Ultrasonic Biometry in pseudophakia

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Ultrasound axial length measures with an intraocular lens implant has been essential when trying to identify the corneal postoperative refraction. It is vey important for determining axial metry for cataract surgery in the when preoperative measurements of the eye are unavailable.

The ultrasonic biometers currently in use for measurements in cataract surgeries and have assumed an average velocity of 1,550 m/sec. The use of these units, the actual velocity cannot be changed, and none of the curves when an intraocular lens is inserted, a simple method for accurately measuring the axial length in these situations can be determined using the relation equations.

\[ \text{ALM}_{50} = 1,550 \left( \frac{T}{2,718} + \frac{AL - T}{1,532} \right) \]  \hspace{1cm} (2)

where ALM_{50} is the apparent axial length at 1,550 m/sec.

Resolving equation 2 for the actual axial length (AL) yields equation 3.

\[ AL = \frac{1,532}{1,550} \text{ALM}_{50} + T \left( 1 - \frac{1,532}{2,718} \right) \]  \hspace{1cm} (3)

Computing the numeric value of the final term yields equation 4.

\[ AL = \frac{1,532}{1,550} \text{ALM}_{50} + 0.44 \]  \hspace{1cm} (4)

Equation 4 states that the actual axial length in the pseudophakic eye can be obtained by multiplying the apparent axial length measured at 1,550 m/sec (ALM_{50}) by the fraction (1,532/1,550), which converts to the apical tissue velocity, then adding 44% of the center plastic thickness of the intraocular lens. If the ultrasonic unit can be set to a tissue velocity of

LETTERS TO THE JOURNAL
TABLE
CENTER THICKNESS OF INTRAOCULAR LENS*

<table>
<thead>
<tr>
<th>LENS POWER (D)</th>
<th>DIAMETER OF LENS OPTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 MM</td>
</tr>
<tr>
<td>10</td>
<td>0.61</td>
</tr>
<tr>
<td>20</td>
<td>0.94</td>
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<tr>
<td>30</td>
<td>1.30</td>
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*Nominal values in millimeters for intraocular lenses made of polymethylmethacrylate.

1,532 m/sec, then the fraction becomes 1 (1,532/1,532) and actual axial length is obtained by simply adding 44% of the lens thickness to the measured axial length using the aphakic tissue velocity. Empiric data verify these results. 4

For example, suppose an apparent axial length in a pseudophakic eye of 22.0 mm were obtained with a tissue velocity of 1,550 m/sec with a 25-diopter intraocular lens that has a center thickness of 1.40 mm. The actual axial length would be obtained by multiplying (1,532/1,550) times 22.0 mm to get the apparent aphakic axial length (21.74 mm), then adding 44% of the 1.40-mm lens thickness (0.62 mm), yielding 22.36 mm. Notice that if the lens thickness effect had been ignored, the error would be 0.62 mm using 1,532 m/sec and 0.36 mm using 1,550 m/sec, resulting in an error of 1 to 2 diopters in the predicted refraction.

Nominal center plastic thicknesses for 6- and 7-mm optic diameter polymethylmethacrylate lenses for three dioptic powers are shown in the Table. Exact thicknesses can be obtained from the lens manufacturer and depend on optic diameter and configuration, for example, biconvex, meniscus, and convexoplan.

References


