



Figure 2-4. (A) Polar diagram of refractive cylinder (R in figure) (corneal plane) at its positive axis, simulated keratometry steep meridian and ORA as they would appear on the eye. (B) Double-angle vector diagram (DAVD) showing a “doubling” of both the positive cylinder axes without a change in the astigmatic magnitudes.

- 3. Paired LRIs Not Associated With a Phaco Incision.** If the natural lens of the eye is clear and will not be removed and if correction of the total astigmatism of the eye is required, then both the corneal and refractive astigmatism (corneal plane) can be considered when planning the effect of the LRIs; the most effective magnitude and position of the LRI will lie somewhere between the 2 corneal and refractive astigmatism. Using this optimization method, it is important to calculate ocular residual astigmatism (ORA) preoperatively. The ORA is the vectorial difference between the corneal astigmatism and the refractive cylinder at the corneal plane and is expressed in diopters (Figure 2-4).^{3,4} The greater the ORA, the more astigmatism will be left uncorrected postoperatively in the optical system of the eye, regardless of how precisely the procedure was performed. A routine assessment of the ORA preoperatively allows the surgeon to advise the patient accordingly on the expected visual outcome. If the ORA is high (>1.00 D), depending on the amount of preoperative astigmatism, the visual outcome may not meet the patient’s expectations. Therefore, the patient should be advised accordingly prior to surgery so that he or she is able to achieve realistic expectations regarding the likely outcome of surgery.

LIMBAL RELAXING INCISION NOMOGRAMS

A number of nomograms currently exist that determine the length of the LRIs:

1. *The NAPA (Nichamin Age and Pachymetry-Adjusted) Nomogram* (Dr. Louis D. “Skip” Nichamin) in which the length of the incision decreases with age and increases with the magnitude of astigmatism requiring correction.
2. *The DONO Nomogram* (Dr. Eric D. Donnenfeld) in which the length of the incision increases with increasing magnitude of astigmatism correction.
3. *The Gills LRI Nomogram* (Dr. James P. Gills) titrates surgery by the length and number of LRIs.