



LIMBAL RELAXING INCISIONS - A SAFE AND EFFECTIVE TOOL IN OPHTHALMOLOGIC ARMOURY

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ABSTRACT

Limbal relaxing incisions (LRI) aren't new procedure to the ophthalmology. Corneal incision surgery starts its way in the midst 20 century and had its climax in the end of 80-ties just before the laser refractive surgery to take over. There are some nomogramms dealing with size and positioning of the incisions depending on age and amount of treated refractive error.

Purpose: To apply modified LRI in a female patient after routine cataract surgery and implanted IOL with high corneal astigmatism and low uncorrected visual acuity (UCVA), respectively as a potential candidate for LRIs.

Settings: Eye clinic, Trakia University – Stara Zagora, Napa and Donnenfeld, combined procedure with applying compression sutures at the flat corneal meridian, autorefractometry (Reichert 12515, Reichert Technologies, USA), corneal topography (Atlas 9000, Carl Zeiss Meditec), simKs, wavefront analysis (WASCA, Carl Zeiss Meditec).

Results: The presenting refraction was $6e +2,5dsph-4,0dcyl/14^\circ$, (SE +0,5) corresponding to UCVA of 0,1. After the combined procedure (LRI+compression sutures) was carried out the refraction became more emmetropic $+0,5dsph+0,5dcyl/15^\circ$ (SE 0,75) corresponding to UCVA of 0,6.

Conclusions: LRI turned to be effective procedure in our hands and led to significant improvement of the UCVA. A proper combination with compression sutures can further reduce the difference between 2 main corneal meridians.

Key words: Limbal relaxing incisions (LRI), astigmatism, cornea, nomogramm, post-cataract.

The pre-existing or iatrogenic induced astigmatism after cataract surgery is one of the leading cause of low uncorrected visual acuity (UCVA) and unhappy patients.(1) After the cataract procedure the patients are not eager to wear glasses for distance that's why the uncorrected visual acuity is the main criterion for the outcome of the operation. With gradual reduction of the corneal incisions (2) and the development of new technologies the residual astigmatism is not a main concern (3, 4). In occasions when the vision postoperatively is low and the reason for that is a toric refraction, the ophthalmology armoury needs a safe and effective tool for its correction.

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We present our patient, female, 67 year old, 3 months after cataract surgery of the right eye and the current ophthalmic status:

UCVA RE =0,1	TOD= 14 mmHg
UCVALE=PPLC, color perception(+)	TOS= 15 mmHg

RE – the rest of the ophthalmology status is unremarkable.

Postoperative refraction of the eye underwent operation was spherocylindrical:
 $+2,5 Dsph/-3,5 Dcyl/14^\circ$, (SE +0,75)
(Fig. 1)

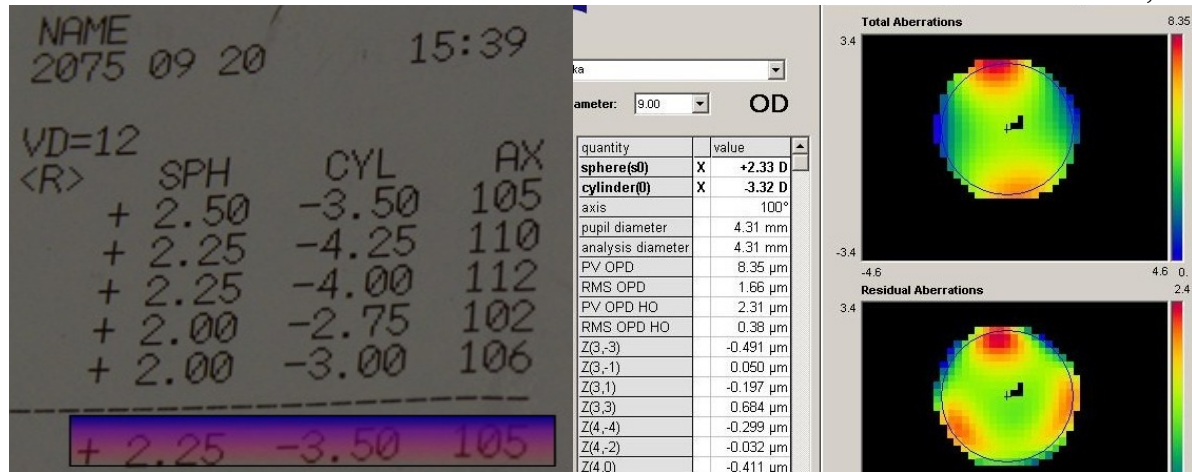


Fig. 1. Refractometry and wavefront analysis, explaining the low visual acuity.

RESULTS

After thorough review of the options the procedure we chose was limbal relaxing incisions (LRI). It was carried out with specific

instruments and markers (fig. 3). For the compressive sutures we used 9/0 nylon, instead of the classical 10/0 corneal sutures because of improved strength and durability of the former.



Fig. 3. Instruments for the procedure : Corneal marker (Duckworth&Kent), pigment marker (DeRoyal), fixed length blade -550µm (BD).

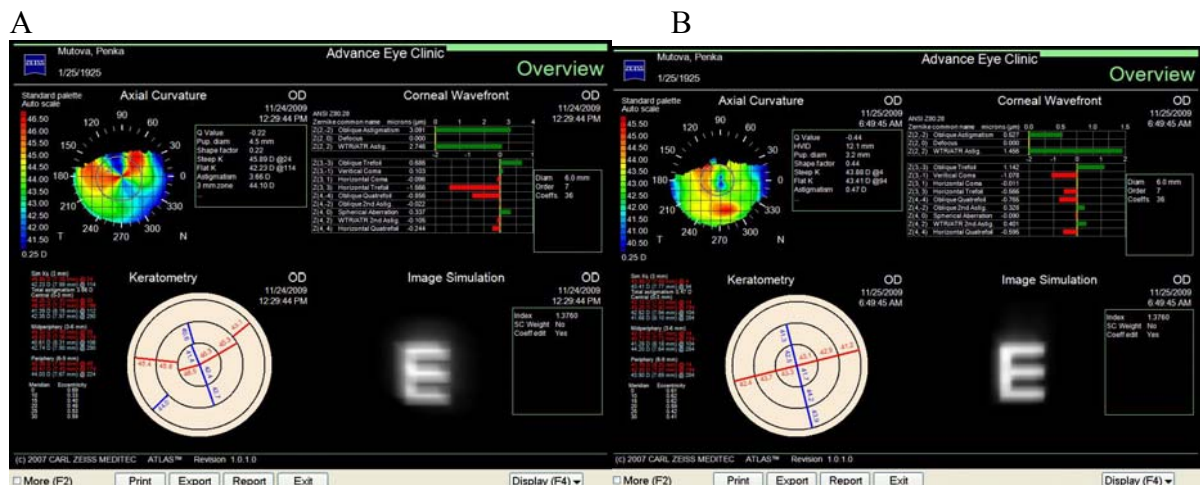


Fig. 4. Corneal topography of the right eye before the procedure (A) and afterwards (B). The reduction of the corneal astigmatism from 3,66 D to 0,47 D is quite convincing.

Other proof of success of the intervention - refractometry postoperatively is shown below.

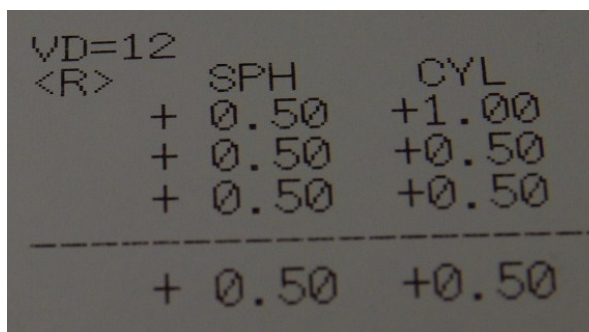


Fig. 5. Autorefractometry on the first day postop.

This change in the refractive features of the cornea after the combined approach (anterior curvature, mainly) - Limbal relaxing incisions + compressive sutures took effect over the refraction, which became more emmetropic (+0,5dsph+0,5dcyl/15° (SE 0,75)) and the UCVA reached 0,6. There is no change in SE (+0,75 preop and +0,75 postop) but we have much better optics with lower astigmatism afterwards and as a rule SE is not a good predictor of visual acuity in cases when dealing with high astigmatism.

DISCUSSION

Usage of peripheral arcuate astigmatic relaxing incisions (LRI) turned to be highly effective and reliable (5). They offer more predictable astigmatic correction compared to conventional astigmatic keratotomies (which utilize smaller optical zone) and results last longer than these achieved with modified phaco incision (6).

The widely used nomograms for LRI are NAPA (Nichamin Age & Pach-Adjusted) - Intralimbal arcuate astigmatic nomogram, created by Louis D. "Skip" Nichamin, M.D. and the one proposed by Donnenfeld (DONO).

A.

The "NAPA" Nomogram							
Nichamin Age & Pachymetry-Adjusted Intralimbal Arcuate Astigmatic Nomogram							
Louis D. "Skip" Nichamin, M.D. - The Laurel Eye Clinic, Brookville, PA							
WITH-THE-RULE (Steep Axis 45°-135°)							
PREOP CYLINDER (Diopters)	Paired Incisions in Degrees of Arc						
	20-30 yo	31-40 yo	41-50 yo	51-60 yo	61-70 yo	71-80 yo	
0.75	40	35	35	30	30		
1.00	45	40	40	35	35	30	
1.25	55	50	45	40	35	35	
1.50	60	55	50	45	40	40	
1.75	65	60	55	50	45	45	
2.00	70	65	60	55	50	45	
2.25	75	70	65	60	55	50	
2.50	80	75	70	65	60	55	
2.75	85	80	75	70	65	60	
3.00	90	90	85	80	70	65	
AGAINST-THE-RULE (Steep Axis 0-44°/136-180°)							
PREOP CYLINDER (Diopters)	Paired Incisions in Degrees of Arc						
	20-30 yo	31-40 yo	41-50 yo	51-60 yo	61-70 yo	71-80 yo	
0.75	45	40	40	35	35	30	
1.00	50	45	45	40	40	35	
1.25	55	55	50	45	40	35	
1.50	60	60	55	50	45	40	
1.75	65	65	60	55	50	45	
2.00	70	70	65	60	55	50	
2.25	75	75	70	65	60	55	
2.50	80	80	75	70	65	60	
2.75	85	85	80	75	70	65	
3.00	90	90	85	80	75	70	

B.

TABLE. THE DONNENFELD NOMOGRAM (DONO) FOR LRIs		
Preoperative Astigmatism	Number of Incisions ^a	Length of Incisions (Clock Hours) ^b
0.50 D	1	1.5
0.75 D	2	1
1.50 D	2	2
3.00 D ^c	2	3
^a All incisions are placed 0.5 mm from the limbus in the correct axis.		
^b Patients who have against-the-rule astigmatism or who are less than 45 years old may benefit from slightly longer incisions. Shorter incisions may be indicated for patients older than 65 years.		
^c I will use LRIs to correct up to 3.00 D of astigmatism if a laser correction is contraindicated for financial or medical reasons.		

Fig. 2. NAPA and Donnenfeld nomograms.

Taking in account that both nomograms correct up to 3 D, and we had to deal with 3,66 D (fig. 3) we decided to implement an additional

technique, that could make the flatter meridian steeper and to be reliable and reversible at the same time. The option was to borrow some

tricks from the perforative keratoplasty (PK) postoperative management – Compression sutures. According to Limberg MB et al. these modified corneal sutures represent a quick and easy method for reducing astigmatism with negligible or no complications. (7)

CONCLUSIONS

Limbal relaxing incisions (LRI) turned to be effective tool in our hands and resulted in considerable improvement of uncorrected visual acuity. Combination with compression sutures leads to additional reduction of the difference between the corneal meridians thus better vision and satisfied patients.

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