Stratus optical coherence tomography findings in patients with retinopathy of prematurity

Tomografia de coerência óptica em pacientes com retinopatia da prematuridade

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INTRODUCTION

Retinopathy of prematurity (ROP) is a proliferative disease(1) and is still a major cause of blindness in children in the developed world despite preventive strategies of screening examinations and current treatment of threshold disease(2). Studying the premature infant shortly after birth with Stratus optical coherence tomography (OCT)(3), gives us an opportunity to evaluate the macula area as it exists in utero and help us to better understand the last stages of fetal development.

Foveal maturation appears to be a slow process, although it has been considered to be the first region to undergo maturation(3). Human macula does not complete its development until a number of weeks after birth(4-5). Macular alterations are present only in advanced ROP, and usually consist of temporal displacement or tractional retinal detachment(6). In ROP, the presence of a line or a ridge in the peripheral retina may act as a barrier retarding peripheral migration of cells even in the posterior pole and thus delay macula development.

In this study, our aim was to investigate the morphologic characteristics of the macula through OCT in premature patients with retinopathy of prematurity.

METHODS

Twelve patients with retinopathy of prematurity grades I, II and III were prospectively evaluated from May to October 2004 by an ophthalmic examination with indirect ophthalmoscopy.

ABSTRACT

Purpose: To describe morphological features of the macula in patients with retinopathy of prematurity. Methods: Twelve premature babies with retinopathy of prematurity grades I, II and III underwent dilated fundus examination and optical coherence tomography evaluation. Results: In all thirteen eyes of the twelve premature patients optical coherence tomography revealed a condensed retinal pigmented epithelial layer in the macular-foveal area shown by increased reflectivity. In these eyes the retinal layers were not well differentiated. Foveal depression was clearly evident in 23%. Conclusions: In premature patients with retinopathy of prematurity, optical coherence tomography revealed poorly differentiated layers in the macular region with increased reflectivity in retinal pigmented epithelial-choriocapillaris zone.

Keywords: Retinopathy of prematurity; Tomography, optical coherence; Macula lutea; Fovea centralis
Screening check-ups were scheduled according to UK guidelines that recommend ophthalmologic examination in all infants of less than 1500 grams birth weight and less than 32 weeks of gestational age(7). Informed consent was obtained from each patient’s mother. Each baby was documented according to the International Classification of ROP(8). Babies’ pupils were dilated with 0.5% cyclopentolate and 2.5% phenylephrine eye drops instilled at least 30 minutes before examination. Topical anesthetic eye drops (0.1% proxymetacaine hydrochloride) were instilled immediately before examination. A lid speculum and a scleral indenter were used to assist the positioning of the eye. After the examination, the babies were submitted to OCT evaluation. The fovea was measured four times for the 6 radial scans. Fundoscopy, classification and OCT were performed on the same day.

RESULTS

OCT images were obtained from fourteen eyes of thirteen premature babies (Table 1). Nominal categorization of ROP was applied according to the International Classification of ROP(7). Mean age and weight were 28 weeks and 1271.1 grams respectively (range examination at from 24 to 32 weeks and 760 to 1710 grams). Mean age was 2 months and two days. ROP I was identified in four eyes (30.7%), ROP II in 23.1% (3/13 eyes) and six eyes had ROP III (46.2%). Although OCT images of one patient (31 weeks, 1060 grams), were analyzed, they were not included in the final results in table 1 because the baby had no ROP.

The fovea, with its characteristic depression, was easily recognizable in the retinal profile in patient #5 (Figure 1). OCT findings in patient #8 revealed the photoreceptor layer as a poorly reflective band immediately above the retinal pigment epithelium and that the band was thicker in the area of the foveal depression (Figure 2). The characteristic external portion of the retina with its highly reflective band that corresponded to the retinal pigment epithelium and the less reflective structure which matched up with Bruch’s membrane and choriocapillaris layer were also observed underneath (Figure 3). This preterm infant (31 weeks, 1060 grams), who had no ROP signals, was examined at 3 months of age and became our control.

DISCUSSION

The macula of the fetal retina is one of the last parts of the eye to complete its development(3). OCT has an important hist-

![Figure 1 - Optical coherence tomography shows the foveal depression of patient #5](image1)

![Figure 2 - Optical coherence tomography shows the poorly reflective band immediately above the retinal pigment epithelium layer (#8)](image2)

![Figure 3 - Optical coherence tomography reveals a foveal depression of a normal premature baby and the hyperreflectivity of the external retina](image3)

Table 1. Patient data regarding age and weight at birth, classification and age at examination

<table>
<thead>
<tr>
<th>Case</th>
<th>Age at birth</th>
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<tbody>
<tr>
<td>1</td>
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<td>1030g</td>
<td>2m 2d</td>
<td>ROP 3+ Z3</td>
</tr>
<tr>
<td>2</td>
<td>24w</td>
<td>1040g</td>
<td>2m</td>
<td>ROP 2+ Z2</td>
</tr>
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<td>1590g</td>
<td>2m 19d</td>
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</tr>
<tr>
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<td>2m 2d</td>
<td>ROP 1 Z3</td>
</tr>
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<td>4m</td>
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</tbody>
</table>

w: weeks; g: grams; m/d: month/day; *According to the international Classification of ROP; †both eyes
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CONCLUSION

These findings demonstrated that Stratus OCT may be a useful exam to access the macula morphology of normal premature babies and with ROP (class I, II, III) without any interventional procedure. OCT enables the diagnosis and quantifies retinal features. It could be useful to follow the development of the macula anatomy in those patients.

We are unaware of previous reports of Stratus OCT images of premature infants with and without retinopathy of prematurity and we could find no reference to them in a computerized search using MEDLINE.

REFERENCES