Corneal diameter in premature infants

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Abstract

The size of the cornea is important in the diagnosis of primary infantile glaucoma. Reference values regarding eyes of premature infants are scarce. Such data are of special importance in areas such as the Middle East where infantile glaucoma is common and often evident already at birth. The authors have measured the horizontal corneal diameter of the eyes of 127 premature Saudi infants with a gestational age between 23 and 36 weeks and a birth weight ranging from 540 g to 4720 g. The corneal diameter ranged from 7.75 mm to 10 mm. The smallest diameter (7.75 mm) was found in an infant with a gestational age of 23 weeks and having a birth weight of 520 g. The largest diameter (10 mm) belonged to two infants with a gestational age of 34 and 35 weeks and a birth weight of 2250 g and 2240 g respectively. Corneal diameter was positively correlated ($p < 0.001$) with gestational age and birth weight. Graphs depicting the regression line of corneal diameter on gestational age and of corneal diameter on birth weight together with the 95% confidence limits for individual values are provided for reference.

corneal diameter in 127 premature Saudi infants with healthy eyes.

Material and methods

The corneal diameter was measured in 127 premature infants with gestational ages ranging from 23 to 36 weeks the mean age being 33.1 (SD 2.98) weeks. The weight at birth ranged from 540 to 4720 g, the mean weight being 1950 (SD 614) g. The corneal diameter was measured in both eyes but one randomly selected diameter – right or left – from each neonate was used for statistical calculations. Neonates showing ocular pathology, somatic anomalies, or having uncertain gestational age were excluded. The measurement (horizontal diameter, white to white) took place during the first week of life but in six cases was made immediately after death. It was performed with the help of a caliper modified to prevent corneal injury (Fig 1). In order to obtain a good visualisation of the eye the upper lid was cautiously lifted using a wire loop retractor (Fig 1). Often the lid retractor was not applied, gentle manipulation being sufficient to obtain a satisfactory separation of the lids. The caliper reading was translated into mm using a set of finely graduated precision rulers. The measurements were approximated to 0.25 mm. Virtually all measurements were made by one investigator (KU).

Results

The corneal diameter ranged from 7.75 mm to 10 mm. In the eyes of 16 infants measurements varied by 0.25 mm, in two by 0.5 mm, and were identical in the rest. The smallest diameter (7.75 mm) was found in an infant with a gestational age of 23 weeks and having a birth weight of 520 g. The largest diameter (10 mm) belonged to two infants with a gestational age of 34 and 35 weeks and a birth weight of 2250 g and 2240 g respectively.

The corneal diameter correlated positively with the gestational age (Fig 2) and with birth weight (Fig 3). In both cases the correlation coefficient was significant at 99% level being 0.827 for the diameter and the age, and 0.746 for the diameter and the weight. The 95% confidence interval for the mean and the 95% confidence interval for individual values are also shown in Figures 2 and 3.

Discussion

The mean horizontal diameter of human cornea at birth is reported to be 10.0 mm.⁶ With regard to the corneal diameter of premature infants no data are available in the literature. According to this study in 127 premature babies with gestational ages between 23 and 36 weeks the corneal

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Figure 1 Modified caliper and retractor used for corneal measurement. In order to minimise the risk of injuring the eye the steel points of the caliper have been replaced with thin, flexible copper wires.

Figure 2 Regression of corneal diameter (mm) on gestational age (weeks). The solid line is the best fit regression line. Inner dotted lines represent the 95% confidence limits for the predicted mean corneal diameter. Outer dotted lines represent the 95% limits for individual diameter values.

Figure 3 Regression of corneal diameter (mm) on birth weight (kg). The solid line is the best fit regression line. Inner dotted lines represent the 95% confidence limits for the predicted mean corneal diameter. Outer dotted lines represent the 95% limits for individual diameter values.

diameter ranged from a minimum of 7.75 mm to a maximum of 10 mm. There was a clear positive correlation between corneal diameter and gestational age or birth weight.

The walls of neonatal eyes, and even more so those of fetal eyes, are distended by an increased intraocular pressure because the corneal and scleral collagen has not yet sufficiently hardened.⁷ Before the age of 6 months the rigidity of the cornea is less than that of the sclera; consequently the cornea enlarges more rapidly under the influence of an increased IOP.⁸ Secretion of aqueous humour presumably begins before birth as suggested by the findings of some degree of aqueous drainage effective by 17–18 weeks of fetal life.⁹ Fetal facility of outflow correlates directly with the diameter of the cornea.⁹ The existence of a fetal aqueous humour circulation has recently been corroborated by a scanning electron microscopy study showing by 18–22 weeks of development the presence of a well formed gap system connecting the anterior chamber with the developing intertrabecular spaces.¹⁰ These data underline the importance of the corneal size in the diagnosis of developmental glaucoma in premature neonates and make it necessary to have reference values available.

Knowing the normal corneal diameter in these children at different gestational age and birth weight is of special interest in areas such as the Middle East where the disease is common and often evident already at birth.¹¹

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