COMPARING LASER CATARACT SURGERY WITH MANUAL CATARACT TECHNIQUES


Researchers assessed the technology's potential benefits.

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A RANDOMIZED CONTROLLED TRIAL COMPARING FEMTOSECOND LASER-ASSISTED CATARACT SURGERY VERSUS CONVENTIONAL PHACOEMULSIFICATION SURGERY

Roberts HW, Wagh VK, Sullivan DL, et al[1]

ABSTRACT SUMMARY

In a randomized controlled fashion, Roberts and colleagues examined differences between conventional phaco surgery (CPS) and laser cataract surgery (LCS) in terms of postoperative visual acuity, refraction, central corneal thickness, central foveal thickness, endothelial cell loss, and complications. Patients undergoing cataract surgery at one facility were randomized to CPS or LCS, with 200 eyes in each study group (N = 400 eyes).

Of the 400 eyes completing this study, seven (3.5%) in the LCS group could not receive treatment and were converted to the CPS group. Uncorrected logMAR vision was 0.15 ±0.21 in the CPS group and 0.15 ±0.19 in the LCS group. No statistical difference between groups was found in terms of visual acuity, central corneal thickness, central foveal thickness, or endothelial cell loss. Compared to the CPS cohort, the LCS group had a higher rate of anterior capsular tears (3% vs 1.5%) and a lower rate of posterior capsular tears (0% vs 3%); three patients in the CPS group developed a posterior capsular rupture. A patient-reported outcome measure questionnaire showed no differences between the groups.

DISCUSSION

A limited number of large randomized controlled trials (RCTs) have compared LCS and CPS. Studies to date have been rather small, or they have been reviews of other RCTs. Proponents of LCS have emphasized potential advantages of the procedure compared to CPS such as reduced complications and better visual outcomes owing to greater surgical precision and reproducibility.[2] Femtosecond laser technology for cataract surgery is an expensive purchase, however, and one that adds surgical time to each case. One study found that, in a state-funded health care system, the technology added approximately $220 to the cost of each cataract procedure.[3]

The study by Roberts and colleagues is the largest RCT to date to demonstrate no statistically significant differences in clinical outcomes and patient-reported quality of vision between LCS and CPS. In particular, no differences were found between groups in terms of visual acuity, refraction, corneal edema, cystoid macular edema, and overall number of complications at the endpoint of the study.

A recent Cochrane review of 16 RCTs including 1,638 eyes concluded that "there is currently not enough evidence to determine the benefits and harms of laser-assisted cataract surgery

STUDY IN BRIEF

- A randomized controlled trial comparing laser cataract surgery and conventional phacoemulsification surgery (CPS) found no difference in terms of postoperative visual acuity, central corneal thickness and foveal thickness, endothelial cell count, or number of intra- and postoperative complications. The incidence of posterior capsular rupture was higher in the CPS group, whereas the laser group experienced a higher number of anterior capsular tears.

WHY IT MATTERS

Femtosecond laser technology for cataract surgery is an expensive purchase that adds surgical time to each case. If laser technology were found to improve visual outcomes or reduce complications compared to CPS, the greater precision and safety could mitigate the increased cost.

compared with standard ultrasound cataract surgery. The evidence is uncertain because current studies have not been large enough to provide a reliable answer to this question."[4]

Roberts and colleagues reported a higher rate of posterior capsular tears with CPS compared to LCS. This finding has not been mirrored in other RCTs on LCS and CPS, whereas the finding by Roberts et al of a higher number of anterior capsular tears with LCS jibes with the results of other RCTs.

Unexpectedly, the study by Roberts and colleagues did not show a reduction in phaco energy between the two groups, as has been reported in other studies.

The authors suggested that LCS reduces the risk of posterior capsular rupture, although RCTs are often underpowered for safety and complications are rare in cataract surgery. Meaningful outcomes are thus harder to discern when comparing these data. Surgeons must do a cost-benefit analysis at their surgery centers that takes operating time into account when deciding whether to offer LCS. Results of this analysis will vary among practices and physicians. Although Roberts et al suggested that no clinical difference exists between LCS and CPS, a lower rate of posterior capsular tears correlates to less risk of long-term retinal complications. The study endpoint of 1 month might have been too short to find long-term retinal complications or vision changes from posterior capsular rupture.

REFRACTIVE OUTCOMES OF FEMTOSECOND LASER-ASSISTED SECONDARY ARCUATE INCISIONS IN PATIENTS WITH RESIDUAL REFRACTIVE ASTIGMATISM AFTER TRIFOCAL INTRAOCULAR LENS IMPLANTATIONS

Lüdeke I, Gonnerman J, Jørgensen J, et al[5]

ABSTRACT SUMMARY

In a retrospective case series review, Lüdeke and colleagues evaluated refractive and visual outcomes of arcuate corneal incisions in the eyes of patients with residual refractive astigmatism after refractive lens exchange (RLE) using trifocal IOLs and a femtosecond laser (LenSx, Alcon).

The study enrolled 95 eyes of 70 patients. The mean follow-up period was 5.6 ±4.9 months. Before RLE, patients had primary corneal astigmatism ranging from zero to 6.40 D. Treatment was performed 3 months after RLE surgery, and the range of residual astigmatism corrected was 0.50 to 2.25 D. The mean preoperative vector length of astigmatism after astigmatic power vector construction was 0.46 ±0.16 D, and mean postoperative astigmatism was 0.17 ±0.16 D ($P < .001$) after the placement of laser arcuate incisions.

Uncorrected distance visual acuity improved from 0.17 ±0.15 to 0.08 ±0.10 after treatment ($P < .10$). No complications were observed. In this study, 10.53% of patients required further enhancement with a second surgery because they were unsatisfied with their visual results.

STUDY IN BRIEF

- In a nonrandomized retrospective interventional case series, investigators evaluated refractive outcomes after laser arcuate corneal incisions in 95 eyes that had residual astigmatism after refractive lens exchange surgery with implantation of a trifocal IOL. The researchers found corneal arcuate incisions to be a safe, efficient, and feasible means of reducing refractive astigmatism.

WHY IT MATTERS

Patients undergoing refractive lens exchange surgery and trifocal IOL implantation require precise astigmatic correction to achieve optimal distance UCVA. Inherent disadvantages of manual corneal arcuate or limbal relaxing incisions and laser vision correction techniques such as surface ablation and LASIK for correcting residual astigmatism after cataract surgery include dry eyes, neurotrophic effects, cost, and low predictability. The precision and accuracy of laser corneal arcuate incisions could therefore be advantageous.

DISCUSSION

Patients undergoing cataract surgery combined with premium IOL implantation are exquisitely sensitive to residual astigmatism. Reducing astigmatism is crucial to success with trifocal lenses because it provides optimal correction for various focal points.

This is the first study in which a sizeable number of patients received secondary epithelium-penetrating laser corneal arcuate incisions after RLE and placement of a trifocal IOL. Corrections were set at 80% corneal thickness with a 90° sidecut at the 8-mm optical zone using a modified Woodcock nomogram.[6] A 2008 study compared femtosecond laser–assisted astigmatic keratotomy to manual astigmatic keratotomy in 40 eyes.[7] Uncorrected distance visual acuity and BCVA improved significantly in the laser group but not in the manual group. Moreover, the manual group had three corneal perforations compared to none in the laser group.

Different methods for correcting residual astigmatism after cataract surgery exist. Manually performed corneal arcuate incisions or peripheral

relaxing incisions as well as laser vision correction surgery with surface ablation techniques or LASIK are widely performed. Manual corneal incisions can be unpredictable, show regression, and result in perforation due to lack of automation. LASIK and advanced surface ablation techniques have adequate precision but may be associated with delayed healing and poor visual recovery, could exacerbate dry eyes, and could lead to the development of neurotrophic keratopathy. Advantages of laser arcuate corneal incisions include higher accuracy and reproducibility of arcuate length, depth, and optical zone diameter as well as the ability to make incisions either penetrating or intrastromal.

Chan and colleagues analyzed corneal astigmatism and higher-order aberrations after corneal relaxing incisions performed with LCS.[8] In their study, corneal astigmatism decreased significantly, whereas higher-order aberrations—except for spherical aberration—increased significantly. No difference in outcomes was seen from 2 months to 2 years, and there was no statistically significant difference in regression of the corrective effect at an average of 6 ±5 months after surgery. Löffler and colleagues reported that penetrating femtosecond laser–assisted keratotomy significantly reduced anterior corneal astigmatism and total corneal refractive power but produced no change in posterior corneal astigmatism.[9] Understanding these effects may facilitate creation of an optimized nomogram and lead to more predictable results for laser corneal arcuate incisions in the future.

Lüdeke et al stated that laser corneal arcuate incisions adequately reduced low residual refractive astigmatism after RLE and trifocal IOL implantation and that visual recovery was acceptable in 90% of patients. ■

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