Degree of myopia in cryopexy-treated and in untreated eyes with ROP (median, -0.5 D)

	Cryopexy-treated	Untreated	Total
Below median	7	22	29
Above median	8	21	29
Total	15	43	58
Mean (D)	1.63	1.61	

Table 5 Degree of myopia in cryopexy-treated and in untreated eyes with ROP (median, -10.0 D)

	Cryopexy-treated	Untreated	Total
Below median	0	3	3
Above median	2	1	3
Patient number	2	4	6
Mean (D)	2.0	9.25	

weight and the extent of myopia ( $\chi^2=11.93$ ,  $p<0.02$ ), and the average myopia gradually declined alongside with the increase of birth weight (Table 6). Fig. 1 also shows that the myopic dioptres of premature infants weighing less than 1000 g were above the median, while in premature infants weighing more than 1000 g the myopic dioptres were almost always below the median except in the group of children weighing between 1500 and 1750 g.

Thirty-seven premature infants (71 eyes) were found to have evident signs of cicatricial stages of ROP. Stage I, 32 (62 eyes); stage II, 3 (6 eyes); stage III, 2 (3 eyes). Of these infants, 18 (30 eyes) in stage I were hypermetropic or emmetropic, while the other 19 who had cicatricial stage I, II, and III were myopic. The myopia varied from -0.25 to -8.25 dioptres (average -3.02 dioptres in stage I, and from -4.0 to -15.5 dioptres (average -8.27 dioptres) in stages II and III (Fig. 1).

Table 6 Relation between degree of myopia and birth weight in premature infants with ROP (median, -2.75 D)

Birthweight (g)	<1001	1001-1250	1251-1500	1501-1750	1751-2000	Total
Number of eyes	16	10	10	4	2	42
Mean myopia (dioptres)	5.73	4.02	2.63	4.8	1.88	

## Discussion

Clinical observations agree that ROP is almost always bilateral, though it may be much more advanced in one eye than in the other.<sup>2</sup> The end cicatricial stages of the disease are usually established 4 to 6 months after the appearance of the active stages.<sup>5</sup>

The presence of myopia and its degree have been previously correlated with the severity of the early retinal changes during the phase of active ROP and later with the cicatricial phase, and it was demonstrated that eyes affected with ROP were most often myopic.<sup>8</sup> However, a conclusion as to the exact correlation between the various stages of the active and cicatricial disease and the degree of myopia has not yet been clearly drawn, either in the natural history of the disease or in cryopexy-treated eyes.

The prevalence of myopia in the general population according to different authors varies from 5 to 18%.<sup>8-13</sup> In a follow-up of a group of school children<sup>13</sup> who weighed less than 1816 g at birth Zaharias *et al.*<sup>8</sup> demonstrated a definite increased prevalence of myopia in those who had ROP. In one-third of the children of this group there were signs of active ROP during the first month of life, and 32% of them were myopic, while in the remaining two-thirds of the children of this group who did not have ROP only 4% were myopic.

Birge<sup>9</sup> reported 7 cases of moderate to severe myopia in surviving premature infants in whom ophthalmoscopy revealed some degree of cicatricial stages of ROP. Other investigators<sup>10-13</sup> showed that cicatricial ROP usually results in permanent myopia. Early myopia in premature infants without a hereditary predisposition may represent the sequela of mild undiagnosed ROP which has regressed.

As our study showed, there was a considerable difference between the existence and severity of the myopia between the premature infants with and without ROP. Moreover, there was a positive correlation between the degree of myopia and the cicatricial stage. It is true that most of the cases of myopia (32 eyes) had cicatricial stage I, and in them the myopia was between -0.25 and -8.25 dioptres, with an average of -3.02 dioptres. However, as the cicatricial stage advanced, the myopia became more severe, between -4.0 and -15.5 dioptres, with an average of -8.27 dioptres (Fig. 1).

Treatment with cryopexy did not influence the relation between the cicatricial stage and the degree of myopia. This is shown in Fig. 1 and in Tables 3, 4 and 5, where the distribution of myopia, related to the cicatricial stage, does not show any statistical difference between treated and untreated eyes.

Whether myopia in ROP is axial, corneal, or lenticular is still questionable.<sup>11-14</sup> We could not draw solid conclusions on this issue because we performed axial measurements by A-mode ultrasound and keratometry only in a limited number of eyes (10 eyes). However, these measurements showed that myopic eyes sometimes had an axial length within the range of hypermetropic or emmetropic true for the age of the patient<sup>13</sup> while other eyes were sometimes emmetropic in spite of the fact that the axial length was within the range of myopia for that age. Thus a variety of factors may be involved in the myopia, but the issue needs to be further investigated.

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