

SOME CONSIDERATIONS ON KERATOMILEUSIS AND KERATOPHAKIA FUNTIONAL EXPLORATION AND CALCULATION

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Introduction

The word Keratomileusis comes from the GREEK roots that means cornea and chiseling; therefore it is to say to carve the cornea, to chisel the cornea or to modelate the cornea. In Keratomileusis the modality is a process of auto-keratoplasty and in Keratophaquia the modality is a combination of auto-and homo keratoplasty. The first one, Keratomileusis, is used in cases of myopia and Keratophaquia in cases of hyperopia and aphakia.

The surgical correction of refractive errors, through the modification of the corneal chape and its radius of curvature, requires special knowleges and skills, many of them quite unfamiliar to the ophthalmic surgeon and to correleated professions, in which Optometry is included.

Knowlege of optics, physiology, anatomy (ocular) mathematics, physics, manufacture of lenses, mechanics and quite many other fields, are required in this technique approach to restore human vision. The inventor and resercher of such surgical procedures and methods, have been developed by Dr. José I. Barraquer, M. D., world known ophthalmologist, originally from Spain and who ha been practicing in Colombia since 1953.

I have been taught by Dr. Barraquer and work in this field under his guindance since 1956, starting with research work in rabbits, and later on human beings.

At the present time and for a period of 15 years, I have been working on the funtional optometric exploration and calculation for the surgical operation.

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The functional exploration, previous to the operation, contains the following data:

1) Refraction at 12 mms. (V. D.), done in most of the cases under cycloplegic status, including visual acuity; the present average range of the surgical indication, is of 5.00 to 15.00 diopters in Keratomileusis and in Keratophaquia, although in the last one as high as, 18.00 diopters has been performed. Note: one of the most frequent indication for this surgical procedure is in anisometropic patients, who have not been able to be fitted with contact lenses.

2) Near vision acuity without correction in high miopes (over 6.00 diopters). This is a quite valuable information in order to know the degree of possible amblyopia, in order to pre-establish the conduct of a Pleoptic treatment post surgery. I have observed, clinically, that patients with surgical correction of refractive errors or contact lenses, are better patients in the restoring a acuity level and other primary components in the pattern of binocular vision.

3) Spherical Equivalent and its value at 12 mms. of vertex distance.

4) Aniseiconia. The determination and measurement of its degree is established.

5) Ophthalmometry or Keratometry. This is measured at the apical zone of the cornea with instruments calibrated with an index of refraction of 1.3375; also a great emphasis is given in the last years to the corneal Topography, central, paracentral and peripheral.

6) Corneal diameter. It is measured in the horizontal and as well as on the vertical one. There is usually an average difference of 0.5 mms. between the two according the kind of astigmatism (with the rule, against or oblique); in high astigmatic conditions of any kind, the difference between the diameters of the cornea increases proportionally in accordance with the amount of the same and the direction of its axis. In high astigmatic cases, average of 3.50 diopters, the indication of the operation has some limitations and reservations.

Fixation. This is determined by direct ophthalmoscopy, following the principles used by Cüppers and Bangerter.

Transparency of ocular mediums. It is important to note on the cornea the presence of any alteration or opacities. In general deep Leucomas are

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contraindication for the operation; the corneal control is made under slit lamp. Other ocular mediums are examined very carefully.

7) Pacometry The central thickness of the cornea is very important, specially in high dioptric ophthalmometries not associated directly with keratoconus problems, where also, the surgical procedure has particular limitation on its indications.

8) The length of the anterior posterior axis of the ocular globe, is measured in a routine manner in all cases, but it has special value when the refractive power of the eye can not be determined by objective or subjective means, like in patients with full opaque lens or other ocular medium. The system used is the Ultra-Sonic, method of Gernet.

9) Ocular tension this is determined usually by means of the Makay-Marg Tonometer in my practice; other Tonometers are also used.

10) Corneal sensitivity. This is taken either apical or topographic by means of Franceschetty and Cochet-Bonnet instruments. This is quite important in the pre-operative and post-operative status, in order to observe the changes in the re-inervation of the cornea sensitivity.

11) The radius of sclera has been at the present time standardized in a value of 12.50 mms.; although an Esc'lerometer was designed and constructed by Dr. Barraquer and used as a routine for some years.

Based on the detailed exploration before mentioned, the procedure for calculations has been quite a lot simplified, as follows:

1) Dioptric optical correction need on anterior surface of the cornea, for correction of the refractive error (Flat cornea for myopia and steep cornea for hyperopia and aphakia).

2) Conversion of the ophthalmometric reading in millimeters from instrument calibrated with an index of 1.3375, into an index of 1.376 (the cornea's tissue one). Special tables have been elaborated to facilitate this operation, covering a range from 15.00 to 80.00 dioptics.

3) Dioptric conversion into millimeters of the final corneal radius needed, under, an index of refraction of 1.376, to compensate for the determined refractive error, to be corrected.

Note: An special procedure is done on the regulation of the lathe by a technician previous the surgical operation.

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A recent Clinical Report of Refractive Keratoplasty in 67 cases, made by David Tucker, M. D. (fellowship from Bascom Palmer Eye Institute, University of Miami, School of Medicine, Miami, Florida) and Dr. José I. Barraquer, President of the "Instituto Barraquer de America" have summarized the following:

"The postoperative clinical follow-up of 67 cases of refractive surgery are presented, 47 following keratomileusis for myopia and 20 following keratophakia for hypermetropia. The correction of the ametropias by these surgical procedures was successful in the majority of patients, and the complications following surgery were minimal".

One very important conclusion describe on this paper is that the average final refractive power obtained after surgery, on basis of the Spherical Equivalent, only differed in 1.75 diopters from the stimated one previously calculated.

I personally like to recomend to the proffesionals interested in this field, to obtain a reprint of Annals of Ophthalmology, Volume 5, number 3, March 1973, by the above mentioned authors, titled "REFRACTIVE KERATOPLASTY: Clinical Results in 67 cases". Also has a great interest the paper titled "QUERATOMILEUSIS PARA LA CORRECCION DE LA MIOPIA" by José I. Barraquer, published the "Archivos de la Sociedad Americana de Oftalmología y Optometría", 1964-5-27.

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