Long-Term Observation of Infants With Macular Hemorrhage in the Neonatal Period

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Abstract: Ten infants with macular hemorrhage in the neonatal period were tested to assess visual acuity, stereopsis, and ocular position. Contrast sensitivity was examined in three of them. The duration of hemorrhages was 1 month in four patients, 1.5 months in one patient, 2 months in two patients, 3 months in one patient, 4 months in one patient (corrected gestational 3 months), and 5 months in one patient (corrected gestational 2.5 months). None of the patients developed deprivation amblyopia or visual loss due to abnormality of macula. The results suggest that there is essentially no risk of visual deprivation for 3 months after birth. If there is any poor visual acuity, abnormal ocular position, abnormal eye movement, or poor stereopsis in the infant with neonatal macular hemorrhage, we have to elucidate the cause of the symptoms.

Key Words: Deprivation amblyopia, neonatal macular hemorrhage, stereopsis, visual acuity.

Introduction

Visual deprivation in early infancy due to various factors is likely to cause deprivation amblyopia. We reported previously that 10 patients with macular hemorrhages in the neonatal period had good visual acuity, normal ocular position, and good stereopsis, in which the duration of hemorrhages was 1–5 months after birth.1,2 These cases were followed up for more than 6 years, and they were available for precise tests for visual acuity and stereopsis. We examined seven of the previously reported cases and three additional cases for visual acuity, stereopsis, and ocular position. Three of them were also examined for contrast sensitivity.

Materials and Methods

Ten cases, presenting with macular hemorrhages or vitreous hemorrhages in one eye or both eyes for 1–5 months after birth, were examined. Ophthalmoscopy showed essentially normal appearance of maculas after hemorrhages were absorbed. Visual acuity was measured by single charts or Teller Acuity Cards (TAC), stereopsis by Titmus Stereo Tests, Lang Stereotest, or TV Random Dot Stereo Test; contrast sensitivity was measured by the Vision Contrast Test System.3 The best results of visual acuity and stereopsis under observation were adopted.

Results

Ten cases of neonatal macular hemorrhage were examined at 3 to 8 years of age. Table 1 presents cases with good visual acuity and good stereopsis. Table 2 shows cases with good visual acuity and poor stereopsis and/or abnormal ocular position. “Duration of neonatal macular hemorrhage” in Tables 1 and 2 refers to the period leading to complete resolution of the macular or vitreous hemorrhage. Cases 1 and 2 both had vitreous hemorrhages.

Cases 1–3 and cases 6–9 were reported previously.1,2 Cases 4, 5, and 10 are additional cases. Visual acuities of affected eyes were more than 0.7 in all cases. Remarkably, cases 1–5 had visual acuities of more than 1.0, good stereopsis, and normal ocular position. Cases 7, 9, and 10 had poor stereopsis, and the others had good stereopsis. Contrast sensitivity was measured in cases 1, 3, and 9, and all of them...
showed normal results in both eyes (Figures 1, 2, and 3). Case 6 shows good visual acuity, good stereopsis, and intermittent exotropia. He is mentally retarded and goes to a school for handicapped children. Although he could not understand the Titmus Stereo Tests, he did understand the Lang Stereotest. Case 7 developed normally but showed poor stereopsis because of slight esotropia and latent nystagmus. Although the cause of latent nystagmus is not obvious, we cannot negate intracranial injury during birth. Case 8 has shown accommodative esotropia since 2 years and 10 months of age. The visual acuity was measured when she was 3 years and 8 months old, and the stereopsis was examined when she was 2 years and 5 months old. Case 9 suffered intracranial hemorrhages during birth. Although he showed good visual acuity, the stereopsis was not exact. He did not cooperate for examinations. He has had epileptic fits since he was 3 years old. His pediatricians indicate that his electroencephalogram has shown delayed development for the past 1 or 2 years, and he is under observation. Intracranial injury is suspected. Case 10 shows a delay in development of speech; she could not speak when she was 3 years and 8 months old. As she could not understand the single chart test, we examined her visual acuity by TAC. She did not cooperate with us when we examined her stereopsis.

**Discussion**

There have been many reports about the incidence and the cause of retinal hemorrhages in the neonate. The incidence ranges from 2.6% to 50% among reports, depending on the circumstances of birth and the timing of examination. Causes of retinal hemorrhage in the neonate include prematurity, asphyxia, hypotension, and trauma. However, the specific cause cannot be determined in many cases. The present study shows that good visual acuity and stereopsis can be seen in cases of neonatal macular hemorrhage. The duration of hemorrhage and the location of the hemorrhage were not always correlated with the results of visual and stereoscopic examinations.

**Table 1. Five Cases With Good Visual Acuity, Stereopsis, and Ocular Position**

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>Affected Eye</th>
<th>Duration of Neonatal Macular Hemorrhage</th>
<th>Visual Acuity</th>
<th>Ocular Position</th>
<th>Stereopsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>6 Y, 4 M</td>
<td>Left</td>
<td>1.5 M</td>
<td>1.5</td>
<td>2.0</td>
<td>Orthophoria</td>
</tr>
<tr>
<td>2</td>
<td>Male</td>
<td>7 Y, 2 M</td>
<td>Right</td>
<td>5 M</td>
<td>1.0</td>
<td>1.5</td>
<td>Orthophoria</td>
</tr>
<tr>
<td>3</td>
<td>Female</td>
<td>5 Y, 11 M</td>
<td>Right</td>
<td>1 M</td>
<td>0.5 (1.0)a</td>
<td>1.0 (1.2)a</td>
<td>Orthophoria</td>
</tr>
<tr>
<td>4</td>
<td>Female</td>
<td>6 Y, 0 M</td>
<td>Both</td>
<td>2 M</td>
<td>1.2</td>
<td>1.2</td>
<td>Orthophoria</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>7 Y, 7 M</td>
<td>Left</td>
<td>1 M</td>
<td>1.5</td>
<td>1.5</td>
<td>Orthophoria</td>
</tr>
</tbody>
</table>

Y: years, M: months, F: female, A: animal, C: circle.
aCorrected visual acuity.
bAs there were no data with Titmus Stereo Tests for 7-year-olds, we used data from the Lang Stereotest.

**Table 2. Five Cases With Good Visual Acuity and Poor Stereopsis and/or Abnormal Ocular Position**

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>Affected Eye</th>
<th>Duration of Neonatal Macular Hemorrhage</th>
<th>Visual Acuity</th>
<th>Ocular Position</th>
<th>Stereopsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Male</td>
<td>7 Y, 10 M</td>
<td>Left</td>
<td>1 M</td>
<td>1.0</td>
<td>1.0</td>
<td>X(T)</td>
</tr>
<tr>
<td>7</td>
<td>Male</td>
<td>6 Y, 6 M</td>
<td>Left</td>
<td>2 M</td>
<td>0.7</td>
<td>1.0</td>
<td>N:sl. ET</td>
</tr>
<tr>
<td>8</td>
<td>Female</td>
<td>8 Y, 10 M</td>
<td>Right</td>
<td>4 M</td>
<td>0.7 (1.2)b</td>
<td>0.7 (0.8)b</td>
<td>Latent nystagmus(+)</td>
</tr>
<tr>
<td>9</td>
<td>Male</td>
<td>7 Y, 2 M</td>
<td>Left</td>
<td>3 M</td>
<td>2.0</td>
<td>1.2</td>
<td>ET</td>
</tr>
<tr>
<td>10</td>
<td>Female</td>
<td>3 Y, 8 M</td>
<td>Left</td>
<td>1 M</td>
<td>1.0 c</td>
<td>1.0 d</td>
<td>Fixation: not good</td>
</tr>
</tbody>
</table>

aWe could not examine case 6 with Titmus Stereo Tests due to mental retardation.
bCorrected visual acuity.
cThe data were from the age of 2 years, 5 months.
dThe data were measured with Teller Acuity Cards.
eCase 10 showed retardation in speech development.
Figure 1. Contrast sensitivity is normal (Case 1). •: fellow eye, x: affected eye.

Figure 2. Contrast sensitivity is normal (Case 3). •: fellow eye, x: affected eye.
nal hemorrhages include built-up intracranial pressure, the decompression factor (e.g., vacuum extraction), prolonged delivery, and primiparae. Newborns’ and/or mothers’ conditions such as asphyxia and toxemia have also been discussed.\textsuperscript{5–8}

Some reports conclude that macular hemorrhages may or may not cause amblyopia.\textsuperscript{1,2,9–15} Although extramacular retinal hemorrhages usually resolve within 1 or 2 weeks after birth, macular hemorrhages often require more than 1 or 2 months to resolve completely.

Hubel et al\textsuperscript{16} reported that the susceptibility to developing visual deprivation was limited to 3 weeks after birth in monkeys and cats and suggested that there was a period of low susceptibility in human beings. We reported that the period of low susceptibility is 4 weeks after birth in patients with complete unilateral lid closure due to ptosis.\textsuperscript{2,17} Elston and Timms\textsuperscript{18} reported the period of low susceptibility to be 6 weeks.

Case 2, in which the macular hemorrhage required 5 months to be absorbed, was born at the corrected age of 30 weeks. Case 8, in which the macular hemorrhage required 4 months to be absorbed, was born at the corrected age of 37 weeks. The longest period required for a macular hemorrhage to be absorbed is 3 months after birth.\textsuperscript{19}

Macular hemorrhage does not lead to absolute scotoma and does not deprive the patient of visual stimulation absolutely. The degree of deprivation lessens with absorption of the macular hemorrhage. It is different from an eye patch, which deprives the patient of visual stimulation absolutely until it is removed.

Brinker and Katz\textsuperscript{20} and Thorleifsson\textsuperscript{21} suggested that the red filter is useful in treating eccentric fixation. Considering their suggestions, macular hemorrhage does not cause deprivation amblyopia. All 10 present cases showed good visual acuity, and there was no visual loss due to abnormality of macula.

Recently, Yamade\textsuperscript{22} reported contrast sensitivity in children with amblyopia. He demonstrated that amblyopic eyes showed reduced contrast sensitivity at higher spatial frequencies or at both higher and lower spatial frequencies. Lewis et al\textsuperscript{23} examined contrast sensitivity in fellow eyes of cases with unilateral congenital cataract. They found that the good eyes of children treated for unilateral congenital cataract had reduced linear acuity and reduced contrast sensitivity at higher spatial frequencies. We measured contrast sensitivity in cases 1, 3, and 9, and the results in both eyes were normal.

Schenker and Gombok\textsuperscript{24} suggested that cases with vitreous hemorrhages may have intracranial hemor-

\textbf{Figure 3.} Contrast sensitivity is normal (Case 9). •: fellow eye, x: affected eye.
rhages, mental retardation, and delayed development of visual function. We suspect that the cause of abnormalities in visual acuity, stereopsis, and ocular position is due to intracranial injury in cases 6, 7, 9, and 10.

References