

Laser-Assisted Clear Corneal Incisions for Phakic IOLs

Postoperatively, corneal changes are minimal and corneal edema is clinically insignificant.

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As use of the femtosecond laser for cataract surgery grows, laser-assisted clear corneal incisions (CCIs; Figure 1) have become a popular method to gain access to the anterior chamber. In our clinic, we use the femtosecond laser to create one main incision and up to two sideport incisions prior to phacoemulsification. After noticing an improvement in the repeatability of our incisions, we started to apply other uses for laser-assisted incision creation, as we believe that the custom design and more angled architecture afforded by laser-assisted CCIs support their use for advanced surgical treatments.

Now we routinely use the femtosecond laser for two custom treatments: (1) creation of CCIs for phakic IOL implantation and (2) a combination of corneal relaxing incisions (CRIs) and CCIs to achieve correction of high cylinder.

Just like properly created manual CCIs, laser-assisted CCIs are self-sealing, helping to prevent postoperative endo-

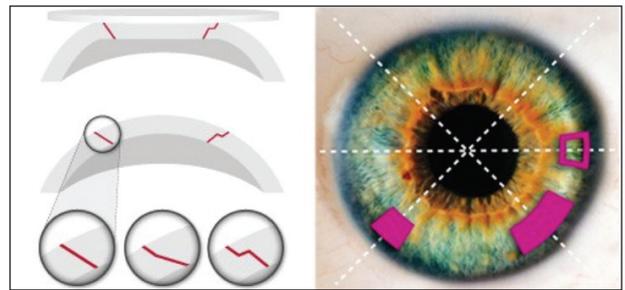


Figure 1. Clear corneal incisions with the Femto LDV Z.

(Courtesy of Zeiss Group)

phthalmitis. The real benefits to using the laser to create a CCI are threefold: (1) incisions can be created with reproducible dimensions, (2) they can be tailored to the eye and the situation, and (3) they allow flexible geometric designs.

PHAKIC IOL IMPLANTATION

Larger incisions induce more astigmatism than smaller ones. For example, our study showed that 3.2-, 2.8-, and 2.2-mm incisions created about 1.11, 0.77, and 0.32 D of surgically induced astigmatism (SIA), respectively.¹

In seven cases in which we used a femtosecond laser to create CCIs for implantation of the Artisan or Artiflex phakic IOLs (Ophtec), we had a significantly lower degree of SIA than we have experienced with manually created CCIs.² The main reason is that the incisions are self-sealing, meaning sutures are no longer required to prevent incision leaks.

TABLE 1. MODIFIED CCI PARAMETERS FOR THE ARTISAN AND ARTIFLEX IOLs

INCISIONS	
Diameter (mm): 9.8 mm	Segments: 3
Sidecut angle 1: 30°	Depth 1: 400 µm
Sidecut angle 2: N/A	Depth 2: N/A
Sidecut angle 3: 60°	Depth 3: 900 µm
MAIN INCISION	
Position: 90°	Width: 5.3 mm (Artisan) 3.2 mm (Artiflex)
PARACENTESIS 1	
Position: 35°	Width: 1.2 mm
PARACENTESIS 2	
Position: 135°	Width: 1.2 mm

TAKE-HOME MESSAGE

- Using a femtosecond laser to create CCIs for phakic IOL implantation can lower the degree of SIA compared with manual incisions.
- Combining laser-assisted CRIs with CCIs is a useful surgical strategy for the reduction of corneal astigmatism.

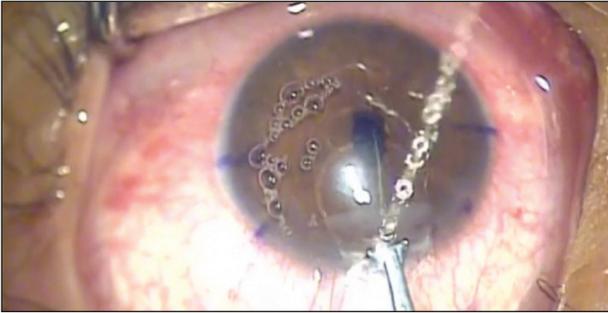


Figure 2. Phakic IOL implantation.



Figure 3. Aqueous humor does not leak through the sutureless main incision.

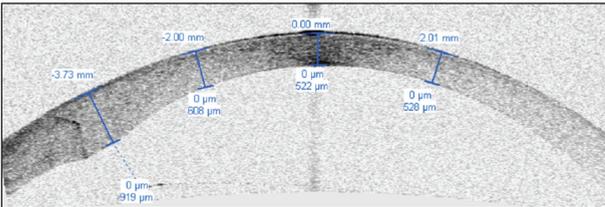


Figure 4. On postoperative day 1, minimal corneal edema is seen.

Our modified parameters for laser-assisted CCI are listed in Table 1. After these CCIs are made, we introduce the phakic IOL into the anterior chamber (Figure 2). When the lens is correctly positioned, we make sure that no aqueous humor is leaking from the incision (Figure 3).

Because postoperative corneal changes are minimal and corneal edema is clinically insignificant (Figure 4), patient satisfaction on the first postoperative day is higher than after phakic IOL implantation through manual incisions. At 3 months postoperative, distance UCVA was 0.04 logMAR or better in all patients.

COMBINATION TREATMENT

About 87% of patients who undergo intraocular surgery have preoperative astigmatism. Of these, 66% have between -0.25 and -1.25 D of astigmatism, and the remainder require correction for higher cylinders.¹ In patients with moderate to severe astigmatism (up to 4.60 D), we combine laser-assisted CRIs and CCIs in a single procedure for better visual outcomes.

This combination procedure significantly reduces corneal astigmatism. In one patient, corneal astigmatism decreased from 4.60 to 1.19 D following this procedure (Figure 5). In this and other instances, we have found no need to implant a toric phakic IOL.

CONCLUSION

The femtosecond laser is a supplemental tool for the refractive surgeon. In addition to routine cataract surgery, we have found that it is useful for advanced treatments including phakic IOL implantation and combined CRIs and CCIs to reduce preoperative astigmatism.



Figure 5. Corneal astigmatism decreased from 4.60 to 1.19 D.

Using a femtosecond laser to create CCIs for phakic IOL implantation can lower the rate of surgically induced astigmatism compared with manual incisions; also combining laser-assisted CRIs with CCIs is a useful surgical strategy for the reduction of corneal astigmatism. ■

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1. Izquierdo L, Henríquez M, Amapola RS. Comparison of surgically induced astigmatism after phacoemulsification through 3.2, 2.8, and 2.2 clear corneal incisions. Paper presented at: the ASCRS Annual Meeting; March 25-29, 2011; San Diego.
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