

# Anterior Eye Segment: A Comparison of Adults and Preschool Age Children

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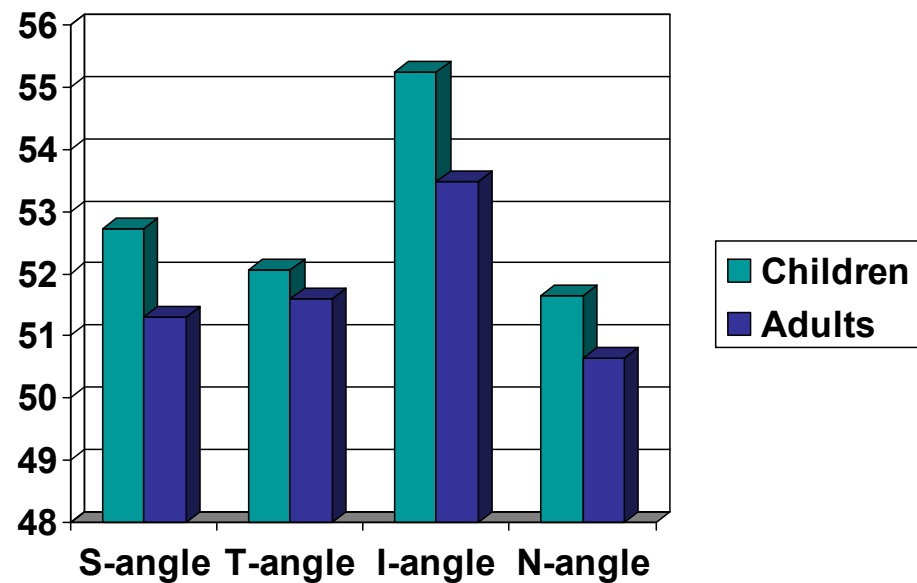
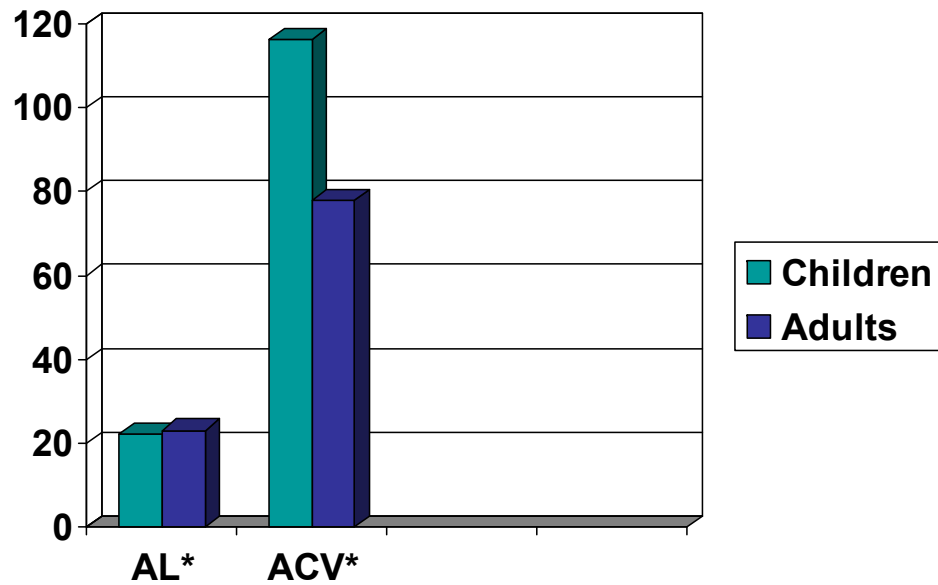
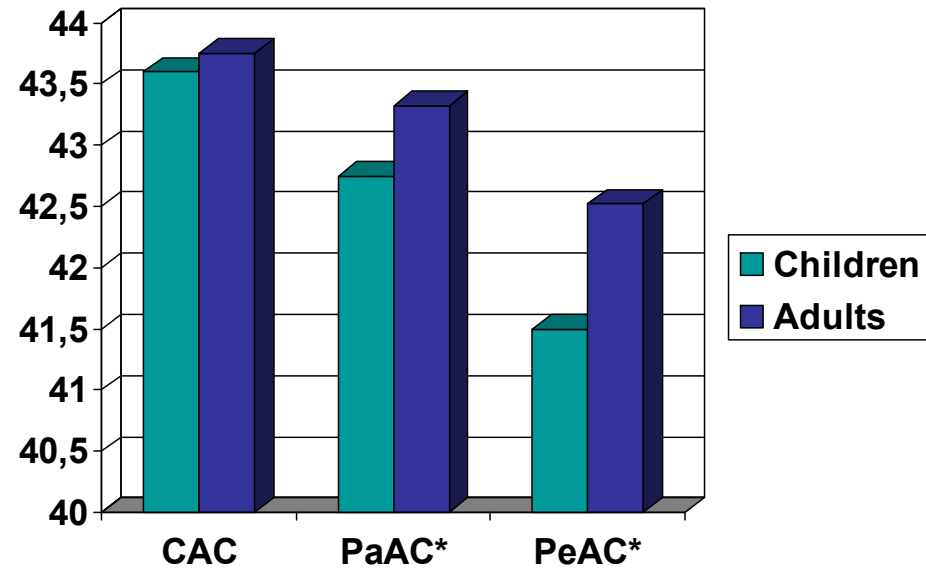
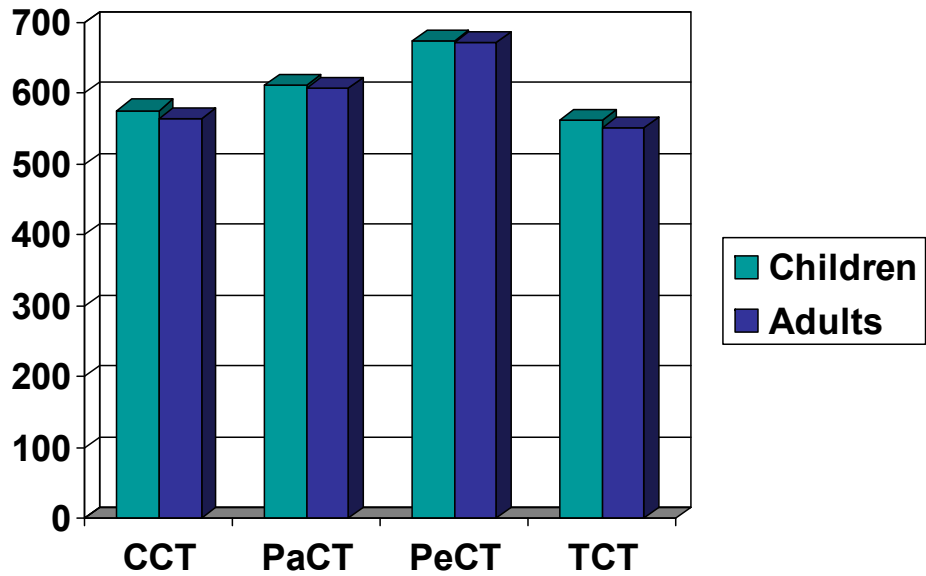
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Ocular structures go through various changes due to aging process like all other organs during the life span.(1, 2) Most of the ocular structures continue developing until around age 14 years and it was previously reported that the axial length, corneal diameter and corneal curvature don't show any significant difference after age 15.(3) By increasing of lens diameter, the structures of anterior chamber can be changed during aging such as narrowing of the angle and decreasing of the chamber depth.(4, 5) During the ocular development, one of the most important parameters affecting the refractive status of the eye is axial length. It is 18 mm at birth, increasing rapidly to 23 mm till age 3 years, after which the growth slows down to about 0.1 mm per year to reach the adult stage at age 14.(1, 6, 7) There are many studies investigating the alterations of the refractive and biometric status of the eye during aging process.(6, 8-15) Our study is a unique study investigating all anterior segment structures in preschool age children by Dual- Scheimflug imaging and comparing the values of anterior segment parameters between preschool age children and adults with same refractive status in order to show the alterations in these structures through aging.

- **Methods:** One hundred and seventy six eyes of 111 healthy children at age between 3 and 6, and 60 eyes of 30 healthy adults were scanned by Galilei Dual-Scheimpflug Analyzer after getting informed consent from legal responsible. Most reliable and accurate scans were selected and rest of them was excluded from the study. One hundred and fifty six eyes of 78 healthy children and all eyes of adults were included in our study. Central (CCT), paracentral (PaCT), pericentral (PeCT), and thinnest (TCC) corneal thicknesses, and anterior BFS (best fit sphere), posterior BFS, simulated average keratometry (Sim Kavg), Sim Kflat, Sim Ksteep, posterior average keratometry (posterior Kavg), posterior Kflat, posterior Ksteep; central (CAC), paracentral (PaAC), and pericentral (PeAC) axial curvatures; axial length (AL), lens thickness (LT), anterior chamber depth (ACD) and volume (ACV); superior (S-angle), temporal (T-angle), inferior (I-angle) and nasal (N-angle) iridocorneal angle values were analyzed. These parameters of both groups were compared by Mann Whitney U test.
- **Results:** The mean age of the children and the adults were  $4,6 \pm 1,03$  ( range: 2,83-6,67 years) and  $35,43 \pm 34,41$  (range: 19- 59 years), respectively. The mean value of spheric equivalent were  $-0,01 \pm 0,51$  Dioptr(D) (range: between -2D and +1D ) in children and  $-0,24 \pm 0,64$  D (range: between -2D and +1,13D) in adults and there was no statistically significant difference between them. The values of posterior BFS, posterior Kavg, posterior Kf, posterior Ks, PaAC, PeAC, and ACD were different between the adults and children and these differences were statistically significant ( $P=0,002$ ;  $P=0,011$ ;  $P=0,006$ ;  $P=0,028$ ;  $P=0,047$ ;  $P=0,004$  and  $P=0,047$ , respectively). For the other parameters of cornea and anterior chamber, there was no statistically significant difference between these groups ( $P>0,05$ ).
- **Discussion:** During the life, some alterations are occurred in refractive and biometric status of the eye. Generally, differentiation of the posterior segment occurs faster at the beginning, but later the anterior segment tends to develop more rapidly than the posterior.(16, 17) Our study aimed to look at age-related differences in ocular parameters between preschool children and adults that have completed functional and structural maturation. The degree of refractory errors is related to various ocular parameters such as corneal curvature, anterior chamber depth, lens thickness, axial length, and the acquisition and maintenance of normal vision requires a balance between them.(18-20)

In the Table, comparison of some parameters between adults and children are shown.

PARAMETERS	ADULTS	CHILDREN	P
<b>Axial Length</b>	<b>23,15 ± 0,68 mm</b>	<b>22,25 ± 0,7 mm</b>	<b>&lt; 0,001</b>
<b>Anterior Chamber Depth</b>	<b>3,37 ± 0,31 mm</b>	<b>3,60 ± 0,13 mm</b>	<b>&lt; 0,001</b>
Central Corneal Thickness	563,91 ± 36,07 µm	575,67 ± 25,36 µm	,062
Paracentral Corneal Thickness	606,83 ± 37,13 µm	611,51 ± 23,71 µm	,575
Pericentral Corneal Thickness	671,00 ± 38,13 µm	673,59 ± 29,73 µm	,655
Thinnest Corneal Thickness	550,83 ± 37,27 µm	562,09 ± 26,68 µm	,118
Anterior Best Fit Sphere	7,77 ± 0,26 mm	7,87 ± 0,31 mm	,051
<b>Posterior Best Fit Sphere</b>	<b>6,49 ± 0,23 mm</b>	<b>6,66 ± 0,32 mm</b>	<b>,002</b>
<b>Posterior Kavg</b>	<b>-6,31 ± 0,26 D</b>	<b>-6,18 ± 0,29 D</b>	<b>,011</b>
<b>Posterior Kflat</b>	<b>-6,13 ± 0,29 D</b>	<b>-5,98 ± 0,30 D</b>	<b>,006</b>
<b>Posterior Ksteep</b>	<b>-6,49 ± 0,28 D</b>	<b>-6,38 ± 0,37 D</b>	<b>,028</b>
Central Axial Curvature	43,75 ± 1,54 D	43,60 ± 1,69 D	,511
<b>Paracentral Axial Curvature</b>	<b>43,32 ± 1,48 D</b>	<b>42,75 ± 1,75 D</b>	<b>,047</b>
<b>Pericentral Axial Curvature</b>	<b>42,52 ± 1,47 D</b>	<b>41,50 ± 2,59 D</b>	<b>,004</b>



\*There was statistically significant difference between the groups.

- In our study, we studied with the children and adults who have similar refraction in order to detect the compensatory mechanisms for holding the eye in emmetropic status while the axial length and lens diameter are increasing. Although preschool age children have similar anterior corneal curvature with adults at the 4mm central part of cornea, adults have lesser values of posterior corneal curvature than the children mathematically. So, posterior cornea gets steeper by aging while anterior cornea remains same and this may cause some changes in asphericity of the cornea. However at the central part of the cornea does not show any alteration anteriorly, paracentral (4 -7mm) and pericentral (7- 9mm) area of the cornea are more steeper in adults than the children with same refractive status.
- In a previous study, it was reported that central corneal thickness slightly decreases with increasing age.(21) When we compared the central, paracentral (4- 7mm), pericentral (7- 9mm), and the thinnest corneal thicknesses between children and adults, we have found no significant difference.
- It is known that anterior chamber depth decreases by aging.(4, 5) In our study, the adults have anterior chamber depth shallower than the children but there was no significant difference between the adults and the children in terms of the values of superior, temporal, inferior, and nasal irido-corneal angles.
- Our study is important for obtaining data about the difference of anterior segment structures between adults and preschool children by Dual-Scheimpflug analyzer in order to define the determinants of refractive and biometric alterations in anterior segment by aging.

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