Instituto Barraquer de América

Archivos de la S.A.O.O.

VOLUMEN 23 No. 3 1993

Editorial

Forum in XXV Anniversario Programa.
Palabras del Profesor José I. Barraquer
Palabras del Doctor Alvaro Rodíguez.
Conferencia del Recipiendario de la Medalla de Oro
"Ignacio Barraquer y Barraquer"
Relja Zivojnovic

Mi interpretación de la Ley de los Espesores
Gabriel Simon.

Corneal Aesthesiometry as an Indicator for Corneal Metabolism After Corneal Surgery
M. Kohlhass, J. Draeger, A. Böhm

Corneal lamellar Dissection in Ophtalmic Microsurgery José Barraquer's Merit to Ophthalmology.
J. Draeger, Markus Kohlhaas

Accelerated Orthokeratology
Richard J. Wlodyga, O.D., F.I.O.S.

Goal and Results of Reedepenening Technique in Radial Keratotomy.
U. Merlin, M. Camellin, F. Merlin, R. Sichirollo

Results of Superior Oblique Weakening in Intermitent Exotropia with a Pattern Anisotropia
By Guillermo Vélez

Monoscleral Fixation for Posterior Chamber Intraocular Lenses in Cases of Posterior Capsule Rupture.
Arturo Maldonado Bas; José Luis Bulacio, Roberto Carrizo.

Resultados de la Ablación de las Membranas Epirretinianas Maculares, Secundarias a la Readaptación Quirúrgica del desprendimiento de la Retina.
Francisco Mateus Marquez

Relaxing Incisions out the Graft for Postkeratoplasty Astigmatism
Merlin U., Merlin F.

Publicación de la Sociedad Americana de Oftalmología y Optometría

Archivos de la S.A.O.O.

Editorial

Con motivo de la celebración de las Bodas de Plata de la Clínica Barraquer, tuvo lugar en Bogotá, Colombia del 21 al 26 de Marzo de 1993, el Forum In XXV Anniversario.

A este Evento asistieron prominentes Oftalmólogos y Optómetras nacionales e internacionales, quienes además de presentar sus experiencias e investigaciones científicas, tuvieron la oportunidad de estrechar aún más los lazos de amistad y confraternidad existentes, durante los 5 días del encuentro.

En el solemne acto inaugural se contó con la asistencia del Señor Presidente de la República Dr. Cesar Gaviria Trujillo, su señora, el Sr, Ministro de Educación Dr. Juan Luis Londoño de La Cuesta y el cuerpo diplomático de los países correspondientes a los invitados especiales.

También fueron otorgadas las medallas de oro y plata Ignacio Barraquer y Barraquer a los Doctores Relja Zivojnovic y Gabriel Simón, por sus valiosos aportes en el campo de la cirugía vitreoretiniana e investigaciones clínico-quirúrgicas de la córnea, respectivamente.

Los discursos de apertura del Congreso estuvieron a cargo de los doctores Alvaro Rodríguez, en calidad de presidente del congreso y José Ignacio Barraquer como fundador y presidente del Instituto Barraquer de América.

Es nuestro propósito, en los siguientes números de la revista, el publicar las conferencias presentadas en el Forum, que contribuyeron a actualizar los conocimientos de todos los asistentes y le dieron el alto nivel científico que lo caracterizó.

En el presente ejemplar, estamos incluyendo; el programa, las conferencias magistrales de los recipiendarios de las medallas y los diferentes trabajos presentados por oftalmólogos y optómetras a lo largo del congreso.

Federico Serrano G.

ACTAS DEL FORUM IN XXV ANNIVERSARIO

1. EDITORIAL 181

2. PROGRAMA DEL FORUM IN XXV ANNIVERSARIO 185
Palabras del profesor José I. Barraquer 197
Palabras del Doctor Alvaro Rodríguez 199

3. ARTICULOS ORIGINALES .....
Conferencias Magistrales.

Conferencia del Recipiendario de la Medalla de Oro "Ignacio Barraquer y Barraquer"
Relja Zivojnovic *202*

Conferencia del Recipiendario de la Medalla de Plata "Ignacio Barraquer y Barraquer" mi Interpretación de la Ley de los Espesores
Gabriel Simón *219*

Presentaciones

Corneal Aesthesiometry as Indicator for Corneal Metabolism After Corneal Surgery.
M. Kohlhaas, J. Draeger, A. Böhm *230*

Corneal Lamellar dissection in ophthalmic microsurgery. José Barraquer meript to Ophthalmology.
J. Draeger, Markus Kohlhaas *234*

4. INVESTIGACIONES CLINICAS
Accelerated Orthokeratology.
Richard J. Wlodyga, O.D., F.I.O.S. *239*

5. INVESTIGACIONES QUIRURGICAS
Goal and results of redeepening technique in Radial Keratotomy.
U. Merlin, M. Camellin, F. Merlin, R. Sichirollo *242*

Results of Superior Oblique Weakening in Intermitent Exotropia With a Pattern Anisotropia
Guillermo Vélez *246*

ACTAS DEL FORUM IN XXV ANNIVERSARIO

Monoscleral Fixation for Posterior Chamber Intraocular Lenses in Cases of Posterior Capsule Rupture.
Arturo Maldonado Bas, José Luis Bulacio, Roberto Carrizo *249*

Resultados de la Ablación de las Membranas Epiretinianas Maculares, Secundarias a la Readaptación Quirúrgica del Desprendimiento de la Retina.
Francisco Mateus Marquez *254*

Relaxing Incisions Out the Graft for Postkeratoplasty Astisgmatism.
Merlin U., Merlin F. *259*

6. CONGRESOS Y ANUNCIOS *269*

FORUM IN XXV ANNIVERSARIO
PROGRAMA

SESION EXTRAORDINARIA CONJUNTA DEL INSTITUTO BARRAQUER DE AMERICA Y LA ESCUELA SUPERIOR DE OFTALMOLOGIA

Lunes 22 de Marzo **9:00 - 11:00 a.m.**

1. Saludo
   Prof. José I. Barraquer M.
   Presidente del Instituto
2. Ceremonia de Graduación de Oftalmólogos egresados de la Escuela Superior de Oftalmología.
   Doctores Cristina Cavelier C.
   y Zoilo Cuéllar S.
3. Nombramiento y entrega de diplomas de Miembros Honorarios y Correspondientes del Instituto Barraquer de América.
4. Conferencias de los Recipiendarios de las Medallas de Oro y Plata
   "Ignacio Barraquer y Barraquer"
   Prof. Relja Zivojnovic y
   Dr. Gabriel Simón.

SESION INAUGURAL FORUM IN XXV ANNIVERSARIO

Lunes 22 de Marzo **11:30 - 12:30 p.m.**

1. Saludo de los Fundadores de la Clínica Barraquer
   Prof. José I. Barraquer M.
   Dr. Hernando Henao R.
2. Palabras de los presidentes del Forum
   Dr. Alvaro Rodríguez-González
   Dr. Henry W. Hofstetter, O.D.
3. Lectura del Acta de Concesión de la Medalla Ignacio Barraquer y Barraquer por el secretario del Instituto Barraquer de América
   Sr. Ignacio Barraquer C.
4. Entrega de las Medallas por el Sr. Presidente de la República a los Doctores **Relja Zivojnovic y Gabriel Simon**
5. Palabras de Inauguración del Forum
   Exmo. Sr. Presidente
   Dr. César Gaviria Trujillo

SESIONES CIENTIFICAS OFTALMOLOGICAS

Lunes 22 de Marzo **Tarde**

Sesión 1 **Córnea**

Presidente : Dra. Carmen Barraquer C.
Moderador: Dr. Jorge Ramiro Barrero S.
Secretario : Dr. Zoilo Cuéllar S.

14:30 El injerto de limbo en la reconstrucción de la superficie corneal
Francisco Barraquer C. (Colombia)

14:40 Micromorfología de la córnea y del Segmento Anterior con un microscopio con barrido en hendidura
Wolfang Wiegand (Alemania)

14:50 Sensibilidad de la córnea como indicador de su metabolismo después de cirugía corneal
Markus Kohlhaas (Alemania)

15:00 Transplante limbo-conjuntival
Elena Barraquer C. (Italia)

15:10 Microscopia especular digitalizada-usos y resultados
Carlos Argento (Argentina)

15:20 El injerto de limbo como tratamiento temprano de quemaduras córnea - limbares
Francisco Barraquer C. (Colombia)

15:30 Comparación de resultados entre Q.P. y Laminar pre-Descemet
Arturo Maldonado-Bas (Argentina)

15:40 Queratoplastia combinada con cirugía de catarata y glaucoma
Joaquín Barraquer M. (España)

15:50 Transplante de córnea en queratocono: astigmatismo residual con sutura continua o puntos separados
Hugo Daniel Nano (Argentina)

16:00 Resultados de incisiones relajantes por fuera del injerto en astigmatismo post-queratoplastia
Umberto Merlín (Italia)

16:10 Nueva Técnica quirúrgica para la colocación de queratoprótesis
Hugo Daniel Nano (Argentina)

Lunes 22 de Marzo **Tarde**

Sesión **Catarata**

Presidente : Dr. Francisco Umaña
Moderador: Dr. Gabriel Velásquez
Secretario : Dra. Cristina Cavelier

16:40 Transición de extracapsular a Faco; los pasos a seguir
Enrique Ariza H. (México)

16:50 Anestesia Peribulbar vs. Anestesia Retrobulbar
José Bernardo Silva (Colombia)

17:00 Construcción de la pequeña incisión en cirugía extracapsular planeada y facoemulsificación
Antonio Méndez (México)

17:10 Evaluación de la seguridad de la Facoemulsificación utilizando el test de control de la hidratación
W.H. Beeknuis (Holanda)

17:20 Complicaciones en la cirugía de la facoemulsificación
Carlos Nicoli (Argentina)

17:30 Extracapsular manual en incisión pequeña y sin sutura.Técnica realizada con sistema de mantenimiento C.A.
Michael Blumenthal (Israel)

17:40 Cirugía de catarata y lentes intraoculares
Joaquín Barraquer M. (España)

17:50 Lentes Intraoculares de fijación escleral vs. fijación al iris
Eduardo Arenas A. (Colombia)

18:00 Incisión temporal en la cirugía de catarata para el control del astigmatismo
José Miguel Varas (Ecuador)

18:10 Tratamiento quirúrgico de cataratas en pediatría
George Baikoff (Francia)

18:20 Seudoafaquia en anhiridia traumática
Salomón Reinoso (Colombia)

18:30 La importancia de la presión pasiva durante la cirugía de catarata.
Michael Blumenthal (Israel)

Martes 23 de Marzo **Mañana**

Sesión 3 **Cirugía Refractiva**

Presidente: Dr. Arturo Maldonado - Bas
Moderador: Dr. Alberto Chacón
Secretario: Dr. Jairo Peñaranda

08:00 Queratomileusis Miópica. Estudio retrospectivo de 21 años de evolución
Carmen Barraquer C. (Colombia)

08:20 Disección laminar de la córnea en microcirugía oftálmica; el mérito oftalmológico de José Barraquer
Markus Kohlhass (Alemania)

08:30 Queratoplastia anular con gel; estudio preclínico FDA
Gabriel Simon (U.S.A.)

08:40 Queratomileusis Miópica por congelación, experiencia de 10 años y correlación con Q.M. In Situ
Alberto Osio (México)

08:50 Comparación de resultados entre QMH y QL
Angela Ma. Gutiérrez (Colombia)

09:00 Nuevas fronteras en cirugía refractiva. Deberíamos pensar más allá de la córnea?
Theodore Werblin (U.S.A.)

09:10 Topografía corneal en queratocono
Angel Hernández (Colombia)

09:20 Topografía y estabilidad corneal después de diferentes cirugías refractivas
Markus Kohlhass (Alemania)

09:30 El uso de la topografía y de un nuevo sistema de tinción para medir la profundidad en queratotomías
Miles Friedlander (U.S.A.)

09:40 Topografía en queratomileusis miópica
Angela Ma. Gutiérrez (Colombia)

10:00 CAFE

Martes 23 de Marzo **Mañana**

Sesión 4 **Cirugía Refractiva-Relajante**

Presidente : Miles Friedlander
Moderador: Gabriel Child
Secretario : José I. Barraquer G.

10:30 Conferencia Banco de ojos
Sra. Ana María de Cadena (Colombia)

10:40 Manejo del astigmatismo corneal 1993 láser quirúrgico
Richard Troutman (U.S.A.)

10:50 Tratamiento quirúrgico del astigmatismo mixto e hipermetrópico con incisiones curvas: factores a tener en cuenta
Alejandro Arciniegas (Colombia)

11:00 Queratotomía hexagonal arqueada
Antonio Méndez (México)

11:10 Sutura circular para hipermetropía y astigmatismo hipermetrópico compuesto
Juan Pablo Naranjo (Colombia)

11:20 Queratotomía arqueada para astigmatismo utilizando un nuevo queratotomo
Alain Abenhaim (Francia)

11:30 Incisiones arqueadas en el tratamiento del astigmatismo
Carlos Argento (Argentina)

11:40 Resultados a largo plazo de cirugía astigmática
Carlos Saldarriaga (Colombia)

11:50 La Técnica Casebeer para queratotomía radial
Theodore Werblin (U.S.A.)

12:00 Q.R. Nuevo tipo de instrumento para evitar la perforación corneal
Jorge Vasco P. (Colombia)

12:10 Tratamiento quirúrgico del astigmatismo compuesto mediante Q.R. doble paralela.
Alejandro Arciniegas (Colombia)

12:20 Causas y efectos de las reprofundizaciones en Q.R.
Umberto Merlín (Italia)

Martes 23 de Marzo **Tarde**

Sesión 5 **Cirugía Refractiva**

Presidente: Dr. Richard Troutman
Moderador: Dr. Angel Hernández
Secretario : Dr. José Francisco Rivera

14:30 Queratomileusis hipermetrópica sin sutura - resultados
Ricardo Guimaraes (Brasil)

14:40 Maniobra para fijar el disco sin sutura en Q.M. In Situ
Arturo Maldonado - Bas .
José L. Bulaccio (Argentina)

14:50 Resultados a largo plazo en cirugía lamelar para hipermetropía
Carlos Saldarriaga (Colombia)

15:00 QMM In Situ: evolución de la técnica quirúrgica y su efecto en los resultados
Eduardo Viteri (Ecuador)

15:10 Q.M. In Situ: nuestra experiencia
Carmen Barraquer C. (Colombia)

15:20 Queratomileusis Miópica sin sutura - resultados
Ricardo Guimaraes (Brasil)

15:30 Epi-neutra más queratomileusis In Situ
Arturo Maldonado - Bas (Argentina)

15:40 Estado actual de la QM In Situ: complicaciones
Alberto Osio (México)

15:50 Cómo mejorar la precisión de sus resultados de Q.M. In Situ con su equipo actual
Eduardo Viteri (Ecuador)

16:00 CAFE

Martes 23 de Marzo **Tarde**

Sesión 6 **Cirugía Refractiva**

Presidente : Dr. Alejandro Arciniegas
Moderador: Dr. Eduardo Viteri
Secretario : Dra. Ma. Laura Gómez

16:30 Láser-fototermoqueratoplastia; efectos quirúrgico-refractivos de un método sin contacto
Gabriel Simon (U.S.A.)

16:45 PKR con Excimer Láser; técnica, seguimiento y resultados después de dos años y medio
Michel Martinsky (Francia)

17:00 Queratomileusis estromal con láser excimer;

experiencia inicial
Fernando Pólit (Ecuador)

17:15 Histopatología comparativa del endotelio corneal post-excisiones con láser
Paolo Bosio (Italia)

17:30 Láser Excimer: estudio preliminar
Dominique Bremond (Francia)

17:45 Queratectomía fotorefractiva con láser Excimer. Resultados a un año
Fernando Pólit (Ecuador)

18:00 Ventajas de utilizar lentes de contacto desechables después de queratectomía fotorefractiva para miopía con Láser Excimer
Michel Martinsky (Francia)

18:10 Lentes intraoculares de cámara anterior en pacientes fáquicos con miopía elevada
George Baikoff (Francia)

18:20 Implantación de lentes de cámara anterior en altas miopías
Roberto Zaldivar (Argentina)

Miércoles 24 de Marzo **Mañana**

Sesión Quirúrgica **Transmitida Vía Micro-Ondas desde las Salas de Cirugía de la Clínica Barraquer al Centro de Convenciones Gonzalo Jiménez de Quesada.**

Miércoles 24 de Marzo **Tarde**

Curso No. 1 **Cirugía de Vítreo y Retina**

Director : Dr. Hernando Camacho A.

15:00 Introducción
Hernando Camacho A. (Colombia)

15:10 PVR Técnica quirúrgica
Relja Zivojnovic (Bélgica)

15:30 MESA REDONDA
Relja Zivojnovic (Bélgica), Klaus Heiman (U.S.A.), Marcos Avila (Brasil), Gustavo Alvira (Colombia)
Coordinador: Albert Vaiser (U.S.A.)

15:50 Desgarros Gigantes. Técnica quirúrgica
Hernando Camacho A. (Colombia)

16:05 MESA REDONDA
Relja Zivojnovic (Bélgica)
Peter Kroll (Alemania)
Alvaro Rodríguez (Colombia)
Coordinador: Gustavo Alvira (Colombia)

16:20 CAFE

16:50 Retinopatia diabética. Técnica quirúrgica
Relja Zivojnovic (Bélgica)

17:20 MESA REDONDA
Peter Kroll (Alemania)
Relja Zivojnovic (Bélgica)
Hugo Quiroz (México)

17:50 Presentación de videos de los participantes

18:30 DISCUSION

Jueves 25 de Marzo **Mañana**

Sesión 7 **Cataratas y Glaucoma**

Presidente : Dr. Francisco Barraquer C.
Moderador: Dr. Carlos Saldarriaga
Secretario : Dr. David Flicker

08:00 Cirugía extracapsular del cristalino con capsulorexis
Enrique Ariza H. (México)

08:10 Explantación y descentración de lentes intraoculares sus causas y soluciones
Carlos Nicoli (Argentina)

08:20 Experiencia con lentes intraoculares en niños 1988-1992
Juan Guillermo Ortega (Colombia)

08:30 Implante de lentes intraoculares "muela de cangrejo" en queratoplastia penetrante
W.H. Beekhuis (Holanda)

08:40 Costo real de la cirugía de catarata
Michael Blumenthal (Israel)

08:50 Trabeculectomía sin sutura escleral
Arturo Maldonado - Bas (Argentina)

09:00 Manejo del paciente con Glaucoma y catarata
Oscar Beaujon Ramírez (Venezuela)

09:10 Glaucoma y Catarata
Carlos Argento (Argentina)

09:20 Indicadores quirúrgicos de glaucoma crónico
Jorge Lynch (Argentina)

09:30 Insayo de una malla trabecular artificial. Técnica quirúrgica y resultado in vivo
Gabriel Simon (U.S.A.)

09:40 Estudio histopatológico de la aplicación de la mitomicina en la trabeculectomía Ab-externo en conejos
Eduardo Arenas A. (Colombia)

09:50 Experiencias con mitomicina
Ma. Eugenia Salazar (Colombia)

10:00 Viscoelástico en cirugía y el comportamiento del tono ocular
Jorge Lynch (Argentina)

10:10 Estado actual de la trabeculoplastia en el tratamiento del glaucuma primario de ángulo abierto.
Oscar Beaujon Ramírez (Venezuela)

10:20 Ciclofotocoagulación
Ma. Eugenia Salazar (Colombia)

10:30 Evaluación de la estabilidad de "umbral rápido" de HFA para determinar la estrategia del campo visual
Martha Luz Araujo (Colombia)

10:40 CAFE

Jueves 25 de Marzo **Mañana**

Sesión 8 **Estrabología**

Presidente : Dr. Guillermo Vélez
Moderador: Dr. Enrique Alemán
Secretario : Dr. Gustavo Arango

11:00 Desviaciones oculares secundarias a neuro-sífilis
Olga Winz (Colombia)

11:10 Toxina butulínica en el tratamiento del estabismo paralítico
Alicia Lozano (México)

11:20 Test de adaptación de prismas: indicaciones y técnicas
Suzanne Veronneau-Troutman (U.S.A.)

11:30 -Errores diagnósticos en neuro-oftalmología -Microcirugía del estrabismo, conservación de los pedículos vasculares en la cirugía de los rectos verticales
Zoilo Cuéllar - Montoya (Colombia)

11:40 **Emma Limón (México)**

11:50 Cirugía debilitante de los oblícuos superiores
Guillermo Vélez (Colombia)

12:00 Ayudas ópticas en pacientes con estrabismo y visión subnormal
Alicia Lozano (México)

12:10 Test de adaptación de prismas: implicaciones quirúrgicas
Suzzane Veronneau-Troutman (U.S.A.)

12:20 Desequilibrios oculomotores secundarios a traumas cráneo-faciales
Enrique Aleman (España)

12:30 Resonancia magnética en patología del globo ocular, de órbita y de la vía visual.
César Maldonado (Colombia)

Jueves 25 de Marzo **Tarde**

Sesión 9 **Oculoplástica**

Presidente : Dr. Virgilio Galvis
Moderador: Dr. Enrique Alemán
Secretaria : Dra. Luz Matilde Mora

14:30 Nuevas orientaciones en la cirugía de los canalículos lagrimales.
Dr. Juan Marube del Castillo (España)

14:40 Intubación lacrimal en infantes
Dominique Bremond (Francia)

14:50 Cisternoplastia en el tratamiento del ojo seco
Juan Marube del Castillo (España)

15:00 Dacrio endonasal con láser de CO2
Federico Serrano - Hernando Harker (Colombia)

15:20 Dacrio con Láser Holmiun Yag-Estudio experimental
Dominique Bremond (Francia)

15:30 Cisticercosis Orbitaria
Juanita Carvajal (Colombia)

15:40 Complicaciones de la motilidad palpebral secundarias a trauma orbitario
Enrique Alemán (España)

15:50 Miotomía marginal para la corrección de las retracciones palpebrales
Sergio Lessa (Brasil)

16:05 Reconstrucción del párpado superior con colgajo frontal preservando la función del músculo elevador del párpado
Ricardo Cáceda (Perú)

16:15 Reconstrucción del párpado y fondo de saco superior en cavidad anoftálmica reoperada
Andrés Laiseca R. (España)

Jueves 25 de Marzo **Tarde**

Sesión 10 **Oculoplástica**

Presidente : Dr. Dominique Bremond
Moderador: Dr. Jaime De La Hoz
Secretario : Dr. Juanita Carvajal

16:30 Autoinjertos dermograsos y sus distintas utilidades en la reconstrucción orbitaria
Andrés Laiseca (España)

16:50 La operación de la Fasanella y Servat para ptosis mínimas, moderadas y severas (1961-1993)
Alberto Manrique G. (Perú)

17:05 Carcinoma de anexos párpado superior Reconstrucción
José Ureta (Colombia)

17:20 Manejo del ectropión secundario a parálisis facial
Juanita Carvajal (Colombia)

17:35 Resección de grasa en la región orbitaria
Sergio Lessa (Brasil)

17:45 Denervación selectiva del nervio facial
Virgilio Galvis (Colombia)

18:00 Tratamiento quirúrgico del epicantus
Felipe Coiffman (Colombia)

18:15 Ultrasonografía en exoftalmos tiroideo
Alicia Montoya (Colombia)

18:30 Blefaroplastia con microscopio y sutura de nylon 9/0
Federico Serrano (Colombia)

Viernes 26 de Marzo **Mañana**

Sesión 11 **Vítreo y Retina**

Presidente : Dr. Hernando Camacho
Secretario : Dr. Francisco Rivera

08:00 Indicaciones del S.L.O.
Fernando Acosta (Colombia)

08:10 Observaciones sobre la neuro-retinitis subaguda bilateral
Rafael Cortés (Venezuela)

08:20 Tratamiento actual con láser de enfermedades vasculares
Boris Bajaire (Colombia)

08:30 Síndrome de manchas blancas
Dario Fuenmayor (Venezuela)

08:45 Tratamiento de melanomas con protones acelerados
Alfredo Muiños (España)

09:00 Retinitis pigmentosa. Fenestración de la vaina del nervio óptico
Jorge Vasco Posada (Colombia)

09:15 Manejo de la pupila durante la vitrectomía
Ricardo Infante (Colombia)

09:30 Cirugía combinada de retina, vítreo y segmento anterior
Antonio Piñero B. (España)

09:45 Manejo de la hemorragia expulsiva
Albert Vaiser (U.S.A.)

10:00 CAFE

Viernes 26 de Marzo **Mañana**

Sesión 12 **Vítreo y Retina**

Presidente : Dr. José Ignacio Cortés
Secretaria : Dr. Claudia Téllez

10:30 Desprendimiento de retina en pacientes operados con cirugía refractiva
Alvaro Rodríguez (Colombia)

10:45 Líquido perfluorocarbono en cirugía vitreoretiniana indicaciones, manejo y complicaciones
Peter Kroll (Alemania)

11:00 Perfluorocarbono en casos primarios de desprendimiento de retina
Marcos Avila (Brasil)

11:15 Estudio de heparina como antiproliferativo
Gustavo Alvira (Colombia)

11:30 Resultados de retinectomía 360 grados en casos desesperados de P.V.R.
Marcos Avila

11:45 Cirugía luego de fracaso de vitrectomía en D.R. con P.V.R.

Relja Zivojnovic (Bélgica)

12:00 DISCUSION

Viernes 26 de marzo **Tarde**

Sesión 13 **Vítreo y Retina**

Presidente : Dr. Humberto Moreno
Secretario : Dr. Santiago Camacho

14:30 Casos complicados de trauma ocular
Ricardo Dodds (Argentina)

14:45 Aceite de silicón en trauma ocular severo
Hernando Camacho (Colombia)

15:00 Tratamiento de las complicaciones tardías del trauma penetrante
Relja Zivojnovic (Bélgica)

15:15 Tratamiento quirúrgico de la endoftalmía
Albert Vaiser (U.S.A.)

15:30 Evolución y complicaciones de la retinopatía diabética después de la afaquia complicada
Wolfgang Wiegand (Alemania)

15:45 Influencia de la hialoides posterior en la retinopatía vítreo proliferativa
Peter Kroll (Alemania)

16:00 Manejo de la hialoides posterior en retinopatía diabética
Hugo Quiroz (México)

16:15 Tratamiento quirúrgico de retinopatía diabética proliferativa
Marcos Avila (Brasil)

16:30 CAFE

Viernes 26 de marzo **Tarde**

Sesión 14 **Vítreo y Retina**

Presidente : Dr. Alvaro Rodríguez - González
Secretario : Dra. Ma. Laura Gómez

17:00 Extracción de catarata, vitrectomía Vía Pars Plana y colocación de lente intraocular en retinopatía diabética proliferativa
Rafael Cortés (Venezuela)

17:15 Resultados de la ablación de las membranas epiretinianas secundarias a la readaptación quirúrgica en el D.R.
Francisco Mateus (España)

17:30 Tratamiento quirúrgico del Grado V de la retinopatía de la prematuridad.
Hugo Quiroz (México)

17:45 Vitrectomía y retinopatía de la prematuridad Grado V
Hernando Camacho (Colombia)

18:30 CLAUSURA
Dra. Carmen Barraquer C.

SESIONES CIENTIFICAS OPTOMETRICAS

Lunes 22 de Marzo **Tarde**

Sesión 1 **Lentes de Contacto**

Presidente : Richard Hill, O.D.
Moderador: Cristina Schnider, O.D.
Secretario : Hernando Henao, O.D.

14:30 Heliodoro y el cuarto siglo la ciencia visual
Henry W. Hofstetter (U.S.A.)

14:50 Manejo del ojo seco en pacientes con lentes de contacto
Cristina Schnider (U.S.A.)

15:00 Elección del lente de contacto en astigmatismo
José Ma. Plata (Colombia)

15:10 RGP: balance entre el oxígeno y otras necesidades
Richard Hill (U.S.A.)

15:25 Nuevos Sistemas y Materiales RGP
Ronald Herskowitz (U.S.A.)

15:35 Tratamiento de trastornos en la superficie ocular y del ojo seco con lentes esclerales de alta permeabilidad
Jan Kok (Holanda)

15:50 Un nuevo lente de contacto bifocal y trifocal RGP con éxito
Harold Davis (U.S.A.)

16:05 Introducción a la investigación de polímeros ópticos y método cualitativo para identificar los materiales de lentes de contacto rígidos

Paul Schuman (U.S.A.)

16:15 CAFE

Lunes 22 de Marzo · · Tarde

Sesión 2 Lentes de Contacto

Presidente : Ronald Herskowitz, O.D.
Moderador: Sergio García, O.D.
Secretario : Fabián Martínez, O.D.

17:10 Análisis clínico en lentes de contacto de diseños especiales
Edgar Kohn (Colombia)

17:25 Experiencias con lentes Saturno
Juan Delgado Espinosa (España)

17:40 Lentes de contacto desechables - química
Eduardo Camacho (Colombia)

17:55 Experiencias con lentes "Kerafaquic"
Sergio García (Colombia)

18:05 Resurgimiento del sistema piggy back
Jan Kok (Holanda)

18:20 Infiltrados corneales asociados con el uso de lentes de contacto blandos
Hernán Benavides (U.S.A.)

Martes 23 de marzo Tarde

Sesión 5 Ortóptica

Presidente : John Kennedy, O.D.
Moderador: Lyndon Jones, O.D.
Secretario : Hernando Henao, O.D.

14:30 Tratamiento ortóptico de la XT en el límite quirúrgico
Martha A. de Forero (Colombia)
Margarita Cortés (Colombia)

14:50 Ametropías en estrabismo
Martha Pachón (Colombia)

15:05 Desde Donders hasta Wesley la relación acomodación - convergencia en la corrección de la exotropía con lentes
John Kennedy (U.S.A.)

15:35 Valoración ortóptica del bebé
Luz Esperanza González (Colombia)

15:50 Conocemos la importancia de la terapia visual?
Elizabeth Galvis (Colombia)

16:05 Sectorización en ambliopía
Liliana Pulgarín (Colombia)

16:20 Proceso de acomodación - convergencia en pacientes geriátricos
Stella Jiménez (Colombia)

16:30 CAFE

Martes 23 de marzo Tarde

Sesión 6 Miscelánea

Presidente : Juan Delgado E., O.D.
Moderador: Rodger Kame, O.D.
Secretario : Hartmut Weber, O.D.

17:10 Filtros Oculares
Carlos Cuiñas (Colombia)

17:25 El acné rosáceo: un problema dermatológico u ocular
Hernán Benavides (U.S.A.)

17:35 Polimegatismo endotelial inducido por el lactato en conejos in vitro
Michael Doughty (U.S.A.)

17:50 Diferenciación entre la toxemia exógena y endógena por medio de los isópteras retinales, aplicación clínica-práctica
Newton Wesley (U.S.A.)

18:20 Curvas de disparidad de la fijación retiniana. Uso clínico
Fernando Hidalgo Santa Cruz (España)

Martes 23 de marzo Mañana

Sesión 3 Lentes de Contacto

Presidente : Henry W. Hofstetter, O.D.
Moderador: Otto Estrada, O.D.
Secretario : Carlos Téllez, O.D.

08:00 El efecto de los preservativos para lentes de contacto sobre la córnea

Graeme Wilson (U.S.A.)

08:15 Evaluación con el microscópico electrónico sobre la limpieza enzimática en los lentes Acuvue
Rodger T. Kame (U.S.A.)

08:25 Biocompatibilidad de los sistemas de cuidado de los RGP
Ronald Herskowitz (U.S.A.)

08:45 Limpieza manual convencional vs. limpieza mecánica
Melvin J. Remba (U.S.A.)

08:55 Entorno de ultravioleta en usuarios de lentes de contacto
B.J. Shanon (U.S.A.)

09:05 Balance entre la toxicidad ocular y la eficiencia de la desinfección con las soluciones para lentes de contacto
Gary Andrasko (U.S.A.)

09:20 Correpraxis contactológica con lentes de contacto protésicos
Erwin Voss (Argentina)

09:40 CAFE

Martes 23 de Marzo **Mañana**

Sesión 4 **Lentes de Contacto**

Presidente : Harold Davis, O.D.
Moderador: Melvin Remba, O.D.
Secretario : Carolina Uribe, O.D.

10:20 El uso de los lentes RGP para aumentar su práctica clínica
Cristina Schnider (U.S.A.)

10:30 Lentes de contacto y los présbitas
Brian Sneag (Sudáfrica)

10:40 Readptación de usuarios de lentes de contacto blandos, sintomáticos con lentes de contacto rígido. gas permeables asféricos
Gary Andrasko (U.S.A.)

10:55 Efecto en las características de adaptación de los lentes desechables del Grupo IV dependiendo del tiempo de neutralización del peróxido de hidrógeno
Lyndon Jones (Inglaterra)

11:05 Adaptación de lentes de contacto a través de la interacción de Soft-ware y topografía corneal computarizada
Sami El Hage (U.S:A.)

11:15 Unidades de stress hipóxico: una escala amigable para el profesional
Richard Hill (U.S.A.)

11:35 Evaluación cuantitativa del efecto de las lágrimas artificiales en el epitelio corneal
Michael Doughty (U.S.A.)

11:50 Evaluación del sistema lagrimal previo a la adaptación de lentes de contacto
Fernando Hidalgo Santa Cruz (España)

Miércoles 24 de Marzo **Mañana**

Sesión Quirúrgica **- Transmitida Vía Micro-Ondas desde las Salas de Cirugía de la Clínica Barraquer al Centro de Convenciones Gonzalo Jiménez de Quesada.**

Jueves 25 de Marzo **Mañana**

Sesión 7 **Visión subnormal**

Presidente : Erwin Voss, O.D.
Moderador: Edward Goodlow, O.D.
Secretario : Orlando Angulo, O.D.

08:00 Manejo sistematizado del análisis visual
Nelson Gutiérrez (Colombia)

08:30 Los cuidados en la práctica de la visión subnormal
Edward Goodlow (U.S.A.)

08:40 Visión subnormal
Roberto Valencia (Colombia)

09:00 Corrección subnormal del lente de contacto y gafas (2 casos)
Hartmut Weber (Colombia)

09:15 El Síndrome Shed

Forrest Shed (U.S.A.)

09:30 CAFE

Jueves 25 de Marzo **Mañana**

Sesión 8 **Visión subnormal**

Presidente : Brian Levy, O.D.
Moderador: Fernando Hidalgo, O.D.
Secretario : Fabián Martínez, O.D.

10:20 Sensibilidad de contraste en pacientes con QMM. Estudio prospectivo
Orlando Angulo (Colombia)

10:35 Visión subnormal
Edwin Voss (Argentina)

10:55 La visión subnormal en casos de retinitis pigmentaria
Carlos Mendoza (Colombia)
Jairo García (Colombia)

11:20 Optometría en Sudáfrica
Bryan Sneag (Sudáfrica)

11:35 Programa de salud visual - Banco Social - Despacho de la Primera Dama de la Nación
Jaime Avendaño (Colombia)

11:50 La optometría Colombiana en la Salud Pública
Julio Guzmán (Colombia)

Jueves 25 de Marzo **Tarde**

Sesión 9 **Ortoqueratología**

Presidente : Charles May, O.D.
Moderador: Howard Day, O.D.
Secretario : Carolina Uribe, O.D.

14:30 Ortoqueratología básica
Charles May (U.S.A.)

14.45 Prevención de la miopía utilizando terapia nocturna
Stuart Grant (U.S.A.)

15:00 Nueva ortoqueratología acelerada
Donald Harris (U.S.A.)

15:20 Ortoqueratología acelerada
Richard Wlodyga (U.S.A.)

15:30 Ortoqueratología en el Instituto Barraquer de América
Hernando Henao (Colombia)

15:40 Optica geométrica y clínica post KR Excimer y Orto-K
Jim Day (U.S.A.)

15:50 Una alternativa no invasiva a la queratotomía radial
Douglas Horner (U.S.A.)

16:10 Ortoqueratología usando el lente Star diseñado por X-Cell Contact, en Atlanta, GA, U.S.A.
Howard Day (U.S.A.)

16:20 Ortoqueratología después de Cirugía Refractiva
Carmen C. Villa (Colombia)

Jueves 25 de Marzo **Tarde**

Sesión 10 **Ortoqueratología**

Presidente : Donald Harris, O.D.
Moderador: Graeme Wilson, O.D.
Secretario : Hartmut Weber, O.D.

17:10 Comparación clínica entre tres retenedores diferentes
Jim Day (U.S.A.)

17:25 Constantes de tiempo para la recuperación del moldeo corneal después de usar lentes Orto-K
Douglas Horner (U.S.A.)

17:35 Relación entre la agudeza visual predecible después de ortoqueratología y la visión inicial con agujero estenopéico
Charles May (U.S.A.)

17:55 Terapia nocturna-eliminación del defecto refractivo durante el sueño
Stuart Grant (U.S.A.)

18:05 Topografía corneal computarizada y la ortoqueratología

Donald Harris (U.S.A.)

18:25 Ortoqueratología pediátrica
Tim Togikawa (U.S.A.)

Viernes 26 de Marzo **Mañana**

Sesión 11 **Lentes de Contacto**

Presidente: **Eduardo Camacho, O.D.**
Moderador: **Oswaldo Vargas, O.D.**
Secretario: **Olga Duarte, O.D.**

08:00 Arbitraje de los problemas con lentes de contacto bifocales.
Juan Carlos Aragón (U.S.A.)

08:15 Investigación actual sobre la propuesta corneal al uso de los lentes de contacto
Brian Levy (U.S.A.)

08:30 Cambios en segmento anterior con deprivación de oxígeno
Fernando Ballesteros (Colombia)

08:40 Renovación de las células epiteliales corneales
Graeme Wilson (U.S.A.)

08:50 "Acantamoeba" límite de la preocupación
Juan Carlos Aragón (U.S.A.)

09:00 El ojo seco y los lentes de contacto
Juanita Londoño (Perú)

09:20 Cambios refractivos inducidos por el aceite de silicón
Fabián Martínez (Colombia)

Viernes 26 de Marzo **Mañana**

Sesión 12 **Lentes de Contacto**

Presidente: **Newton Wesley, O.D., M.D.**
Moderador: **Stuart Grant, O.D.**
Secretario: **Lucía Henao, O.D.**

10:20 Relación entre el edema corneal y la topografía corneal
Timothy Comstock (U.S.A.)

10:35 Distorsión corneal debida al uso de lentes de contacto
Carlos Téllez (Colombia)

10:45 Lentes de contacto desechables para uso diario
Lyndon Jones (Inglaterra)

11:00 Lentes desechables para uso terapéutico
Brian Levy (U.S.A.)

11:15 Resultados del estudio sobre lentes de cambio frecuente
Desmond Fonn (U.S.A.)

11:35 Análisis de los depósitos en lentes con el microscopio confocal scanning laser
Rodger Kame (U.S.A.)

11:50 Alteraciones visuales y oculares en usuarios de pantalla de computador
Oswaldo Vargas (Colombia)

Viernes 26 de Marzo **Tarde**

Sesión 13 **Miscelánea**

Presidente: **Edgar Kohn, O.D.**
Moderador: **Michael Douhty, O.D.**
Secretario: **Orlando Angulo, O.D.**

14:30 Lentes de contacto rígidos cosméticos
Alexandra Garzón (Colombia)

14:40 Análisis de la topografía corneal tomada electrónicamente
Carolina Uribe (Colombia)
Claudia Jaramillo (Colombia)

14:50 Filtros oculares
Eduardo Camacho (Colombia)

15:15 Prótesis oculares - resultados estéticos
Margarita Rosa Caycedo (Colombia)

15:25 Condiciones visuales en pacientes tratados con psicofármacos
Alvaro Rey (Colombia)

15:35 Nuevas ideas para las prescripciones en queratocono
Robert Morrison (U.S.A.)

15:55 El diseño lenticular de lentes asféricas en queratocono
Otto Estrada (Colombia)

16:05 Vergencias ópticas en oftalmología y optometría
Gabriel Merchán (Colombia)

16:20 No siempre es ambliopía
Margarita Rosa Caycedo (Colombia)

Viernes 26 de Marzo **Tarde**

Sesión 14 **Lentes de contacto y cirugía refractiva**

Presidente: **Robert Morrison, O.D.**
Moderador: **Brian Sneag, O.D.**
Secretario: **Carlos Téllez, O.D.**

17:10 Podemos reemplazar la película lagrimal artificialmente?
Harold Davis (U.S.A.)

17:20 Lentes de contacto biasféricos posterior a cirugía refractiva
Sergio García (Colombia)

17:30 Cuál es la forma normal de la córnea?
Sami El Hage (U.S.A.)

17:40 Aplicación de la topografía corneal en la adaptación de lentes de contacto post queratotomía radial
Orlando Jaramillo (Colombia)

17:50 Errores refractivos astigmáticos bajos. Hay necesidad de corregirlos?
Timothy Comstock (U.S.A.)

18:00 Resultado estadístico de cirugía refractiva en el Hospital Militar Central
Jesús Avilán (Colombia)

18:15 Seguimiento optométrico de los pacientes con cirugía refractiva en el Instituto Barraquer
Lucía Henao (Colombia)

18:25 Videoqueratografía y deflectometría Maire en el diseño y adaptación de lentes de contacto
Tomas Pfortner (Argentina)

18:30 CLAUSURA

Palabras del prof. José I. Barraquer

Exmo. Sr. Presidente de la República, Dr. César Gaviria Trujillo;
Exmo. Sr. Ministro de Salud Pública Dr. Juan Luis Londoño de la Cuesta;
Exmo. Sr. Embajador de España. Don. José Luis Dicenta Ballester;
Sr. Dr. Don. Tomás Wilde;
Decano Facultad de Medicina, Universidad Javeriana;
Sres. Miembros de Honor y Correspondientes del Instituto;
Sra. Dra. Directora del Forum;
Dra. Carmen Barraquer;
Sres. de la Mesa Presidencial;
Señoras, Señores y Colegas;

Es muy honroso y emocionante para mí darles la más cordial bienvenida a este acto inaugural del Sexto Forum Internacional, realizado por nuestro Instituto y la Sociedad Americana de Oftalmología y Optometría.

Este Forum está dedicado a la celebración del vigésimoquinto aniversario de la inauguración del nuevo edificio de la Clínica Barraquer, edificio que aloja nuestras instituciones, asistenciales, científicas y docentes.

En este período de tiempo, nuestras actividades, se han podido desarrollar en una forma extraordinaria paralela al desarrollo conceptual y tecnológico de la medicina y cirugía actuales.

Solo en el campo quirúrgico, citaré el gran progreso en el desarrollo de los lentes intraoculares, en la corrección de la afaquia.

El de la Cirugía Refractiva, que tuvo su cuna aquí en Colombia, para la corrección o disminución de la Miopía e Hipermetropía.

Asi como el de la cirugía Vitreo-retiniana tan bien representada por los ganadores de las Medallas Ignacio Barraquer: El Prof. Robert Machemer, en 1988 y el Prof. Relja Zivojnovic, este año.

También en otros campos de la cirugía ocular los progresos han sido notables, especialmente en las cirugías del Glaucoma, Plástica y de las Vías Lagrimales.

Deseo hacer mención especial al progreso de los trasplantes corneales, con técnicas quirúrgicas desarrolladas en nuestra institución.

Así mismo, al progreso de los medios de preservación del tejido, que conjuntamente con la sabia y ejemplar legislación Colombiana han permitido beneficiar a un sinnúmero de invidentes gracias al apoyo de Medicina Legal y de su Director el Dr. Egon Lichtemberger y sus colaboradores, sin olvidar al banco nacional de córneas.

En este congreso, tendremos la ocasión de conocer los últimos adelantos de nuestra ciencia en bien de nuestros pacientes, pues ellos solos son la causa de nuestros estudios y desvelos.

A todos los asistentes, conferencistas y delegados, les agradezco efusivamente su asistencia y deseo que su estancia entre nosotros sea agradable y muy provechosa.

Bienvenidos al Forum in Aniversario.

Muchas gracias.

Palabras del Dr. Alvaro Rodríguez

- Señor Doctor César Gaviria Trujillo, Presidente de la República
- Señora Ana Milena Muñoz de Gaviria
- Señor Ministro de Salud Pública Juan Luis Londoño
- Señor Embajador de España José Luis Dicenta
- Señor Profesor José Ignacio Barraquer y Miembros de su distinguida familia Señores Directivos del Instituto Barraquer de América y organizadores del XXV Foro
- Señor Secretario de Salud del Distrito, Doctor Gustavo Malagón Londoño
- Señores Invitados especiales Profesor Zivojnovic y Hofstetter
- Señor Decano de Medicina Universidad Javeriana
- Señores Presidentes de las Sociedades de Oftalmología y Optometría
- Colegas Señoras y Señores

Las Juntas Directivas del Instituto Barraquer de América y de la Sociedad Americana de Oftalmología y Optometría me han designado como uno de los Presidentes de Honor del Forum In XXV (Vigésimoquinto) Aniversario, honrosa distinción que he aceptado con mucho placer y agradecimiento en su real significado, como el homenaje que a través de mi persona se desea hacer a la oftalmología colombiana sin distingos.

Hace ya varios lustros tuve la fortuna de conocer a la familia Barraquer, Don Ignacio y sus hijos los Doctores José Ignacio y Joaquín, en su casa matriz de Barcelona, cuando recién iniciaba mis estudios de oftalmología. Junto con otros colegas iberoamericanos, algunos hoy presentes, allí fuí orientado, no solo en el aprendizaje diario de labores clínicas y quirúrgicas sino el calor familiar de su casa de Laforja 88. Las enseñanzas recibidas ciertamente me abrieron nuevo panorama y ayudaron a trazar una directriz en mi vida profesional. Una amistad cordial me ha ligado desde entonces a la Familia Barraquer.

Allende los mares, esta nueva casa, el Instituto Barraquer de América cumple 25 años de una magnífica y fructífera labor en su nueva sede obra admirable digna de encomio y de felicitación para el profesor José Ignacio, sus hijos y colaboradores y aniversario que motiva el foro que hoy se inaugura. Para esta celebración, el Instituto presenta una enorme y excelente obra en varios campos: en el asistencial médico-quirúrgico, en el educativo y en el investigativo y su difusión. Han sido pioneros en el campo de la microcirugía y en el de la cirugía refractiva, de gran auge en la actualidad. A la par, han contribuído al desarrollo tecnológico e instrumental y en el campo de la bioingeniería. Sus discípulos establecidos por doquier expanden el prestigio de esta Alma Mater que ha ayudado a colocar a Colombia en el mapa mundial de la Oftalmología. Además, su influencia y la lucha por la competencia profesional obligó al conglomerado de especialistas del país a estudiar, a prepararse y superarse, uno de los factores que explica el prestigio y renombre nacional e internacional que ha adquirido la oftalmología colombiana.

Con el tiempo se ha avanzado local y regionalmente en actividades mancomunadas y de intercambio que se realizan entre el Instituto Barraquer y otras Instituciones y Asociaciones oftalmológicas del país, en beneficio

mutuo y de enorme proyección hacia la comunidad. Tres ejemplos son: uno, la creación de la Corporación Colombiana de Bancos de Ojos que junto a la legislación gubernamental existente y a la excelente colaboración del Instituto de Medicina Legal han permitido un progreso significativo en los transplantes de tejidos oculares. Otro, es el estudio del trauma ocular como factor de pérdida visual en el país y un tercero, la enseñanza profesional compartida.

Sabemos los esfuerzos que hace el alto Gobierno para resolver a diario y planear hacia el futuro la solución exitosa de las múltiples necesidades a que se enfrenta el país. Por ejemplo, en el campo de la salud, el Estado debe atender con prontitud graves problemas; entre otros, la mortalidad infantil, el paludismo y el Sida. Sin embargo, creemos que no se deben descuidar otros aspectos aparentemente menos importantes y a los que se les puede dar solución más rápida y eficiente con una inversión moderada; éste es el caso de la salud ocular en la cual nuestra Primera Dama Doña Ana Milena está vivamente interesada e involucrada. Motivar en este sentido al Gobierno de cada país, a nivel mundial y a través de Naciones Unidas, Unesco y otras entidades en el proyecto que desea estimular el Consejo Mundial de Oftalmología, en cuya Reunión participé hace un mes en Ciudad de México durante el Congreso Centenario de la Sociedad Mexicana de Oftalmología. Es preciso invitar a todos los gobiernos para que dediquen un porcentaje anual se su presupuesto a esta labor y a que se aprueben normas legales y tributarias que favorezcan la prevención de la Ceguera y la rehabilitación del ciego.

Otra solicitud es la de dar apoyo a las Organizaciones Oftalmológicas no Gubernamentales (NGO), tanto por parte de los gobiernos como del sector privado, pues ellas colaboran en la cobertura de la salud en los estratos bajos y en los cuidados que requieren los diversos niveles de atención médica-quirúrgica, especialmente secundaria y terciaria.

Para sustentar este problema, en la actualidad existen en Colombia trescientos cincuenta mil, total o parcialmente ciegos, no corregibles que constituyen una responsabilidad para el Estado, la Sociedad y los Oftalmólogos.

También, en el presente, el trauma, (en los diversos tipos de violencia), la diabetes, las cataratas, las enfermedades infecciosas, las lesiones por envejecimiento de los tejidos y las alteraciones de prematuros que logran sobrevivir, son desafíos que para un mejor futuro ya debemos enfrentar mancomunadamente en proyectos para el año 2.000, con soluciones asistenciales, educativas y tecnológicas. Debemos mejorar estadísticas actuales alarmantes y penosas.

Somos un país en vía de desarrollo pero nuestra medicina no puede ni debe ser subdesarrollada. Debemos llegar al siglo XXI cuidando adecuadamente la salud ocular de nuestros conciudadanos de cualquier nivel social y en cualquier lugar de nuestra geografía. Adicionalmente, el conjunto de medidas que se tomen redundará en reducir el descontento social de quienes se enfrenten a nuestras estructuras gubernamentales legítimamente constituídas.

Para finalizar, debemos felicitar y agradecer a los organizadores de este Foro, por su entereza y decisión de realizarlo en momentos difíciles y a veces violentos. También a los asistentes nacionales y del extranjero por su voluntad de ayuda para que Colombia no de detenga en sus actividades diarias ni en su proyección hacia un promisorio futuro.

Señor Presidente, Profesor José Ignacio Barraquer, señoras y señores, muchas gracias por su atención.

Conferencia del Recipiendario de la medalla de Oro "Ignacio Barraquer y Barraquer"

Prof. Relja Zivojnovic.

Profesor Jose Ignacio Barraquer and members of his family

Members of the Colombian and District Government

Honorary Presidents of the Congress

Special Guests, Dear Graduates

Members of the organizing committe and the Barraquer Institute

President of the Colombian Ophthalmological and Optometrical Societies

Ladies and Gentlemen

It is a great honour for me to be rewarded with the gold medal of Ignacio Barraquer y Barraquer for my contribution in the development of vitreo-retinal surgery.

Progress and sucess in very few human activities can be attributed to one individual only. Particulary in vitreo-retinal surgery this is not the case and therefore, on this occasion I want to mention those who have contributed to my success with their work and commitment. They are my colleagues and collaborators from the Eye Hospital Rotterdam, especially the staff of the operating theatre, instrument workshop and photography. My particular gratitude goes to my colleague Diane Mertens for cooperation and support in the long years of our work together. My appreciation is also directed to the small but faithful group of collaborators, who accompanied me and continued working with me when I moved from Rotterdam to Antwerp. Last but not least I wish to thank my wife Vesna for her steady support and acceptance of all difficulties and changes in our life dictated by my professional career.

Vitreoretinal surgery Dpt. of Ophthalmology A.Z. Middelheim

This medal carries the name of Ignacio Barraquer y Barraquer, the founder of the clinic and the Barraquer Institute.

He was a universal personality. Besides his other activities his particular interest in technique resulted in an enormous amout of techniques and instruments. He was a great teacher well known by his openness and generosity. But above all he probably was a happy and satisfied person. By his extraordinary career and achievements he justified expectations of his father, Jose Antonio Barraquer, the first professor of ophthalmology in Barcelona. Besides he handed over his work as inheritance to his descendants. The fourth Barraquer generation is treading now his fascinating path.

At the time of my residence in the Eye Hospital Rotterdam, in the early sixties, the name of Barraquer was the most frequently used name in our operating theatre. We were using Barraquer Colibri blepharostat and forceps and mosquito needleholder. Erysiphak was not replaced yet by the cryo-extractor, Alpha-chymotripsin was used routinely with cataract extraction. Virgin silk was the most suitable material for corneoscleral suture. And all that was related to the name of Barraquer. As a young specialist, having spent three previous years at general surgery in Yugoslavia and Germany, I had a special interest in surgery, and at that time the name of Barraquer was for me the symbol of progress and inventiveness in ophthalmic surgery.

Although, due to my dedication to the vitreo-retinal surgery, this first contact had not been

maintained, I was much interested to visit Barraquer's Institute during my first vivit to Bogota in 1986. I was deeply impressed, and everything I saw corresponded to my expectations. However, two matters sank deeply in my mind.

First, at the outpatient clinic, I saw separate waitingrooms for private and poor patients on the opposstie sides of the building. But in the middle were the examination rooms equipped with the most up-to-date devices in which the same staff members were working with both groups of patients.

Second, I saw a room equipped with microscopes in which residents were operating on cadaver eyes or animals supervised by staff members, preparing for surgery on patients after a sufficient number of such operations.

Surgical education of residents in such a responsible way is, to my knowledge, unknown in Europe, and if it does exist somewhere, then it is a great exception and not a rule.

Both above-mentioned matters may be used as proofs for humane, social and realistic approach in otherwise professional work at the highest leve.

To recount the development of my contribution to treatment of vitreo-retinal pathology, which is the suggested theme of my lecture, allow me to begin with the description of the situation in the Eye Hospital Rotterdam at the time of my residency. My start as a resident in Rotterdam coincided, by chance, with the retirement of Professor Flieringa, who was a surgeon "pur sang" with a distinct interest in anterior segment surgery and very little respect for the other, non-surgical disciplines. Eye Hospital Rotterdam was a private, non-profit institution with loose ties to the university. Owing to Professor Flieringa and a monopolist position in the region, it developed into a place with a huge number of patients and operations. Professor Flieringa's succesor, Professor Harold Henkes tried immediately to change the image of the hospital by stimulating and developing more theoretical disciplines such as electrophysiology, genetics and diagnostics of degenerative pathology of the fundus. Very soon in this new trend a new belief was established, that surgery is daily routine work, everybody's burden, which can and must be done by all of us, and those who want to prosper have to do more than that.

Following the new trend the best residents applied themselves to the research of rare and serious hereditary diseases, producing - with the help of electrophysiology, fundus photography and genetic research - marvellous theses. The Netherlands, as a highly civilised country, for centuries without destructive wars, and with its 500 years old civil records is indeed a country par excellence for genetic research. In my own country civil records could never survive for more that 50 years.

With my surgical background and my preference for surgery as well as my lack of affinity to the mentioned disciplines, I was in the above mentioned situation rather fustrated and lost. Regarding good opportunities for practical work I decided, though, after my residency to stay another year at the Clinic as a junior staff member before my return to Yugoslavia. My only recommendations for this function were reliability and commitment to work.

My new position was very bizarre and I was immediately in charge of thirty beds and as subspecialities did not exist at that time, I operated all pathology admitted to my ward without any system. Supervision by the few serior staff members was restricted, but it was always possible in case of doubt and hesitation to call one of the senior staff members, who despite the burden of their own work and lack of time were always ready to help. In this way I was confronted with many surgical problems carrying responsibility for them.

In that situation I was also expected to perform independently retinal detachment surgery, not having - as more of us at that time - any special training for it. Retinal detachment surgery was then on the list of priorities behind the mentioned new disciplines and behind anterior segment surgery, wich were on a high level. It was neither better or worse than in many leading hospitals in Europe. And that means it was bad. Encircling procedure and shortening of the sclera were performed as techniques, cryopexy was done under monocular indirect ophthalmoscope-bonoscope. There were

a lot of recurrent detachements and they were a nightmare for surgeons who tried in any possible way to avoid or postpone a new operation.

Patients with both eyes closed were positioned in bed for weeks. When the possibilities of positioning with or without a cushion were exhausted, it was time for bricks to be put under beds. Doctor Beekhuis has illustrated that situation with the following slides. (Fig. 1, Fig. 2).

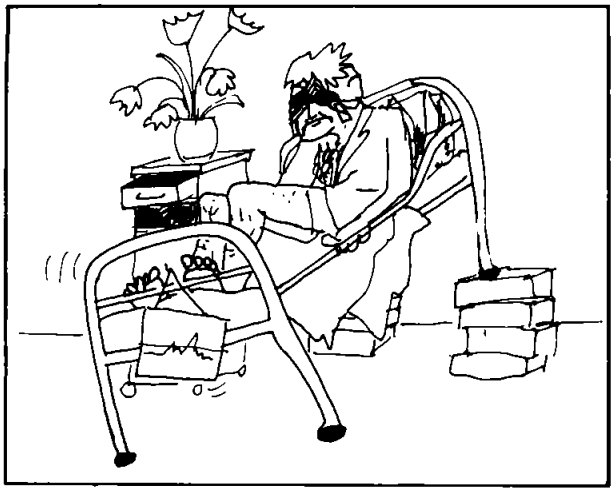


Fig. 1 Positioning in case of leakage of an inferior retinal tear

Fig. 2 Positioning in case of leakage of a superior retinal tear

Frequently after the last so-called successful operation - the retina attached, counting finger vision - the patient's mobility was restricted for months and he had to come for a check-up in tha wheelchair. And to increase this misery, he also had to wear Lindner stenopaelo glasses for 3-4 weeks, as it is illustrated in Doctor Beekhuls's cartoon (Fig. 3). This depressing situation obviously could not be satisfying, and I tried to change and improve it by reoperating patients earlier and introducing new techniques. In my attemps to improve the level of the surgery by introducing new techniques, changing policy of the treatment and by long and exhausting operations I had very stimulating support of the senior staff. And as nobody was happy with that surgery, after a short time I had the divided pleasure of operating most detachments and difficult cases in the hospital.

Fig. 3 Waiting for the first check-up after the successful operation

After two and a half years of hard work and mostly self education I returned to my native country. A few years spent in Yugoslavia, where

I worked as a general ophthalmologist with little opportunity to use my experience in posterior segment surgery, did not satisfy my professional ambitions, so that in 1972 I returned to Eye Hospital Rotterdam.

On my return I was enabled to continue my work on detachment surgery and after a certain time I was able to ascertain that the level of surgery was significantly improved.

Success rate rose, the number of re-operations declined, and what was important, patients got rid of the above-mentioned torture. At the same time I was able to assert that for a certain number of difficult cases our surgical possibilities could not offer any solution. Visiting famous centres for detachment surgery such as Bonn, Essen and Lyon, learning always and everywhere, I saw that they could not pass a certain limit-line in treatment of retinal detachment. That limit-line were the difficult cases of retinal detachment with the immobile retina and vitreous organization. During a (lengthy) sabbatical in England I visited John Scott in Cambridge. At that time - I am talking about the middle seventies - John was the only surgeon in Europe who seriously and persistingly treated the inoperable cases of retinal detachment. Watching his surgery I was extremely impressed not only by his insight in this difficult pathology and by his surgical skills, but particularly by his devotion and commitment to his work.

Al this moment I would like to make a digression and to say a few words about the development of vitreo-retinal surgery.

Retinal detachment surgery, based on Gonin's principles of closing retinal hole made a significant progress in the fifties owing to Custodis' method of episcleral buckle and Arruga's equatorial cerclage. But although the results were improved significantly, it was obvious that even with these new methods it was not possible to cure a certain number of difficult cases. The reason was a process which led to shrinking of the vitreous and fibrosis and immobilization of the retina. As a result of the process the relations between the retina and the vitreous were visibly disturbed on a large scale, so that an operation from outside could have no effect (Fig. 4.). Introduction of the intravitreal air

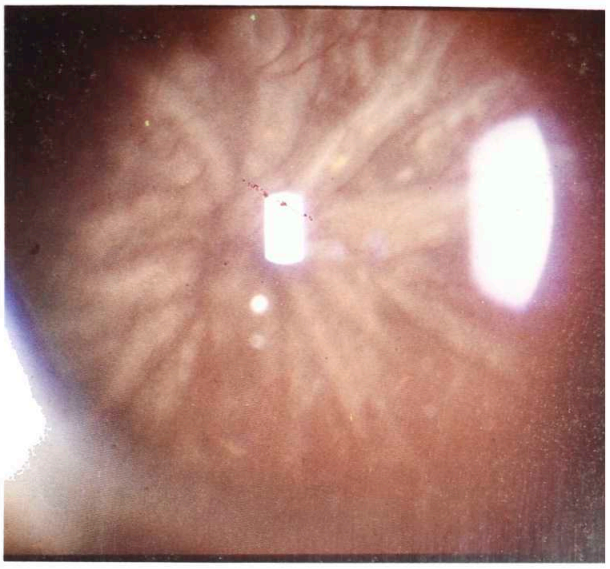


Fig. 4 Total retinal detachment with closed funnel

injection by Rosengreen was a logical attempt to approach the problem from another side, but in itself it was insufficient in treatment of difficult cases. The break-through came from the side of Paul Cibis, who introduced silicone oil into vitreo-retinal surgery in the early sixties [1, 2]. Cibis tried to use hydraulic power of silicone oil as an instrument (Fig. 5, 6). Expansion of silicone oil, which due to the surface tension remained in the form of a bubble, was observed in the indirect picture by binocular ophthalmoscope. In this way he managed to separate fibrotic membranes from the retina and to press the retina against the pigment epithelium. To make place for the injected silicone he evacuated subretinal and intravitreal fluid. After re-attachment of the retina he left the silicone in the eye as a permanent tamponade. In this technique he operated several patients (Fig 7), inoperable according to the norms of that time, and achieved convincing results. His pioneering work was unfortunately stopped by his early death in 1965 and his method survived only owing to John Scott, who took it up in the early seventies and improved further[3,4]. He introduced the vitreous scissors and flute needle for fluid evacuation as active manual surgery and much improved the technique and results. This technique in his hands was the only hope for many difficult cases for a number of years.

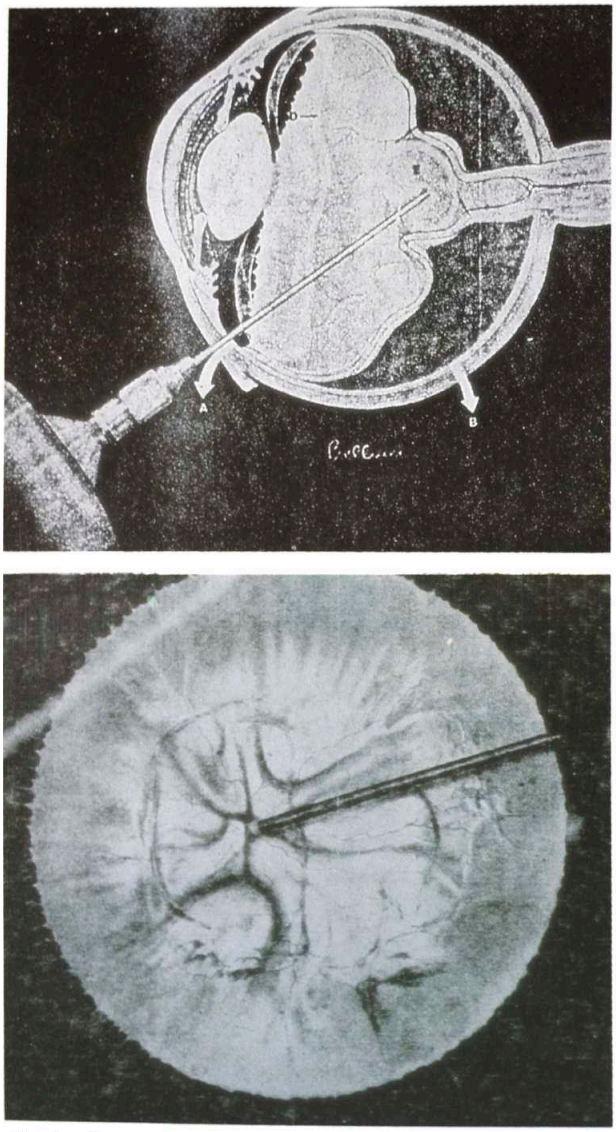


Fig. 5 y 6. Injection of silicone oil following Cibis' technique

Parallel to the described development, at nearly the same time, another approach to the solution of the problem was taking shape, namely removal of the vitreous. For a long time the vitreous had been the greatest enemy of ophthalmic surgeons; the prolaps of the vitreous in cataract surgery often resulted in fatal complications. The vitreous was a great tabu and every surgeon tried to avoid getting involved with it. There were rare such inventive surgeons as Ignacio Barraquer, who

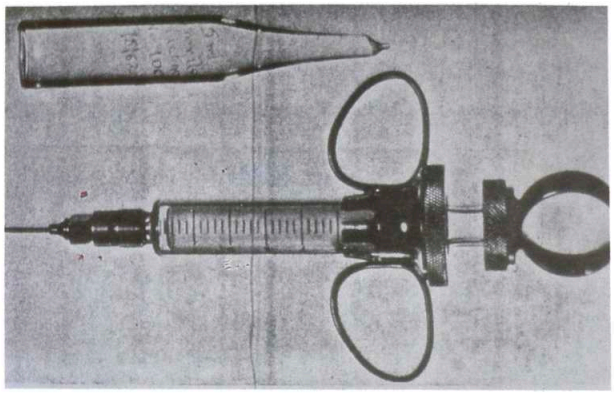


Fig. 7 Cibis syringe for injection of silicone oil

already in 1946 advocated a more active approach to the treatment of vitreous prolaps, advising excision, reposition and air injection in the anterior chamber.

The break-through was made by David Kasner, who was the first surgeon who intentionally removed the diseased vitreous. He performed this as a routine in a few cases and proved, that it can be tolerated by the eye[5]. His so-called "open-sky vitrectomy" method, although, basically revolutionary, had a lot of shortcomings; it was necessary to remove the lens, anatomic structures did not have normal relastions, the instruments were not adequate etcetera. All this inspired Robert Machemer, who was working close to Kasner at that time, to solve these problems, introducing, in 1971, new and spectacular technique, pars plana vitrectomy, which will mark a new era in ophthalmic surgery[6]. The main principles of the new technique were vitreous removal by a cutting instrument, which is introduced into the eye through a small scleral incision. The described procedure is performed with the controlled eye pressure and observed through upright image of an operating microscope. The action is directed straight to the deseased tissue and there is no need to remove a clear lens. Main indications for the new technique were haemorrhages and vitreous opacities of various etiology.

In the middle-seventies it became clear that the expectations related to pars plana vitrectomy, concerning the treatment of difficult cases of re-

tinal detachment, were not fulfilled, so that gradually the interest arose in the Cibis-Scott technique and the use of sillicone oil. It was also a logical step to combine these two methods. It was done in Paris in 1976 by Jean Haut, who used silicone oil mainly as tamponade after vitrectomy.

I introduced silicone oil in my surgery in the beginning of 1978 after I was convinced of effectiveness of the technique due to several visits to John Scott. At the same time we started with vitrectomies at the Eye Hospital Rotterdam. I operated a few hunderd cases using Scott's technique with the binocular ophthalmoscope and without vitrectomy (Fig. 8 and 9). I did pars plana vitrectomy only in cases with opaque media. The results were not bad, at least for some time after the operation (Fig. 10 and 11). After a certain time I came to the conclusion that the advantages of bimanual pars plana vitrectomy with the possibility of removal of the diseased vitreous and fibrotic tissue are superior to Scott's method, so that I abandoned it completely.

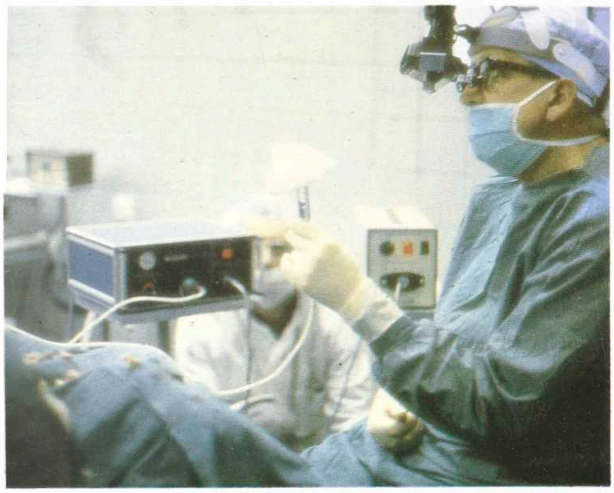


Fig. 8 Preparation of silicone injection

Fig. 9 Operation under the binocular ophthalmoscope

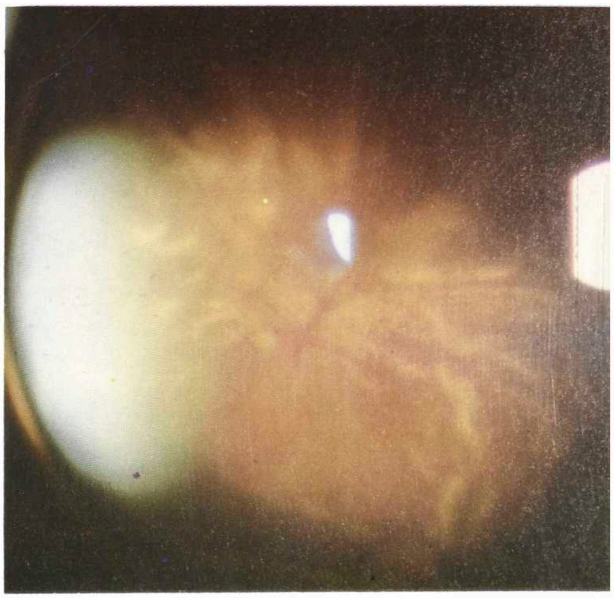


Fig. 10 A case of retinal detachment with PVR

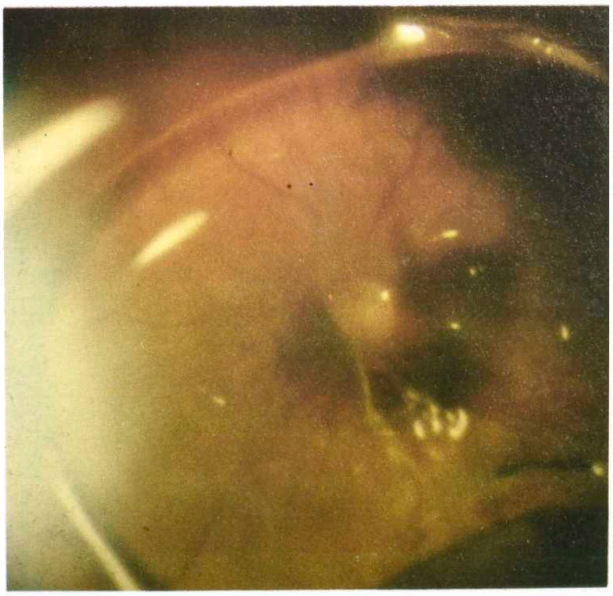


Fig. 11 The same case after the surgery

Operating more and more difficult cases proved that in the most difficult cases removal of vitreous and all proliferative tissues as well as cleaning of the retina were not sufficient to get the retina attached. In these cases the retina was either contracted or incarcerated, and sometimes detached due to existence of subretinal strands and proliferations. It became obvious to me that without surgical treatment of the retina itself such cases could not be solved (Fig. 12 and 13). At that time, in spite of an almost 10-year experience with vitrectomies, the retina was still a surgical tabu, and a fear existed with surgeons to damage the retina during operation. This rule was trespassed only sporadically and in cases of the greatest neccessity[7]. Arrived at that decision after having to give up on the sole remaining eye of a few young patients following exhausting operations and application of all possible contemporary techniques, it was easler to decide because of certainty of permanent tamponade with silicone oil at the end of the operation, which greatly guaranteed the postoperative anatomic position. Owing to a large number of difficult cases, very soon it was possible to introduce retina surgery into our daily surgical work.

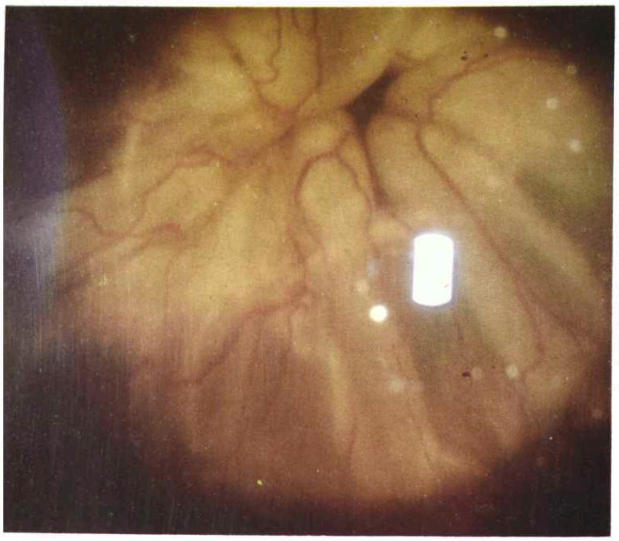


Fig. 12 A case of retinal detachment with subretinal proliferation before the silicone oil injection

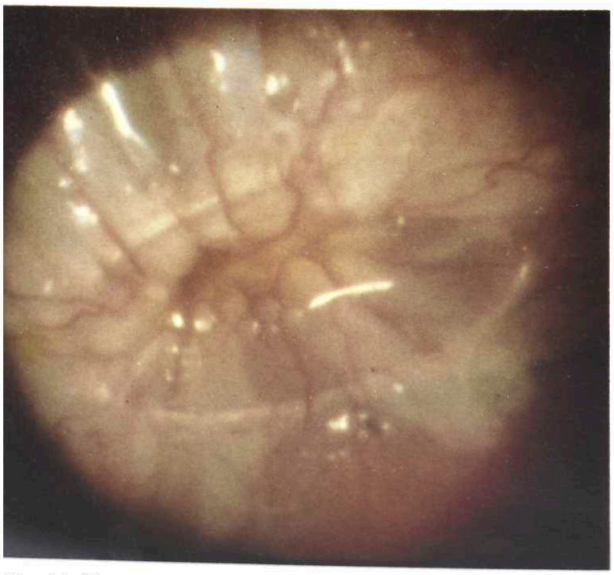
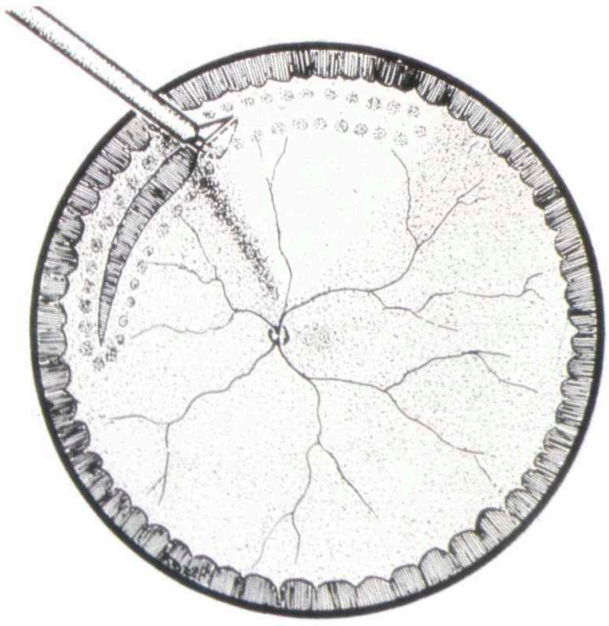


Fig. 13 The same case after the failed operation

Already in 1980 I started performing retinotomies with extraction of subretinal strands, retinectomies of the peripheral retina with the contracted retina in giant tears and circumcision of big posterior chorioretinal scars (Fig. 14 and 15), (Fig. 16 to 23).



14. Retinotomy after diathermic coagulation of the retina

After the introduction of peripheral retinotomy logically followed the problem of fixation of the retina prior to the silicone oil injection. Inspired by a Japanese paper on sutures with giant tears[8] and

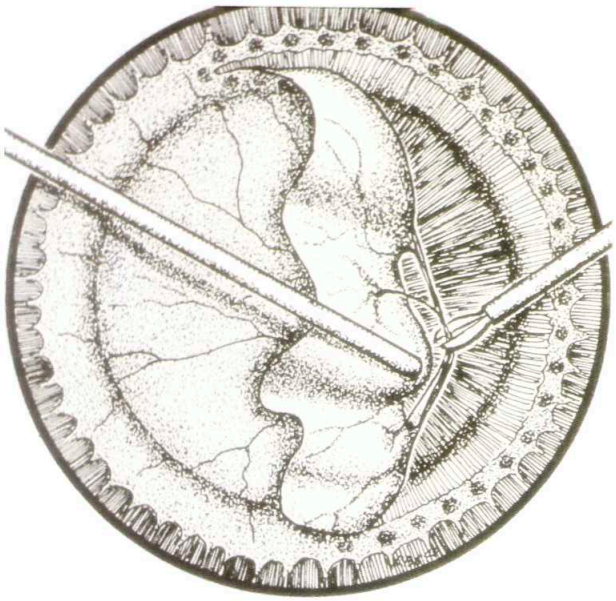


Fig. 15 Removal of subretinal strands through large peripheral retinotomy

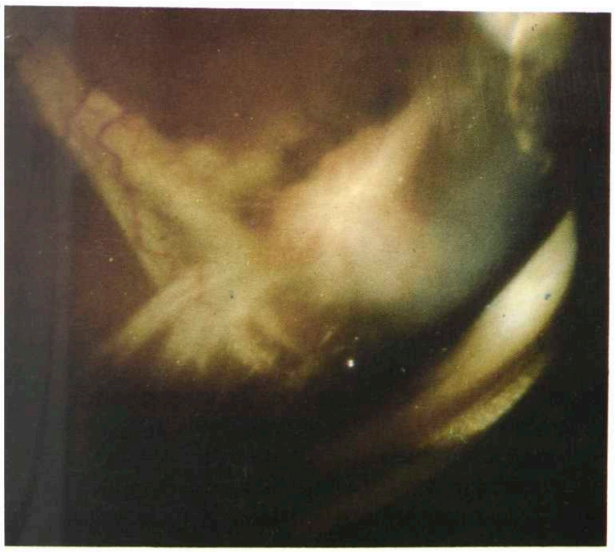


Fig. 16 y 17. Massive subretinal strands after double perforation

following the old principle of the Singer sewing-machine I invented a method with transvitreal continuous suturing of the retina (Fig. 24, 25, 26 and 27). This method, thoung very time-consuming, served well in about 20 difficult cases. (Fig. 28 and 29). In 1983 Ando published the

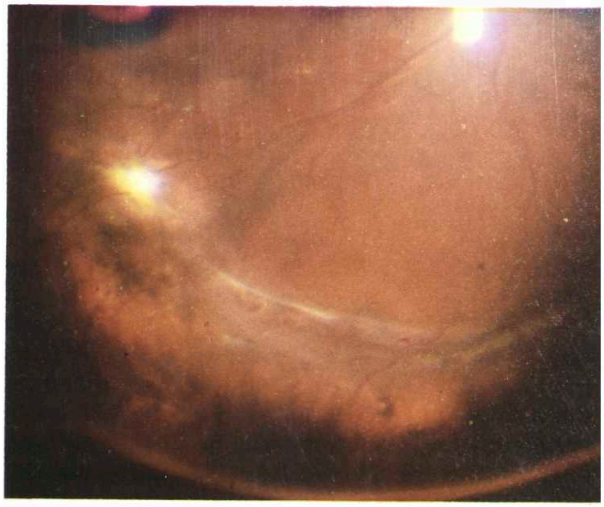
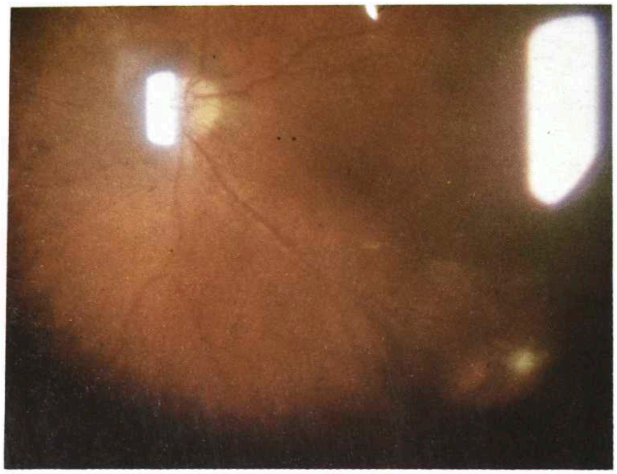


Fig. 18 y 19. The same case after the treatment and after removal of silicone oil

method of permanent retinal fixation with plastic tacks[9]. As I did not see the necessity of permanent mechanic al fixation of the retina, I took over this excellent idea and constructed metal tacks, which were only used as an instrument during the operation, and taken out after the injection of silicone oil at the end of the operation (Fig. 30, 31, 32 and 33). This technique was popular for many years, but also compromised by many surgeons due to erroneous use. I used it successfully until perfluorocarbon was introduced three or four years ago (Fig. 34 and 35).



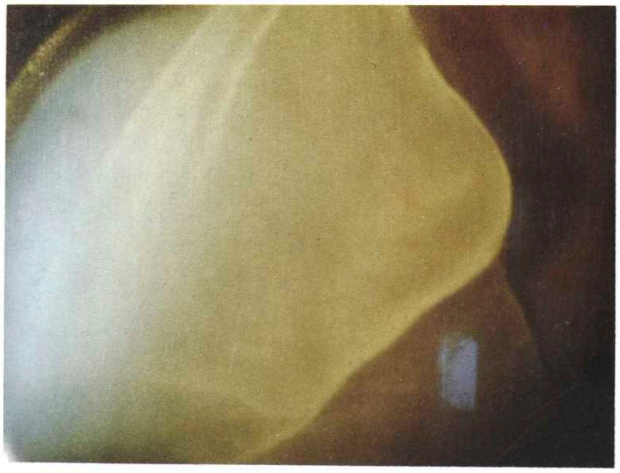
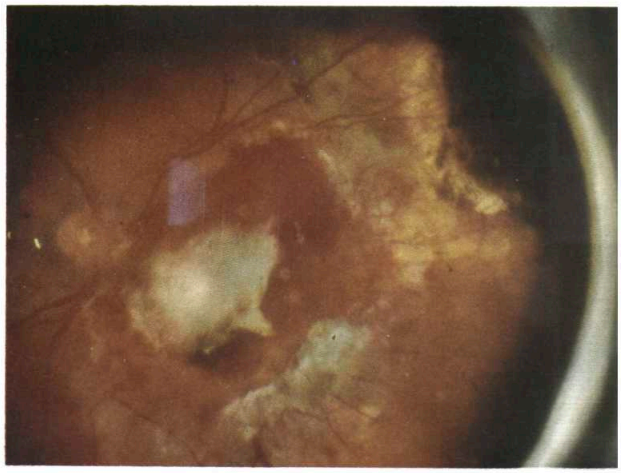
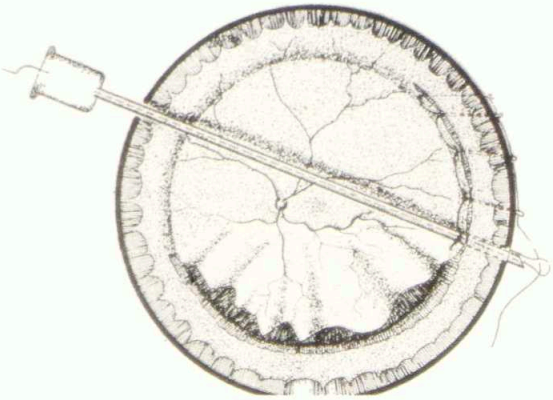


Fig. 20 A giant retinal tear

Fig. 22 Tractional retinal detachment after double perforation





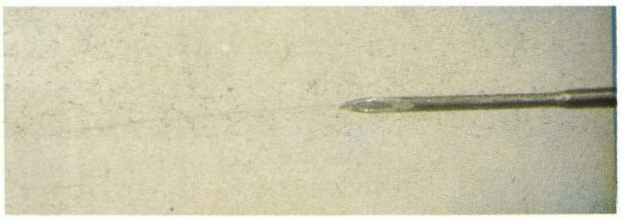


Fig. 26 y 27 Modified disposible needle for suturing of he retina

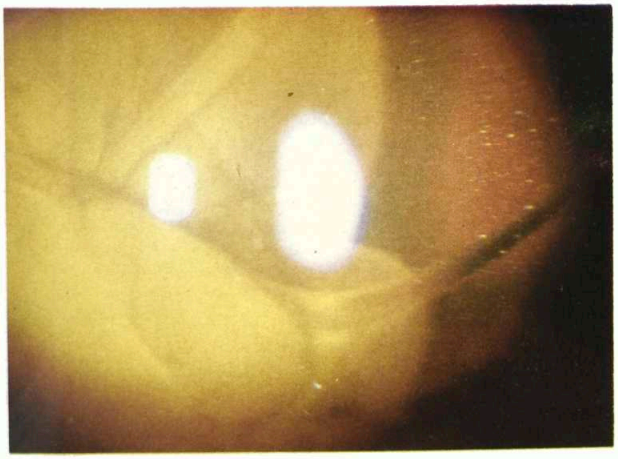


Fig. 28 A case with a 360 degrees giant retinal tear after perforating trauma

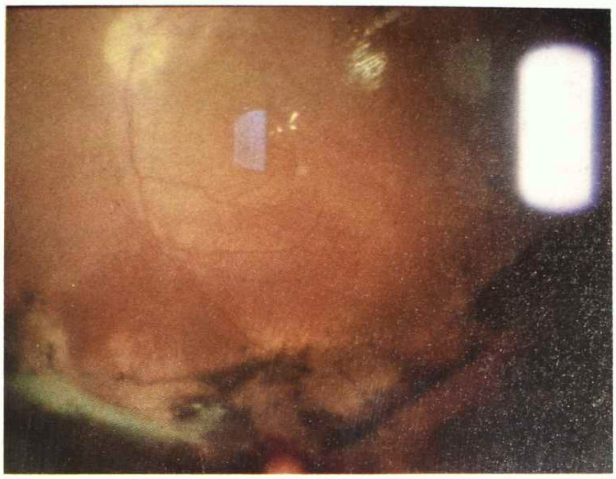
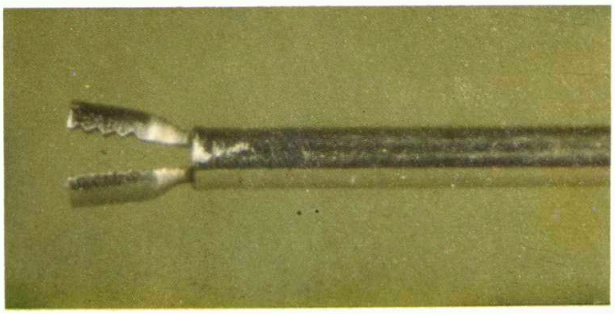
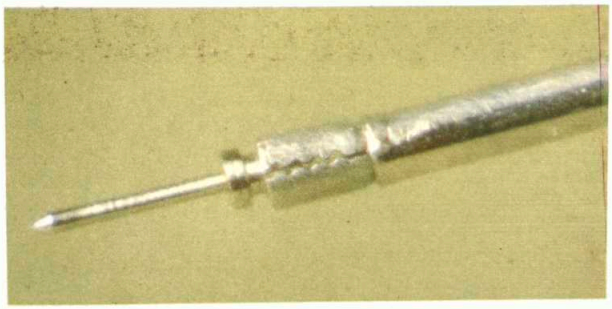


Fig. 29 The same case after vitrectomy and 360 degrees suturing of the retina

Fig. 30, 31 y 32 Metal tacks for temporary fixation of the retina





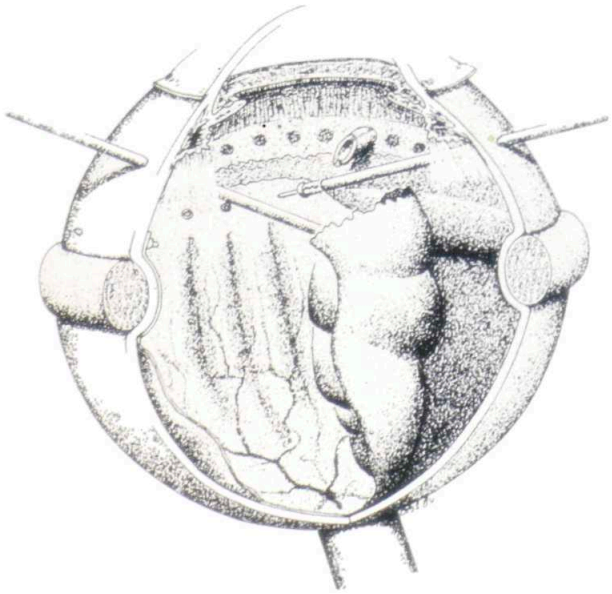


Fig. 33 Illustration of the use of retinal tacks

Fig. 35 The same case after the use of retinal tacks, vitrectomy and silicone oil injection

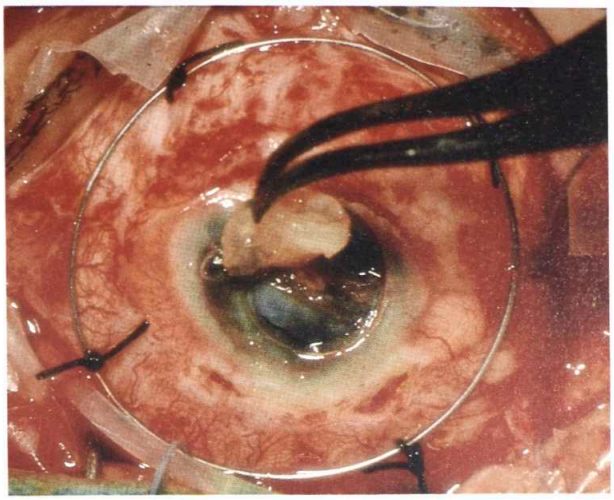
Fig. 34 A case of a giant retinal tear with the contracted immobile retina

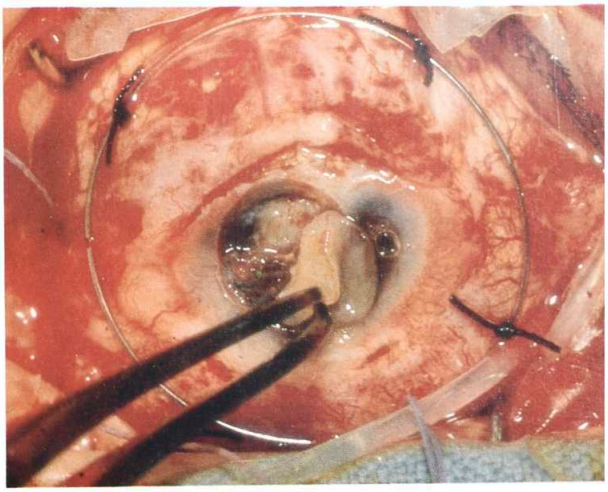
Fig. 36 y 37 Cases of a severely traumatized eye with destruction of the anterior segment and long-standing retinal detachment

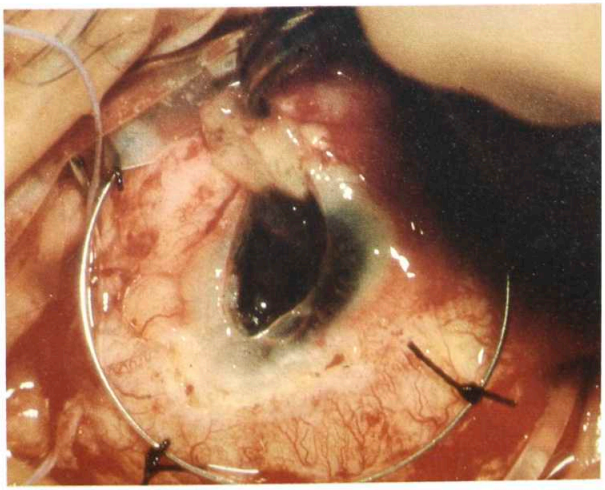
Another surgical problem was severely traumatized eyes with destruction of the anterior segment and an old retinal detachment (Fig. 36 and 37). In the combination of reconstruction of the anterior segment, use of temporary keratoprosthesis by Landers or Eckardt, (Fig. 38) pars plana vitrectomy and extensive retinal surgery, it was possible to operate succesfully even these most difficult cases (Fig. 39 - 46).

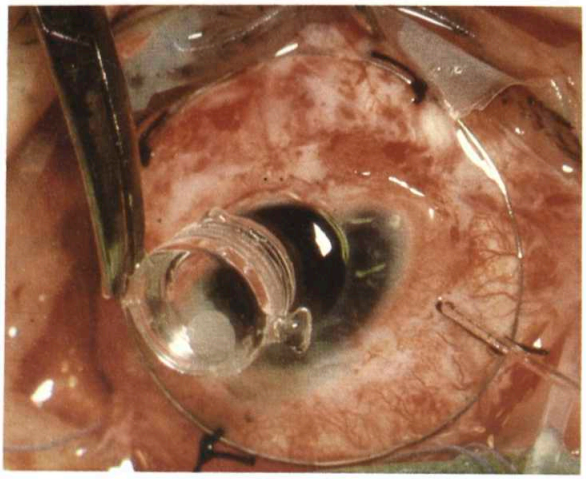
Fig. 38 Landers and Eckardt temporary keratoprosthesis

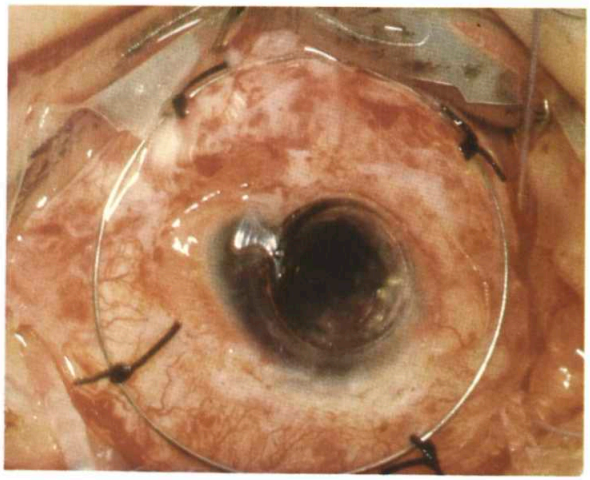
Fig. 39 y 46. A case with destruction of the anterior segment and long-standing retinal detachment (1 year after the injury) - operation and final result

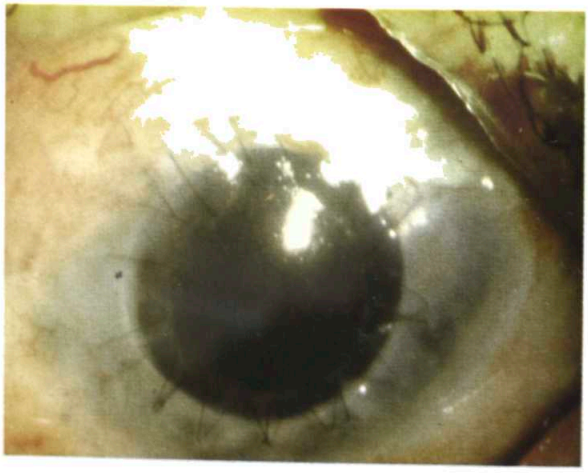


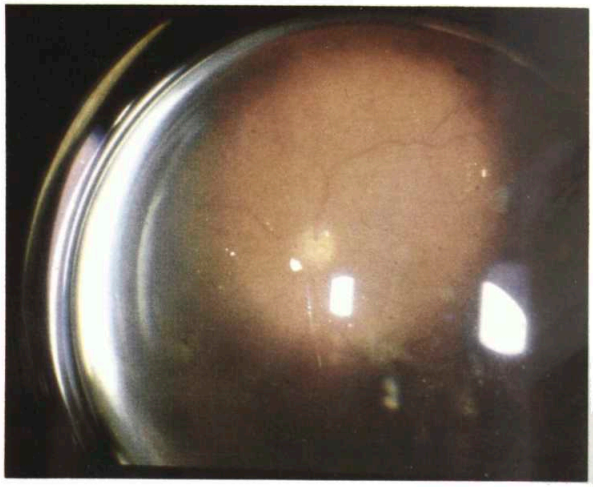












It is easy to understand that corresponding instruments were necessary for performance of the above-mentioned complicated techniques.

Curiously enough, in 1979, when I started doing the complicated surgery, intravitreal surgical instruments for vitrectomy were very scarce. Besides, naturally, various types of vitrectoms, they consisted mostly of vertical scissors, Charles'flute needle for evacuation of fluid and blood and a bent hypodermic needle for membrane peeling. Using the ideal situation of having an instrument workshop in the hospital it was possible for me to follow the decribed development of surgical technique by the development of instrumentation. In the fertile - and still existing - cooperation with Mr. Vijfvinkel, who was head of the workshop at that time, we first replaced the silicone screw driven syringe with the silicone injector (Fig. 47 and 48). Then in rapid succession we constructed a fair number of forceps, various types of spatula and scissors, modified twice the classical Charles'flute needle (Fig. 49, 50, 51 and 52),constructed the mentioned needles for suturing of the retina and the retinal tacks. In that fascinating time of developing surgery and accompanying instruments, Ger Vijfvinkel, following and understanding problems of the surgery, was not only a manufacturer but frequently a co-inventor of new instruments.

Having introduced new surgical techniques it

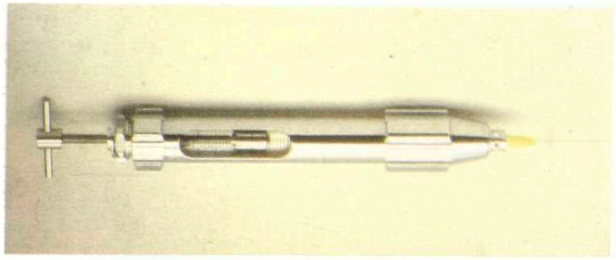


Fig. 47 Hand-driven syringe for injection of silicone oil

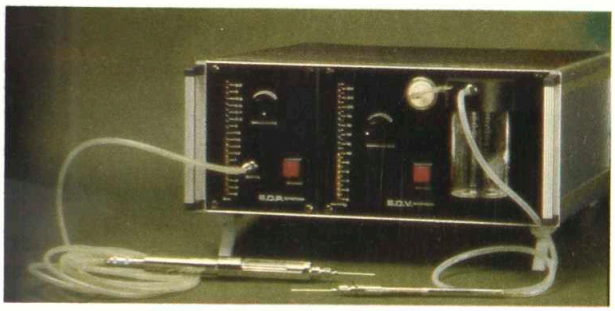


Fig. 48 Injection pump for silicone oil

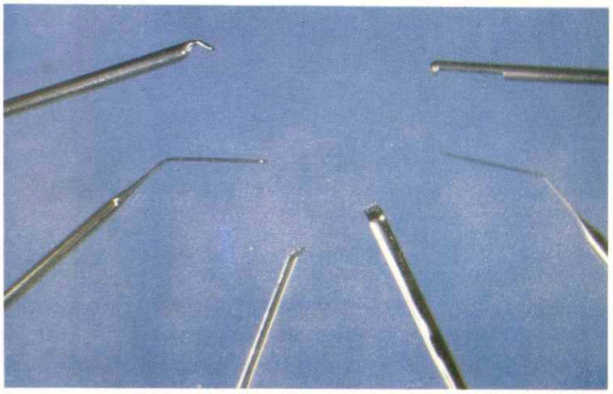


Fig. 49 Various types of spatulae

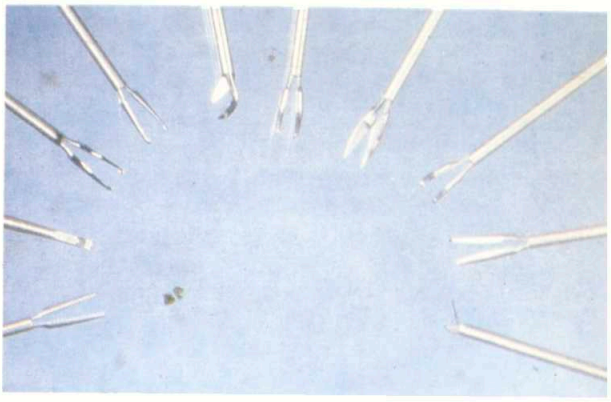


Fig. 50 Scissors and forceps

Fig. 51 Back-flush needle

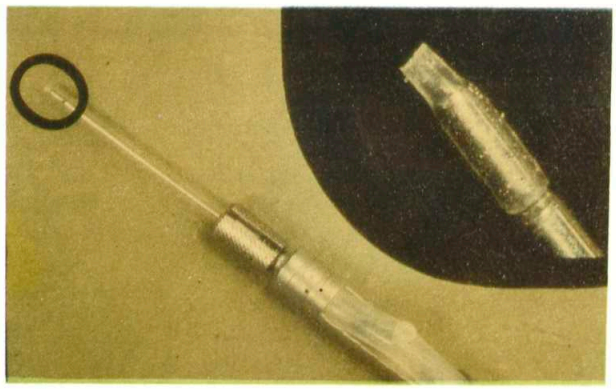


Fig. 52 Back-flush needle with the silicone tip

became possible to treat successfully even those cases which were absolutely inoperable before. At the same time, practising this extreme and aggressive surgery, and exhausting to the very end surgical possibilities of the treatment I have become aware of two facts. First, in spite of the success, in all these cases the surgery was indeed the only possible but also a very inadequate treatment, since the basic problem is not a surgical but a biological one. Consequently there is a great number of redetachments and re-operations because of reproliferations. Second, wich is the consequence of the first, introducing this new extreme surgery, which is though indispensable, still very traumatizing, we introduced a new stimulans for reproliferation, due to the iatrogenic trauma. Therefore it is necessary to remark that surgical treatment of the retina is, in principle, the last step which has to be done only when all the preceding possibilities have been

exhausted, such as vitrectomy, membrane peeling and removal of fibrotic tissue, and the attachment of the retina has not been achieved. Danger of this surgery, which requires experience and serious and ethical approach; is illustrated by the following horror pictures, which are the proof of inadequate application of retinal surgery (Fig. 53 and 54).

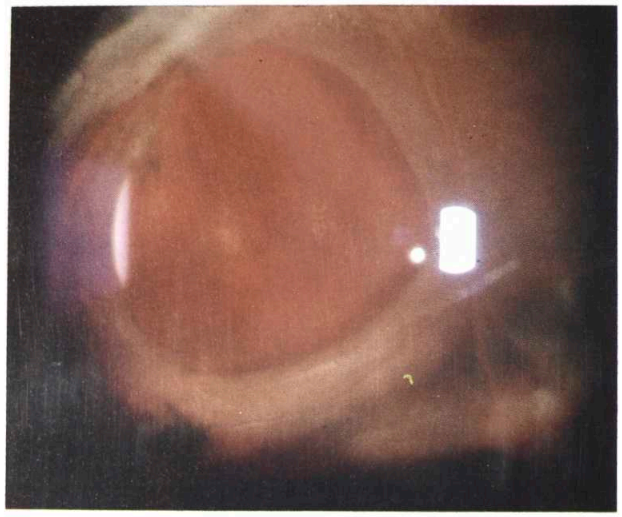


Fig. 53 A large retinal tear after the failed operation

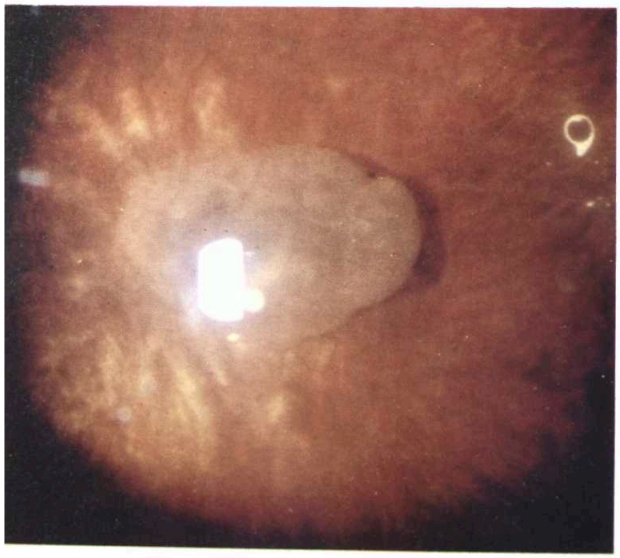
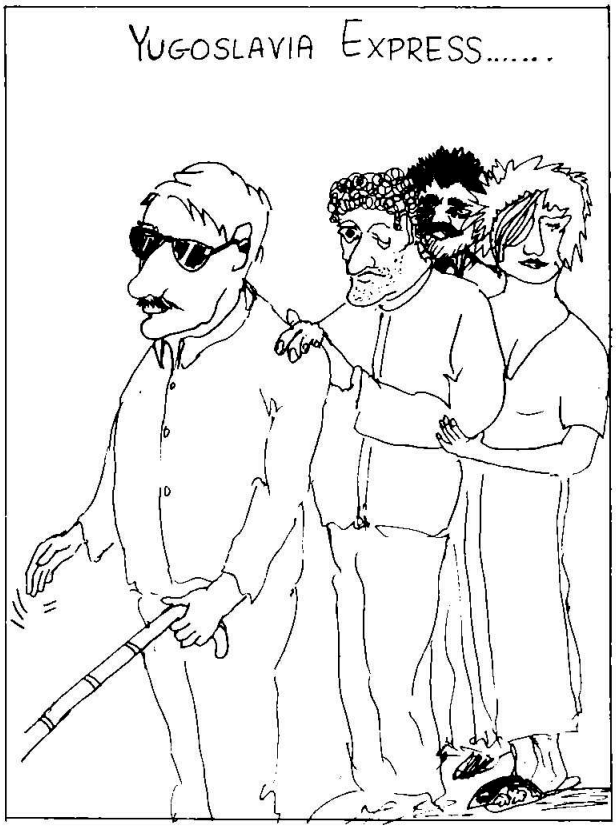


Fig. 54 A completely contracted retina after a 360 degrees retinotomy and the failed operation

Improved results and particulary my readiness to operate even the cases with an utterly small chance of success resulted in the inflow of a great number of patients, specially from my own country. (Fig. 55).



Postoperative functional results in particular immediately after the operation were very modest. My and the patient's justified desire for the best possible result was thus observed by Doctor Beekhuis, from his superior position of the anterior segment surgeon, (slide) (Fig. 56).

After a time we had the pleasure of receiving a growing number of interested visitors. Although at that time we had no television monitor, behind my back there was always a crowd of visitors who were waiting their turn at the microscope tube. Doctor Beekhuis has immortalized a true dialogue of two Italian visitors (slide) (Fig. 57).

After five or six exciting years of hard and inventive work, which resulted in a surgical concept and a combination of vitrectomy, retinal

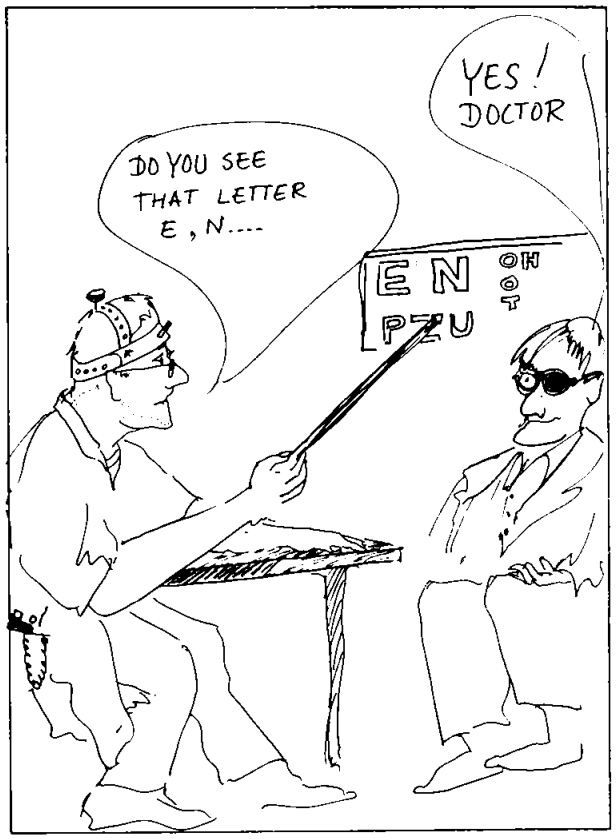


Fig. 56. A suggestive V.A. check-up

surgery and silicone tamponade for treatment of complicated cases of retinal detachment, I wrote a book in which I tried to explain all this[10]. From the publishing of the work in 1987 until now no new things have occurred with me. Also generally speaking even if we take into account the Fhantastic contribution of Stanley Chang (perfluorocarbon heavy liquid used as an instrument for re-attachment of the retina) nothing essential has happened in vitreo-retinal surgery in the last few years. As I have said before, due to the biologic nature of the problem the real breakthroughs need to be expected from parmacological treatment, which unfortunately, does not seem to be very near. In the meantime two things remain: First, to try each time to find a balance between well-considered, aggressive, radical surgery and as atraumatic as possible performance of that surgery, and second, to try to improve the level of conventional and trauma surgery, to improve control and laser treatment of diabetics, because a great number of our cases is still of direct or indirect iatrogenic etiology.

VIDEO

At the end of my lecture let me answer the question whether I had obstacles on my professional way, particulary concerning my contribution to the development of vitreo-retinal surgery.

My professional career was very unbalanced, characterized by changes of surroundings, hospitals and countries and consequently by compulsory changes of professional activities. In all this, there was little system or school in my education, and the biggest part of it was self-education. What persisted all the time was the interest in surgery and the patient, as well as

constant dissatisfaction with achieved results. At the moment when I achieved results that were relevant and interesting for the others, I had no problems in publishing them and I was immediately accepted. Maybe because the things I discussed were correct and evident, but what is even more important, they came at the right time.

When young people ask me what is needed to become a vitreo-retinal surgeon I usually answer that it is important to work very much and to be persistent-but that is important in any profession. That it is useful to be somewhat neurotic and never to be sure that one has removed the very last membrane, but to keep looking for it again and again. And to be able to bear it all, it is also good to be just a little bit a masochist, but what is most important one has to feel distressed for every eye one has to give up.

Thank you very much for your attention. Finally, I would like to show you a video-film of six or seven minutes about the present possibilities in vitreo-surgery

References

1. Cibis P.A., Becker B., Okun E., Canaan S.: The use of liquid silicone in retinal detachment surgery. Arch. Ophthalmol., 68, 590-599, 1962.

2. Cibis P.A.: Vitreous transfer and silicone injections. Trans. Am. Acad. Ophthalmol., 68, 983-987, 1964.

3. Scott J.D.: Treatment of the detached immobile retina. Trans. Ophthalmol. Soc. U.K., 92, 351-357, 1972.

4. Scott J.D.: The treatment of massive vitreous retraction by the separation of pre-retinal membranes using liquid silicone. Mod. Probl. Ophthalmol., Karger, Basel, 15, 285, 1975.

5. Kasner D.: Vitrectomy: A new approach to the management of vitreous. Highlights Ophthalmol. 11: 304, 1968.

6. Machemer R.: Vitrectomy, a pars plana approach. By Grune & Stratton Inc., 1975.

7. Machemer R.: Retinotomy. Am. J. Ophthalmol. 92, 768-774, 1981.

8. Usui M., Hamazaki S., Takan S., Matsuo H.: A new surgical technique for the treatment of giant tears. Transvitreal fixation. Jap. J. Ophthalmol. V., 23, 206-215, 1979.

9. Ando F., Kondo J.: A plastic tack for the treatment of retinal detachment with giant tear. Am. J. Ophthalmol., 95, 260-261, 1983.

10. Zivojnovic R.: Silicone oil in vitreoretinal surgery. Martinus Nijhoff/Dr. W. Junk Publishers, 1987.

Mi interpretación de la ley de los espesores

Dr. Gabriel Simón

La primera vez que tuve la oportunidad de mantener una conversación con José Ignacio Barraquer, fue en 1987, en Barcelona. Me encontraba en el curso de mi tercer año como Residente de Oftalmología en la Clínica Barraquer de esa ciudad, e interesado ya desde hacía algún tiempo en los fenómenos y efectos inducidos por la cirugía refractiva. Recuerdo que en nuestra conversación discutimos los resultados experimentales que había obtenido tras implantar anillos interlamelares de silicona en córnea de conejo[1]. Esta técnica se desarrolla partiendo de una pequeña incisión limbar (0.6 mm), de profundidad dos tercios; y a su través, con el uso de una espátula roma, se practica un bolsillo interlamelar en el plano seleccionado de la córnea (Fig. 1). Este estudio demostró que interponiendo anillos de diferentes grosores (entre 50 y 200 μm), diferentes diámetros internos (entre 4 y 7 mm), y diferentes secciones, es posible variar la curvatura de la córnea entre un límite amplio de aplanamiento central. Quizás, la cuestión que más me atrajo de ese estudio él fue su mecanismo de acción, y al discutirla con el, me comentó que los anillos funcionaban según "La ley de Espesores". Esta ley dice: La cara anterior de la córnea se incurvará al adicionar tejido en su centro óptico o substraerlo de su periferia, y se aplana al substraerlo del centro o adicionarlo a la periferia del vértice óptico.

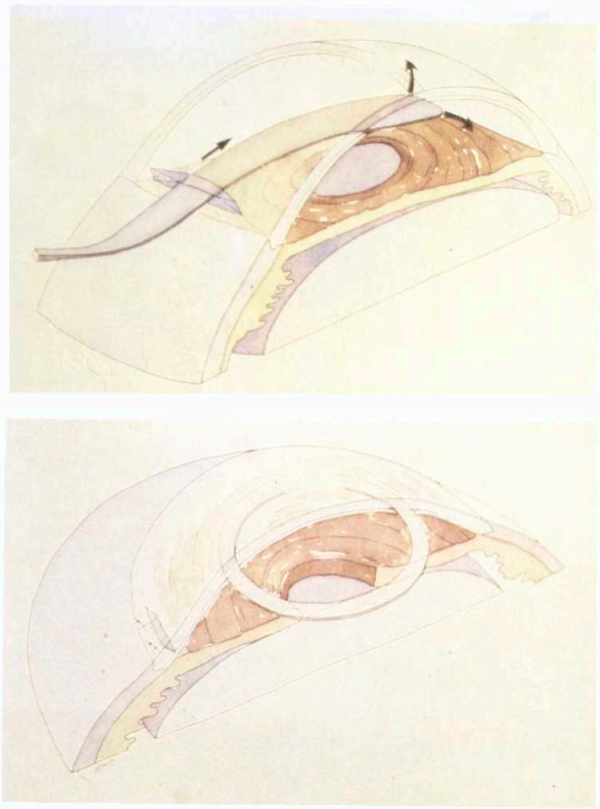


Figura 1: A/ Disección lamelar de la córnea con espátula dirigida a través de una pequeña incisión periférica. B/ Inclusión de un anillo.

Todavía hoy es ampliamente aceptado que la membrana de Bowman tiene un protagonismo especial en definir la curvatura final de la córnea. Su localización superficial, su acelularidad y estructura compacta dan pie a aceptarla como tal. De hecho, si situamos discos positivos de un diámetro superior a los 3 mm entre las lamelas del estroma de la córnea en cualquier plano de la misma (anterior o posterior) siguiendo la técnica del "bolsillo" descrita anteriormente, es difícil observar cambios refractivos anteriores, apareciendo una amplia identación posterior. Esto pudiera interpretarse como si en la Ley de Espesores entraran en conflicto la adición de tejido periférico y centralmente al mismo tiempo, ya que se trata de discos de dimensiones superiores al área óptica, de tal forma que el incurvamiento conseguido por la adición central de tejido quedará anulada por el aplanamiento conseguido al adicionar tejido periférico, aunque este fenómeno no se observa cuando la queratofaquia se practica con práctico método clásico[2]. De cualquier modo, a fines practicos, la membrana de Bowman se considera como una estructura simultáneamente flexible e inelástica, y aún la mayoría de los cirujanos que practican la

queratotomía radial, entienden su mecanismo relajante al romper la barrera que representa la membrana de Bowman a la presión intraocular. Un argumento contradictorio al menos conflictivo se plantea cuando no se observan cambios refractivos significativos o incluso miopizantes[4], si se practican queratotomías circulares relajantes[3].

La queratofaquia practicada con el microqueratomo (no con la técnica de bolsillo lamelar ya descrita), obedece en todo momento la Ley de los Espesores y favorece al concepto de la Bowman como una estructura limitante, es decir, si colocamos tejido central a modo de sandwich entre las lamelas de la córnea o periférico en forma de anillo, se observan incurvamientos o aplanamientos muy predictibles cuando la membrana de Bowman ha sido seccionada[2]; pero si efectivamente esta estructura decide la curvatura final de la córnea,? Por qué no se observan deformaciones cuando esta se elimina con una ablación superficial con láser Excimer por ejemplo?.

Estudios experimentales han demostrado que la córnea se comporta como una estructura difícil de distender[5], no solamente cuando se le someten fuerzas globalmente, sino también individualmente a sus lamelas. De hecho, hemos comprobado que si sometemos la córnea a una gran presión intraocular, ésta se deforma mínimamente manteniendo su equivalente esférico[6], tanto cuando la córnea está íntegra como cuando se ha excindido el 75% de las capas anteriores con un microqueratomo (Fig. 2) o se ha practicado una queratotomía radial del 50 y 90% de su espesor en su lado epitelial o endotelial con el fin de desviar la localización del stress a un plano posterior o anterior respectivamente (Fig. 3).

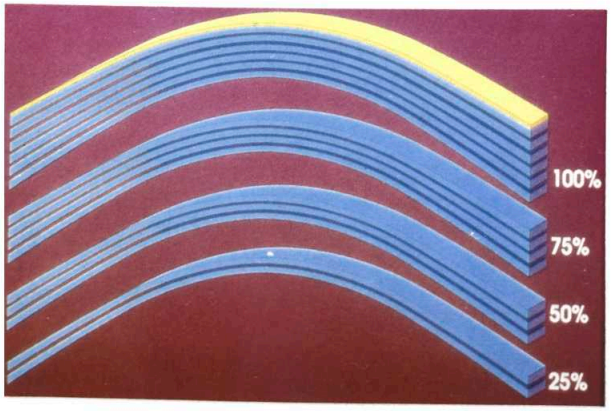
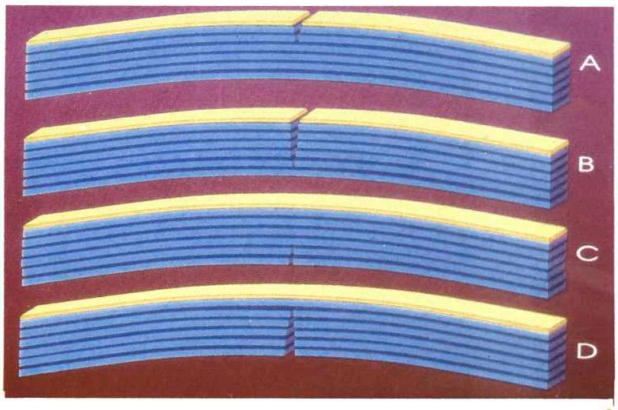


Figura 2: A/ Diferentes grosores corneales conseguidos con un microquerátomo. B/ La presión intraocular no modifica la curvatura dentro de los límites expuestos.



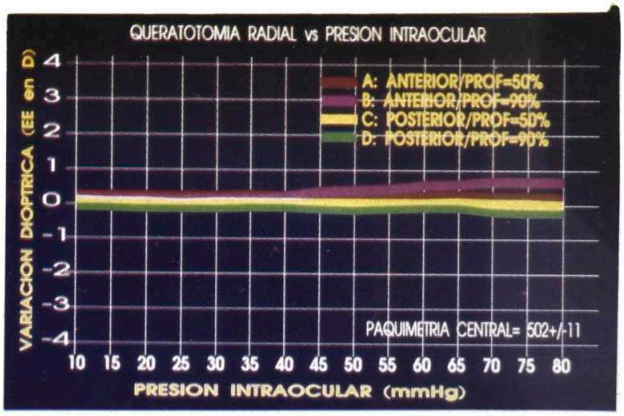


Figura 3: A/ (a y b) queratotomías anteriores de diferente profundidad (c y d) queratotomías posteriores. B/ La presión intraocular no modifica la curvatura de la córnea ante las condiciones expuestas.

La Ley de los Espesores se cumple tanto si la Bowman está íntegra como si no, de modo que debe cumplir un mecanismo independiente de ella. Si al practicar un bolsillo inerlamelar situamos en su interior y en el centro de la córnea una pequeña lente positiva con un diámetro de 2 mm y un grosor de 300 μm, se observa un cambio refractivo anterior en córneas normohidratadas de cadáver, y un aplanamiento periférico, que se hace menos evidente cuando la córnea se hidrata, y más localizado cuando se deshidrata. Este mismo fenómeno se observa cuando se incluyen anillos o geles inyectados de 300 μm de grosor con un diámetro interno de 5 mm y externo de 7 mm (Fig. 4). Efectivamente, esta observación sugiere que la Ley de los Espesores también está sujeta a los cambios hídricos corneales. De hecho la hidratación de la córnea ha demostrado tener un protagonismo excepcional al observar el efecto esperado tras practicar la queratotomía radial en ojos de cadáver[7] o en las variaciones diurnas de nuestros pacientes[8].

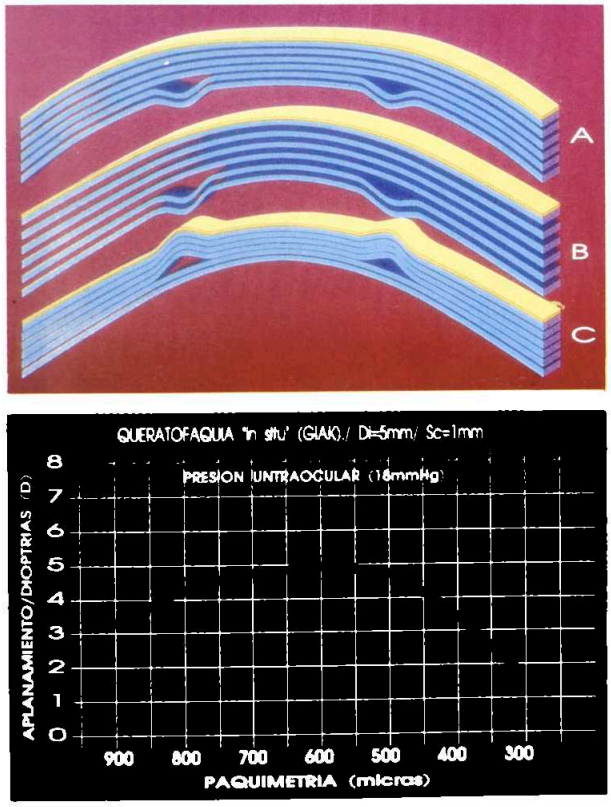


Figura 4: A/ Diferente efecto de una inclusión interlamelar en relación al grado de hidratación corneal, (a) muestra aplanamiento central cuando la córnea presenta un grosor central entre 480 +10μ sin epitelio, (b) no observa cambio alguno ya que la córnea al hidratarse desplaza su stress a las capas superficiales, y la inclusión idenla posteriormente en las capas flácidas, (c) muestra el efecto opuesto a (b) en una córnea deshidratada. B/ gráfica del efecto queratométrico.

Recuerdo que tras mi llegada al Bascom Palmer Eye Institute, inicié un estudio comparativo del efecto de las queratotomías arcuatas efectuadas con un cuchillete de diamante o con láser HF en ojos frescos de cadáver siguiendo el protocolo descrito descrito por Swinger y Kornmehl[9]. Los ojos se introducen en una solución al 15% de dextrano para normalizar la hidratación de la córnea durante un tiempo predeterminado, se les restaura su presión intraocular y se les somete al tratamiento quirúrgico.

Los resultados iniciales fueron dispares y confusos ya que se observaron tanto pequeños incurvamientos en el eje de las queratotomías como aplanamientos. Gracias a que las medidas eran tomadas automáticamente con un queratómetro electrónico (SK-1, Canon, Inc., New York, NY), fue posible efectuar disparos por unidad de tiempo y observar las variaciones queratométricas mientras se irrigaba la superficie corneal con BSS. La córnea presentaba un astigmatismo tanto más evidente cuanto mayor era el tiempo durante el que se la observaba. Si no hubiéramos efectuado el estudio comparativo hubieramos pensado que el láser HF pudiera tener un efecto térmico que contrajera el colágeno temporalmente para relajarse después; lo cierto es que al observarse el mismo fenómeno en las queratomías efectuadas con el cuchillete de diamante, fue más lógico pensar que la irrigación con BSS era la responsable de la inestabilidad observada. Posteriormente se utilizaron otras soluciones de Dextrano al 7% (teóricamente isosmótico) y aceite mineral y no se observó ni tan siquiera la aparición del efecto en córneas con un grosor central de 475 +13 μm[10]. Con todos estos datos, fue fácil determinar que es necesario cierto grado de hidratación corneal para que una queratotomía desarrolle su efecto. Lógicamente, continuamos el estudio de este efecto en la queratotomía radial y los resultados fueron idénticos (Fig. 5).

La córnea se ha entendido y aceptado como una

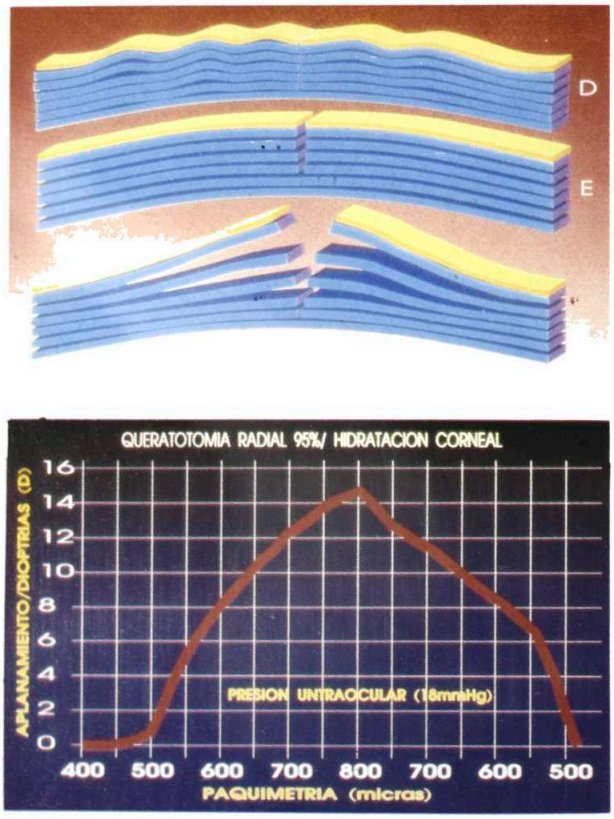


Figura 5: A/ (d) Una incisión relajante en una córnea deshidratada no libera stress en las lamelas afectadas ya que aparecen flácidas. Solamente se consigue efecto refractivo cuando la córnea supera cierto grado de contenido en agua (f). B/ Cuando se compara el efecto queratométrico con el contenido hídrico corneal, apenas si se observan cambios en espesores "normales", aunque tras cierto límite, pequeños incrementos hídricos implican grandes cambios queratométricos.

estructura isotrópica (con características idénticas en todos sus puntos) en los normogramas y algoritmos del programa que pretenden predecir su comportamiento ante determinada agresión quirúrgica [11]. Si la córnea está sometida uniformemente a un determinado grado de stress en todos sus puntos, al practicar una incisión de cierta longitud y profundidad, será posible liberarla del mismo y calcular la relajación esperada proporcional a las características de la queratotomía. La realidad no ha sido así, y las variaciones observadas por una misma técnica quirúrgica, practicada por el mismo cirujano en una córnea de idénticas características condujeron a G. Waring III a organizar el estudio prospectivo de la queratotomía radial (PERK). Curiosamente este estudio dedujo que el factor que inicialmente tenía más espectativas de influir en el resultado final (presión intraocular), en realidad no lo hizo[12], y que globalmente se observaba un paradójico aplanamiento progresivo después de cuatro años del momento quirúrgico[13].

Tras mi llegada al "Bascom", otro de los proyectos que acaparó mi atención fue la aplicación térmica del láser Ho:Yag en la superficie de la córnea y con el reciente "fichaje" de un extraordinario físico especializado en láseres, Qiushi Ren, fue posible estudiar en profundidad este tema. De hecho esta es una versión actualizada de la antigua termoqueratoplastia practicada con cauterio[14]. Theo Seiler, en Alemania, ya había empezado a estudiar los efectos de este método con tecnología láser, pero utilizando una fibra óptica que se aplica con contacto directo sobre la superficie de la córnea y por lo tanto efectuando las cauterizaciones individualmente siguiendo un patrón radiado[15]. Personalmente no me pareció una gran ventaja utilizar tecnología avanzada (Ho:Yag) con el concepto manual antiguo de la "fibra óptica - cauterio" como instrumento. Nosotros[16] desarrollamos un sistema óptico sin contacto, utilizando la combinación de un sistema de ocho prismas para dividir el haz láser, que combinado con otro sistema de lentes, se enfoca a la distancia de trabajo de la lámpara de hendidura (sin contacto) sobre la superficie de la córnea. Este sistema ya había sido utilizado por JM. Parel, Shimada y E. Barraquer para tatuar la superficie de la córnea y así facilitar la labor del cirujano en la sutura de las queratoplastias. Recuerdo que en 1990, en París, durante el curso de unas conferencias en Hotel Dieux, G. Waring me preguntó qué cuál era en mi opinión la gran ventaja de este sistema con el de Seiler. Yo haciendo una broma le contesté que ese método estaba a mitad de camino entre la edad de piedra (cauterio) y la era moderna (sistema sin contacto). Este sistema nos permitió estudiar y entender mejor la córnea, y de cómo se comporta y cumple la Ley de los Espesores. Para ello déjenme explicarles brevemente un concepto simple y más tarde como creo que esta técnica actúa. Fundamentalmente se ha comprobado que cuando una determinada cantidad de calor alcanza el colágeno

de la córnea éste reduce su volumen encogiéndose[2]. Bien, si entendemos esta situación como si en cada punto de aplicación excindieramos cierta cantidad de tejido (si el tejido se encoje es como si cierta cantidad del mismo desapareciera), pudieramos pensar que estamos en la posesión de un método que sustrae tejido. Si efectivamente la Ley de los Espesores se cumple, esta técnica debería arrojar resultados inversos a los postulados por la adición, es decir, se deberán observar aplanamientos centrales cuando se aplica calor centralmente e incurvaciones cuando lo hacemos periféricamente. Theo Seiler publica que no es posible aplanar la córnea con esta técnica[15]. José Barraquer, en su libro[2], hace un comentario opuesto (pág. 141). En nuestro laboratorio pudimos comprobar que para cierta cantidad de energía y tamaño de spot (300 μm) es posible aplanar la córnea cuando actuamos dentro de un área central de 3.5 mm y que se incurva cuando actuamos por fuera de los 4.5 milímetros (Fig. 6). Estos resultados me parecieron la evidencia más clara del comportamiento esperado por la córnea según la Ley de los Espesores.

El epitelio corneal ha sido definido desde los años 40 como una estructura uniforme en grosor[17]. Su distribución tapizando la superficie de la córnea queda definida por un grosor característico dependiendo de factores individuales (edad, raza, geografía...), y que al ser una cubierta de caras paralelas, no representaría un componente refractivo significativo. Tuve la oportunidad de efectuar una encuesta de opinión entre los residentes y facultativos de nuestro servicio de córnea acerca de las diferencias ópticas que el epitelio pudiera inducir en el sistema óptico ocular. Es decir, si medimos el poder dióptrico de la córnea sobre el epitelio, y luego, tras retirarlo con una espátula roma, volvemos a medirlo sobre la membrana de Bowman,? van a registrarse diferencias dióptricas significativas?. Las respuestas fueron unánimes, y la opinión de los encuestados consideró que la presencia del epitelio no iba a efectuar cambios refractivos sustantivos sobre la membrana de Bowman. Afortunadamente pudimos comprobar y medir en el laboratorio el cambio refractivo corneal inducido en ojos frescos de cadáver cuando se les desnuda el epitelio. La córnea gana hasta 2 dioptrías de incurvamiento cuando se mide sin epitelio[18]. Observándose los mapas computarizados de un videoqueratoscopio, pudimos comprobar que la córnea describe una forma cónica, y que el epitelio siendo más delgado en el centro que en la periferia, tiende a mitigar esta configuración. Este hallazgo hizo pensar en que quizás el epitelio pudiera desarrollar una función óptica extraordinaria, intentando ofrecer al aire la superficie óptica más esférica posible. Para comprobarlo, efectuamos un amplio estudio comparativo de las superficies corneales con y sin epitelio[18], y pudimos observar un mayor grado de astigmatismo en la superficie de la membrana de Bowman. El epitelio nos demostró tener una actividad óptica mucho más dinámica que el resto de la córnea. Si se observan inestabilidades tras practicar ciertos procedimientos refractivos, al menos uno de los factores implicados en ello debe de ser el epitelio. Nor-

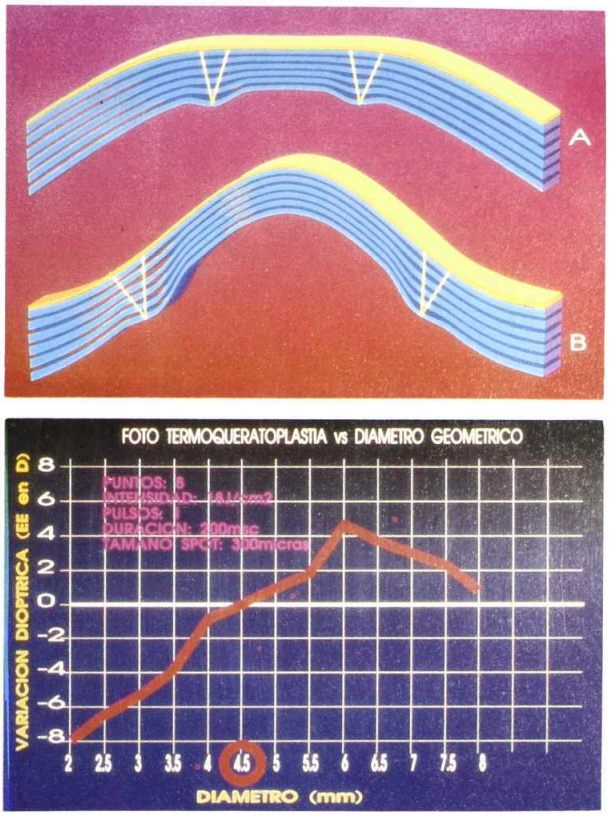


Figura 6: A/ Proyección de láser Ho:Yag en la superficie de la córnea con un patrón geométrico de diámetro inferior a 4 mm (a) y superior a 5 mm (b). B/ Características queratométricas de diferentes diámetros geométricos en la Termoqueratoplastia Láser con Ho:Yag.

malmente, tras cualquier procedimiento refractivo se observa cierto grado de regresión[19] o progresión del efecto[20], considerándose como parte del cálculo quirúrgico refractivo, y es útil entender el esfuerzo epitelial en conseguir una superficie más regular. Este suele ser uno de los temas más candentes cuando se discute la inestabilidad y regresión de ciertos pacientes sometidos a la queratotomía foto refractiva con láser Excimer y de la aparición de úlceras tróficas epiteliales. Juan Sayans la explicaba como resultado de una "fatiga epitelial": El epitelio quiere corregir fuertes cambios de curvatura, y se fatiga. La ayuda que le podemos brindar al epitelio para reducir su esfuerzo será reduciendo al mínimo los cambios bruscos de curvatura corneal aumentando al máximo el área óptica tratada.

Membrana de Bowman, Ley de los Espesores, grado de hidratación corneal, incisiones relajantes, epitelio, fototermoqueratoplastia... Todas estas palabras lógicamente están relacionadas e indican que puede existir una clave para entender mejor la biomecánica de la córnea.

La córnea, en el modo en que yo la veo, puede observarse con un modelo simplificado de una estructura lamelar (capas de cebolla) flexible, inelástica y relativamente estática (que le confiere cierto grado de rigidez), con apreciables diferencias individuales cuando se compara su mayor rigidez anterior (más compacta y deshidratada) con la posterior y similar resistencia a la distensión entre la córnea anterior (incluyendo la Bowman) y la posterior (excluyendo la Descemet), pero extraordinariamente sensible al componente hídrico interlamelar (grado de hidratación); y cubierta por una estructura altamente elástica y dinámica capaz de modificar su estructura para ofrecer una superficie "aceptable" al aire (epitelio).

La córnea posee un grosor central y periférico diferente, y más o menos constante confiriéndole cierto grado de rigidez. Si la córnea es inelástica, cuando aumente su grado de hidratación interponiéndose agua uniformemente entre sus lamelas, ésta no modificará significativamente su curvatura anterior[6], lo cual está aceptado por la Ley de los Espesores, ya que para variarla, deberíamos modificar localizadamente la hidratación en el centro o en la periferia (Fig. 7). Pero lo que si va a tener

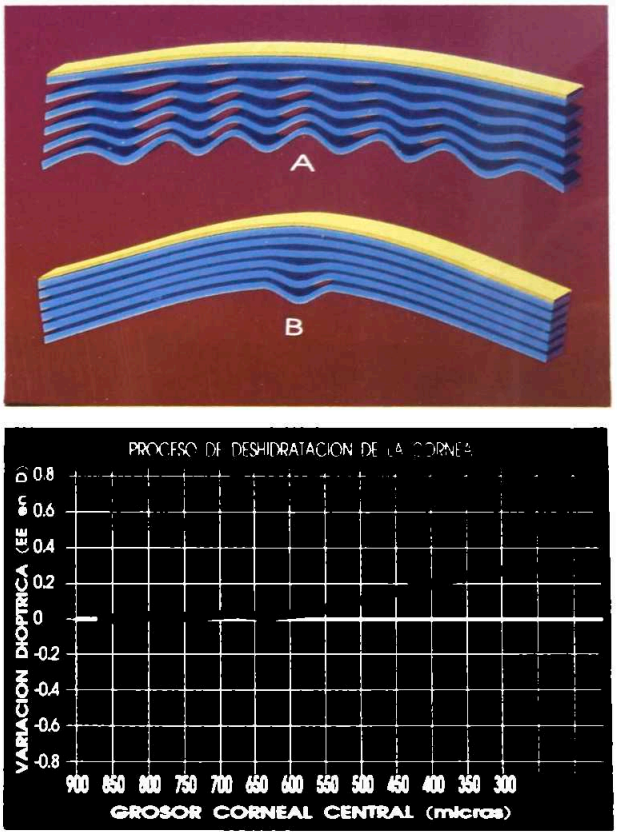


Figura 7: A/ (a) Una córnea uniformemente hidratada no modifica su configuración superficial; si inyectamos agua en un punto localizado (b), la superficie se incurva sobre ese punto. B/ Relación entre hidratación y poder dióptrico corneal. La córnea intacta es muy estable refractivamente ante cambios hídricos. Unicamente en estados de deshidratación puede observarse un discreto incurvamiento.

que modificarse es la distribución de stress en sus lamelas, siendo las anteriores las que van a resistir el influjo de la presión intraocular. La presencia de agua interlamelar impide que los diferentes niveles estromales cooperen en su resistencia a la fuerza intraocular observándose un desplazamiento anterior de su stress; por lo tanto, las lamelas anteriores aparecerán tensas y progresivamente perderán esta imagen cuanto más posteriores sean. De hecho la superficie posterior presentará múltiples pliegues (Pliegues de la Descemet). Este fenómeno, observable con lámpara de hendidura, puede incluso medirse por simple tonometría (aplanación)[6] (Fig. 8). Tres factores van a modificar los valores arrojados por el tonómetro, la curvatura corneal, la presión intraocular, y su rigidez. En ge-

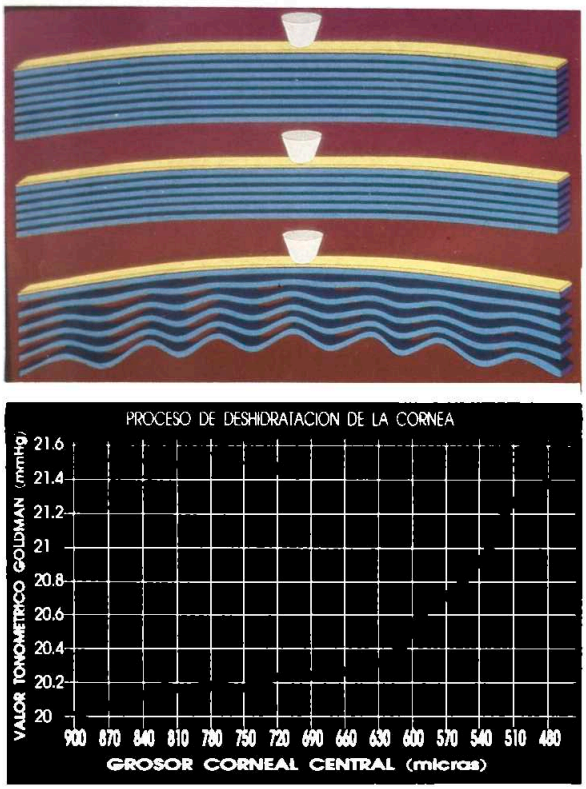


Figura 8: A/ Tonometría en tres situaciones diferentes. Superior: Córnea engrosada; Medio: Córnea Adelgazada; Inferior: Córnea Hidratada. B/ Comportamiento de la córnea ante el tonómetro en diferentes situaciones de hidratación. Cuando la córnea se hidrata por encima de cierto punto, el tonómetro "la ve" como adelgazada.

neral, una córnea delgada (no deshidratada) observa menor rigidez (queratomileusis por ejemplo) que una córnea gruesa (no hiperhidratada) por poseer "extralamelas" de una forma congénita o artificial (epiqueratoplastia, queratofaquia, ...). Hemos comprobado en el laboratorio que al medir la presión intraocular inductivamente mediante el método de aplanación, aparece una incongruencia tanto más aparente cuanto mayor es el grado de hidratación de la córnea[6]. Cuando la córnea se hidrata, las lamelas posteriores aparecen plegadas "fuera de jugo", y la córnea pierde con ello parte de su rigidez ante el tonómetro que la ve como una córnea adelgazada. Cuando la córnea se deshidrata, las lamelas anteriores aparecen "flácidas", y a través del biomicroscopio es posible desplazarlas lateralmente con la punta de una aguja de un modo semejante al que lo hace la piel del envés de la mano cuando la rozamos con un dedo (Fig. 9).

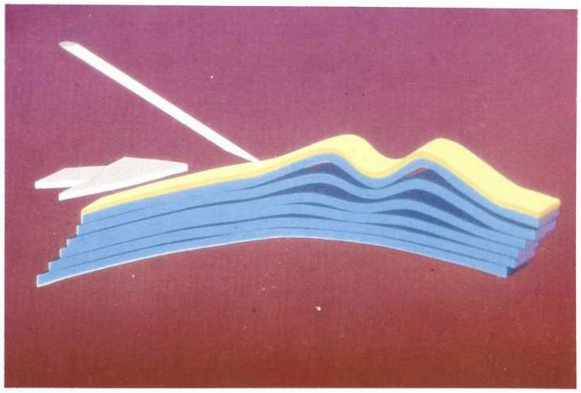


Figura 9: Cuando la córnea se deshidrata, las lamelas superficiales se vuelven flácidas y pueden desplazarse lateralmente con facilidad.

¿Pero que tiene que ver el grado de hidratación corneal con la Ley de los Espesores?. Bien, la hidratación es una forma de "adicionar tejido" difusamente, tanto en el centro como en la periferia y aunque no modifique su curvatura en córneas intactas, claramente tiene un papel decisivo en la biomecánica de la córnea. La adición de tejido localizadamente tiene un comportamiento similar, pero la influencia refractiva de los resultados biomecánicos globales son dramáticamente distintos. En este sentido, voy a describir una técnica que estrictamente sigue el concepto de la Ley de los Espesores. En inglés la denominamos GIAK, según las iniciales de "Gel Injection Adjustable Keratoplasty" ya que inyectamos más o menos gel para dar cierta curvatura a la córnea. En español podría llamarse "Queratofaquia in situ", ya que formamos una lente negativa aprovechando un espacio interlamelar específico. Esta técnica representa una evolución natural de los anillos de silicona descritos al inicio de este escrito. Para ello se efectúa una pequeña incisión de 0.6 mm a 3 mm del centro óptico seleccionado[21] con un cuchillete de diamante calibrando su profundidad al 80% de su espesor en ese punto (paquimetría). Con la ayuda de una espátula helicoidal roma, se diseca a su través un espacio anular del ancho de la espátula (1 mm) y se inyecta en su interior un gel de óxido

de polietileno (hidrogel) al 0.4% en solución salina balanceada (Fig. 10). La cantidad de gel, den-

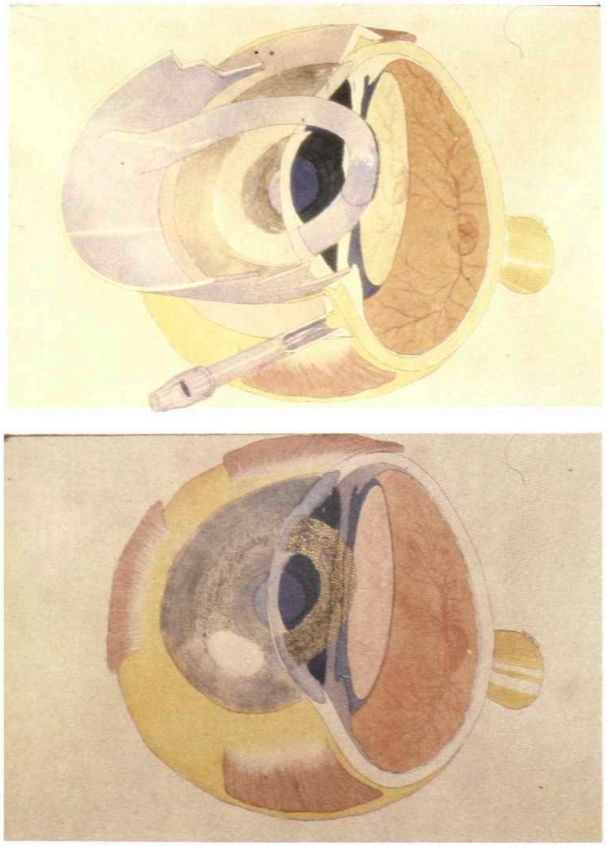
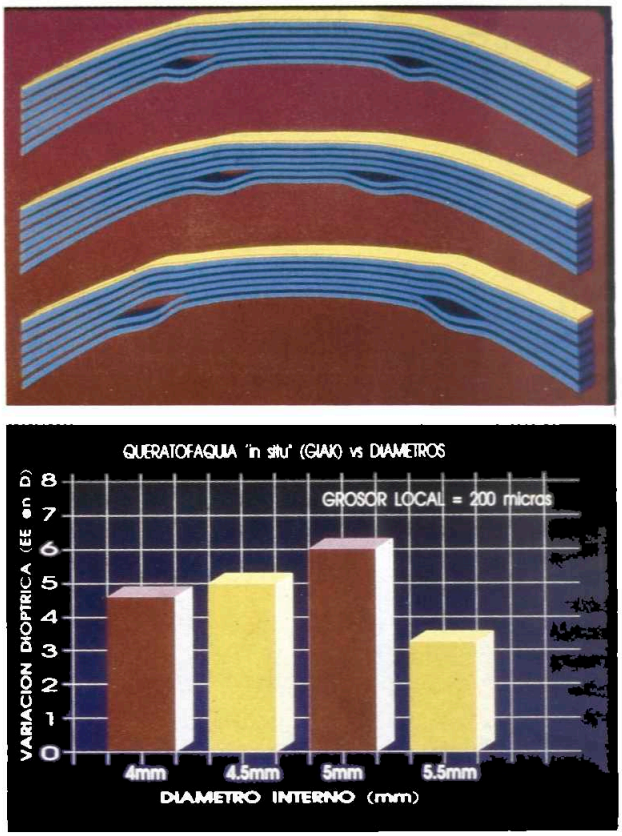


Figura 10: A Instrumentos y técnica quirúrgica de la queratofaquia miópica "in situ". B Inclusión de gel o "tejido" en la periferia del vértice óptico haciendo de esta técnica el ejemplo más claro del sentido de la Ley de los Espesores.

tro de unos límites, define cierto grado de aplanamiento central. A medida que incrementamos las dimensiones de este anillo haciéndolo más periférico, para una misma cantidad de gel, su efecto es menor. Fue curioso observar que al reducir el anillo disecado por debajo de 5 mm de diámetro interno, al injectar el polímero no se observa un incremento proporcional a la cantidad de gel inyectada (Fig. 11). Esta situación es sorprendentemente semejante a la observada por mi experiencia con el uso del Ho:Yag en la fototermoqueratoplastia, aunque en un sentido opuesto (comparar gráficos GIAK y LPTK). Ambas técnicas responden característicamente ante el modelo biomecánico expuesto cuando se les somete a variaciones



de presión intraocular o de hidratación estromal. Ante incrementos hídricos las variaciones de la curvatura corneal con LPTK se hacen más efectivos, con GIAK menos.

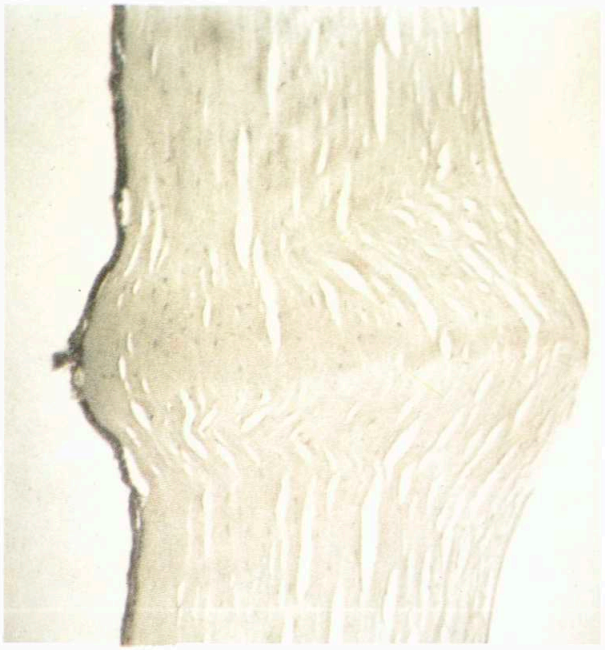
Entendiendo la córnea de este modo, se puede deducir que la queratotomía radial también funciona según la Ley de los Espesores. Para ponernos de acuerdo en esta afirmación, primero debemos discutir como se distribuye el stress en la córnea habitualmente antes de efectuar la QR. Ya hemos anticipado que en una córnea deshidratada con dextrano al 15% (con un grosor central menor de 400μm) el stress "migra" a las capas posteriores de la córnea, y lo hemos demostrado al no conseguir efecto significativo tras practicar queratotomías anteriores, posteriores o fototermoqueratoplastias. Una córnea hiperhidratada desplaza su stress hacia sus capas anteriores y lo hemos demostrado practicando la QR o la FTQ en estas condiciones (con un grosor central superior a las 550 μm), observándose de inmediato cierto grado de

efecto tanto más evidente cuanto mayor es el contenido de agua entre las lamelas de la córnea.

El contenido hídrico de la córnea se ve fundamentalmente controlado por la acción deshidratante del endotelio, y la evaporación superficial de la película lagrimal cuando los párpados están abiertos. Por la mañana, tras permanecer con los párpados cerrados durante la noche, parece lógico pensar que la córnea esté en su apogeo hídrico. Al final del día, tras dieciseis horas de exposición al aire, la córnea deberá estar menos hidratada. Se han comprobado fluctuaciones diurnas de grosor entre el 1.7 al 4.5% en córneas humanas normales [22,23,24] así como una distribución progresivamente mayor en contenido acuoso cuanto más cerca se mide del lado endotelial[25]. La estructura de la córnea deberá estar diseñada para que aunque varíe su contenido hídrico no lo haga su curvatura. Para que esto sea posible tiene que ser lamelar e inelástica, aunque con ello está sometida a un vaivén anteroposterior de relevo de stress. Es muy atractivo imaginar que esta situación a provocado una selección natural de equilibrio entre el grado de hidratación y la localización del stress en el espesor corneal dependiente del momento del día en el que se observa. Así, la córnea posterior deberá estar menos acostumbrada a soportar tensión (stress) ya que para ello la córnea debería deshidratarse. La porción anterior deberá ser más rigida y compacta al tener que responder con más frecuencia que la córnea posterior a las consecuencias de la hidratación (la córnea con la edad pierde su mecanismo deshidratante). De esta forma, la córnea tiene su configuración de acuerdo a un mecanismo adaptativo.

Al efectuar una queratotomía anterior, no solamente seccionamos la parte de la córnea que normalmente resiste a los cambios hídricos, sino que introducimos un factor hidratante con la misma queratotomía. Ante estas condiciones, los cortes en la córnea introducen un pequeño componente hídrico (adición de tejido-like), éste desplaza el stress hacia la superficie que al estar seccionada cede y varía su curvatura. Por supuesto el diseño de la queratotomía y la magnitud de las mismas deberá favorecer al cambio de curvatura.

La fototormoqueratoplastia, de la forma con que hoy se aplica, induce una lesión corneal que tiene configuración cónica (Fig. 12) de base anterior y

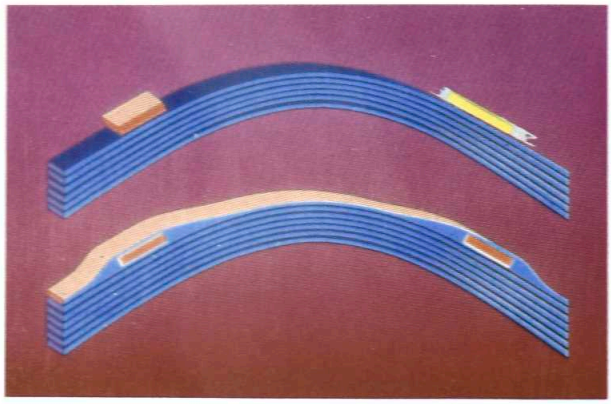


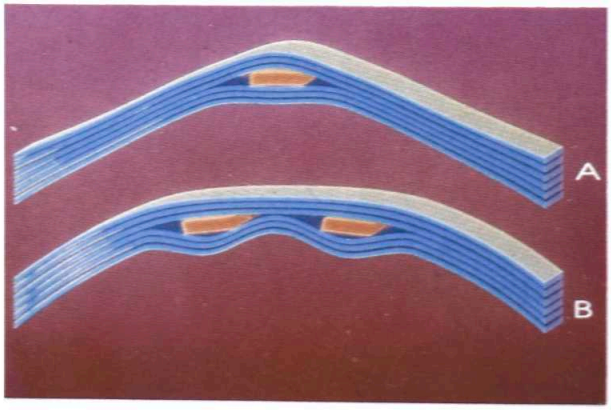
vértice posterior. Superficialmente el tejido se afecta en mayor extensión que en profundidad. Esta situación lógicamente implica que las tensiones en su superficie van a estar más afectadas que en su cara posterior, al menos inicialmente. Para restaurar el equilibrio de resistencias la córnea se aplana en ese punto y por lo tanto se incurva a cierta distancia del mismo. Combinando el tamaño geométrico de diferentes puntos sobre la superficie de la córnea se pueden obtener tanto aplanamientos como incurvamientos. Obviamente, si aplicando esta técnica, afectaráṁos el tejido corneal de modo inverso, es decir, posteriormente, los resultados serían inversos.

Con la injección localizada de gel entre las lamelas de la córnea, se induce un pliegue posterior localizado, que desplaza discretamente tejido fuera de su lugar de contribución de stress y al mismo tiempo lo "anula". Esto desplaza el stress a las capas posteriores, que luchan por devolver el tejido plegado a su posición original. De esta manera el tejido interpuesto, empujado por las capas posteriores, empuja a la córnea por encima de él, incurvándola en ese punto hasta un punto de equi-

librio. Por supuesto la córnea se aplana en un segundo plano. Esta puede ser uno de los mecanismos de acción para la Ley de los Espesores.

La Ley de los Espesores, en su faceta aditiva, se manifiesta del mismo modo según dos situaciones fundamentalmente distintas. Una es puramente morfológica: Si adicionamos tejido superficialmente, ya sea en el centro o en la periferia del vértice óptico utilizando a la córnea como soporte, ésta "remodelará" la nueva superficie intentando ofrecer la superficie más regular posible al aire (Fig. 13a). Otra es puramente biomecánica: Si adicionamos tejido intraestromalmente, ya sea en el centro o en la periferia del vértice óptico, la córnea modificará su curvatura propiamente dicha, incurvándose en la superficie adyacente al punto de adición y aplanándose en un segundo plano (Fig. 14b).





La localización de esta adición determinará incurvamientos o aplanamientos centrales.

Hace unos meses leí el libro de Stephen Howking, "historia breve del tiempo"[26]. Me pareció curioso el consejo que recibió de su editor para aumentar el mercado del libro: "Stephen, le dijo, cada vez que escribas una fórmula matemática perderemos un millón de ventas". Yo le he pedido a J M Parel calcular el modelo matemático de la ley de los espesores cuando se adiciona tejido interlamelar periférico. Los resultados se describen en la figura 14. Estoy seguro de que su rigor biomecánico sólo puede aumentar la claridad de mis observaciones puramente descriptivas.

Bibliografía

1. Simon G, Barraquer JI: Queratocricoemfitesis, nuevo procedimiento de cirugía refractiva (estudio experimental). Arch Soc Oftal Invest 1: 87 - 94, 1989.

2. Barraquer JI: LXV Ponencia de la Sociedad Española de Oftalmología, 1989. Cirugía Refractiva de la Córnea. Pág. 137 - 138.

3. Arciagas, A. Amaya, L. Velásquez, G. Hernández, L.: Corneal astigmatism induced by the combination of arc and radial keratotomies; Experimental Research in rabbits. Journal of Refractive Surgery. Vol. 2, No. 2, March - April 1986, pp. 67 - 77.

4. Gaester, RN. Yamashita, T. Circunferencial keratotomy to reduce hyperopia in rabbits. ARVO. Invest Ophthalmol Vis Sci (Suppl). Vol. 24 No. 3 pp 149.

5. Maurice DM: Mechanics of the cornea. In Cavanagh HD, Editor: The Cornea: Transactions of the World Congress on the Cornea III, New York, 1988, Raven Press, pp 187 - 194.

6. Simon, G., Small, R.H., Ren, Q.S., Parel, J-M.: The Effect of Corneal Hydration on Goldmann Applanation Tonometry and Corneal Topography. Refract Corneal Surg (in press).

7. Simon G, Small R, Ren Q, Parel J-M: The effect of wound hydration and intraocular pressure on the keratometric change induced by radial keratotomy J Corneal Refrac Surg. (in press),

8. Maloney RK: Effect of Corneal Hydration and Intraocular Pressure on Keratometric Power after Experimental Radial Keratotomy. Ophthal July 1990. Vol. 97. Number 7.

9. Swinger CA, EW Kornmehl.: Dehydration of potmontem eyes for practice and experimental surgery. Ophthalmol. Surg. 16: 182-184, 1985.

10. Parel J-M, Simon G, Lowery JA: The effect of wound hydration on central corneal curvature in laser and dimond knife keratotomy. ARVO, Sarasota, Florida, April 29 - May 4, 1990.

11. Hanna KD, Jouve FE, Bercoivie MH and Waring GO: Preliminary computer simulation of the effects of radial keratotomy, Arch Ophthalmol 1989: 107: 911 - 918.

12. Neumann AC, Osher RH and Fenzl RE: Radial keratotomy: A comprehensive evaluation, Doc Ophthalmol 1984; 56: 275 - 301.

13. Waring GO, Lynn MJ, Fielding B, Asbel P, Balyeat HD, Cohen EA, Culberston W, Doughman DJ, Fecko P, Mc Donald MB, Sith RE, Wilson LB, and the PERK stufy Group: Results of the Prospective Evaluation of Radial Keratectomy (PERK) study 4 years after surgery for myopia. JAMA 263: 1083, 1990.

14. Lans LJ. Experimentelle Untersuchungen uber Entstehung von Astigmatismus durch nicht-perforirende Corneawunden. Graefes Arch Ophthalmol. 1989; 44: 117 - 152.

15. T. Seiler, M. Matallana, T. Bende.: Laser Thermokeratoplasty by means of a pulsed Holmium: Yag Laser for hyperopic Correction. Refractive & Corneal Surgery, Vol 6 Sep./Oct. 1990.

16. Simon G, Parel J-M, Lowery JA, Cartlidge A: Noninvasive myopic and hyperopic laser refractive surgery. III International Congress on Laser Surgery of the Cornea. Atlanta, Georgia, November 1 - 2, 1990.

17. Adler's physiology of the eye. Capítulo III (pág. 38), línea 14.

18. Simon G, Kervick GN, Parel J-M: The optics of the corneal epithelium and its significance to photorefractive keratoplasty. 8 th Congress of the European Intraocular Implantlens Council, Dublin, Ireland September 10 - 14, 1990.

19. Gartry DS, kerr Muir MG, Marshall J: Photorefractive Keratectomy with an Argon Fluoride Excimer Laser: A Clinical Study. Refractive & Corneal Surgery, Vol 7 Nov./Dec. 1991.

20. G. Simon, Y. Takesue, P. Hostyn, F. Kuhne, J-M Legeais, F. Villain, Q. Ren, G. Margules, J-M. Parel: Long term in vivo topographic studies of gel injection adjustable keratoplasty (GIAK). ARVO Invest Ophthalmol & Vis Res, 1993.

21. Simon G, Parel J-M, Lee W, Kervick GN: Gel Injection Adjustable Keratoplasy (GIAK). Graefes Arch Clin Exp Ophthalmol 229: 1991.

22. Kiely PM, Carney LG, Smith G., Diurnal variations of corneal topography and thickness. Am J Optom Physiol Opt 1982; 59: 976 - 82.

23. Hara T, Hara T. Postoperative change in the corneal thicknes of the pseudophakic eye: amplified diurnal variations and consensual increase. J Cataract Refract Surg 1987; 13: 325 - 9.

24. McRae S, Rich L, Phillips D, Bedrossian R. Diurnal variations in visión after keratotomy. Am J Ophthalmol 1989; 107: 262 - 7.

25. Wilson G, O'Leary DJ, Vaughn W. Differential swelling in the compartments of the corneal stroma. Invest Ophthalmol Vis Sci 1984; 25: 1105.

26. Stephen Howking. A brief history of time.

27. Stringer, H. and Parr, J.: Shrinkage temperature of eye collagen. Nature, 204: 1404, 1964.

Corneal aesthesiometry as an indicator for corneal metabolism after corneal surgery

M. Kohlhaas, J. Draeger, A. Böhm (*)

Summary

The recovery and reinnervation of corneal sensitivity was examined at 82 patients after Excimer - Laser - Ablation, at 35 patients after Radial Keratotomy and at 7 patients after Epikeratophakia. The aesthesiometer of Draeger used in this retrospective study is extremely precise and independent of external changes in temperature and humidity. It could be shown that the corneal sensitivity after radial keratotomy does not change. Even 3 years after Epikeratophakia the lenticle center showed asensible tresholds. The recipients cornea showed normal values at the circular trephination after 6 months. We could demonstrate that the reinnervation of corneal sensitivity after Excimer - Laser - Ablation is parallel to the woud healing and corresponds to the ablationdepth.

Key-Words: Corneal Sensitivity - Refractive Surgery

Introduction

Touching the cornea triggers one of the most sensitive protective reflexes of the human body. The treshold of sensitivity, especially in the center of the cornea, is exceedingly low, so that pathological changes can be diagnosed early and very precisely. Although this has been recognized since von Frey (4) published his original investigations, aesthesiometry is not yet widely used because of the difficulties of the technique. Because of the low treshold values the applied force also must be very small; furthermore the measurement has to be rapid and reproducible. Up to now the methods used have not met these requirements: Fibre filaments have been used in modern instruments but these vary with age, and are affected by humidity and the temperature of the air. The speed and angle of the approach and the elasticity of the filament vary, not to mention the skill of the examiner, so that the unreliability of the measurement has long hampered its use both clinically and in research.

We have developped a new method of measuring the corneal sensation very precisely and have been able to determine the reinnervation of the cornea, especially after surgical procedures. In this way we have been able to assess not only wound healing but also the state of the corneal metabolism (1, 2, 3). Incising the cornea cuts numerous centripetal nerve fibres and corneal sensitivity has been used as a sensitive indicator of the reinnervation of the particular area of the cornea after cataract extraction and penetrating corneal grafting. At cataract surgery the fibres are cut at the limmbus in a semicircle, whereas in corneal grafts the fibres are cut within the cornea and in a complete circle (6,8).

However, what happens to corneal sensitivity after Excimer - Laser - Ablation, after Radial keratotomy (5) or after Epikeratophakia (7)?

Method

The aesthesiometer used in this study is

(*) Department of Ophthalmology
University, Hamburg
Martinistr. 52
2000 Hamburg 20

extremely precise and is independent of external changes in temperature and humidity. One hand holds the instrument.

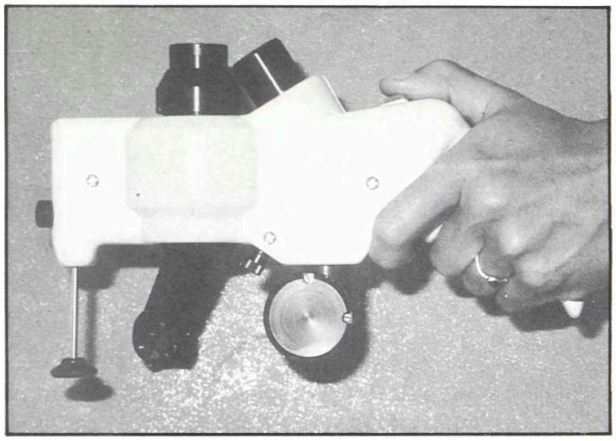


Fig. 1 An estesiometer ready for use

With the fingertip the motion of the contact pin is released and at the same time the force applied is diminished or increased. Optical control of the measurement is mandatory in order to determine the precise location of contact with the corneal epithelium.

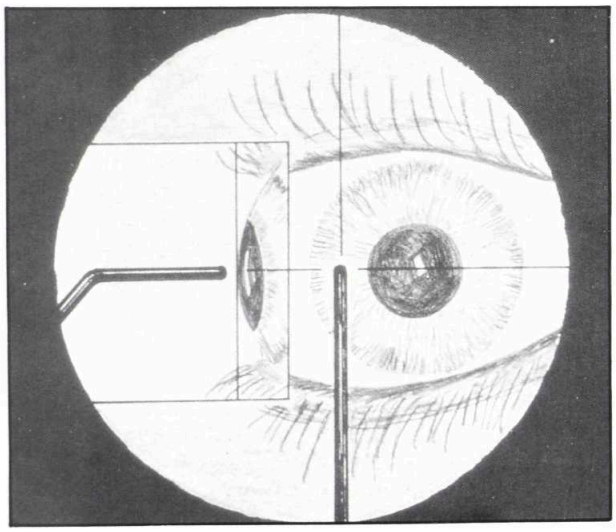


Fig. 2 Optical control of the contact pin

The contact pin touches the cornea rapidly at a predetermined speed which is automatically controlled. The focus adjustment is facilitated by focusing cross lines. The illumination is part of the instrument. The treshold profile of the instrument is determined first. Before touching the corneal epithelium the forward motion is slowed down to avoid any ballistic effect.

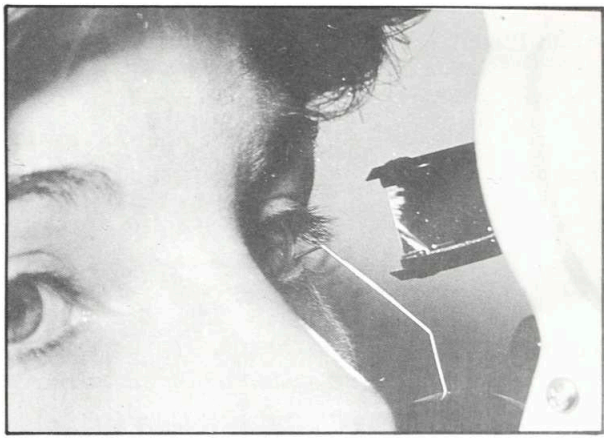


Fig. 3 An esthesiometer applied to the eye

Patients

In a retrospective study between one month and three years we measured the corneal sensitivity and reinervation after Excimer - Laser - Ablation, Radial Keratotomy and Epikeratophakia.

82 patients after Excimer - Ablation, 51 female and 31 male, age between 18 and 51 years, with a preoperative myopia between -1,0 and -25,0 dpt, with an ablated optical center between 4,5 and 5,5 mm were examined.

35 patients after Radial keratotomy, 21 female and 14 male, age between 21 and 37, with 4 - 16 incisions and a preoperative myopia between -1,5 and -15,0 dpt and an optical zone of 3,5 -4,5 mm were examined.

7 patients after Epikeratophakia, 3 female and 4 male, age between 19 and 35, with a preoperative myopia between -13,0 and -24,0 dpt and a lenticle diameter of 7,5 - 8,5 mm were examined.

Results

In our measurements at corneas after Radial Keratotomy it could be shown that the corneal sensitivity is normal even one month after surgery. The central and peripheral sensitivities have an intact treshold pattern like healthy corneas.

The central sensitivity after Epikeratophakia was totally asensible even three years after surgery. The peripheral parts of the refractive lenticle of each patient showed three years later a mild hyposensibility. The recipient cornea showed one year later next to the circular trephination a normal sensitivity.

Corneal wound healing and metabolism can effect the outcome of refractive corneal surgery in general and Excimer - Laser - Ablation in particular.

The temporal response of the cornea to Excimer - Laser - Ablation can be diveded into three phases: Acute phase 0-4 weeks, intermediate phase 4 weeks to 6 months and long-term phase 6 months and more.

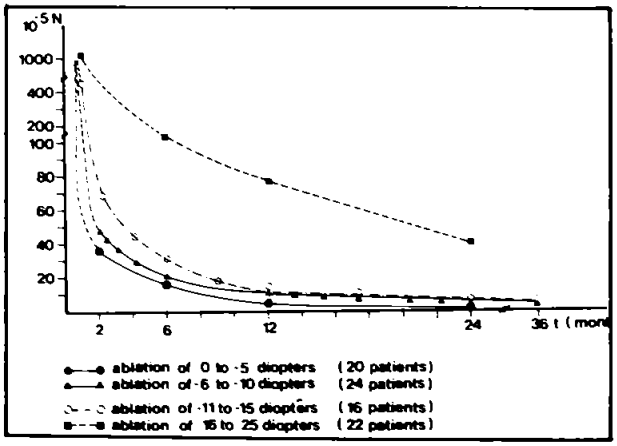


Fig. 4 Corneal reinnervation after Excimer - Laser - Ablation

Ablating the anterior stroma of up to 150 mm causes large to mild hyposensibility in the first weeks after surgery. The superficial nerve fibres are destroyed and need time to regenerate. After 6 months the corneal sensitivity is almost normal. However, ablating more than 150 nm, which means a correction more than 16 dpt, causes large to moderate hyposensitivity. Even two years after surgery the sensitivity is remarkably reduced.

Discussion

Concerning Radial Keratotomy we could prove the anatomical corneal structure that radial incisions do not cut the centripetal nerve fibres like after transverse incisions.

The superficial circular trephination of the cornea as a preparatory procedure for the Epikeratophakia leads to peripheral mild hyposensitivity which corresponds to the retrograde nerve fibre degeneration. Because of the small circular wound surface, the dissected superficial nerves and the reduced metabolism at the lenticle, the regeneration and ingrowth of nerve fibres are slowed down . In this way we have been able to assess not only wound healing, but also the state of the corneal metabolism inside the lenticle.

During the acute phase of wound healing, the cornea starts its initial response to epithelial removal and photoablation. In this period corneal sensitivity is decreased. In the intermediate phase the epithelium remodels itself to a normal structure. Nerve fibres regenerate inside the ablated area. However, the corneal sensitivity is still decreased because a large number of fibroblasts populates the anterior stroma which correspond a clinical subepithelial haze and loss of refractive effect.

In the long-term phase the subepithelial stroma remodels itself and corneal haze disappears. Corneal sensitivity and refraction are almost normal and stable. However, ablating more than 100 nm or 10 dpt leads to instable refractive results and a decreased corneal sensitivity. The more stroma is ablated, the worse is the refractive stability and even sensitivity. This proves histological findings that the deeper corneal stroma contains less nerve fibres than the superficial parts. With our examination we are able to show that the regeneration of nerve fibres after Excimer - Laser - Ablation is parallel to the stromal wound healing 3.

References

1. Draeger, J., R. Martin: Reinnervation der Hornhaut

nach cornealen und corneoscleralen Wunden. S. 102-209, München: J.F. Bergmann (1980).

2. Draeger, J.: Modern aesthesiometry: Contribution to corneal metabolism after anterior segment surgery. Trans. Ophthal. Soc. U.K. 99 (1980) 247-250.

3. Draeger, J.: Corneal sensitivity. Springer (Wien/New York)n 1984.

4. Von Frey, M., H. Strukholt: Weitere Untersuchungen über das Verhalten von Hornhaut und Bindehaut des menschlichen Auges gegenüber Berührungsreize. Z.f. biol. 84 (1926) 321-334.

5. Grabner, G.: Complications of epikeratophakia. J. refract. Surgery; 4/3 (1988) 96-104.

6. Schirmer, K.E.: Corneal sensitivity after Cataract Extraction. Arch. Ophthal. (Chic) 65 (1961) 433-437.

7. Shivitz, E.A., A. Ira, P.N. Arrowsmith: Corneal sensitivity after Radial keratotomy. Ophthalmology, Vol. 95/6 Juni (1988) 827-835.

8. Zander, E.,G. Weddell: Reaction of corneal nerve fibres to injury. Brit. J. Ophthal. 35 (1955) 61-88.

Corneal lamellar dissection in ophthalmic microsurgery - Jose Barraquer's merit to ophthalmology

Head: Prof. Dr. J. Draeger (*)
Markus kohlhaas (*)

Abstract

The first scientific and precise procedure for lamellar and even lamellar refractive dissection techniques was developed by Jose Barraquer. His extensive and outstanding research work on this corneal surgical field covers now more than 40 years. Even if the application of lamellar and lamellar refractive dissection techniques is changed and simplified nowadays, Jose Barraquer deserves the honour to be the father of modern corneal lamellar and lamellar refractive surgery. Through his genius the field of lamellar surgery is what it is today.

Key-words: Corneal lamellar surgery

The first scientific and precise procedure for lamellar and even lamellar refractive dissection techniques was developed by Jose Barraquer. His extensive and outstanding research work on this corneal surgical field covers now more than 40 years (1, 2, 3, 4, 5). All other surgical techniques for dissecting and shaping the cornea are based upon his ideas and knowledge of operating corneal tissue.

However, in the last three decades, with the availability of better donor material and surgical instrumentation and with the better understanding of the pathophysiology of corneal diseases that require corneal transplantation, the number of lamellar keratoplasties being performed has been dramatically reduced. For most of all optical and curative indications penetrating keratoplasty is still performed nowadays. A considerable part of optical indications, however could be replaced by lamellar keratoplasty leading to equivalent functional results and in the same time avoiding graft rejection and complications or risks due to the necessary opening of the anterior chamber.

On the other hand precise lamellar dissection of lenticles was still very difficult in the last century. The problem in manual lamellar dissection was to obtain a smooth incision surface which was almost impossible due to the discontinous movement of the instruments.

Hallermann's device, developed in the late

(*) Department of Ophthalmology University of Hamburg
Martinistraße 52 2000 Hamburg 20 Germany

fifties, was an important progress in manual dissection (6). The cornea is pressed into a transparent block with a defined cavity. A Graefe knife is moved horizontally through the cornea under optical control. However, this device can not be used on the recipient eye.

Many further attempts have been made to improve the quality of manual dissection. Castroviejo applied the hairclipper principle (7). His instrument consisted of a rapidly oscillating blade and an adjustable stop to determine the lenticle thickness. Lenticles and surfaces cut with this microkeratome were not very precise in diameter and thickness.

Jose Barraquer deserves the honour for being the first developing an electromechanical microkeratome for lamellar keratectomy. It consists of a detachable head, that incorporates a remanufactured commercial razor blade which oscillates at very high speed. The microkeratome has a series of interchangeable base plates that allows one to vary the depth of the keratectomy, Fig. 1

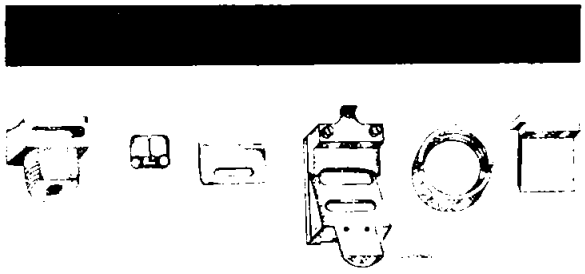


Fig. 1 Barraquer's microkeratome

The microkeratome comes with a set of perilimbal suction rings that vary in height above the limbus. These allow for variable corneal protrusion through the corneal aperture and allow one to vary the diameter of the keratectomy. These perilimbal suction rings are one of the main advantages and progresses in lamellar keratoplasty guaranteeing a stable fixation between eyeball and microkeratome. Slots allow for guidance of the microkeratome. A higher ring allows for less corneal protrusion and will result in a corneal disc of lesser diameter when resected with the microkeratome.

In order to predict the diameter prior to the actual cut, applanation lenses are used. The lens contains a reticle on its lower surface and which lies in the same plane as the cutting blade of the microkeratome. The surgeon compares the diameter of the applanated area of the cornea with the diameter of the reticle and determines if the area to be cut is correct.

Also, a smooth keratectomy is best ensured when the intraocular pressure is at a level of 65 mmHg, or more. A special applanation tonometer is used for this measurement determining if the intraocular pressure is sufficient for the lamellar dissection.

When the parameters of the keratectomy, diameter and intraocular pressure have been chosen, the microkeratome is engaged. The instrument than has to be passed manually in a slow and even fashion avoiding any upward, downward or sideward movement, Fig. 2.

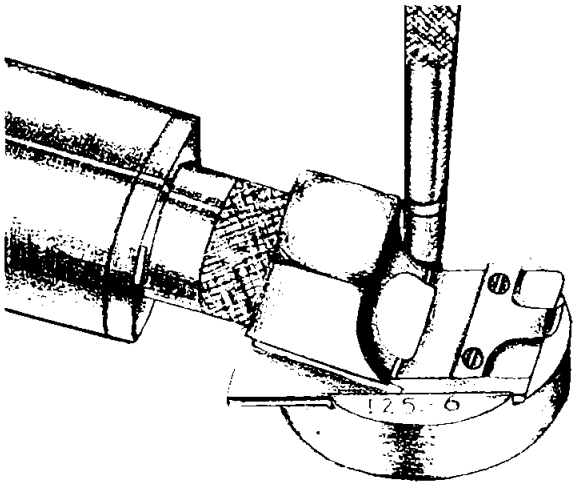


Fig. 2 Barraquer's microkeratome with suction ring

It has been more than 35 years since Jose Barraquer began developing his techniques of keratophakia and keratomileusis, and it is primarily through his genius that the field of corneal refractive surgery is what it is today. He developed a cryolathe with a rotating headstock that incorporates the disc to be modified and the cutting

tool are connected separately to carbon dioxide inlets that provide cooling. The cryolathe is equipped with heaters that can elevate the gas pressure, if necessary, and relieves a valve to prevent excessive pressure, Fig. 3.

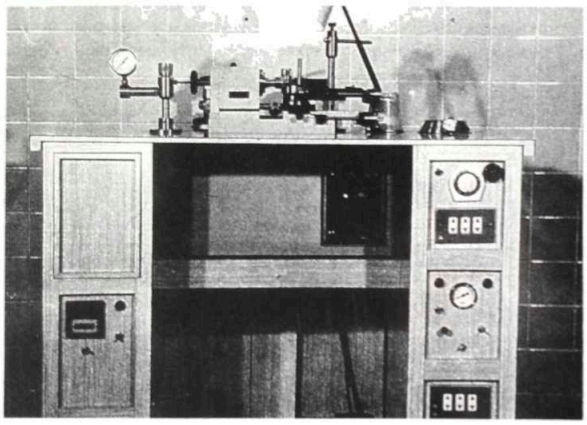


Fig. 3 Barraquer's cryolathe

The resected tissue is placed into a cryoprotectant solution before it is clamped with its epithelium against the concave surface and centered on the plastic base held in the headstock of the cryolathe. The values of the thickness before and after cryoprotectant of the resected disc are entered into the computer. The cryolathe settings are generated in several seconds, Fig. 4.

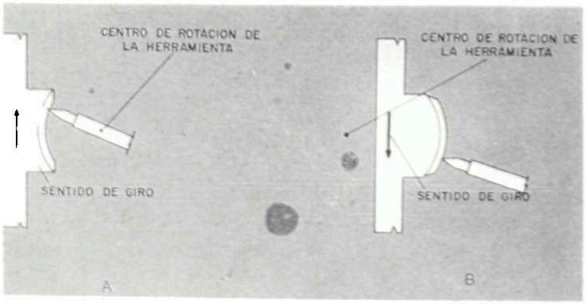


Fig. 4 Tissue modification with the cryolathe

However, the procedure of performing a lamellar refractive keratoplasty with the cryolathe is very complicated and should only performed by excellent trained surgeons. The reasons for residual inaccuracy are many, as the procedure involves many steps, contact of tissue with air and fluid, cryoprotectant solution, complex instrumentation, use by technicians or surgeons and even wound healing.

However, because of the oscillation of the blade and the manual blade advancement the lenticle surface is not perfectly smooth. Based on the work of Jose Barraquer we tried to develop an automatic rotating microkeratome for precise lamellar dissection. We think that only unidirectional motion of the cutting edge results in a smooth surface, 2 different motors, one driving the rotating blade, the other for the automatic blade advancement are integrated into the keratome (8,9,10,11,12).

This microkeratome optimizes the correlation between high blade rotation speed and slow blade advancement. A lamellar dissection is performed automatically. Under lubrication to reduce shearing forces between blade and corneal tissue the applanation plate is moved forward within 20 sec, Fig. 5.

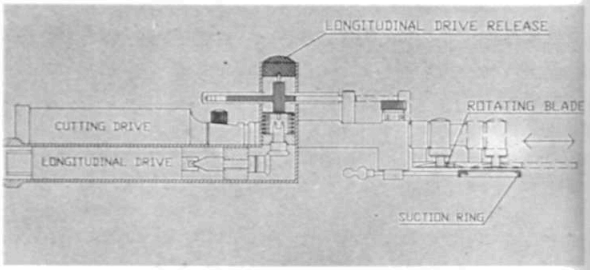


Fig. 5 Draeger's automatic microkeratome

Different thickness spacers at the keratome head determining the distance between blade and applanation plate can be changed easily and determine precisely the lenticle thickness.

A vacuum suction ring is used to maintain a defined relation between eyeball and instrument considering the empirical data of Jose Barraquer that an elevated introcular pressure improves cutting qualities. The inner opening of this suction ring exposes almost the entire cornea so that even extensive dissections can be performed.

In our experimental research on pigcornea we could also demonstrate that the intraocular and suction pressure were found to be very important

for the lenticle geometry. The longitudinal and transverse profile of dissections from soft eyes was less homogenous than the longitudinal and transverse profile of eyes with elevated pressure.

The instrument can be placed on the patient eye without problems, Fig. 6.

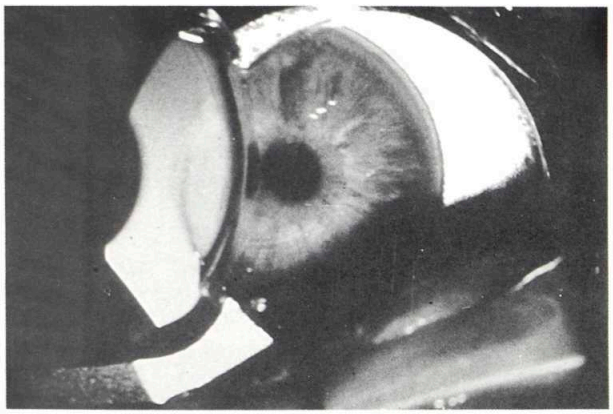


Fig. 6 Draeger's microkeratome on patient's eye

After vacuum fixation on the eye the lamellar dissection is performed automatically. The rotating blade moves unidirectional with constant speed. Apart from the continous change in thickness in the marginal area a lenticle shows an uniform thickness and smooth cutting surface.

Scanning electron microscopy of a lenticle with the rotating blade reveals in contrast to an oscillating microkeratome a smooth cutting surface, however, shows occasionally in periodic intervalls some collagen fibres in the rotating direction.

If donor eyeballs are not available corneoscleral discs from an eyebank can even be used. A simple artificial anterior chamber was developed in which the corneoscleral discs can be clamped. This anterior chamber dissects plano lenticles with the lamellar microkeratome special cutting characteristics. After applanating the corneal surface for determining the lenticle diameter the lamellar keratectomy is performed under sufficient lubrication within 20 sec.

To facilitate refractive dissections in a non-freeze manner a handsome refractive set was developed using again the automatic rotating dissection technique. Thus, a simple instrument with an exchangeable set of molds designed, Fig. 7.

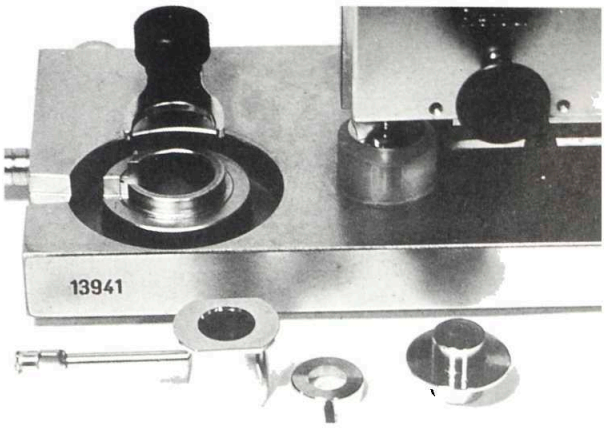


Fig. 7 Non-freeze refractive set

A concave or convexe mold with an optical center of 5 mm retains a plano lenticle dissected with the lamellar microkeratome epithelium downwards with rather low suction. The calculated changes in lenticle curvature are assigned to effective changes in central or peripheral lenticle thickness, Fig. 8.

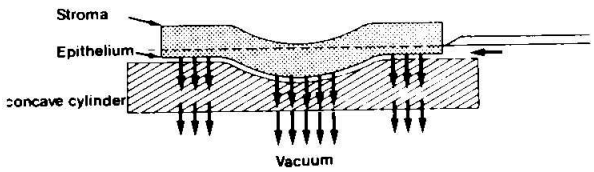


Fig. 8 Refractive mold for non-freeze modification

The following refractive modification is performed within 40 sec again under sufficient lubrication to reduce shearing forces between rotating blade and tissue.

The lenticle center is left intact as almost no mechanical fixation is applied here. The small peripheral indentations at the lenticle periphery disappear after 10 minutes and have no refractive effect.

With ultrasound pachymetry we compared central lenticle thickness with the lenticle thickness

of the peripheral parts. From these results it was obvious that a good correlation was observed in tissue modified with a lower change in refraction. Lenticles modified with a higher change of curvature showed less acurate results, which were still within 80% of the desired refractive change.

The results after performing an Epikeratophakia could confirm our measurements with ultrasound pachymetry. For large corrections in the myopic or hyperopic direction 80% of the desired changes could be accomplished. This undercorrection probably could be explained with the corneal collagen structure. Reaching the optical center the rotating blade has the tendency to maintain in one collagen layer which leads to the observed undercorrection.

However, even if the application of lamellar and refractive dissection techniques is changed and simplified nowadays, Jose Barraquer deserves the honour to be the father of modern corneal lamellar and lamellar refractive surgery. Through his genius the field of lamellar surgery is what it is today.

References

1. Barraquer, J.: Queratoplastia refractiva estudios e informaciones. Oftalmología 2: 10 (1949).

2. Barraquer, J.: Method for cutting lamellar grafts in frozen cornea: New orientation for refractive surgery. Oftalmol. Optom. 1: 261-271 (1958).

3. Barraquer, J.: Queratoplatia. Arch Soc Amer Oftal Optom 3: 147-167 (1961).

4. Barraquer, J.: Queratomileusis para la correction de la myopia. Arch Soc Am Optom 5:27 (1964).

5. Barraquer, J.: Keratomileusis for myopia and aphakia. Ophthalmology 88: 701-708 (1981).

6. Hallermann, W.: Zur Technik der lamellären Keratoplastik. Klin. Mbl. Augenheilk. 142: 243250 (1963).

7. Castroviejo, R.: Atlas of keratectomy and keratoplasty, Saunders, Philadelphia (1966).

8. Draeger, J., Hackelbusch, R.: Experimentelle Untersuchungen und klinische Erfahrungen mit neuen Rotorinstrumenten. Ophthalmologica, Basel 164: 273-283 (1972).

9. Draeger, J.: Ein halbautomatisches elektrisches keratom für die lamelläre Keratoplastik. Klin. Mbl. Augenheilk 167: 353-359 (1975).

10. Böhnke, M., Draeger, J., Kohlhaas, M.: Die Präzision lamellärer refraktiver Hornhautlentikel. Fortschr Ophthalmol 87: 659-661 (1990).

11. Draeger, J., Kohlhaas, M.: Lamellar corneal grafting with autologous and homologous tissue. Sourdille Ph (ed): Evolution of microsurgery Dev Ophthalmol. Basel, Karger, 22-27 (1991).

12. Wilmes, C., Draeger, J., Kohlhaas, M.: Lentikeldickenpräzision in Abhängigkeit von den Gewebeausgangsdicken. Ophthalmologe 89: 147-150 (1992).

Accelerated Orthokeratology

Richard J. Wlodyga, O.D., F.I.O.S. (*)

I'm here to introduce to you an improved and expanded orthokeratology that can accomplish excellent results in a very short time period. We now can temporarily change corneal refraction of six diopters of myopia; three diopters of hyperopia and 2.5 diopters of corneal astigmatism. These changes can be accomplished in days and sometimes in just hours. This new system called accelerated orthokertology or A-OK for short is a miracle to witness.

In 1972 I started learning all there was to know about orthokeratology. Within six years I realized a better system was needed to afford more control over the changes in our patients' vision. Until that time doctors knew the cornea could be changed but it was a slow, arduous process which took from six months to two years to complete. Also, the range of these changes was limited to about two diopters. This meant this treatment could only be offered to a relatively small number of patients.

I had thought long and hard about designing lenses in the shape we wanted the cornea to attain. I actually solicited every contact lens laboratory in the country inquiring whether they could manufacture a lens with a flat center and steeper periphery. My thought was fitting the periphery of the cornea and using the center of the contact lens to flatten the cornea. This would cause changes to take place at a much faster pace.

After calling dozens of labs and having them tell me the design I wanted was impossible to manufacture, I temporally gave up my search for an improved ortho-K lens.

Early in 1987 I read in a professional contact lens journal that a contact lens laboratory in California would make any design. I thought, "Here's my chance!". I called the magnufacturer and described to him what I wanted and he said he could make it without a problem. I was doubtful this lab could make something all those other labs said couldn't be made. So, I asked this man to make the lens I needed and send it to me. Well, sure enough, when the lens arrived I checked it on my instruments and it was flatter in the center and steeper on the periphery. When I put a lens of this design on a patient's eye, I was elated to find it changed the correction as much as two diopters in an hour. That's something that would previously have taken six months to one year.

I immediately set up a clinical study in my own office. My staff and I found that not only could we change eyes more quickly but also we could change greater amounts of myopia. All the patients who participated in the original study were written up in August 1989 *Spectrum*, a contact lens periodal printed in the United States. This study has regenerated an interest in this procedure among optometrists around the world. Before the study many doctors were not interested in ortho-k because they thought it was too complicated and too time consuming for the patients. This new technique enabled the process to be completed sooner and now patients with astigmatism were experiencing the same improvements. As the study progressed I discovered patients with hyperopia could have improved vision by fitting the new lens in a different way.

Some have considered radial keratotomy as the answer to their quest for "natural vision". Now, after several years of this surgery, doctors are finding cases of damaged eyes. We are also discovering the permanent change in vision that had been promised is not true in most cases. The surgeons are now doing an additional surgery which they call an enhancement procedure on patients for whom the original surgery was not completely successful or permanent. In plain terms, enhancement means another surgery.

However, in the new *accelerated orthokera-*

* South Macomb Professional Center 12415 East Twelve Mile RD Warren, Michigan 48093 Telephone: (313) 573-4477

tology, as we are calling it, we can predict exactly what will happen to the patient's vision. It's not guess work! On a regular basis we see patients for a diagnostic fitting at which time lenses are applied. At the end of the patient's office visit I know if the A-OK will work because in an hour or two the patient will have gained up to three or four lines of improvement in uncorrected vision. This is exciting! It's exciting for the doctor and I know it's exciting for the patient. I've asked a couple of them to share their enthusiasm.

Here's what Chris Hansen wrote following his first experience with A-OK. "In August 1992 I heard about the accelerated ortho-k that Dr. Wlodyga was involved with. I immediately made an appointment to find out more about this procedure. I also contacted my eye doctor to get his opinion on Dr. Wlodyga's new procedure. He gave his approval inmediately. I started this new procedure in September 1992. My first appointment for my contacts was totally amazing. I remember getting my new contacts, being told to go have lunch and return in about one hour. After only one hour of wearing these special contacts I was able to read the 20/20 line on the eye chart. I was totally amazed!"

"At that point I was instructed to wear my contacts for only eight hours per day. Of course I asked what do I do for the remainder of the day. Would I have to wear my glasses? Dr. Wlodyga reminded me that I had just read the 20/20 line with no help and that my glasses would no longer help because the strength of my eyes had changed!".

After her first fitting with A-OK lenses Lisa Ashmore wrote, "I felt wonderful when I experienced improved vision! When Dr. Wlodyga tested my eyes for the program, I was able to see 20/20 after the first session!"

When I find the lenses do not change the cornea within an hour or two it's fairly certain this patient does not have a cornea that will change. Of all patients, on whom I do diagnostic fittings, about five per cent will be rejected because the cornea is not moldable. With the new technique patients do not need to invest large amounts of either time or money before discovering accelerated ortho-k may not work. Now I can tell the patient after the first fitting that he is a candidate for the A-OK and be reasonably sure the procedure will be successful.

Also, as a result of the work with the A-OK method, several universities have shown a renewed interest in this miraculous treatment called orthokeratology. Professors are now completing their own studies because they intend to begin teaching ortho-k to optometric students in their colleges. Thankfully, doctors of optometry who graduate in the future will have knowledge of ortho-k for their future patients who need or want this "natural vision".

Basically, people who *need* this procedure to qualify for their jobs are airline pilots, fire fighters, police officers, FBI agents, border patrol agents and some military personnel. In addition, there are thousands of people who want to have 'natural vision'.

They wish to get rid of glasses and contact lenses and yet need to be functional without these optical aids.

One of the most exciting cases was of a young woman having all the qualifications needed to be an FBI agent, except one. She needed a minimum of 20/200 uncorrected vision and she had less than 20/600 uncorrected vision. She had worn contact lenses most of her life and now needed to pass this eye test. She was the patient of a colleague of mine in Michigan. Her doctor called me and asked if I thought her vision could be changed in a matter of two weeks so she could pass her test. I said, "Terry, if you had asked me this two years ago, I would have said, 'not possible', but with this new technique using accelerated lenses, it is possible. Send her down!"

With the older system, this would have taken two or three years, but after only two weeks she passed her FBI test with 20/50 vision. This young woman was able to enter the FBI training program and, indeed, she is an FBI agent today. For her, this is a dream come true.

In conclusion, I hope I have presented information that will inspire you to investigate this new accelerated procedure. I invite all of you to the global meeting of the National Eye Research Foundation in Chicago in July 1993. At that time I will present an in depth lecture on this new procedure. At the same meeting we will be presenting a manual of all the ortho-K procedures known at this time.

Thank you for your interest and kind attention

Goal and results of reedepenening technique in radial keratotomy

U. Merlin (*)
M. Camellin
F. Merlin
R. Sichirollo

Introduction

The technique of redeepening the incision towards the periphery in an attempt to adjust depth to corneal thickness rises a series of problems regarding the wider field of radial keratotomy in its correcting possibilities, its predictability, its safety and the stability of results. Most refractive surgeons now agree that the correcting effect, i.e. the corneal bulging effect produced by an incision, relates not so much to the amount of incised tissue, but rather to the amount of uncut tissue (1). Hence, the less tissue remains intact with an incision, the greater the correcting effect of a radial keratotomy.

The problem would be easily solved if the cornea were equally thick in all its point, but its thickness varies not only gradually towards periphery but also along the different meridians.

Not taking into account the thickness variation along the different corneal meridians, single-pass incisions, as were those performed in PERK study (2), inevitably yield not only extremely varied results with poor predictability but also disappointing results in terms of visual acuity due to the asymmetrical bulging modifications of the cornea (3).

According to clinical observation, if in an incision there remains uncut tissue bridges or if a perforation is produced, the corneal bulging effect appears reduced in the first case and increased in the second instance. Both situations lead to an asymmetry of the corneal surface if the incision irregularity is restricted to only one meridian.

Generally, the concept now followed is that of performing incisions while leaving at the bottom some uncut tissue as uniform as possible in terms of quantity.

The technical solution to this problem has not been found as yet, and it can only be reached by combining an instrument giving a continuous measurement of corneal thickness with a knife with a tip that can be adjusted in real time depending on thickness variations. For the time being, we must be contented with an approximate incision uniformity, which is the main reason for the not yet satisfactory predictability of radial keratotomy.

In an attempt to obtain the greatest possible uniformity of uncut tissue, the technique of incision redeepenings when the corneal thickness becomes higher has taken root. First proposed by Fiodorov (4), at the beginning the technique of peripheral redeepenings of incisions was not followed by many. Most surgeons preferred to act on the number of incisions rather than on their depth in order to obtain a greater correcting effect. Only a few surgeons suggested the use of the redeepening procedure in their programmes. Sawelson proposed a redeepening with a 6-mm optical zone, increasing incision depth by 0.05 mm (5). Sawelson's technique is used by the school of José I. Barraquer (6) and by Ellis (7). Tate proposed two redeepenings on areas of diameters measuring 6 and 9 mm with a 3-mm optical zone (8). Most likely, now some surgeons have modified their procedures by adopting peripheral redeepenings, but this has not yet been reported in the literature. It his latest book, Waring (9) asserts that there is still no convincing publication on an increased correcting effect of redeepenings.

We have been using this procedure since 1982, and in order to determine the influence of redeepenings on the final correction of myopia we have collected the data on the patients we have operated upon in the last 5 years.

(*) Address Prof Umberto Merlin
Via de Polzer 32 - 45100 Rovigo - Italy

procedures were used: either to dissect these parts of tissue with a high level of magnification by using Dossi's technique or to rotate the knife performing a redeepening by starting slightly before the point determined for the redeepening.

All in all, this study was carried out on the results of primary surgery on 440 patients ranging from 20 to 40 years of age. This series does not include cases of secondary surgery. The number of patients belonging to one of the subgroups is listed in the table below.

Table 1

Number of cases belonging to different categories according to the type of redeepening

No. redeep	0	1	1	2	2	3	
Diam. redeep	None	6	7	5-7	6-8	5-7-9	Total
No.inc.							
6	8	8	10	15	27	43	111
8	15	10	17	105	48	134	329

Results

Tables 2 and 3 show the mean, the highest and the lowest correcting value and the standard deviation for each group and subgroup, determined as spheroequivalent value. Unfortunately, such marked a division into subgroups caused a decrease in the number of cases in each series, so that, from a statistical standpoint, some date may have only an indicative value. Nevertheless, their importance increases greatly if compared with the results of the other series.

Table 2

Mean correcting effect with 6 radial incisions and redeepenings

Redeep. Diameter	None	1 (6)	1 (7)	2 (5-7)	2 (6-8)	3 (5-7-9)
Average	3,77	3,92	4,24	4,54	4,72	5,24
Max	3,63	2,63	3,13	1,38	2,88	4,00
Min	4,38	5,25	5,50	7,50	6,25	6,25
St. Dev.	0,31	0,83	0,78	1,17	1,42	0,80

Table 3

Mean correcting effect with 8 radial incisions and redeepenings

Redeep. Diameter	None	1 (6)	1 (7)	2 (5-7)	2 (6-8)	3 (5-7-9)
Average	4,38	5,03	4,68	5,20	5,40	6,51
Max	3,25	3,75	3,50	1,75	4,25	-1,75
Min	5,63	6,25	5,75	9,50	6,50	11,00
St. Dev.	0,82	0,79	0,77	1,55	0,70	1,79

Discussion

An examination of the mean correcting values of the individual groups clearly shows that redeepenings increase the correcting effect by up to 1.5 Dpts. for 6 incisions and over 2 Dpts. for to 1.5 Dpts. for 6 incisions and over 2 Dpts. for 8 incisions from single-pass incisions to go against some authors' opinion whereby the correcting effect of radial keratotomy is related basically to the part that is closest to the optical zone and that the rest of the incision has little influence (11).

The redeepening procedure not only yields better results, but it also reduces its variability, since the coefficient of corneal thickening towards the periphery varies from person to person. On these grounds, since redeepenings adjust to thickness variation, these allow a more consistent response.

It is intuitive that the single-pass procedure, even with the same number of incisions, yields a different correcting effect in corneas whose thickness increase towards the periphery varies. Thus, beside offering a greater correction, there is also a higher level of predictability. Incision depths must clearly vary not only in a centrifugal but also in a circular sense, so as to leave the same quantity of uncut tissue in each of the incised areas.

We decided to control the phenomenon of progressive hypermetropy, and we noted

Materials and Methods

Since almost 1987, our technique has been based on the concept of reducing the number of incisions and trying to obtain instead a greater correction with a greater depth, by performing peripheral redeepenings. With the increase of our experience and of our and patient's demands, the concept of uncut tissue uniformity has been applied to the technique of "differentiated depth" both along the various meridians and towards the periphery. This can be obtained by changing the knife tip on the basis of the pachymetric data registered in the different radial markings and with different zone diameters in relation to the desired correcting effect. Thus, the knife tip is changed not only according to the centrifugal increase but also depending on the thickness variation in the different meridians.

Sampling criteria:

The results reported here refer to patients operated since 1987, because since then our technique has been modified with the characteristics reported further on. We have reported those cases in which a simple radial keratotomy alone was performed without other incisions for astigmatism, either transverse or curved.

For a better assessment of the results, all patients over 40 or under 20 years of age have been excluded. For the same reason, cases with a corneal diameter over 11.5 mm or under 10.75 and of a thickness over 0.58 mm and under 0.45 mm were also excluded, since in our experience these variables greatly influence the result.

With the above-mentioned limitations, two main series of patients were gathered with either 6 or 8 radial incisions. Yet, given that redeepenings may vary in number and distance from the centre, subgroups have been formed, dependending on the characteristics of these redeepenings. The system has been used whereby the term "diameter" refers to the point in which the redeepening begins. For instance, a redeepening made at diameter 7 begins at 3.5 mm from the centre of the optical zone. Thus, each group with either 6 or 8 incisions has the following subgroups:

1) With no redeepening;
2) Two subgroups with only one redeepening with a diameter at either 6 or 7 mm;
3) Two subgroups with two redeepenings at either and 5 and 7 mm or at 6 and 8 mm;
4) One subgroup with three redeepenings with diameters 5, 7 and 9 mm.

The procedure has not changed in the course of the last five years apart from an improved control of the scalpel and, obviously, a greater experience and skill. The pillars of the technique we have used are the following:
- All cases were operated by the first Author;
- Alignment of the optical zone with the pupillary axis;
- All cases presented with a 3-mm optical zone;
- Either round or radial marking depending on the surgical plan;
- Intraoperative pachymetry at mark crossing;
- The most central part of the incision was performed with a centripetal movement of the scalpel with an incision depth equal to the most central pachymetric reading, so that the central part of the incision is really perpendicular. Incisions of the same depth are grouped together whenever pachymetric readings are not over 0.02 mm of thickness selecting the lowest value so as to avoid microperforations. Recently, this can be obtained by using a computer programme conceived by Camellin (10).

- All redeepenings were made by the centrifugal technique, by augmenting the blade by 0.01 mm of the pachymetric reading registered at the starting point of the incision, always with the same incision grouping criterium. The use of this technique for redeepenings has drastically reduced down to 3.4% microperforations.
- In the case of a marked pupillary decentering, the criterium of isometric incisions was adopted, according to our previous publications (3).

Obviously, the use of the redeepening technique, in the conjunction of the parts with a different depth there remain parts of uncut tissue or "bridges", which may reduce the correcting effect. In order to dissect these bridges, two

remarkable differences with respect to other scientists' statistics. It must also be said that at least primary surgery is rarely performed with more than 8 incisions.

Yet, the statistics reported in this study only refer to patients under 40 years of age, in which the phenomenon of progressive hypermetropic shifting is less frequent. Beyond this age limit, redeepenings were used with great caution to avoid overcorrection and progressive hypermetropic shifting. As Waring rightly stated (9), this technique requires a greater amount of time with the risk of corneal dehydration and thinning. To avoid this drawback, it is necessary to maintain the same himidity and temperature in the patient's environment and a constant corneal wetting with a Merocel sponge.

Conclusions

The redeepening technique is useful to increase the correcting effect by up to 1.5 Dpts. with 6 radial incisions and by over 2 Dpts. with 8 incisions. When used in patients under 40 years of age, it never presented with noteworthy side effects, considerable daily refraction variations or progressive hypermetropy. Thus, this procedure should also be applied in view of the greater predictability of its results.

References

1. MERLIN U.: Appunti di chirurgia refrattiva incisionale (In press).

2. WARING. G., MOFFITT SD., GELENDER H., e Coll.: Rationale for and design of the National Institute Prospective Evaluation of Radial Keratotomy (PERK) study. Ophthalmology 1983; 90: 40.

3. MERLIN U.: Utilita delle incisioni isometriche nella cheratotomia radiale. Contatt. Med. Ch. Refr. 1190; 9: 263.

4. FYODOROV S.S.: Surgical Correction of Myopia and Astigmatism in Keratorefraction. Ed. Schachar R., Levy N., Schachar L. Publ. LAL. Denison, Texas 1980.

5. SAWELSON H., MARKS R.. Five years results of Radial Keratotomy. J. Refr. & Corn. Surg. 1989, 5: 8.

6. Barraquer J.I. Cirurgia Refractiva of the Cornea. Ed. Ist. Barraquer de America, Bogotá, 1989 Tomo II. Pag 690.

7. ELLIS W.: Radial Keratotomy and Astigmatism Surgery. Publ. Keith C. Terry & Ass. Irvine CA. 1986.

8. TATE G.W.: Centrifugally Placed Stepped Incisions: Optical Zone To Limbus Cutting. In Radial Keratotomy Surgical Techniques Ed. Sanders D. Pubb. Slack Thorofare 1986.

9. WARING G.: Refractive Keratotomy. Pag. 612. Mosby - Year Book, St. Louis 1992.

10. CAMELLIN M. Computerizzazione dell' esecuzione della cheratotomia radiale. In press.

11. SALZ JJ.: Pathophysiology od Radial and Astigmatic Keratotomy Incisions. In "Refractive Corneal Surgery" di Sanders DR, Hofmann RF, Salz JJ. Publ. Slack, Thorofare 1986.

Results of superior oblique weakening in intermitent exotropia with a pattern anisotropia

By Guillermo Velez M.D. (*)

Weakening of superior obliques have been accepted to treat A anisotropia. After the introduction of Berke[1] of the tenotomy of the superior obliques other procedures to treat the overaction of superior oblique have been reported.

Ciancia and Prieto Diaz[2] in 1970 presented the recession of the superior oblique by the nasal approach as an important alternative. Caldeira[3] and Romano and Rohlt[4] presented a graduate recession of superior oblique. Prieto Diaz[5] reported the posterior partial tenectomy of superior oblique for treatment of small A pattern. In recent years the tenotomy by the temporal approach reported by Goldstein[6] has been an important technique to treat the overacting superior oblique. There is a great discussion for the treatment of patients with intermitent exotropia with A pattern with a weakening of the superior obliques using a tenotomy. It is the purpose of this study to evaluate the results of bilateral superior oblique weakening in patients with intermitent exotropia that have fusion at near.

Material and method

Eight patients with intermitent exotropia with A pattern anisotropia between 25 and 40 prism diopters with an average of 31 prism diopters of A pattern anisotropia were treated, besides the horizontal surgery to treat the exotropia in the primary position a disinsertion of superior obliques[7], a tenotomy by the temporal side[8] or a recession of the superior obliques[4] were done. None of theese patients have a trasposition of the horizontal rectus.

The age of patients were between four and a half and 14 years of age with an average of 8 years of age.

Results

All the 8 patients before surgery have fusion at near. The A pattern anisotropia was corrected in all patients. In[1] a moderate V pattern anisotropia was observed. In 5 patients an important hypertropia was got between 6 and 14 prism diopters and 3 patients prsented a hypotropia between 10 and 12 prism diopters. One of the patients that had a recession of superior obliques by nasal approach presented a hypertropia of 14 with torticulis. The fusion was lost in all the 8 patients (Table 1).

Comment

Weakening of both superior obliques for the treatment of A pattern anisotropia when there is an overaction of the superior obliques has been accepted for most of the investigators. Souza Diaz[9], reported the correction of A pattern anisotropia using different techniques. In 1987 I reported a graduate tenotomy of the superior obliques by temporal aproach for the treatment of A pattern anisotropia[8], showing that the

(*) Calle 49B No 64B-37 Centro Suramericana Medellin - Colombia

TABLE 1

RESULTS OF SUPERIOR OBLIQUE WEAKENING IN INTERMITENT EXOTROPIA					
Patient	Age	Pre-Dev	Superior Oblique Weakening	Pos-Dev	Results
1	5	X'4 X6 0 X6 XT25	Desinsertion	ET4HT6	Lost Fusion Hypertropia
2	12	X'4 XT25 0 XT25 40	Disinsertion	HOT10	Lost fusion Hypotropia
3	7	X'X4 0 X4 XT25	Disinsertion	HT8	Lost fusion Hypertropia
4	6	X'4 X4 0 x4 XT30	Tenotomy	HOT12	Lost fusion Hypotropia
5	14	X'18 XT35 XT20 XT35 XT60	Tenotomy	ET14 V HT10	Lost fusion V pattern Hypertropia
6	4	X'14 XT30 XT20 XT30 XT60	Tenotomy	HOT10	Lost fusion Hypotropia
7	5	X'20 XT40 XT20 XT40 XT55	Recession	HT12	Lost fusion Hypertropia
8	6	X'14 XT30 XT18 XT30 XT50	Recession	HT14	Lost fusion Hypertropia

correction was less when the tenotomy was done near the insertion of the superior oblique and greater when the tenotomy was done more far from the scleral insertion of the tendon. There is not question that a tenotomy or a recession are good procedures for A pattern anisotropias in patients with no fusion potential. But there is an important controversy to weak the superior obliques with tenotomies or similiar procedures in patients with fusion potential as are the intermitent

exotropias. Reynolds and Wackerhagen[10] in 5 patients with fusion with A pattern anisotropia using a bilateral tenotomy of the superior obliques by temporal aproach showed that the fusion was not lost in these group. Others investigators, Parks[11] and Veronneau - Troutman[12] have reported that there is a contraindication for a tenotomy of superior obliques in patients bifixators as are the patients with intermitent exotropia with A pattern. In the present study in 8 patients with intermitent exotropia with A pattern anisotropia after a tenotomy or recession of superior obliques an important vertical deviation was got with lost of fusion in all eight patients. Based on this study I do not advised a weakening procedure as a tenotomy or recession of superior obliques for the treatment of A pattern anisotropia in bifixators as are the patients with intermitent exotropia. Other options as trasposition of horizontal rectus can improved the A pattern and prevents a lost of fusion.

Abstract

Eight patients with intermitent exotropia with A pattern anisotropia had a bilateral disinsertion, tenotomy or recession of superior obliques. In five patients besides the weakening of the superior obliques had horizontal surgery to treat the exotropia in the primary position. The A pattern anisotropia range between 25 and 40 prism diopters with a mean of 31 prism diopters. In all of the eight patients a lost of fusion was got. Five remained with a hypertropia and three with a hypotropia. The secondary vertical deviation ranged between 6 and 14 prism diopters. According with this study in bifixators as intermitent exotropia with A pattern anisotropia I do not advised a tenotomy or recession of superior obliques.

References

1. Berke. R.N.: Tenotomy of superior oblique for hypertropia. Trans Amer. Acad. Opthtalmology Socie. 44: 304, 1946.

2. Ciancia, A y Prieto Diaz, J.: Retroceso del oblicuo superior. Arch. de Oftalmologia de Buenos Aires. 45: 193, 1970.

3. Caldeira, J.H: Graduated recession of superior oblique. British Journal of Opthalmology. 59: 553, 1975.

4. Romano, P and Rohlt, P: Measured graduated recession of superior oblique. Journal of Pediatric Opth & Strabismus. 20: 134, 1983.

5. Prieto Diaz, J: Posterior partial tenectomy of superior oblique. Journal of Pediatric Opthalmology & Strabismus. 16: 32, 1979.

6. Goldstein, J.H. Temporal approach of the superior oblique Arch of Opthalmology 92: 224, 1974.

7. Prieto Diaz, J: Disinsertion of the superior oblique for A pattern anisotropia. Binocular Vision 2:1, 1987.

8. Vélez, G: Graduated tenotomy of the superior oblique by temporal approach for A pattern anisotropia: A report of 49 cases. Binocular Vision 2: 217, 1987.

9. Souza Diaz C and Uesiugi, C: Different Techniques of superior oblique weakening in the correction of A anisotropia. Journal of Pediatric Opthalmology & Strabismus. 23: 2, March - April, 1986.

10. Reynolds, J.D. and Wackerhagen, M: Bilateral superior oblique tenotomy for A pattern strabismus in patients with fusion. Binocular Vision, 3: 33, 1988.

11. Parks, M.M.: Personal Comunication

12. Veronneau - Troutman, S: Personal comunication.

Monoscleral fixation for posterior chamber intraocular lenses in cases of posterior capsule rupture

Arturo Maldonado Bas, MD, (*)
Jose Luis Bulacio, MD, (*)
Roberto Carrizo, MD, (*)

A method for monoscleral fixation of posterior chamber intraocular lenses in posterior capsule rupture is described. Five lenses fixated with this technique are reviewed.

In those cases in which, during surgery, a large tear occurs in the posterior capsule with vitreous loss or in those patients already operated on with an extracapsular cataract extraction who also have a large capsular rupture, the question arises whether to place an anterior chamber intraocular lens (IOL) or to try to place a posterior chamber IOL with special techniques[1, 2]. Although an anterior chamber IOL is simple to place in cases of capsular rupture, it also has a greater number of postoperative complications and disadvantages depending on its positioning, design, and manufacture[3, 4].

McCannel sutures have been used to fix the haptics of a posterior chamber IOL to the iris[5]. Malbrán developed a method of using sutures for guiding and fixing the haptics to the sclera in patients after intracapsular cataract extraction[6]. Scleral fixation has also been used to hold IOLs in place with a whole capsule[7] or a broken one [8, 9]. Nano sutured the optic through its holes to the iris (personal communication).

We describe a transscleral fixation technique, 2 to 3mm behind the limbus, with Prolene sutures (Ethicon, Sommerville, NJ) tied to one of the lens's haptics in those cases where there is enough capsule remaining to support the other haptic, which is placed in the ciliary sulcus. The results obtained in five cases treated with this technique are presented.

(*) From the National University of Cordoba
Address for reprints: Arturo Maldonado Bas, MD, Achaval Rodriguez, 5000 Cordoba, Argentina

Surgical technique

In those cases (Figures 1 and 2) in which there was a rupture of the posterior capsule and vitreous loss, a careful mechanical vitrectomy was done through the limbus, until the anterior chamber was clean and there was a concave surface on the anterior face of the vitreous behind the remaining posterior capsule (Figures 3 and 4). In general the enlargement of the capsular rupture expands towards the surgical incision, so there are normally remains of the capsule in the distal part.

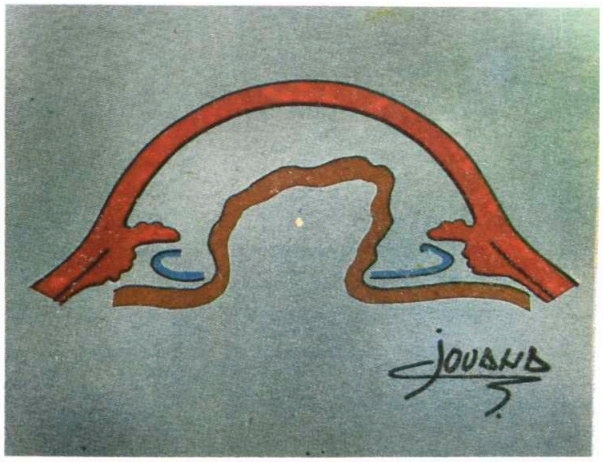


Figure 1 Posterior capsular rupture. The vitreous body is in the anterior chamber. Profile.
(Modification of original drawing by Rolando Agüero)

The wound was closed provisionally, and a

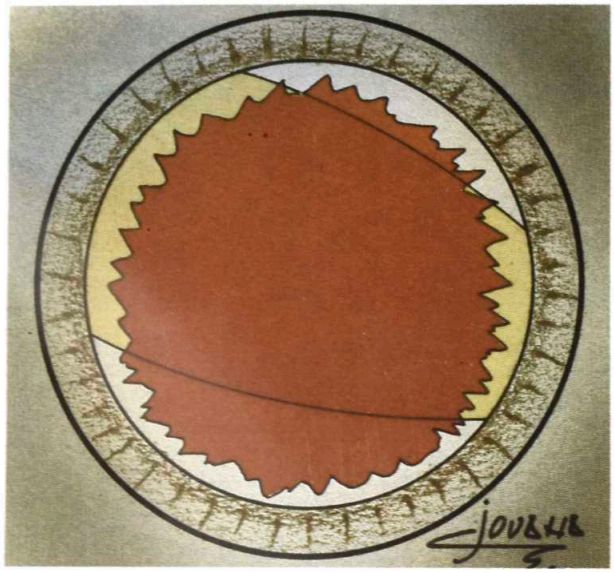


Figure 2 Posterior capsular rupture. Front.
(Modification of original drawing by Rolando Agüero)

Figure 3 Mechanical vitrectomy through the limbus produces an anterior concave surface of the vitreous.
(Modification of original drawing by Rolando Agüero)

lamellar sclerotomy was done, making a lamellar flap, 2 to 3mm behind the surgical incision, but no further than 3.5mm behind the limbus. With this, the scleral wall was weakened to facilitate the passage of the needle and to leave the Knots buried.

Then the incision was reopened and using a viscoelastic substance with a 9-0 polypropylene

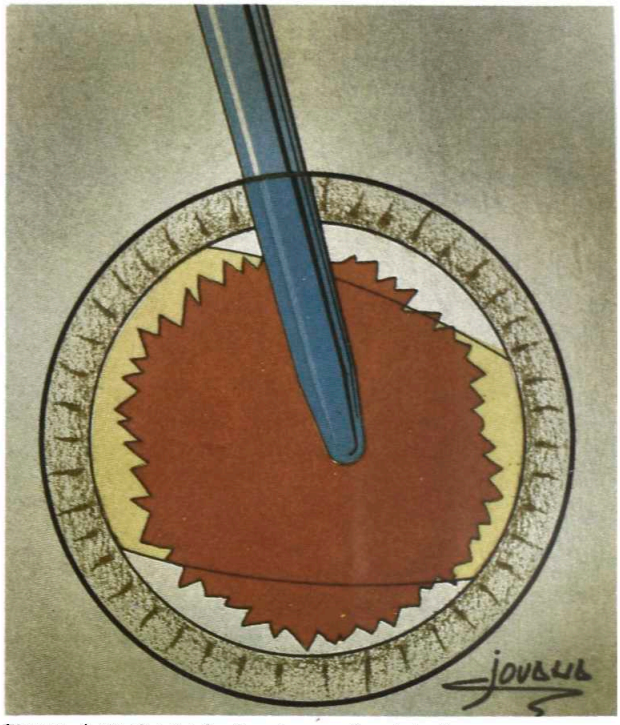


Figure 4 Mechanical vitrectomy. Frontal view.
(Modification of original drawing by Rolando Agüero)

suture (12" T 6160-6 Plus) with two needles , the Prolene suture was knotted around the proximal haptic of the IOL.

The needles were passed through the incision, through the pupil from front to back, and the sclera was pierced with both needles from the inside to the outside in the bed of the scleral flap (Figures 5 and 6). The IOL was gently in troduced, placing the distal haptic in the ciliary sulcus in front of the remaining inferior capsule.

The haptic to be sutured was placed in front of the iris (Figures 7 and 8). Both Prolene sutures were pulled up with one hand, and using a Kelman McPhearson forceps in the other hand, the nearer haptic was introduced behind the iris.

Both Prolene sutures were tightened and knotted in the bed of the lamellar sclerotomy and covered with the flap which was sutured with two stitches of 10-0 nylon so the Knots were buried (Figures 9 and 10). The corneoscleral incision was closed with a suture of 10-0 nylon. Intraocular

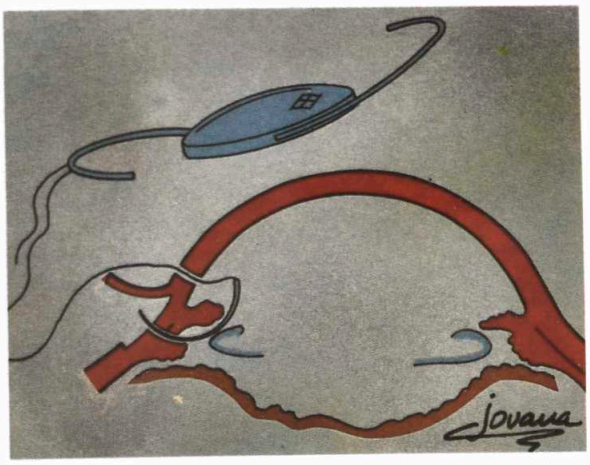


Figure 5 The Prolene suture is knotted in the lens haptic and the needle passed from the inside to the outside in the bed of the scleral flap.
(Modification of original drawing by Rolando Agüero)

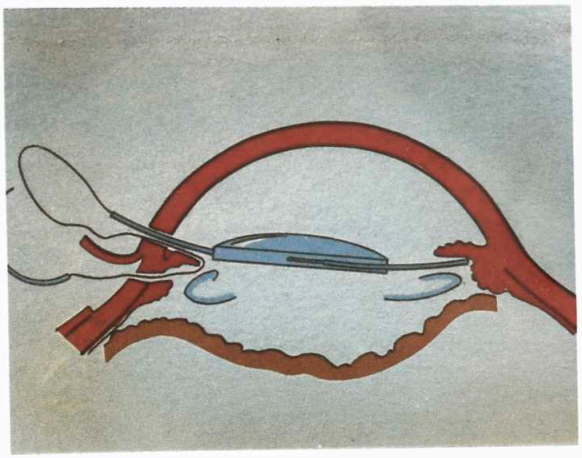


Figure 7 The IOL is inserted into the eye. The distal haptic is placed in the ciliary sulcus in front of the remaining capsule, and the near haptic lays in front of the iris.
(Modification of original drawing by Rolando Agüero)

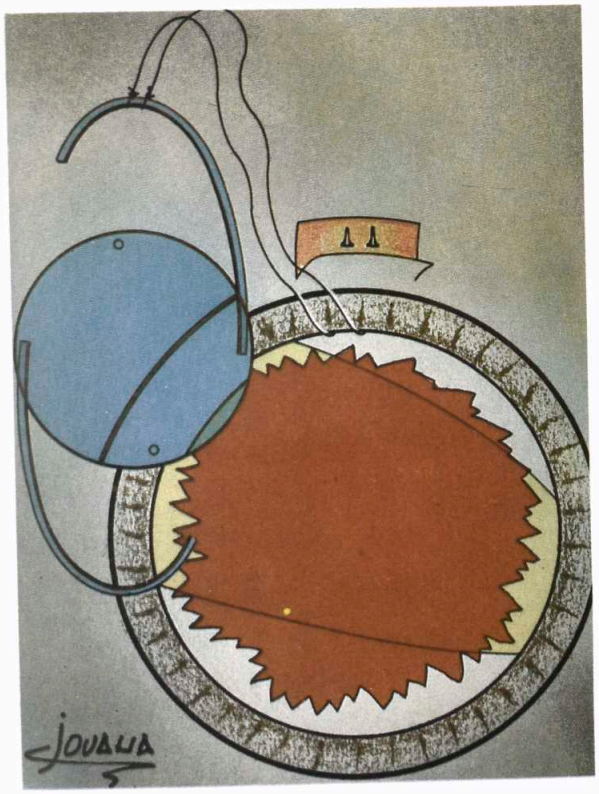


Figure 6 The same in frontal view.
(Modification of original drawing by Rolando Agüero)

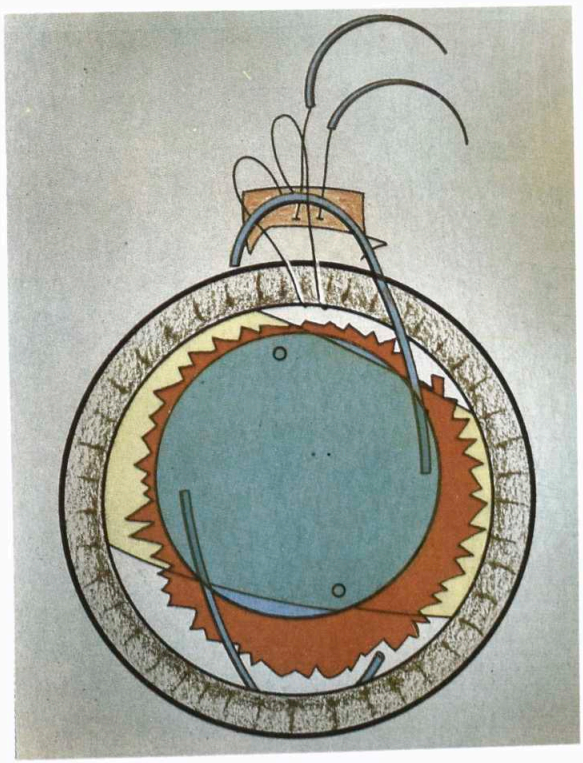


Figure 8 The same in frontal view.
(Modification of original drawing by Rolando Agüero)

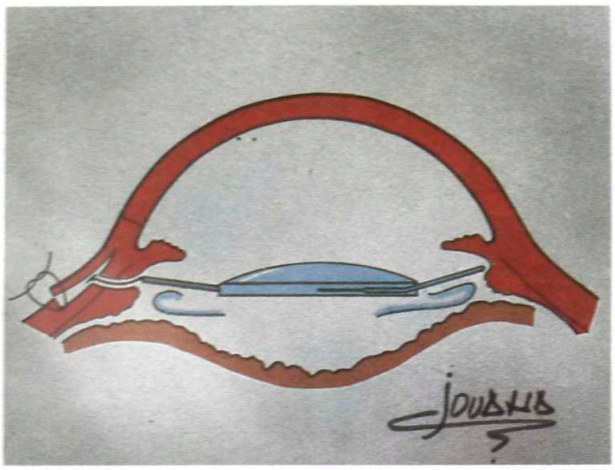


Figure 9 The lens in place. One haptic is located in the ciliary sulcus; the other is fixated by the polypropylene transcleral suture.
(Modification of original drawing by Rolando Agüero)

lenses with both Prolene and polymethylmethacrylate haptics were used.

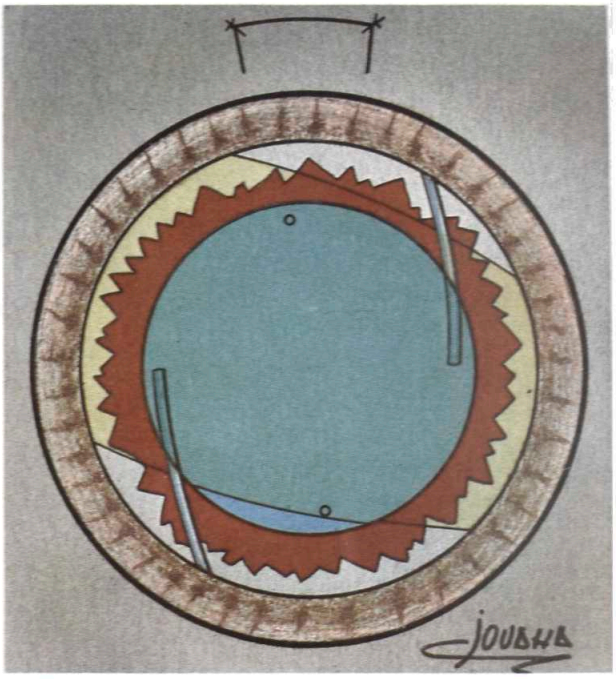


Figure 10 The lens in place. The scleral flap closed by two nylon 10-0 knots.
(Modification of original drawing by Rolando Agüero)

Table I

Summary of Clinical Data						
Case	Sex	Age (Yrs)	Follow-up (mos)	Primary Technique	Reason for sutured IOL	Optic Diameter and Haptic material
1	M	66	12	Phacoemulsification	Capsule rupture	7mm PMMA
2	F	64	9	Intracapsular	Capsule rupture	6.5 Prolene
3	M	61	10	ECCE	Complicated aphakia	7mm PMMA
4	F	62	11	Intracapsular	Luxated IOL	6.5 Prolene
5	M	67	8	ECCE with AC IOL	Corneal decompensation CME and uveitis	7mm PMMA

ECC = extracapsular cataract extraction; AC = anterior chamber; IOL = intraocular lens; CME = cystoid macular edema; and PMMA = polymethylmethacrylate.

Table II

Summary of Clinical Data							
Case	Power	VA Preoperative	VA Postoperative	IOP Preoperative	IOP Postoperative	Complications	Tyndall Effect at 15 Days
1	+ 16.50	20/200	20/30	15	17	-	-
2	+ 10	20/200	20/200	15	16	Previous myopic maculopathy	+
3	+ 19.50	20/200	20/20	16	14	Pigmentary dispersion	+
4	+ 19.50	20/60	20/25	22	16	-	-
5	+ 19	20/400	20/60	15	14	CME	+

VA = visual acuity, IOP = intraocular pressure, CME = cystoid macular edema.

Results

This technique was used in five eyes (Tables I and II). Two cases were done at the time of cataract surgery after capsule rupture. One eye was operated on with phacoemulsification and the other with an intracapsular procedure.

Of the three remaining cases, one was aphakic with the remains of the nucleus and uveitis; the second had a relocation of a luxated IOL in the anterior vitreous; and the third had an exchange of an anterior chamber IOL in an eye with complications of endothelium decompensation and cystoid macular edema.

The postoperative courses of these eyes were similar to our normal cases, and the visual acuity obtained was better than 20/40 in those cases with no preoperative macular problems.

One eye had visual acuity of 20/200 due to myopic maculopathy. Another had 20/60 visual acuity due to preexisting cystoid macular edema; the previous operation had been an extracapsular cataract extraction with complications, and the patient came to the consulting room with an anterior chamber IOL.

Conclusion

Suturing of one loop of an IOL to the sclera is an easy, useful, and satisfactory technique in our hands in cases where rupture of the capsule leaves a shelf on one side to support the other IOL haptic.

References

1. Sigelman A, Lindstron R, Nichols B, et al: Visual results following vitreous loss and primary lens implantation. *J Cataract Refract Surg* 1989; 15: 201-204.

2. Wang HS: Management of a posterior capsule rupture in planned extracapsular cataract extraction and posterior chamber lens. *J cataract Refract Surg* 1986; 12: 73-76.

3. Apple DJ, Brems RN, Park RB, et al: Anterior chamber lenses. Part I: Complications and pathology and a review of designs. *J Cataract Refract Surg* 1987; 13: 157-174.

4. Apple DJ, Hansen S, Richards S, et al: Anterior chamber lenses. Part II: A laboratory study *J Cataract Refract Surg* 1987; 13: 175-189.

5. Alpar J: Use of the Ethicon 1713 suture for McCannel suturing. *J Am Intraocul Implant Soc* 1985; 11. 296-298.

6. Malbran E, Malbran E Jr, Negri I: Lens guide suture for transport and fixation in secondary IOL implantation after intracapsular extraction. *Int Ophthalmol* 1986; 9: 151-160.

7. Gess L: Scleral fixation for intraocular lenses. *J Am Intraocular Implant Soc* 1983; 9: 453-456.

8. Girard L, Nino N, Wesson M, et al: Scleral fixation of a subluxated posterior chamber intraocular lens. *J Cataract Refract Surg* 1988; 14. 326-327.

9. Stark W, Goodman G. Goodman D, et al: Posterior chamber intraocular lens implantation in the absence of posterior capsular support. *Ophthalmic Surg* 1988; 19: 240-243.

Resultados de la ablación de las membranas epirretinianas maculares, secundarias a la readaptación quirúrgica del desprendimiento de la retina

Dr. Francisco Mateus Márquez (*)

Resumen

Las membranas epirretinianas localizadas en el área macular (MEM) después de una cirugía exitosa para el desprendimiento de la retina (D.R.), suelen presentarse de un 4% a 10% de los casos.

Las MEMs, generalmente causan metamorfopsia y reducción postoperatoria de la visión.

Para evaluar la eficacia de la escisión quirúrgica de las MEMs, hemos revisado 53 casos de fruncimiento macular, 31 de los cuales, secundarios a cirugía para la adaptación de la retina.

La agudeza visual (A.V.) postoperatoria mejoró a 0.5 en el 10% de los casos; a 0.4 en el 20%; a 0.2 en el 40% y a 0.1 o permaneció igual en el 30% restante de casos.

Tres de los 53 ojos terminaron con peor A.V.que preoperatoriamente. La visión pocas veces mejora a un nivel normal, incluso cuando la mácula no ha sido previamente afectada por el desprendimiento y un poco de metamorfopsia persiste en el postoperatorio de la cirugía de la retina, con edema angiográfico preoperatorio, después de resecar las membranas, la visión mejora, pero si el edema ha persistido por largo tiempo, las alteraciones maculares son irreversibles y los resultados funcionales no son buenos. La más seria complicación es el D.R. recidivante y la progresión de la esclerosis nuclear del cristalino en pacientes de edad avanzada.

(*) Centro de Oftalmología Barraquer
Barcelona - España

Palabras Claves

Vitrectomía, macular Pucker, membranas epirretinianas maculares, fruncido macular.

Introducción

Las membranas epirretinianas en el área macular ocurren en algunas situaciones clínicas, causando disminución y alteración de la agudeza visual. Las membranas pueden ser vasculares o avasculares. Las vasculares se encuentran en las retinopatías de tipo proliferante secundarias a isquemia, cuyo ejemplo más clásico es el producido por la retinopatía diabética proliferante.

Existen otras formas de maculopatías por formación de membranas epirretinianas secundarias a:

1. Afecciones de carácter vascular.
2. Traumas o intervenciones quirúrgicas.
3. Intervenciones paraquirúrgicas: fotocoagulación, criocoagulación.
4. Procesos inflamatorios retino-uveales: uveitis, pars-planitis.
5. Desprendimiento de la retina.
6. Desprendimiento del vítreo.
7. Retinitis pigmentosa.
8. Vítreo hiperplásico primario.

En otros casos no hay nexo evidente de causa a efecto y estas son las formas llamadas idiopáticas.

Es conocido que estas membranas son producidas por proliferación celular y secreción de material extracelular; su origen parece depender de la patología del fondo. También hay que tener en cuenta la importancia del desprendimiento del vítreo posterior en la patogénesis de las formas idiopáticas, dado que a través de dehiscencias, provocadas en la lámina interna, elementos celulares intrarretinianos pueden migrar sobre la superficie interna de la retina y crecer.

Las membranas epirretinianas localizadas en el área macular, después de una cirugía con éxito para tratar el desprendimiento de la retina, ocurren entre un 4% a un 10% (revisando varias series).

Las MEMs, después de la cirugía para el D.R., generalmente causan metamorfopsia y reducción de la visión en el postoperatorio. Esto es debido a:

1. Formación de tejido traslúcido u opaco cubriendo el área macular, a veces distorsionando la mácula (Pucker).

2. Desprendimiento del polo posterior por tracción.

3. Difusión vascular, produciendo edema.

Las MEMs, pueden ser escididas, mediante cirugía vítrea, obteniéndose una mejoría en la agudeza visual y disminución de la metamorfopsia.

Materiales y Métodos

Para evaluar la eficacia de la resección de las membranas epirretinianas maculares, hemos revisado 53 casos de ablación de MEMs por fruncimiento macular, 31 de los cuales eran secundarios a cirugía para la readaptación de la retina. Empleamos la visión pre y post operatoria como criterio para la voloración de los resultados:

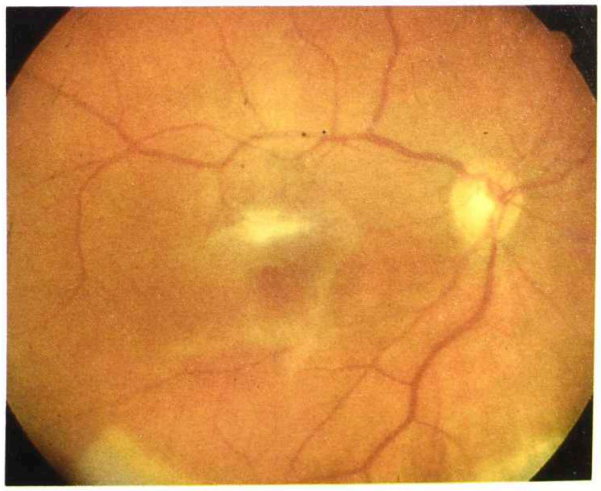


Figura 1 Membrana epirretiniana macular, secundaria a la readaptación quirúrgica del desprendimiento de la retina.

Figura 2 El mismo caso a mayor aumento, donde se aprecia un pseudo agujero macular.

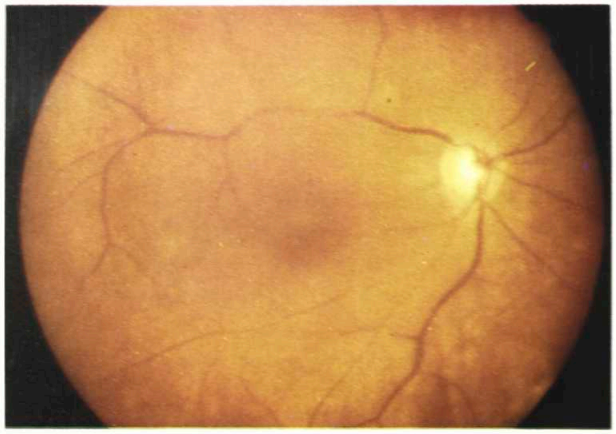


Figura 3 Aspecto del fondo de ojo, después de la ablación de la membrana epirretiniana macular.

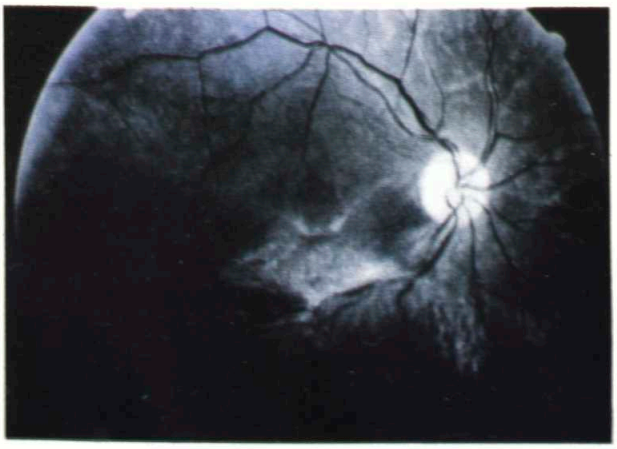


Figura 4 Retinografía en blanco y negro donde se aprecia una M.E.M. secundaria al tratamiento quirúrgico del D.R.

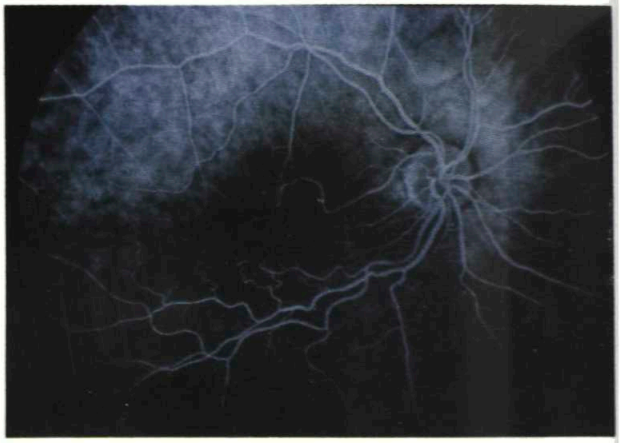
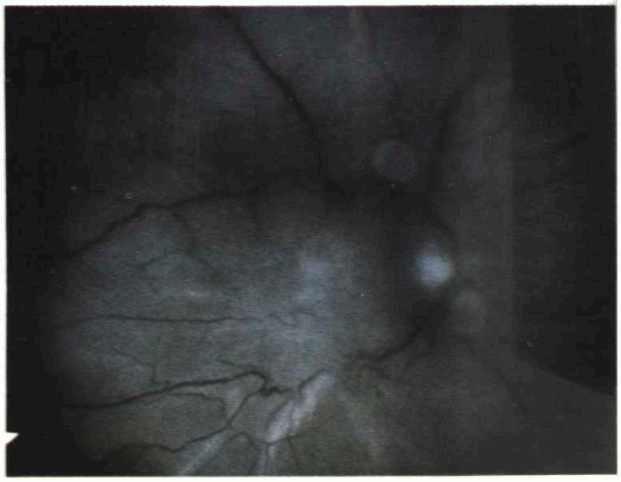


Figura 5 A la angiografía con fluoresceína se aprecia tortuosidad vascular característica. No se aprecia edema.



Figuras 6 y 7 Pucker en la mácula, como consecuencia de cirugía para el D.R. 2 meses después la membrana causa distorsión de la retina asociada a edema y pérdida de visión.

Aquellos casos que presentan edema prolongado de la mácula, no mejoran mucho funcionalmente, debido a alteraciones maculares irreversibles. Se deben intervenir pronto, entre 8 y 12 semanas de su aparición.

Bueno = Cuando la A.V. y la metamorfopsia habían mejorado en relación a la preoperatoria.

Regular = Cuando la A.V. permaneció igual pero mejoró la metamorfopsia.

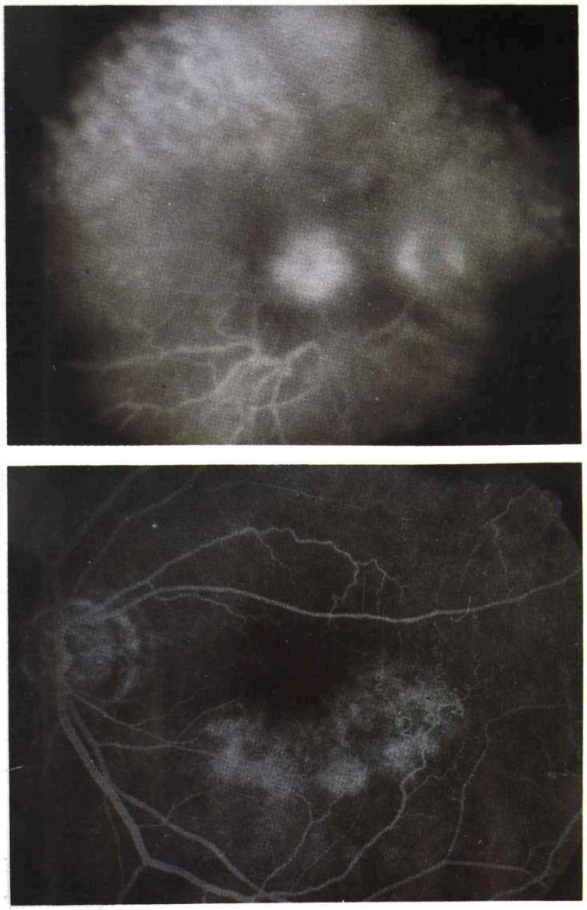


Figura 8 Edema Macular Secundario a la formación de una membrana epirretiniana macular reciente, que también causa metamorfopsia.

Malo = Cuando terminaron con peor A.V. que la preoperatoria.

Resultados

Tabla 1.

A.V. mejoró	
a 0.5 en 3 casos	= 10% bueno
a 0.4 en 6 casos	= 20% bueno
a 0.2 en 12 casos	= 40% bueno
a 0.1 ó = a la preoperatoria en 10 casos	= 30% regular

La visión pocas veces mejora a niveles normales, incluso en varios casos en que la mácula no había sido afectada por el desprendimiento y casi siempre persiste un poco de metamorfopsia en el postoperatorio de la cirugía vítrea para resecar las membranas.

En los casos con edema macular detectado por angiografía preoperatoriamente, al resecar las membranas, el edema angiográfico y la visión mejoraron en 6 casos (20%).

En 3 casos, en los que el edema macular había sido prolongado por largo tiempo (más de 10 meses en 1 caso y en los otros 2 casos más de 1 año y medio), la A.V. no mejoró, ya que las alteraciones maculares son irreversibles y los resultados funcionales no fueron buenos.

En 3 casos, de los 31, se presentó recidiva del desprendimiento (10%), los cuales fueron reoperados con buen resultado anatómico final.

En 5 casos (16%) con facoesclerosis por edad avanzada, progresó la esclerosis nuclear del cristalino; inicialmente tuvieron buena visión, pero esta bajó por las opacidades del cristalino, 2 de los cuales fueron operados de catarata con buen resultado.

Comentarios

Las MEMs que causan fruncimiento retiniano (Pucker) con alteración y disminución de la A.V. en el postoperatorio de la cirugía del desprendimiento de la retina, suelen ocurrir en un significativo número de casos (1) (2), y pueden ser tratadas eficazmente con recuperación de la visión en 0.1 a 0.2, después de la ablación de las membranas en un 70% de casos. Ver Tabla 1. En esto coincidimos con varios autores (3) (4) (5) (6) (7).

En tres de nuestros casos (10%), el resultado visual fue inferior a 0.1 porque previamente habían tenido edema macular cistoideo de larga evolución ya señalado por Trese et al. (5). Aunque existen otros trabajos que no han demostrado esta correlación (8).

En cuanto a las complicaciones, observamos 3 casos (10%) de recidivas del desprendimiento de la retina, como también señala Michels (9) y así mismo, la progresión de cataratas nucleares en 5 casos (16%), en pacientes de edad avanzada.

Conclusiones

Las MEMs son probablemente una forma limitada de vítreo-retinopatía proliferativa causada por células del epitelio pigmentario que circulan en la cavidad vítrea y que se depositan en el polo posterior de la retina donde estimulan la producción de sustancias proliferativas, para formar las membranas. La ablación quirúrgica está recomendada si la agudeza visual está reducida a 0.2 o menos o si el paciente se encuentra muy afectado por la metamorfopsia.

Bibliografía

1. HAGLER W.S., and ATURALIYA U.: Macular puckers after retinal detachment surgery. Br. J. Ophthalmol. 55: 451, 1971.

2. LOBES L.A. Jr. and BURTON T.C.: The incidence of macular pucker after retinal detachment surgery. Am. J. Ophthalmol. 85: 72, 1978.

3. MICHELS R.G.: A clinical and histopathologic study of epiretinal membranes affecting the macula and removed by vitreous surgery. Trans. Am. Ophthalmol. Soc. 80: 580, 1982.

4. MICHELS R.G.: Vitreous surgery for macular pucker. Am. J. Ophthalmol. 92: 628, 1981.

5. TRESE M.T., CHANDLER D.B., and MACHEMER R.: Macular pucker. Prognostic criteria. Greafe's Arch. Clin. Exp. Ophthalmol. 221: 12, 1984.

6. MACHEMER, R.: The surgical remover of epiretinal macular membranes (macular puckers). Klin. Monatsbl. Augenheilkd. 173: 36, 1978.

7. MALDERCORN M.S., and LIAO R.: Preretinal membranectomy in idiophatic preretinal macular fibrosis. Can. J. Ophthalmol. 18: 321, 1983.

8. MARGHERIO R.R., COX M.S. Jr., TRESE, M.T. et al.: Removal of epimacular membranes. Ophthalmology. 92: 1075, 1985.

9. MICHELS R.G.: Vitrectomy for macular pucker. Ophthalmology 91: 1384, 1984.

Relaxing incisions out the graft for postkeratoplasty astigmatism

Merlin U. (*)
Merlin F

Introduction

In 1977 Troutman proposed "relaxing incisions" as a technique to relax intrastromal or cicatricial tensions producing a steepening effect (1,2,3). Troutman's original technique provided for symmetric arcuate 60° - 90° incisions, centred in the steepest meridian and placed in the wound.

This original technique underwent some modifications regarding either the incision shape, depth or location. Ruiz suggested to perform its trapezoidal keratotomy also in postkeratoplasty astigmatism and various surgeons (4,5) tried this technique, but is was commonly held that the procedure was powerful but with poor predictability (6,7). Lindstrom (8) proposed transverse incisions performed in the wound or in the graft.

Both computerized and fluorescein keratoscopies have offered data on either the symmetry or the asymmetry of the steepest meridian or sector. For this reason, Troutman's "relaxing incisions" have become "selective" in relation to the type of deformation (9,10).

A second modification of the procedure is linked to incision depth. Troutman suggested an incision depth of 80 - 90%. Lindstrom increased incision depth with successive redeepenings during the same surgical intervention, or in the following days when at check-up the correcting effect appears insufficient (8).

"Relaxing incisions" also change in relation to their site; in the graft, the wound or else outside the graft in the patient's cornea? Troutman's original technique provided for symmetric 90° incisions made at wound level. The majority of authors reported cases of incisions made in the wound or inside the graft (11,12,13,14,15,16), sometimes with Ruiz's trapezoidal incisions.

Results are extremely variable and a comparaison is impossible due to procedure (17) and follow-up variability. The mean correction with simple incisions, either arcuate, transverse or trapezoidal, ranges between 3 to 8 diopters. In our opinion, with the technique of the incision in the wound it is not easy to determine the right incision depth due to both the variation in the scar thickness and the difficulty in obtaining precise pachymetric readings because of the different echoes deriving from acoustic transmission irregularities.

Material and Methods

On these grounds, microperforations are a likely complication so that some surgeons prefer to use a bent insulin needle for a gradual detachment of the graft of the patient's cornea down to almost the Descemet's membrane.

We experimented this technique in 8 cases with disappointing results in terms of both correction and predictability, and in all cases secondary surgery was necessary. Yet, it should be kept in mind that this site is adequate only when a scar retracting at the junction level is evident.

Apart from this procedure, the cases of relaxing incisions operated by the Authors were 75, of which 5 had incisions in the wound, 2 in the graft, while all the other cases had incisions in the host cornea. In this series of 68 cases, 50 underwent

Author's address:
Prof. Umberto Merlin Via de Polzer 32 45100 Rovigo - Italy

simple relaxing incisions and 18 with compression sutures.

We prefer to perform relaxing incisions in the patient's cornea about 0.2 - 0.3 mm close to the wound. Because of the yielding tissue, in keratoconus the incision produces a remarkable corneal effect, so that it is possible to correct high astigmatism even with incisions placed at about 3.5 or 4.25 mm from the centre. This is due to the fact that most grafts for keratoconus have a diameter of 7.5 - 8.5 mm.

If doubled, this distance from the centre equals the so-called Optical Zone. If performed for congenital astigmatism, arcuate incisions would produce an extremely limited effect (about 1 to 1.5 Dpts.), while in astigmatism following trasplant for keratoconus, it is possible to obtain corrections up to 8-9 Dpts.

We feel that this difference is related to the keratoconic tissue, which shows a greater tendency to bulge even if the incision is made farther from the centre. These incisions often show a dehiscence with epithelialization of the incision, which, however, does not interfere with vision due to its peripheral location. Moreover, being the thickness of the patient's cornea more regular than that of the wound, it is possible to obtain pachymetric readings and, consequently, to adjust incision depth. We set the diamond tip at about 0.04 - 0.05 below the lowest pachymetric reading.

Instead of redeepening the incision in the following days when the effect appears insufficient, we prefer to widen the incision, depending on keratoscopic indications. Keratoscopy is also used for a correct surgical planning in terms of incision site and width. Sometimes we performed a single incision in only one sector, while in other instances asymmetric incisions were made.

From what has been said, in this series an index regarding the type of astigmatism, and perhaps its pathogenesis too, may be derived also from the number of procedures performed with either symmetric or asymmetric incisions. Table 1 indicates the number of either symmetric or asymmetric incisions.

Table 1
Type of relaxing incisions in 68 cases

Type	Symmetric	Asymmetric	Isolated
Number	25	34	9

These data show the morphological irregularity of these corneas and how keratoscopy helps in correcting those forms of astigmatisms that are otherwise impossible to correct in a precise manner. Incision width is also suggested by the keratoscopic map with a variability of 40° to 90°. In any case, the characteristic of these relaxing incisions lies in their poor predictability.

Results

The results of simple wound opening is shown in Table 2.

Table 2
Results of astigmatism correction after keratoplasty by wound opening in 8 cases

	CORRECTION
AVERAGE	1,14
MAXIMUM	3,75
MINIMUM	-6,00
ST. DEV.	3,35

The technique used in the 8 cases not only revealed its extremely poor efficacy, but it also underlined the risk that over a certain limit, difficult to assess, the wound may bulge and cause an incontrollable overcorrection. In one case with an overcorrection up to 14 Diopters a second suture was necessary. Conversely, an indication for this technique may be the correction of low astigmatism causing aniseiconia and problems in binocular vision. In all other cases, relaxing incisions should be performed with a diamond knife.

The other cases were operated either with relaxing incisions performed out the graft or together with compression sutures.

Table 3

Results on 50 cases of post-keratoplasty astigmatism correction with simple relaxing incision outside the graft (in absolute keratometric values)

	PREOP	POSTOP	CORRECTION
AVERAGE	7.71	2.31	5.40
MAXIMUM	14.00	6.00	10.00
MINIMUM	3.5	0.25	1.25
ST. DEV..	1.95	1.26	2.03

The follow-up of mean 32.10 months, with range from 63.33 to 2.47.

After a few cases, which grew into over-correction at one month postoperatively and had to be resutured, we now prefer to perform narrower incisions and to increase their depth after one or two weeks if the patient is undercorrected. In Table 4, the number of secondary surgeries indicates the poor predictability of the procedure in these cases.

Table 4

Under and overcorrections with incision dehiscenses in 50 cases of stitchless relaxing incisions

Cases	Undercorrected	Overcorrected	Total
	42	8	50

In 7 out of 8 overcorrected cases it was necessary to apply more stitches due to incision dehiscence, and only 1 case was corrected with two more small incisions in the 90° meridian. We deem preferable to perform secondary surgery for overcorrection by widening the incisions or else with new incisions rather than suturing dehiscent incisions since the former procedure grants better results. Another reason for this is that, incising the patient's cornea and dealing mostly with keratoconus, the morphological stabilization is slower, and the full correcting effect may show even after one month.

The correcting results of the series with compression sutures is shown is Table 5.

A comparaison with the mean results obtained from the series of patients operated with only relaxing incisions shows how adding compressive stitches to relaxing incisions increases the average effect only by over one diopter.

Table 5

Corrective results of 18 cases operated with relaxing incisions outside the graft combined with either symmetric or asymmetric compressive stitches

	PREOP	POSTOP	CORRECTION
AVERAGE	9.46	3.19	6.38
MAXIMUM	12.25	5.5	10
MINIMUM	6.5	0	2
ST.DEV.	1.74	1.51	2.12

In some of the first cases, one compressive stitch was applied in each sector, so that one can logically think that greater number of compressive stitches would have yielded a greater effect as indeed we have seen in the subsequent cases.

The technique of combining compressive stitches to relaxing incisions is extremely useful to modulate successively the corrective effect by selective removal. Once the desidered correction is obtained, following the removal of one or two stitches, the others are left in situ up to even 8 - 10 months so as to allow the relaxing incision to heal in the desired fashion.

In conclusion, if planned, non perforating incisions-out the graft, either single or double, symmetric or asymmetric-may grant a good correction in cases up to 8 diopters, although with an evident sectorial depression the correction could be greater. When a greater correction is necessary, the so-called "compressive stitches" should be applied

To sum up, we perform only relaxing incisions with astigmatism below 8 diopters, while we apply compressive stitches in the orthogonal meridian with an astigmatism exceeding that value. Thus, we feel that separate compressive stitches used after the plastic phase may be given only by using non-elastic and non-degradable thread that is not so thin as to cut the tissue.

The visual results of the two series of patients - incisions alone and incisions combined with compressive stitches - show that the two techniques not only reduced the amount of astigmatism, but also improved its regularity in the 68 cases.

Table 6

Improvement of corrected visual acuities (in tenths) of the two series of patients operated with relaxing incisions (No. 50) and with compressive stitches (No. 18) as obtained preo - and post-operatively

	PREOP	POSTOP	IMPR.
AVERAGE	4.55	7.70	3.15
MAXIMUM	10	10	0
MINIMUM	1	4	3
ST.DEV.	2.03	1	0.36

The only serious complication reported with this technique was a corneal decompensation following a negative immunologic reaction in one case in which the endothelial density had not been assessed pre-operatively. Such density later turned out to be critical (540 cell/mm^2). In this case the refractive result was excellent. This teaches us that an endothelial microscopy examination is necessary prior to any surgical approach in transplants and that it is wiser to perform relaxing incisions in the graft than in the patient's cornea when the latter is vascularized.

Conclusion

In conclusion, in the surgical treatment of the postkeratoplasty astigmatism we obtained very good results with relaxing incisions performed in the host cornea as well as with those performed in in either the wound or the graft.

Among the advantages we noticed with these incisions are: less danger of microperforations than with incisions performed in the wound, a greater correction effect in keratoconus than with incision incisions performed in the graft and a grater possibility to control the effect.

Besides, this procedure is atraumatic for the graft since it is performed outside the wound. The only contraindication is a neovascularised host cornea.

References

1. TROUTMAN RC.: Surgical correction of high corneal astigmatic errors after successfull keratoplasty. A preliminary report. Advances in Ophthalmology 1972, 27-170.

2. TROUTMAN R.C.: Microsurgery of the anterior segment of the eye. Vol. 2, 286 Ed. Mosby 1977.

3. TROUTMAN R.: Microsurgery of the anterior segment of the eye. Mosby. 1974 Vol. 2, 23.

4. MERCK PM, WILLIAMS PA, LINDSTROM RL. Trapezoidal keratotomy. A vector analysis. Ophthalmology 1886, 93, 719.

5. LAVERY G.W., LINDSTROM R.L.: Clinical results of the Ruiz astigmatic keratotomy - J. Refract Surg, 1985, 1, 70-74.

6. BUZARD K.A., HAIGHT D., TROUTMAN R: Ruiz procedure for postkeratoplasty astigmatism. J. Refr. Surg. 1987, 3, 40.

7. KAUFMAN H.E.: Corneal Transplant and Visual Disability. Refr. & Corneal Surgery - 1989, 5, 213.

8. LINDSTROM R.L., LAVERY G.W.: Correction of Post-Keratoplasty Astigmatism. In Sanders D.R., Hofman R.F. "Refractive Surgery" Ed. Slack - 1985, 167.

9. MERLIN U.: Il problema dell'astigmatismo nel trapianto di cornea. Atti LXVI Congr. SOI 1986, 245.

10. FRANGIEH G.T., KWITKO S. MCDONNEL P.J.: Prospective corneal topographic analysis in surgery for keratoplasty astigmatism. Arch. Ophthalm. 1991, 109, 506.

11. KRACHMER J.H., FENZL R.E.: Surgical correction of high postkeratoplasty astigmatism: relaxing incisions vs wedge resection. Arch. Ophthalm. 1980, 98, 1400.

12. SUGAR J., KIRK A.K.: Relaxing keratotomy for postkeratoplasty high astigmatism - Ophthal. Surg. 1983, 14, 156.

13. LAVERY G.W., LINDSTROM R.L., HOFER L.A. DOUGHMAN D.J.: The surgical managment of corneal astigmatism after penetrating keratoplasty -Ophthal Surg, 1985, 16, 165-169.

14. KRACHMER J.H., CHING S.S.T.: Relaxing corneal incisions for postkeratoplasty astigmatism - Int Ophthalmol.Clin. 1983, 23, 153.

15. MANDEL M.R., SHAPIRO M.B., KRACHMER J.H.: Relaxing incisions with augmentation sutures for correction of postkeratoplasty astigmatism. Am. J. Ophthalm. 1987, 103, 441.

16. ARFFA R.C., Results of graded relaxing incision technique for postkeratoplasty astigmatism. Ophthalmic Surg. 1988, 19, 624.

17. BINDER P.S., WARING III G.O.: Keratotomy for astigmatism. In "Refractive Keratotomy" Ed. Mosby 1992, 1174.