

Central corneal topographic changes after retinal detachment surgery

Alterações topográficas da área central da córnea após cirurgia de descolamento de retina

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SUMMARY

Purpose: To analyze early central corneal topographic changes induced by encircling band procedure to better understand its influence on corneal curvature and visual rehabilitation.

Methods: Twelve patients with regmatogenic peripheral retinal detachment, without macular involvement, were evaluated regarding best corrected visual acuity, biomicroscopy, tonometry, fundoscopy, axial length ultrasonography and corneal topography, both preoperatively and 4 weeks postoperatively. Paired *t* tests were used to compare pre and postop-surgical values.

Results: We found statistical significant central flattening in 11 out of 12 cases with mean flattening of 1.22 diopters ± 1.73 ($p < 0.05$). There was a minimal change in the axial length with no statistical significance.

Conclusion: Refractive changes after encircling procedure are frequent and play an important role in the final visual acuity, especially in patients with healthy or nonaffected macula. The nature of these changes apparently depends upon the type of procedure used.

Keywords: Retinal detachment surgery; Corneal topography; Cornea curvature; Astigmatism; Computerized videokeratography.

INTRODUCTION

The use of solid silicon implant as encircling band in conventional retinal detachment surgery is still being the procedure of choice to the majority of the retinal surgeons ^{1,2}. Geometric and refractive changes are very well described in the literature ³⁻⁹ but the impact of surgically-induced changes in the corneal topography has not been systematically evaluated and little attention has been given to the relationship between retinal detachment surgery and corneal topographic changes. This is very important when the visual prognosis is good and macular area is not affected ¹⁰.

We prospectively analyzed a group of patients submitted to the encircling band retinal surgery, using computerized videokeratoscopy to access their early central corneal topographic changes and influence in the corneal curvature and visual acuity rehabilitation.

MATERIAL AND METHODS

We evaluated preoperatively and 4 weeks postoperatively 12 patients

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with regmatogenic peripheral retinal detachment, without any other previous surgery, regarding the following aspects:

- Best corrected Snellen visual acuity (BCVA).
- Biomicroscopy at slit lamp.
- Tonometry with Goldman applanation tonometer and Tonopen.
- Fundoscopy.
- Axial length by ultrasonography.
- Corneal topography with EyeSys® 3.03 (EyeSys Technologies, Houston, Texas), which generates a color-coded topographic map of the cornea in normalized scale, absolute and other scales. To study the central corneal curvature pre and postoperatively, we determined the topographic circle of 7.0 mm as the external limit of this area. Three topographies were taken from each affected eye and data from the best quality image were stored. The mean of all measurable points (in mm) was obtained and the surgically induced change in power was calculated by subtracting the preoperative curvature from the postoperative curvature after one month based on the numerical and tangential scale.

All the patients have been submitted to 360° scleral buckle 12 to 14 mm from the limbus with a 2.0 mm hard-silicon band sutured with 4-0 Dacron. One of them (patient 4) had associated vitrectomy plus silicone oil injection.

We measured the Snellen visual acuity, tonometry, axial length and corneal topography preoperatively and four weeks after the surgery. Paired *t* tests were used to compare pre and post-surgical values.

RESULTS

This study included 12 patients with rhegmatogenous peripheral retinal detachment (7 males = 58.3%; 5 females = 41.6%; mean age = 61.9; range = 33 to 70).

Table 1 shows the central corneal topography and BCVA preoperatively and 4 weeks after surgery of each patient. There were statistical significant central flattening in 11 of 12

cases, mean $1.22 \text{ D} \pm 1.73$ ($p < 0.05$). Patient 4 presented a steep central cornea and high intraocular pressure after the procedure. This patient had had a multiple procedure with scleral buckle, posterior vitrectomy and silicon oil injection.

Table 2 displays the preoperative and 4 weeks follow-up tonometry and axial length. Except for patient 4, no significant intraocular pressure change was found. There was minimal change in the axial length with no statistical significance.

DISCUSSION

The literature describes refractive and anatomic changes after the encircling procedure, as anterior chamber narrowing¹¹, scleral rigidity decrease³, axial length and lens thickness increase⁵. Fiore and Newton³ reported that conventional keratometry was not enough reliable to define the induced astigmatism. Some authors found astigmatism after surgery^{12, 13}, others not¹⁴. In our study, computerized corneal topography demonstrated to be an efficient tool in detecting early corneal changes, including the first week after the surgery besides all the inflammatory status of the eye. Muller-Albach et al¹⁵ analyzed the influence of scleral buckling and encircling elements on corneal topography, surgical induced astigmatism and axial length in 19 patients, demonstrating computerized corneal topography as an effective tool to detect slight surgical changes.

In our study, four weeks after the surgery, central flattening was the most important finding. Just one patient presented a steep central cornea. This patient had had intraocular silicone oil injection and presented high IOP in the early post-operative. Based on the corneal topography, we believe that induced early corneal topographic changes associated to anatomical and geometrical alterations could be responsible for low visual acuity in the early postoperative period, especially in patients with no macular involvement and good visual prognosis. Such induced change may decrease gradually over the time. However, induced topographic changes could persist for up to 6 months after the buckle¹⁶.

Table 1. Central corneal curvature and visual acuity preoperatively and 4 weeks after encircling band to treat retinal detachment.

Patient	Preoperative	4 Weeks Postop	Induced change in mm	BCVA Preop	BCVA Postop
1	42.33	41.33	-1.03	20/200	20/80
2	43.42	42.42	-1.00	CF 3 meters	20/100
3	43.58	39.36	-3.62	20/100	CF 6 meters
4	43.19	46.99	3.80	20/200	CF 6 meters
5	44.91	43.71	-1.20	20/80	20/80
6	41.54	40.11	-1.43	20/100	20/80
7	42.43	41.23	-1.20	MM	20/200
8	44.45	43.00	-1.45	20/200	20/100
9	43.55	41.76	-1.79	20/100	20/60
10	45.56	43.78	-1.78	20/200	20/800
11	45.32	43.00	-2.32	20/70	20/100
12	43.65	42.00	-1.65	20/200	20/80
Mean	43.66 ± 1.22	42.39 ± 1.97	-1.2225 ± 1.73 ($p < 0.5\%$)		

Table 2. Tonometric findings and axial length in 12 patients submitted to scleral buckling (preoperatively and 4 weeks postoperatively)

Patient	Preoperative IOP (mmHg)	4 weeks postop IOP (mmHg)	Preoperative axial length (mm)	4 month postop axial length
1	14	15	23.40	23.39
2	17	16	22.61	22.60
3	14	16	22.60	22.71
4	18	35	24.41	24.60
5	17	15	25.12	25.10
6	14	14	24.41	24.43
7	16	14	23.30	23.32
8	15	18	24.70	24.70
9	15	14	24.30	24.34
10	14	17	23.09	23.00
11	14	16	23.90	24.00
12	16	17	24.09	24.12
Mean	15.33 ± 1.43	17.25 ± 5.7	23.82 ± 0.82	23,25±0,83

Hayashi et al¹⁶ described a marked flattening of the middle to peripheral cornea, which was accompanied by a localized steepening of the central cornea, one month after encircling procedure in 17 patients. These changes altered over time and irregular flattening was left at 6 months after surgery.

Procedures without buckling for retinal detachment such as pneumatic retinopexy have been said not to influence corneal curvature and should be an option to treat patients with peripheral retinal detachment and preserved macula, allowing better and earlier visual rehabilitation. But if scleral buckling is the procedure of choice, careful attention to suture tension and encircling band location has to be paid, and the patient must be informed about the slow visual rehabilitation due to corneal topographic changes, even though the retina is attached.

RESUMO

Objetivo: Analisar alterações corneais precoces induzidas por cirurgia de cerclagem, para melhor entender sua influência sobre a curvatura corneal e a reabilitação visual. **Método:** Doze pacientes com descolamento de retina regmatogênico periférico sem envolvimento macular foram avaliados quanto à acuidade visual melhor corrigida, biomicroscopia, tonometria, fundoscopia, comprimento axial por ultrassonografia e topografia de córnea, tanto no período pré-operatório quanto 4 semanas no período pós-operatório. Testes *t* pareados foram usados para comparar valores pré e pós-operatórios.

Resultado: Encontramos aplanamento central significante estatisticamente em 11 dos 12 pacientes com média de 1,22 Dioptrias ±1,73 (*p* < 0,05). Houve mínima alteração no comprimento axial, sem significância estatística.

Conclusão: Alterações refrativas após procedimento de cerclagem são freqüentes e desempenham importante papel na acuidade visual final, especialmente em pacientes que não apresentam comprometimento macular. A natureza

destas alterações dependem aparentemente do tipo de procedimento feito.

Palavras-chave: Descolamento de retina; Topografia de córnea; Curvatura corneal; Astigmatismo; Videokeratografia computadorizada.

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