macular edema [CME] in the macula; and/or specific patient complaints such as light sensitivity, blurred vision, or aching).

As we gradually increased the TA dose, we saw fewer eyes requiring postoperative steroid; from 45% at the lowest dose to 2% at the 1.8 to 2.1 mg level. No eye receiving 2.8 mg or more required additional steroid treatment. Similarly, we saw a decrease in the rate of clinical CME as the TA dose increased. At the 1.8 mg level or higher, there was no occurrence of CME.

With intravitreal injections of TA, elevated intraocular pressure (IOP) has been noted in the first 3 months.[6–8] In these studies, higher doses of 4 to 25 mg of TA were administered. We used much lower doses of TA injected into the AC and vitreous and have had a smaller incidence of IOP spikes than seen with postoperative drops.[9] At 2 weeks postoperatively, 6% had an increase of 5 mm Hg or more and 1%, an increase of 10 mm Hg or more. At the same time, 15% had a decrease of 5 mm Hg or more and 3 cases (0.5%), a decrease of 10 mm Hg or more.

There was no uniformity in the way the TA cleared from the eye. In younger patients, it cleared faster; in older patients, glaucoma patients, and hyperopes, it remained for days, sometimes weeks. The TA crystals spread throughout the eye, the iris, the wound sites, the capsular bag, and into the vitreous. In some cases, the TA may pool in the AC, resembling a hypopyon. Much of the TA may progress through different channels of access to the AC such as the trabecular meshwork and the iris itself. We did not perform gonioscopy in each patient to check for the deposition of TA crystals on the trabecular meshwork, but when we did perform it, especially early on with the pseudohypopyon, the gonioscopy revealed TA in the trabecular meshwork, especially inferiorly. However, that so few particles are seen at 1 week suggests there is an embodiment of the TA in the tissues of the eye or there is drainage through the trabecular meshwork or areas of pseudofacility of aqueous outflow.

Some studies of vitreally injected TA report noninfectious endophthalmitis or pseudoendophthalmitis.[10,11] In more than 10 000 cases, we have had no incidence of endophthalmitis or other infection. We have had 3 cases of pseudoendophthalmitis. It is possible that leakage of the TA into the AC, which caused the snow-globe appearance that we observed, can be mistaken for endophthalmitis. In these cases, however, the patient is asymptomatic. Intravitreal injections by retinal surgeons use a higher dose (up to 25 mg) and a different technique, which may account for the difference. Our prophylactic use of antibiotic and antiinflammatory agents in the injection solution may also have prevented an infection.

Triamcinolone may help with patient compliance and the use of postoperative drops and also prevent the side effects of corneal melts, conjunctival irritation, and dry eyes that are seen with the use of local drops. Injection of TA is more economical as patients are spared the cost of postoperative medications. Patients, especially those who had TA in 1 eye and drops in the other, appreciated the increased comfort and convenience when postoperative drops were not used.

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Improved precision with the millimeter caliper for limbal relaxing incisions

Limbal relaxing incisions (LRIs) are a simple and effective method to correct preexisting keratometric astigmatism during cataract surgery.[1–3] Precision and reproducibility are important for consistent outcomes.[4] Several commercial degree gauges and markers exist for surgeons working with nomograms in degrees, but they can be costly.

Serendipitously, we found that every 10 degrees of arc on a 12.0 mm circle has a chord length closely approximating 1.0 mm (Figure 1 and Table 1). Limbal relaxing incisions placed in the

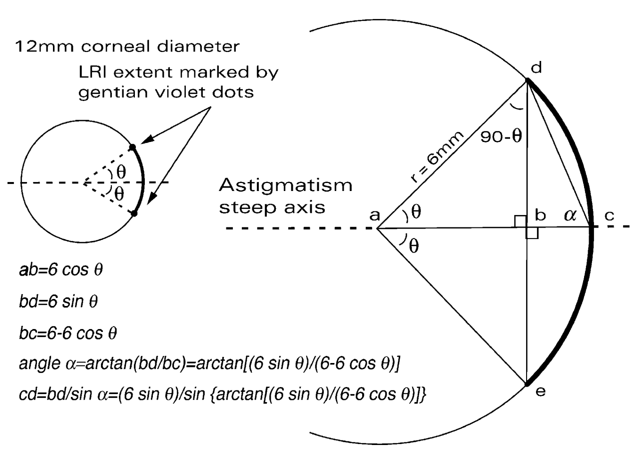

Figure 1. Schematic illustrating an enlargement of the cornea, showing the relationships between LRI *dce* of angle 2θ, chord length *cd* for θ, and corneal radius (*r*).

Table 1. Error in caliper setting from intended angle (θ) for a 10.5 mm circle on which incisions are placed and for 12.0 mm limbal circle. Negative error in last column indicates caliper setting is smaller than intended angle.

LRI Angle (Degree)	Half LRI Angle, θ (Degree)	Millimeter Chord Length Set on Caliper	Chord length of θ for 12 mm Circle (mm)	Angle Corresponding to Millimeter Chord Length Set (Degree)*	Angle Corresponding to Millimeter Chord Length Set (Degree)†	Difference Between θ and Actual Angle Set on Caliper (Degree)‡	Difference Between θ and Actual Angle Set on Caliper (Degree)¶
30	15.0	1.50	1.57	16.5	14.5	+10.00	−3.33
35	17.5	1.75	1.83	19.0	17.0	+8.57	−2.86
40	20.0	2.00	2.08	22.0	19.0	+10.00	−5.00
45	22.5	2.25	2.34	24.5	21.5	+8.89	−4.44
50	25.0	2.50	2.60	27.5	24.0	+10.00	−4.00
55	27.5	2.75	2.85	30.5	26.5	+10.91	−3.64
60	30.0	3.00	3.11	33.0	29.0	+10.00	−3.33
65	32.5	3.25	3.36	36.0	31.5	+10.61	−3.08
70	35.0	3.50	3.61	39.0	34.0	+11.43	−2.86
75	37.5	3.75	3.86	42.0	36.5	+12.00	−2.67
80	40.0	4.00	4.10	45.0	39.0	+12.50	−2.50
85	42.5	4.25	4.35	48.0	41.5	+12.94	−2.35
90	45.0	4.50	4.59	51.0	44.0	+13.33	−2.22

LRI = limbal relaxing incision
*To nearest 0.5 degree for 10.5 mm circle
†To nearest 0.5 degree for 12.0 mm circle
‡For 10.0 mm circle, %
¶For 12.0 mm circle, %

intralimbal zone from 10.5 to 12.0 mm therefore create an intimate relationship between the incision chord length and the angle of arc subtended. The mathematical relationships are shown in Figure 1. Using gentian violet, we routinely mark the steep axis and the length of the hemi-LRI incisions in each direction from the point of the steep meridian. Thus, for a mean 12.0 mm corneal diameter, chord length (mm) × 10 approximates half the angle (degrees) of each LRI incision. For example, if 2 × 40-degree LRIs are required, each 40-degree LRI (2θ) may be marked at the intralimbal area by taking half this angle θ (ie, 20 degrees) on each side of the steep axis with the caliper set at 2.0 mm (ie, one tenth of 20). Setting 2.0 mm on the caliper for an intended angle θ of 20 degrees marks an angle of 19 degrees (actual LRI arc = 38 degrees) for a 12.0 mm circle and 22 degrees (actual LRI arc = 44 degrees) for a 10.5 mm circle (Table 1). This corresponds to an error of −5% with a 12.0 mm circle (negative sign indicates angle measured is smaller than intended) and an error of +10% with a 10.5 mm circle (Table 1).

The error with a 12.0 mm circle ranges from −2.86% to −5.00% for LRI angles (2θ) from 30 to 90 degrees; the error for a 10.5 mm circle ranges from +8.57% to +10.61% for angles of 30 to 65 degrees, increasing to +11.43% to +13.33% for angles of 70 to 90 degrees.

The cylinder dioptric error on a 10.50 mm incision circle for 2 × 40 degrees intended arcs (actual arc 44 degrees) is less than 0.25 diopter (D) using the NAPA (Nichamin age and patch adjusted) nomogram[5] for a patient aged 50 to 60 years, a change from 1.25 D (40-degree arcs) to less than 1.50 D (44-degree arcs). Similarly, it is less than 0.25 D for 2 × 70 degrees intended arcs (actual arc 78 degrees), a change from 2.75 D (70 degrees) to less than 3.00 D (78 degrees).

Thus, one may substitute a millimeter caliper for a degree gauge on a normal-sized cornea with good accuracy and excellent precision. This may be useful for surgeons who wish to use LRIs but are hesitant because of the expense of instrumentation. The inherent error may be less than when the angle is approximated visually in reference to a degree gauge, where the error may be variable. We think this technique is sufficiently useful, reproducible, and accurate to justify its adoption into the surgical routine by busy surgeons performing LRIs.

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