Central corneal thickness changes and horizontal corneal diameter in premature infants

A prospective analysis

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Abstract

To report observations of horizontal corneal diameter (HCD) and central corneal thickness (CCT) changes in premature infants with stable optic disc cupping and intraocular pressures (IOPs). The HCD and CCT at term serve as a baseline for premature infants.

Sixty-three premature infants were enrolled in a prospective case series. HCD, CCT, and IOP were measured. RetCam images of the optic discs were used to evaluate the cup-disc ratio (CDR) and read by an independent masked observer. Data were collected at between preterm (32-36 weeks) and again at term (37-41 weeks) postconceptual age. Left eye measurements were used for statistical analysis. Left eye findings were combined to construct predictive models for HCD and CCT.

The mean HCD was 9.1 mm (standard deviation [SD]=0.7 mm) at preterm and 10.0 mm (SD=0.52 mm) at term. The mean CCT preterm was 618.8 (SD=72.9) μm and at term 563.9 (SD=50.7) μm, respectively. The average preterm CDR was 0.31 and at maturity was 0.33. Average IOP of preterm and term was 13.1 and 14.11 mm Hg, respectively. There was significant linear correlation between HCD with the postmenstrual age (r=0.40, P<.01) and the head circumference (r=0.33, P<.05). Predictive models were constructed for HCD (R²=0.52, 0.2 mm/wk) and CCT (R²=0.23, -11.4 μm/wk) with postconceptual ages.

The HCD and CCT variation did not affect IOP reading over time. CCT was not correlated with birth parameters and decreased as the infant reached term. Corneal diameter correlated with gestational age at birth and head circumference.

Abbreviations: CCT = central corneal thickness, CDR = cup-disc ratio, HCD = horizontal corneal diameter, IOP = intraocular pressure, SD = standard deviation.

Keywords: corneal diameter, intraocular pressure, premature infants

1. Introduction

In premature infants, the association between corneal thickness and intraocular pressure (IOP) over time is not known with certainty. For adults, corneal thickness is a routine part of the

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assessment of IOP.[1] In a meta-analysis, Doughty and Zaman[2] reviewed 600 sets of central corneal thickness (CCT) data between 1968 and mid-1999 and found in 134 sets which included IOP measurements. They reported a statistically significant correlation between IOP and CCT, with a 3.4±0.9 mm Hg difference noted for every 10% increase in CCT (P<.001, r=0.419) for all eyes irrespective of whether the eyes were normal, glaucoma suspects, or had eye disease including glaucoma. Changes in corneal thickness and corneal diameter in premature infants have been observed to occur.[3-8]

Data available in the published literature on the CCT in premature infants are limited; earlier studies had small sample size[1,4] and more recent larger series report cross-sectional measurements only.[5,8,10] (Table 1). Musiluba et al[11] compared 45 premature infants at postconceptual age 33 to 37 weeks with term infants and found CCT of 660μm vs 586μm, respectively (P=.7). In other studies, a significant change in CCT from preterm to term has been found.[1,6-8] Further, CCT readings obtained from these studies have varied. This difference in average CCT results may be in part due to the variable instrumentation used in the studies; difficulties in obtaining measurements from infants and possibly racial differences and perinatal factors such as ventilation. Notably, in adults, racial differences in CCT have been reported; Shimmmyo et al[21] found mean values of CCT of 550μm in Caucasians, Asians, and Hispanics compared to 535μm in African-Americans. This study was undertaken to investigate prospectively changes in IOP from preterm to term and their relationship to changes in