“Scleral expansion bands have been used to increase the limbal diameter in the presbyopic eye and thereby rejuvenate zonular tension to increase accommodative amplitude. As an alternative, Spencer Thornton, MD, suggested performing anterior ciliary sclerotomy, and an increase in accommodative amplitude of up to 2.2 D was reported in one study using that technique.”

“The increase in accommodation was accompanied by marked improvement in reading ability. Binocular logMAR uncorrected near visual acuity (UCNVA) measured without distance correction improved by day one from 0.49 to 0.07. It remained ≤0.12 in testing through 12 months, and while mean logMAR UCNVA had worsened to 0.26 at 24 months, 93 per cent of patients were able to read J3 or better compared with a mean of J8 pre-operatively, reported Dr Rassier.

“These results suggest LAPR is a promising new technology that may allow reading glasses to become a thing of the past,” said Dr Rassier, who is a fellow working under Sandra Belmont, MD, director of the cornea service, Weill Medical College of Cornell University, New York. Dr Belmont and Jon Siems, MD, Las Vegas, Nevada, are the two principal investigators in the Phase II study.

LAPR rationale
Dr Schachar’s theories of accommodation and presbyopia provide the foundation for using scleral expansion techniques, including LAPR, to restore near vision. According to Dr Schachar, ciliary body contraction increases equatorial zonular fibre tension that leads to peripheral flattening and central steepening of the anterior lens surface, causing a decrease in spherical aberration. Presbyopia is thought to occur as a result of continued growth of the lens that causes slackening of zonular tension and secondarily prevents the ciliary body from increasing equatorial tension during accommodation.

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In LAPR, ablation of the sclera with the erbium:YAG laser allows scleral expansion that is thought to result in enhanced efficiency of the ciliary muscle and zonules and improved accommodation. The procedure involves first marking the eye to indicate the site of the sclerotomies. Then, four fornix-based conjunctival peritomies are created in each of the four quadrants between the recti muscles using a Wescott scissors. After applying light cautery to stop the bleeding, the laser (20 mJ, 20 Hz, 500 micron spot) is used to create four pairs of scleral ablations spaced about 2.5 mm apart from each other. The ablations start at about 0.5mm posterior to the limbus, measure about 4.5mm in length, and are made to a depth of 80 per cent total scleral thickness ± 10 per cent.

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The results were similar for the two methods of accommodative amplitude testing, and results from monocular testing were similar between fellow eyes while the binocular outcomes showed a slightly greater effect on accommodation. In binocular testing, mean accommodation was about 1.95 D pre-operatively. It increased to about 3.08 D on the first day after surgery and to about 3.65 D by week two. At one year, mean accommodative amplitude was 4.18 D and by two years it was still increased almost 2.0 D from baseline with a mean of 3.93 D by push-up and 3.75 D using the blur method.