
Discussion

R. Sampaolesi, M.D. (co-workers, R. Reca and A. Carro), Universidad del Salvador, Buenos Aires, Argentina. Dr. Sampaolesi reported on the "Intraocular pressure in children up to 5 years of age." The investigators found metoxiflurane (Penthrane) more reliable than ether, halothane (Fluothane), or barbiturates. It was administered by open-drop inhalation which was continued while tensions were taken with the Draeger and the Goldman applanation tonometers.

The pressures were found to be lower than in adults. The average intraocular pressure of 26 normal children, aged 1 month to 5 years, was 10.56 mm. Hg, with a variation of 8 to 16 mm. Hg. He suggested that the lower pressure of children's eyes was related to the lower blood pressure found in this age group.

Optic cup symmetry in normal newborn infants

Kenneth T. Richardson

Ophthalmoscopy was performed on 483 normal newborn infants to determine the incidence of optic cup asymmetry and to compare this with glaucomatous infants. The incidence of marked optic cup asymmetry in normal newborn infants is 0.6 per cent in contrast to 9.0 per cent in monocular glaucomatous infants. The incidence of optic cups greater than ½ disc diameter in eyes of normal newborns is 2.6 per cent in contrast to 61.0 per cent in infantile glaucoma eyes. These findings underscore the importance of ophthalmoscopic evaluation of the optic discs in the congenital glaucomas.

Ophthalmoscopic evaluation of the adult optic disc is of proved value in estimating the functional status and prognosis in chronic open angle glaucoma. Recent work has suggested that even though chronic open-angle glaucoma is a bilateral and reasonably symmetrical disease, a meticulous study of the discs will often reveal an asymmetry of the cupping. This asymmetry can be very useful in recognizing early pathological change and possibly helpful in evaluating long-term therapeutic response.

In infantile glaucoma evaluation of optic nerve cupping has not achieved such a prominent diagnostic position. This is attributed in part to the difficulty in ophthalmoscopy in these children who often have hazy corneas and miotic pupils, and in part to the misconception that optic nerve cupping occurs at such a late stage as to be of little diagnostic or prognostic importance.

From the Department of Ophthalmology, Eye and Ear Hospital, University of Pittsburgh, Pittsburgh, Pa.
Supported in part by the W. I. Patterson Charitable Fund.
Changes in the optic disc in infantile glaucoma occur early in the course of the disease\textsuperscript{2,3} and are valuable in determining both progress and prognosis in these infants. This is particularly true since there is no other means available in infants to estimate the functional capacity of glaucomatous eyes. The tendency toward asymmetry of disease in infantile glaucoma should make the study of disc asymmetry of even greater value than in adult chronic open-angle glaucoma—if physiological cupping of the newborn optic discs is symmetrical. It is the purpose of this study to determine the incidence of symmetry of physiological cupping of optic discs in normal newborn infants, and to compare this with glaucomatous infants.

**Method**

In this study 483 randomly selected normal newborn infants were examined within the first 96 hours of life. The examinations were accomplished with a Richardson-Shaffer lens and a direct ophthalmoscope. The infant was wrapped securely in a blanket and the cornea anesthetized with proparacaine prior to the insertion of the lens. The description of the examining lens and the method for its insertion are described in another communication.\textsuperscript{4} Dilation of the pupil was unnecessary in almost all cases with this technique. There were no complications resulting from these examinations.

In evaluating the disc asymmetry both the depth and diameter of the optic discs were diagramed. A slash was placed through the "diameter diagram" indicating the meridian of the "depth diagram" (Fig. 1). Bilateral comparative ophthalmoscopy was used to categorize the optic cups as symmetrical, slightly asymmetrical, or markedly asymmetrical. The judgments are of necessity subjective. The examinations were all performed by the same individual so that reasonable consistency could be expected.

Marked asymmetry refers to cases where in the examiner’s judgment no question could reasonably be raised concerning the asymmetry of the optic cups. The cases classified as slight asymmetry demonstrated a definite difference between the optic cups but slight enough that some ophthalmologists might consider this difference within physiological limits by adult "standards." Where the cause of the asymmetrical cupping was due to a developmental abnormality, such as a unilateral temporal pit or Bergmeister’s papilla, the cases were separately categorized.

**Results**

In this series of 468 normal newborn infants, optic cup asymmetry of any degree, excluding obvious developmental anomalies, occurred in 11 infants (2.3 per cent). This compares with Snydacker’s\textsuperscript{5} findings in adults where 15 out of 500 ran-
domly selected patients showed asymmetry. In 3 of the 11 asymmetrical infant cups the asymmetry involved depth alone, the cup areas being similar.

Only 3 of these normal infants (0.6 per cent) demonstrated marked asymmetry of the optic cups. This is in contrast to 27 cases of unilateral infantile glaucoma infants where Shaffer found marked cup asymmetry in 89 per cent (24/27) (Fig. 2).

There were 14 normal infants (3.0 per cent) in whom one or both cups were greater than 1/3 disc diameter. It is interesting to note that marked asymmetry occurred in 4/14 (29 per cent) of the infants showing either or both cups greater than 1/3 disc diameter in size as compared to 0.6 per cent in the total series. Shaffer’s studies of infantile glaucoma eyes indicate that 61 per cent (52/85) had optic cups greater than 1/3 disc diameter; this is in contrast to normal newborn eyes where only 2.6 per cent (26/936) demonstrated cups greater than 1/3 disc diameter (Fig. 3).

OPTIC CUPS LARGER THAN 1/3 DISC DIAMETER

<table>
<thead>
<tr>
<th>Normal Infants</th>
<th>Glaucoma Infants</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6 %</td>
<td>61.0 %</td>
</tr>
<tr>
<td>(26/936 Eyes)</td>
<td>(52/85 Eyes)</td>
</tr>
</tbody>
</table>

Fig. 3.

INFANTS WITH CONGENITAL ABNORMALITIES ON OR ABOUT DISC

<table>
<thead>
<tr>
<th>Abnormality</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertically oval discs</td>
<td>4</td>
</tr>
<tr>
<td>Abnormal vascular pattern</td>
<td>2</td>
</tr>
<tr>
<td>Persistent hyaloid artery</td>
<td>2</td>
</tr>
<tr>
<td>Inferior crescent</td>
<td></td>
</tr>
<tr>
<td>Bergmeisters papilla</td>
<td>1</td>
</tr>
<tr>
<td>Temporal crescent</td>
<td>1</td>
</tr>
<tr>
<td>Temporal optic pit</td>
<td>1</td>
</tr>
<tr>
<td>Partial inferior coloboma adjacent disc</td>
<td>1</td>
</tr>
<tr>
<td>Unusual amount peripapillary pigment</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15 (2.8%)</strong></td>
</tr>
</tbody>
</table>

Fig. 4.

Congenital anomalies on or about the disc excluding cupping were found in 3.1 per cent (15/483) of the total series. These anomalies are categorized in Fig. 4.

Discussion

It is often necessary to follow a chronic glaucoma patient with disc diagrams or photographs over several years in order to be certain whether the cupping is physiological or pathological. Since chronic glaucomas will often show some asymmetry in development, comparative ophthalmoscopy evaluating disc asymmetry may aid in more prompt understanding of the cupping status of the individual patient. Optic cups in newborn infants are normally symmetrical. The method of comparative ophthalmoscopy is therefore of even greater value in congenital glaucomas since these cases are prone to follow a more asymmetrical course than adult glaucomas. This tendency toward asymmetrical development in congenital glaucoma is well illustrated by the statistics of numerous authors showing unilateral development in about 25 per cent of the cases. Consequently, the use of comparative ophthalmoscopy in a search for optic cup asymmetry in newborn infants suspected of having glaucoma is statistically valid and clinically a very useful technique. Unfortunately, it is a technique that is all too often neglected or utilized in a cursory manner. In addition, the incidence of optic cups greater than 1/3 disc diameter in normal newborn infants is low (2.6 per cent) compared to an incidence of 61 per cent in infantile glaucoma eyes.

Ophthalmoscopy is the only available method for evaluating the functional status of infantile glaucoma patients. The findings of this study substantiate the validity and
underscore the importance of careful comparative ophthalmoscopy in infantile glaucoma.

REFERENCES

Discussion
Dr. Daniel Snydacker. Daniel Snydacker, M.D., agreed with the publication that asymmetry of optic discs was most unusual. When present at any age, it should lead the ophthalmologist to most careful examinations to determine the presence or absence of glaucoma. John Hetherington, M.D., reported the observation that the size of a glaucomatous cup can become much smaller after normalization of pressure in an infant with glaucoma.

Principles and problems of therapy in congenital glaucoma

Joseph Haas

It is proper and fitting to begin this discussion by acknowledging the immense debt of infants with congenital glaucoma and their ophthalmologists to the late Dr. Otto Barkan. In spite of the problems that will be discussed, his application of the goniotomy operation has favorably reversed the prognosis of this disease.

Suspicion of congenital glaucoma may result from the symptoms of epiphora, photophobia, and blepharospasm, but unfortunately the majority of cases are seen when the mother notices a sudden clouding of the cornea in eyes which were previously considered big and beautiful. The infant is then referred to the ophthalmologist for further care.

From Presbyterian St. Lukes Hospital, Chicago, Ill.

At the initial consultation it is unusual to be able to conduct more than a cursory examination, but as much should be accomplished as possible. Rarely in small infants can a satisfactory presumptive diagnosis be made by external examination, tonometry, and even gonioscopy and ophthalmoscopy. Since this is usually impossible, nevertheless, it affords an excellent opportunity to obtain a comprehensive history relative to the pregnancy with emphasis on rubella, a good family history, and the knowledge of whether associated congenital defects are present. At this point, the ophthalmologist must skillfully blend the art of medicine with the science of ophthalmology, for in addition to the eye in question, there are widespread social ramifications involved.