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PERSPECTIVES IN REFRACTION

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Aligning the Goldmann Tonometer Tip by Means of the "Precontact Whitish Rings"

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Abstract. A set of whitish rings observed before contact is made during Goldmann-type applanation tonometry can help simplify and speed the examination. The orientation and size of the rings are useful both in aligning the tonometer and in estimating the distance remaining before contact is made. Relying on these whitish rings can also avoid some of the shear-related damage exerted on the corneal epithelium from alignment movements of the tonometer tip after contact with the cornea has been made. (**Surv Ophthalmol 44**:171–172, 1999. © 1999 by Elsevier Science Inc. All rights reserved.)

Key words. applanation tonometry • Goldmann tonometry • tonometry

Goldmann applanation tonometry is currently considered the gold standard, as well as the most widely used method, for intraocular pressure (IOP) estimation in the living human eye.[1] The measurement endpoint is determined by the relative position of the green fluorescent rings, such that the inner portions of the two rings just overlap. However, before any attempt is made to estimate the pressure, the center of the tonometer tip must be aligned opposite the apex of the cornea, so that the two half-circular green bands are centered and of equal size.

I have observed a different set of rings that appear as the tonometer head is moved toward the cornea. As opposed to the fluorescent rings, which only appear once contact is made, these whitish rings appear before contact has occurred and, thus, can serve to align the center of the tonometer tip precisely against the corneal apex. This alignment eliminates the need to slide the tonometer tip sideways across the corneal epithelium after contact has been made, a maneuver that may damage the epithelium, as evidenced by a circular and punctate staining pattern often observed after repeated measurements are performed. Although experienced users do not need to use this technique routinely, it may be of benefit when poorly cooperative adults, children, and those with a nonseeing fellow eye are examined.

The Precontact Whitish Rings

These precontact whitish rings (Fig. 1) first appear when the tonometer tip is positioned several millimeters from the corneal surface. These faint half-circular rings have a somewhat blurred appearance and vary in intensity between different instruments. With some instruments, I have had difficulty in visualizing these rings.

These whitish rings initially appear as if they slide into view from opposite ends of the prism. As the tonometer tip is advanced closer to the cornea, the rings assume a more central position, i.e., the radius of these half-circular rings increases as the cornea is approached. It is crucial to mention that the orienta-

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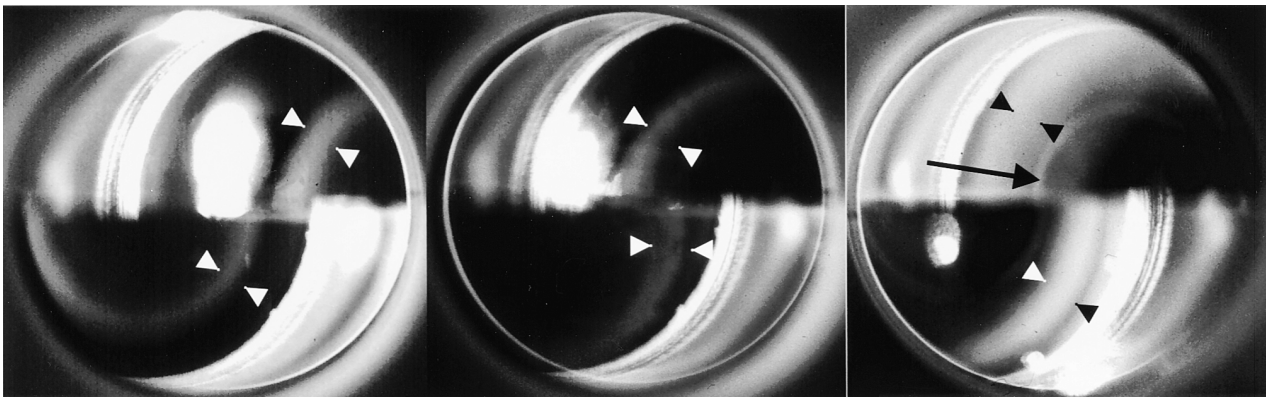

Fig. 1. The precontact whitish rings are marked with arrowheads throughout the figure (both black and white arrowheads). *Left:* The whitish rings are not yet overlapping, implying that the cornea is still distant from the tonometer tip. Also, notice that the rings in this image are not centered. To center the rings, the tonometer needs to be moved to the right and slightly downward. *Center:* The rings are centered, and the inner aspects are slightly overlapping. Corneal touch has not as yet occurred. *Right:* The tonometer tip is in contact with (actually applanating) the cornea, as evidenced by the faint fluorescein rings (solid black arrow). Notice the large amount of overlap of the whitish rings (arrowheads), an overlap that signifies tonometer-corneal touch. Both the whitish rings and the fluorescein rings are seen perfectly centered within the tonometer prism tip.

tion of these rings has nothing to do with the IOP. If anything, their size enables one to estimate the distance between the prism and the cornea, so that with experience one can predict the precise moment when actual contact will be made. Contact with the corneal apex is made only after the inner aspects of the two rings overlap significantly (Fig. 1, right). Translating the relative size and asymmetry of these rings into joystick movements is relatively simple, as this alignment parallels the movements used to center the fluorescent rings. With a little practice, and aided by these whitish rings, one can advance the tonometer toward the cornea, knowing that contact will be made with precise alignment.

An easier method for learning to use these rings is to start out by removing the cobalt blue filter. When IOP is being measured with maximal white light (slit beam wide open), the so-called whitish rings become very obvious, in fact, impossible to miss.

Conclusions

In addition to the green fluorescent rings that serve for measuring IOP, a second, distinct set of rings can be viewed through the Goldmann applanation prism. These precontact whitish rings may be used to align the prism tip against the corneal apex. For the practiced examiner, these rings can also accurately estimate the remaining distance between the tonometer tip and the corneal surface. Using these rings may reduce the shear-related damage to the central corneal epithelium. There is the additional benefit of speeding and smoothing the tonometry procedure by allowing the examiner to observe through the slit-lamp oculars throughout the tonometry procedure.

References

1. Whitacre MW, Stein R: Sources of error with use of Goldmann-type tonometers. Surv Ophthalmol 38:1–30, 1993

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