

Measurement of Corneal Diameter using Calipers and Smart Phone Technology among term Neonates at Alex-Ekwueme Federal University Teaching Hospital, Abakaliki: A Cross Sectional Comparative Study

Ngozi D. Mgbafulu¹, Chinyelu Nkemdilim Ezisi¹, Rich Umeh²

¹Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi State, Nigeria

²University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu

Corresponding author: Chinyelu Nkemdilim Ezisi, Email: chynkem2002@gmail.com

Background: Corneal Diameter (CD) measurement in newborns is essential for detection of blinding ocular pathologies. It requires specially trained personnel using methods that involve contact with the globe as well as use of anaesthesia. Smart phone use may obviate these challenges. The objective of this study is to compare white to white corneal diameter measurement among newborns using smart phone and manual caliper measurement.

Patients and Methods: This was a cross-sectional comparative study among stable term neonates within one week of life. The setting was in the Alex-Ekwueme Federal University Teaching Hospital, Abakaliki, (AEFUTHA) Ebonyi State, Nigeria.

Consecutively selected stable term neonates within one week of life whose mothers consented to the study and met the inclusion criteria had their corneal diameters measured, while lying supine, using both callipers and smart phone and the values were compared. The ImageMeter® app downloaded from Samsung store online was used to measure the corneal diameter following a photograph of the cornea in primary position using Samsung J3 smartphone. The photograph was opened in the app and a horizontal line drawn from 3 to 9 o'clock position and the value read off in millimetres.

Descriptive statistics were used to determine mean, range and standard deviation using Statistical package for social sciences (SPSS

IBM) software (version 22, Chicago, USA) while paired t-test calculated the difference in mean CD measurements between calipers and smart phone methods. Pearson's correlation and Bland-Altman's analysis determined the correlation and agreement between methods respectively. Inter and intra observer repeatability were assessed. P-value less than 0.05 was taken as statistically significant.

Results: A total of 180 neonates were studied. The study found a mean Corneal Diameter using caliper method of 10.01 ± 0.29 mm and 10.03 ± 0.24 mm (right eye (RE) and left eye (LE) respectively) for observer 1 and 10.16 ± 0.25 mm and 10.19 ± 0.21 mm (RE, LE) for observer 2. Using smart phone measurement, mean Corneal Diameter measurement of 9.98 ± 0.21 mm and 10.00 ± 0.29 mm (RE, LE) were observed for Observer 1 and 10.07 ± 0.19 mm and 10.06 ± 0.21 mm (RE, LE) for observer 2. The difference in mean Corneal Diameter between RE, LE for both methods and both observers were not statistically significant (p-value >0.05).

Discussion: This study demonstrated no statistically significant difference in the measurement of corneal diameter using calipers and smartphone in both observers. This was corroborated in similar studies by Harby¹ et al in Saudi Arabia and Robinson² et al using a Medical-Nikkor f200mm lens camera versus caliper method.

This study showed significant correlation between both methods by both observers following Pearson's correlation analysis. This is further established by the Bland-Altman's plot which demonstrated that over 95% of measurements are within the limit of agreement with a P-value of 0.001. This finding has been corroborated by Robinson et al²

In addition, both intra and inter observer variability for both methods did not meet statistical significance in this study, suggesting good intra and inter observer repeatability for both methods and both observers. Similar findings were reported by Harby¹ et al for intra observer variability. This represents a good quality of an ideal measurement tool.

Corneal Diameter measurement in the newborn using smart phone technology does not deviate significantly from caliper measurement and is thus advocated.

References

1. Harby MA, Shamrani MA, Edward DP. Measurement of Corneal

Diameter Using Smart Phone Technology. *J Clin Exp Ophthalmol* 2015; 6:476-80.

2. Robinson J, Gilmore KJ, Fielder AR. Validation of photographic method of measuring corneal diameter. *Br J Ophthalmol* 1989;73(7):570-573.