CILIARY BODY THICKNESS IN RELATION TO AXIAL MYOPIA

Ayser Abd El-Hamid Fayed. MD
Ahmed El-Mohamed, M.D.

Propose: To determine and compare, the ciliary body thickness (CBT) of high axial myopia and relatively emmetropic eyes.

Methods: Thirty eyes of 18 patients, [22 – 45] years of age, were recruited CBT was measured from ultrasound biomicroscopy, at CBT, CBT mm posterior to sclera spare. Cycloplegic refractive error was measured & axial length using ultrasound biometry was determined. Patients were divided into two groups, group A (10 patients) of high myopic eyes, group B (8 patients) of emmetropic eyes.

Results: Thicker measurements at CBT1 (P < 0.001) and CBT2 (P = 0.003) were associated with increasingly myopic refractive errors and were associated with longer axial lengths.

Conclusion: Thicker ciliary body measurements were associated with myopia and a longer axial length.

Introduction:
Ultrasound biomicroscopy (UBM) allows in vivo, real time imaging of the ciliary region, including structures not otherwise visible and quantitative assessment can be readily made. In a study using magnetic resonance imaging (MRI) for analysis of globe shape, myopic globe is relatively prolate than emmetropic globe, and the myopic eye having dimension that are more elongated axially than in horizontal or vertical dimension. A variety of explanations have proposed to account for the relatively prolate shape of myopic globe. Several study suggested that, the prolate pattern of growth in premyopic eyes, and
the crystalline lens has been offered as a potential source of internal growth restriction.

Equatorial enlargement during ocular growth may increase tension on the Zonules and may affect ciliary body thickness\(^{(3)}\). Recently Olivera et al.\(^{(5)}\) suggested possible source of the altered globe shape in myopia. They reported an association between refractive error and an ocular component in the equatorial region of the globe, adult patients with myopia were found to have thicker ciliary body than those without myopia.

**Subjects and Methods:**

30 eyes of 18 patients who come to outpatient clinic Benha Hospital. They were divided into two groups, group A and group (B). Group (A) included 15 eyes of 10 patients high myopic eyes of more than \(-6.00\) D (5 unilateral & 5 were bilateral), group (B) included 15 eyes of 8 patients of relatively emmetropia (one unilateral & 7 bilateral). The study procedures and design were approved by the ophthalmology department of Benha university hospital. All measurements were made. At (temporal quadrant) patients age ranged from (22 – 45 years) with mean age (35.07) years. Exclusion criteria were included, the presence of central nervous system or systemic disease, presence or history of ocular disease, previous ocular surgery or trauma, and use of systemic or ocular medication. Subjects who were enrolled underwent an ophthalmological examination, that included corrected visual acuity, slit lamp biomicroscopy and fundus examination. After 25 minutes after instillation of 4 drops of 1% tropicamide, all eyes underwent axial length measurement (Sonomed, Inc. USA). Ciliary body thickness (CBT) measurement were made using (Dicon P45 plus, UBM, paradigm
instrument salt lake city, UT ah, USA). All ciliary body measurements were made under cycloplegic conditions. UBM was performed at the temporal corneoscleral limbus, with a 50 MHz transducer allowing 4-5 mm tissue penetration. Surface anaesthesia was achieved after instillation of with 0.5% proparacain. Under room light, ciliary body thickness (CBT) was measured on radial section at 1.00 mm and 2.00 mm posterior to the sclera spur (CBT$_1$ – CBT$_2$) respectively (Fig. 1). The relationship between CBT and refractive error and axial length was assessed, with CBT as an out cor. And axial length and refractive error as predict (Fig. 1).

**Measurement:**

All images for a given subject were varied to identify precisely the location of the sclera spur in each subject. Once the sclera spur was identified, one end of a caliper 1.00 mm in length was placed on the sclera spur. The other end of a caliper was placed along the border between the sclera and the ciliary body. This process was repeated for calipers that were 2.00 m in length with careful to place the sclera spur end of all calipers at the same location, overlying the scleral spur. Using the software, CBT measurement were then made 1.00 mm and 2.00
mm posterior to the scleral spur. The caliper used to measure the thickness at 1.0 mm (CBT1) posterior to the sclera spur was aligned so that it was perpendicular to the local curvative of the sclera and then the other and was extended toward the ciliary pigmented epithelium, this process was then repeated at 2.00 mm (CBT2) posterior to the sclera spur. Finally, each of the two measurements was recorded.

**Result:**

The general characteristics of the study sample are displayed in Table (1) there was a statistically significant univariate correlation between refractive error and CBT$_1$ ($P = 0.03$) and CBT$_2$ ($P = 0.005$).

**Table (1):** CBT measurements by refractive error.

<table>
<thead>
<tr>
<th></th>
<th>Emmetropia n = 15</th>
<th>Myopia n = 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBT</td>
<td>Mean – SD</td>
<td>Mean – SD</td>
</tr>
<tr>
<td>CBT1</td>
<td>930.35 - (100.4)</td>
<td>899.50 - (99.7)</td>
</tr>
<tr>
<td>CBT2</td>
<td>595.57 - (91.55)</td>
<td>395.70 - (68.1)</td>
</tr>
</tbody>
</table>

* Emmetropia, spherical equivalent refractive error ≤ 2.00 D, 0.75 D

* High myopia, spherical equivalent refractive error of more than 6.00 D
**Table (2):** The spherical equivalent, AL,CBT of eyes with high axial myopia and normal emmetropic eyes.

<table>
<thead>
<tr>
<th></th>
<th>High myopic Group A</th>
<th>Emmetropic Group B</th>
<th>Difference</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCVA</td>
<td>(0.05 – 1.00)</td>
<td>(0.00– 0.05)</td>
<td>-0.25</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Al(mm)</td>
<td>28.05</td>
<td>23.52</td>
<td>4.53</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>C.SE</td>
<td>-10.50</td>
<td>-1.50</td>
<td>-9.00</td>
<td>&lt; 0.005</td>
</tr>
<tr>
<td>CBT$_1$ µm</td>
<td>930.35</td>
<td>899.50</td>
<td>30.85</td>
<td>&lt; 0.03</td>
</tr>
<tr>
<td>CBT$_2$ µm</td>
<td>595.57</td>
<td>395.70</td>
<td>199.87</td>
<td>&lt; 0.006</td>
</tr>
</tbody>
</table>

**BCVA:** Best corrected V.A.

**C.SE:** Cycloplejic spherical equation.

**AL:** Axial length

Table (2) displayed the relation of CBT and axial length there was a significant interaction between the location of the CBT measurement and axial length. Eyes with longer axial length were found to have a thicker ciliary body.

**Fig.(2):** High myopic CBT1 (1.093), CBT2 (0.861)
Fig.(3): Emmetropic eye of CBT1 (0.952), CBT2 (0.765)

**Discussion**

Measurement of the ciliary body. Thickness or dimension is not a routine practice in clinical vision care\(^6\). Our study of correlation between CBT and high axial myopia and compared the results with subjects with emmetropia of relatively normal AL, to overcome the possible influence of the ciliary body configuration changes during accommodation, we performed our UBM scanning 45 minutes after instillation of 1.00% tropicamide. The thickness of the ciliary body was measured at two locations CBT\(_1\) and CBT\(_2\), and showed that it was significantly thicker in eyes with high axial myopia compared to those of relatively normal eyes. Olivera et al.\(^5\) found similar results with strong association found between CBT2 and refractive error as well as axial length. In another study\(^6\), using anterior segment OCT, documents CB thickness is much more in children who are myopic refraction compared to children who are not. A thickened ciliary body contract poorly and
could explain the accommodative abnormalities which are a hallmark of Juvenile myopia. The mechanism by which a thickening in ciliary muscle as a response in the process of myopia's development is unknown but, biochemical process may underlie the muscle thickening\(^{(7)}\). As hyperope accommodate more than emmetrope and myope\(^{(8)}\), so we expect that the shorter and more hyperopic eye the thicker ciliary body than in longer and myopic eye.

**In Summary.** This study documents the existence of a thicker ciliary body in myopic eyes compared to emmetropic one. Further investigation is necessary to determine the association in relation to IOP and how myopic eye will respond to anti-glaucoma medication.

**References :**


(6) **Melissa D, Baraine T and Donald O.**: Ciliary body thickness and refractive error in children, Invest. Ophthalmology, 2008; (49), 4353 – 4360.
