A FOLLOW UP STUDY OF 25 MIOPIC CASES WITH FLOURESCEIN ANGIOGRAPHY[1]

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This presentation reviews the visual, ophthalmoscopic and fluorescein angiographic findings that were observed in a small selected group of twenty five miopic patiets followed over a period of one to five years.

The most frequently encountered myopia was simple myopia. This form of refractive error was accesible to treatment by the us of corrective concave lenses. The amount of myopia varied from a low degree, up to 6D, to a medium degree up to 12D. The vision was correctable and the cases represented controlled degrees of ametropia in otherwise healthy eyes.

Myopia of high degree and that associated with degenerative changes of the fundus, by comparison, was relatively rare. This type of myopia however was a common cause of marked visual disability and even blindness. A number of therapeutic procedures have been recommended some optical others surgical but none have as yet established the effectivity in modifying the basic problem of the disease.

The findings were compared to those in the literature. The fluorescein angiographic studies pose questions the answers to wich may assist our understanding of some of the grave complications of degenerative myopia and in particular that of glaucoma. The arm retina circulation time (ARCT) were studied and compared to the normal values.

Materials and Methods

Twenty five patients with myopia were selected for this study. The diagnosis of myopia was based on retinoscopic and ophthalmoscopic measurements. On initial examination apart from the refrative study, intraocular tensions, visual fields, when obtainable, and fundus photographs were

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performed. Since 1959 the Zeiss fundus camera was used for color fundus photography. The blach and white and colour fluorescein angiographic techniques have been reported previously (7, 8, 9). Since 1965 extrarapid serial fluorescein angiography has been regularly employed. In the Zeiss fundus camera the Kodak Wratten 45 with Kodak Wratten 15 filters have been replaced by two other filter combinations: the Baird Atomic interference filter B4 as exciter filter with a Kodak Wratten 12 barrier filter and a Baird 4 exciter with a Baird 5 barrier filter. In the Topcon camera a Kodak Wratten 23A exciter filter without a barrier was used for infrared photography.

Findings

The following results emerged from the study of 46 myopic eyes.

Heredity, sex and race

Fifteen cases were females and ten were males. Of the twenty five cases, twenty had a family history of myopia. The twenty five patients were caucasian of hispano-american extraction. The data was summarized in table 1.

Age

The age of the patients varied from 7 to 79 years the data was arranged into three groups: (see table 2).

Group A: consisted of patients under age 21, fifteen cases belonged to this group.

Group B: included patients from 30 to 50 years of age, five cases belonged to this group.

Group C: included patients from 50 to 80 years of age, five cases belonged to this group.

Degree of myopia

The degree of myopia was determined by measuring the dioptric power of the concave lens, or spherical equivalent, required for best correction of vision. The data was summarized in table 2. The degree of the myopia varied from -1.00 to -8.00 in the cases of simple myopia and from -6.50

to -20.00 in those with degenerative myopia. Myopia was grouped as low, medium and high depending on its degree: from -1.00 to -6.00 D was considered low myopia, from -6.00 to -12.00 D medium and high above -12.00 D. Low myopia accounted for the greatest number of good vision eyes except for the cases described under amblyopia. Degenerative myopia on the other hand was more frequently found with high myopia and poor vision.

Vision

Vision did not run parallel to the degree of myopia but to the degree of degenerative ophthalmoscopic changes. (Tables 2, 3), Fig. 1.

Patients in group A usually consulted because of visual difficulties at school, of the 28 eyes vision was correctable from 20/20 to 20/30 in 21 eyes, from 20/40 to 20/50 in 5 eyes and from 20/60 to 20/80 in 2 eyes. The cases with sub normal vision will be discussed later and were due to causes other than myopia.

Two out of the five cases in group B presented with signs and symptoms of glaucoma (cases 16, 17), of cataract (cases 17, 20), of macular involvement one showed a Foster-Fuch macula (case 18). The vision in this group in part contrasted with the vision in group A. Of the 9 eyes, vision was correctable from 20/20 to 20/30 in only 4 eyes, from 20/40 to 20/50 in 3 eyes and from 20/200 to 20/400 in 2 eyes.

Group C comprised 9 eyes corresponding to an advanced age group from 50 to 80 years of age. Of the 9 eyes, 5 showed a marked depression of vision, reduced to hand movement and light perception, 1 had vision of 20/200 to 20/400, 2 showed 20/80 vision and 1 had 20/50 vision. Case 24, presented one eye suffering from absolute glaucoma and the other aphakic with 20/200 vision. With age the heavy toll to vision was evident. These eyes had high myopia and the complications of advanced degenerative myopia. The relation of vision to the degree of myopia appears in table 3.

Progress

The degree of myopia was observed to increase, in the young patients of group A, from one to 5 D during the growth periods.

As puberty was reached the progress became arrested. The higest refractive errors were found in groups B and C, as shown in table 3.

Amblyopia

The amblyopia of group A, included five cases, 2 eyes had a vision of 20/30, 2 of 20/40 to 20/50 and 1 was correctable to 20/70.

Clinical appearance

The external appearance of the myopic eye was that of a large prominet eye with frequently large size pupils sluggish in reaction and with a deep anterio chamber. The accommodation convergence relation, no uneexpectedly, was dissociated in thirteen of the twenty five cases. Of the corrected myopic children four had divergent *strabismus* and three convergent strabismus.

Ophthalmoscopic findings

The patients classified as simple myopia (table 2, 3, Fig. 1), presented, in the cases with low myopia, a temporal crescent at the disc. (Fig. 2); with high degree myopia the annular peripapillary crescent was seen (Fig. 3).

The eyes with degenerative myopia studied by *fluorescein angiography* showed characteristic changes. At the disc the optic nerve was observed to enter obliquely in two cases with high astigmatism. The disc was surounded by an annular crescent (Fig. 4), or only showed a marked temporal crescent. The *choroid* presented localized areas of atrophy (Fig. 5), with reference for the macula cracks' appearence.

The *retina* was thinned, specially in the macular area. Two cases, number 18 and 21, presented a Foster-Fuch macula, (Fig. 7), showed the round pigmented lesion from proliferated pigment. "Lacquer cracks" were observed with bright fluorescein at the site of the choroidal break and neighboring vessels were depicted in growing from the choroid.

The sclera appeared ectatic and at times accompanied by a posterior staphyloma.

Two cases showed a disciform scar at themacula secondary to bleeding as observed in Figs. 6 and 8, Fig. 9 demostrates a over the macula area. One case presented a pigment epthelium *hemorrhagic detachment* that cleared in one eye but oscured permanently the vision of the other eye.

Glaucoma: four patients showed fundus changes of myopia superimposed in eyes with glaucomatous lesions deep disc cupping nasal displacement of vessels, elevated intraocular pressure above 30 mm. of mercury, and diagnostic field defects. The summarized case findings were as follows:

Case 16: PP 30 years old, white male with no family history of myopia had -1.25 D with a best corrected vision of 20/50 in the left eye. The intraocular pressure of that eye was 35 mm. of mercury and there was a fiber bundle field defect. The pressure was controlled with myotics.

Case 17: ME white male, 32 years with a history of traumatic cataract had a -20.00 D after extraction of the lens the vision corrected with a -2.00 to a 20/100. The other was normotense and had a low degree of myopia with vision of 20/20.

Case 24: JA 72 years old, white male: lost and eye from absolute glaucoma the opposite eye has had lens extraction correctable with +6.00 to 20/200. The vision corresponded with the ophthalmoscopic findings of glaucomatous disc cupping and degenerative myopia.

Case 25: JL 79 years old: had an aphakic right eye of -20.00 D of myopia and vision of had movements. The left eye was cataractous and corrected with -4.00 to 20/50.

The visual behavior of these four glaucomatous cases has been poor.

The fluorescein angiography

The retinal circulation times as measured by fluorescein angiography showed in the four glaucoma cases a marked increase of 10 to 15 sec. in ARCT when compared to the reported normal values ( ) were selected to illustrate the increase of ARCT. At 20 sec. from injection time fluorescein arrived at the disc. Norms for that age would have been 10 seconds less. The RCT was also increased from 3 to 4 secs. in the normal to 6 sec.

Cataract

Myopes whinch have had an uncomplicated cataract lens extraction were happy with the recuperate vision, since they had never seen as well before. This vision showed the risk of progressive loss from degenerative myopia and sudden loss from bleeding or detachment.

TABLE 1

STUDY OF 25 MYOPES

	Sex	Age	Heredity
Male	10		
Female	15		
Under 21		15	
Over 30		10	
Familial			20

Number of cases in relation to Age, Sex and Heredity

TABLE 2

DATA OF 25 CASES IN RELATION TO AGE, SEX, VISUAL ACUITY AND DEGREE OF MYOPIA

GROUP A

Name	Age	Sex	V.A.	Degree of M
1. I.R.	7	F	OD 20/60 OS 20/50	—10.50 —10.50
2. J.O.	9	F	OD 20/20 OS 20/20	— 4.00 — 4.50
3. A.C.	11	M	OD 20/20 OS 20/50	— 1.00 — 1.00
4. M.C.	12	F	OD 20/25 OS 20/35	— 2.50 — 3.25
5. M.S.	12	F	OD 20/20 OS 20/20	— 0.50 — 0.50
6. L.A.	13	M	OD 20/20 OS 20/35	— 1.50 — 8.50

TABLE 2 (CONT.)

Name	Age	Sex	V.A.	Degree of M
7. M.G.	14	F	OS 20/70	—12.50
8. D.W.	15	M	OD 20/40 OS 20/40	—13.00 —14.00
9. A.G.	16	F	OD 20/25 OS 20/20	— 4.00 — 4.00
10. J.B.	17	M	OS 20/50	— 5.00
11. V.N.	18	F	OD 20/20 OS 20/20	— 2.00 — 1.75
12. I.N.	19	F	OD 20/20 OS 20/20	— 1.00 — 1.00
13. S.A.	21	F	OD 20/20 OS 20/20	— 1.25 — 0.75
14. M.R.	21	F	OD 20/20 OS 20/20	— 1.00 — 1.00
15. P.L.	21	M	OD 20/25 OS 20/20	— 1.50 — 1.50

GROUP B

Name	Age	Sex	V.A.	Degree of M
16. P.P.	30	M	OD 20/20 OS 20/50	— 1.00 — 1.25
17. M.E.	32	M	OS 20/400	—20.00 (Aphakic)
18. C.B.	40	F	OD 20/200 OS 20/25	— 6.50 — 6.50
19. W.R.	42	M	OD 20/25 OS 20/25	— 6.75 — 5.25
20. A.G.	49	M	OD 20/40 OS 20/40	—11.50 (Aphakic) —13.00 (Aphakic)

TABLE 2 (CONT.)

GROUP C

Name	Age	Sex	V.A.	Degree of M
21. F.R.	58	F	OD HM OS 20/70	—22.00 (Aphakic) —12.00
22. J.P.	67	F	OD FC OS FC	—16.00 —15.00
23. I.N.	71	F	OD FC OS 20/80	—11.25 (Aphakic) — 9.75
24. J.A.	72	M	OD 20/200	—14.00 (Aphakic)
25. J.L.	79	F	OD HM OS 20/50	—20.00 (Aphakic) — 4.00

The degree of myopia in aphakics was related to the post surgery refractive correction accounting for the loss of lens refractive power. When pre-surgery refraction was available this allowed for a better understanding of the type of myopia.

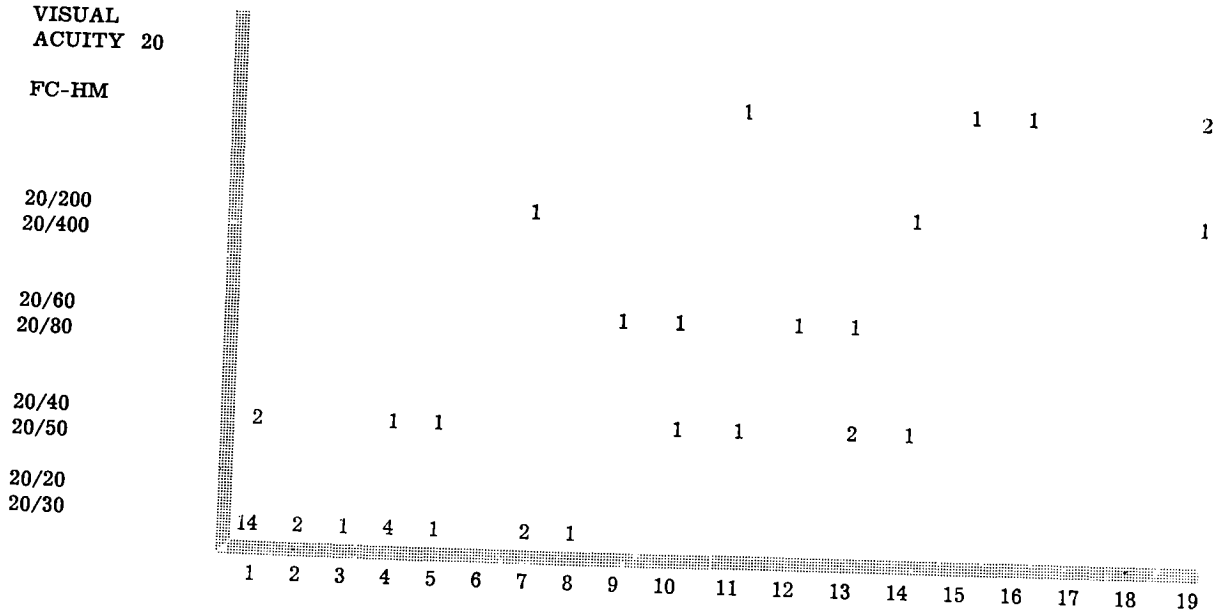
TABLE 3

VISUAL ACUITY IN RELATION TO AGE AND DEGREE OF MYOPIA IN 46 EYES

AGE. DEGREE OF MYOPIA IN 46 EYES

	Number of eyes with Degree of Myopia			Number of eyes with vision of				
	Low	Medium Above	High Above	20/20 30/30	20/40 20/50	20/60 20/80	20/200 20/400	FC HM
	-1 to -6 D	-6 to -12 D	-12 D -12 D					
Group A								
7-21 years	22	3	3	21	5	2	0	0
Group B								
30-50 years	3	4	2	4	3	0	2	0
Group C								
50-80 years	1	3	5	0	1	2	1	5

RELATION OF VISUAL ACUITY TO DEGREE OF MYOPIA IN 46 EYES OF 25 MYOPES*



*Number of eyes related to visual souity and degree of myopia.

Conclusions

From the graph in figure 1, two data stand out: one is that 25 out of 46 eyes (54.3%) had 20/30 vision or better; of these, 21 eyes (84.0%) were from patients under 21 years of age (table 3), and 22 (88%) had low degree myopia.

Second, 8 out of 46 eyes (17.3%) had 20/200 vision or less; of these 6 eyes (75.%) were from patients over 50 years of age (table 3) and 6 (75.0%) had high degree of myopia.

Simple myopia of low intensity was the most frequently encountered myopia 88% of the eyes. In the young, this type of myopia behaved as a correctable ametropia in an otherwise normal eye.

Degenerative myopia, in contrast, was much less frequent, 17.3% but of these 75% had a high degree myopia with marked loss of visual function. A study of the fluorescein angiograms substantiated the reason of the visual loss which was attributable mainly to retinal, pigment epithelium and choroidal atrophy with its correlating pigmentary, hemorrhagic and detachment complications. The arm retina circulation time (ARCT) showed no abnormal values in the normotense myope but was markedly increased in the glaucomatous myope. The ARCT of simple myopia had values similar to those of the emetropes and the RCT in degenerative myopia showed a slight increase of from 4 to 6 seconds of unknown relevance. The choroidal circulation of the glaucomatous myope demostrated a circulatory embarrasement relative to the increase of the Intra ocular pressure. The results of cataract surgery were markedly dependent on the extent of degenerative involvement.

The natural history of both types of myopia point to the need for an effective management of degenerative myopia to avoid the final outcome of blindess. The gravity of the matter is apparent: how to stop or nullify the scleral stress before its subsequent complications appear and later if the macula of one eye is badly damaged what heroic measures can be indicated for the second eye starting to fail? It is not in the province of this presentation to discuss the multiple therapeutic measures that have been formulated in the texts. Other have yet to be proven of value in curtailing the progress of simple myopia. However, in degenerative myopia, the futility of most endeavors my reorient our search perhaps in the direction of a replacement of tissue, probably sclera. Tissue cultures may allow eventually the reinforcement and or replacement of the unserving sclera. The difficulty of the problem await future research.

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DOCTOR VARAS:

Muchas gracias doctora Ferrer, por sus expresiones a mi pequeña contribución, y sobre todo a su valiosa exposición que coordina muy bien todos los pensamientos expuestos. ¿Hay algunos comentarios al respecto? El profesor François.

PROFESOR FRANÇOIS: (Gante)

Quisiera preguntarle, doctor Barraquer, si en los casos de la toma tensional, ha separado los miopes débiles de menos de 6, de aquellos de más de 6 dioptrías de miopía (miopías patológicas con alteración de fondo de ojo). Y si cree que con una tensión intraocular de 22-23 mm/HG se puedan producir alteraciones tan graves como las que vemos en la miopía maligna.

En lo concerniente al vítreo, creo que no puede ser considerado como un líquido, sino como un verdadero tejido, ya que posee células, los hialocitos, fibras colágenas mucopolosacáridos.

DOCTOR JOSE I. BARRAQUER:

Es muy difícil poder fijar un límite preciso entre una tensión normal y patológica. Los especialistas de glaucoma, la tienen ya fijada en 16 y cada día vemos más pacientes glaucomatosos con tensiones de 22 y 23, que se quejan y reportan síntomas que solamente se alivian cuando esta tensión se les baja a cifras del orden de 15 o 16. Es por consiguiente muy posible, que tensiones del orden de 23 a 24, o sus equivalentes más altos durante el período de desarrollo, o sea la edad de 4 o 5 años, puedan desencadenar el círculo vicioso que nos llevará más tardíamente al cuadro de la miopía. Las tensiones que hemos demostrado han sido en ojos miopes sin discriminación. Creo que ninguno de ellos tenía miopía menor de 5 o 6 dioptrías, habiendo incluidos casos de hasta 15 y 20 dioptrías. No se tomaron casos de miopía más bajos con el fin de excluir las miopías de refracción.

En cuanto a la hipótesis de la transmisión de las fuerzas del segmento anterior al posterior por el cuerpo vítreo, me complace que el doctor François, esté de acuerdo conmigo en que el cuerpo vítreo no debe considerarse como un líquido, sino como una sustancia viscoelástica, dada su propia naturaleza, y estas características viscoelásticas son mucho más acentuadas en el niño que en el adulto.

Todos sabemos que el vítreo del niño es mucho más espeso que el del adulto. La diferencia entre un líquido y un sólido, en lo que respecta a la transmisión de fuerzas, es muy sencilla. El líquido transmite presiones, o sea que una fuerza aplicada en él se transmite en todos los sentidos. Un sólido en cambio, transmite fuerzas, o sea que solo las transmite en una dirección. El medio viscoelástico es un intermedio, o sea, transmite fuerzas, y transmite presión. Naturalmente, en nuestro caso, si la fuerza se genera en el segmento anterior del ojo a nivel de la encrucijada del cuerpo ciliar, zónula y cristalino, (donde también hemos visto que hay cambios muy curiosos de emetropización en el desarrollo de la miopía, ya sea por esfuerzos de acomodación o por congestión uveal), se puede pensar que se transmiten fuerzas de preferencia al polo posterior donde lesionan los finos capilares de la coroides. La lesión coroidea precede y condiciona la degeneración de la esclera, que secundariamente cede primero a la fuerza y en períodos más avanzados a la presión.

DOCTOR VARAS

Muchas gracias, doctor Barraquer. Doctor Pérez-Llorca.

DOCTOR PEREZ-LLORCA: (Cádiz)

Quería felicitar a los comunicantes y preguntar si en estos miopes en los que ellos han considerado, con razones que a mí me han hecho mucha impresión, una tensión ocular dentro del mecanismo etiopatogénico, quizás han encontrado defectos perimétricos en haz de fibras, quizás han encontrado defectos perimétricos de tipo glaucomatosos. Y además, felicitarlos otra vez.

DOCTOR VARAS:

No sé si esta pregunta referente a alteraciones del campo visual pueda la doctora Ferrer ilustrarla.

DOCTORA FERRER:

¿Cómo es la pregunta? ¿Alteraciones del campo visual con referencias a las alteraciones miópicas?

En haz de fibras sí. Hay alteraciones en haz de fibras correspondiendo con ellos. Muy semejantes a la del glaucoma. Porque la más usual es que

las alteraciones vistas son en realidad peripapilares, pero la cuestión está en que no quedan simplemente peripapilares; sino que más bien las otras que corresponden con las de haz de fibra.

Bueno, esto de decir: "hay, existe, porque tengo un caso", pero, ¿cuántos habrá de esos por casualidad?, un caso no puede decir mucho...

DOCTOR PEREZ-LLORCA:

Va a haber que aconsejar hacer más campos a los miopes de aquí en adelante, en vista de esto.

Debemos pensar más en el miope en el sentido de que aquí tenemos un aspecto glaucomatoso; de que ese que nos está pareciendo simplemente miope, a lo mejor nos está actuando solo por ser miope.

DOCTOR VARAS:

Muchas gracias, doctora Ferrer. En realidad se abre un campo muy interesante en el glaucoma. Se puede también ver la razón de regresión de alteraciones del campo que no se explicaban por el mecanismo tradicional simplista de lesiones directamente a fibras nerviosas en la papila. El doctor Carlos Silva, quiere hacer alguna observación.

DOCTOR CARLOS SILVA: (Lima)

Opino que realmente, si examinamos campos visuales con el perímetro de Goldman, practicando la perimetría quinética y encontramos, como dice la doctora Ferrer, defectos campimétricos, correspondientes a cambios glaucomatosos, lo mismo se puede encontrar con mayor incidencia haciendo la perimetría estática del doctor Harms, que es mucho más completa que la de Goldman, que aunque el de Goldman es muy exacto, en estos casos debemos basarnos igualmente en la perimetría estática.

DOCTOR VARAS:

¿No hay ningún otro comentario? A continuación el doctor Vasco Posada, de Medellín, nos hablará sobre asociaciones y antagonismos.