

CHROMATIC SENSE AND CHORIORETINAL CIRCULATION

A STUDY OF O.P.C. (Endotelon)

Flash can be particularly uncomfortable for a number of activities, in particular for those performing dangerous duties (marine, aviation, train engineers, truck drivers, etc). It has also been said by many that it is one of the essential after-effects of refractive surgery par radial keratotomy.

Certain authors have already worked on improving the visual functions in strong and weak lighting by using products susceptible to favoring retinal nutrition (Jayle, Mercier, Perdriel, Rouher).

We know about retinal damage caused by intense lighting can be the fault of photochemical disorders produced either at the sensory receptor cells (pigmented epithelium, cone cells and stick cells) or at the bipolar cells. Intense lighting destroys the visual purple and the visual pigments, which are not only found on the external surfaces of the cyterne of the photoreceptive cells but also on the fringes of the pigmentary epithelium.

The recovery of normal retinal activity after this flash is linked to the reconstitution of these pigments. This will occur starting with “reserve molecules” (vitamin A) found inside the external articles of the cones and sticks and starting with the synthesis of the new sensitive pigment molecules coming from the blood circulation.

In assuring a better a better nutrition for the different retinal structures the procyanidol oligomers should react on the regenerative speed of the visual purple and therefore on the recovery of the retinal activity after being subjected to sudden flash. By the same token there will be an action on the scotopic vision.

These derivatives come in the form of pills of 50 mg (Endotelon), composed of a vegetal origin of grape seed belonging to the chemical class of flavones. They attach themselves to the collagen and elastin reinforcing the tissue structure of the conjunctive vascular.

The goal of our study was to put into evidence the action of this product on the light senses. We measured flash resistance using the Comberg nychtometer and the determination of the nocturnal morphoscopic threshold by using Beyne’s scotoptometer. These two tests have the advantage of being practical, easy to run, translating a capacity to react in a real situation. The electrophysiological (EOG – ERG) techniques reflected any cellular modifications.

On the other hand it would have been interesting to integrate a study of the mesopic visual field but the length of the exam would have risked fatiguing the patients too much.

MATERIALS AND METHODS

For practical reasons we included in the study:

1) SUBJECTS

- Workers who worked on movie screens and underwent a prompt and prolonged luminous visual stimulation.
- Automobile drivers who underwent exposure to bright lights and flashes from headlights.

The men and women in this study were all older than 18, some showing and some not showing a visual functional symptomatology.

Those not included in the study were those with retinal infections stemming from diabetes, hypertension, detached retinas, glaucoma, astigmatic or myopic. These different diseases bring with them a poor adaptation to changing levels of light, permanent efforts to accommodation and would give false data, especially from those working on movie screens.

1) TREATMENT

The test was carried out on one hundred subjects at two centers. The number of 100 was reached by the function of recruitment possibilities of the two centers since the existing bibliographic data didn't permit us calculate precisely the benefits we could expect from this therapy.

- Fifty subjects were under the ophthalmologic care of Professor Corbe (Principal Center of Medical Expertise for Navigators).
- Fifty subjects were the ophthalmologic care of Doctor Boissin (Air France, Paris)

The one hundred subjects were randomly chosen to participate in the following two groups:

- One group would take four pills of Endotelon a day (2 in the morning, 2 in the evening).
- The other group would receive nothing at all.

The person conducting the experiment received sealed envelopes drawn randomly by chance numbers allowing him to place the subject in one group or another.

1) CRITERIA FOR JUDGING

1. Visual recuperation after being exposed to flash using a Comberg nycrometer to measure numbers.
 - a) After globally exposing the retinal face to a flash with fixed intensity for three minutes the subject was given optotypes with values from 1/10 to 10/10 of visual acuity.

Visual acuity is determined every ten seconds and the increase in recuperated visual acuity as a function of time is automatically registered on a graph.

b)

c) The subject is then exposed to a lateral flash for 27 seconds and the optotypes are given under a luminance of 0.5 apostilbs (asb). We then determine the corresponding visual acuity. As the lateral flash continues the lighting of the optotypes increases and we determine the corresponding visual acuity on tables of 8 apostilbs and then 64 apostilbs.

2) Determination of the morphoscopic threshold by using the Beyne scotometer.

The subject is put into visual rest in a slightly lighted room and then undergoes a pre-adaptation of staring at a white screen for three minutes then placed into complete darkness for 30 minutes.

The test is made up of two black parallel bars on a white background (one being discontinued) and shown to the subject at 75cm with a background lighting of 2 cd/hm² and then with progressively fading lighting. The smallest amount of light allowing the detection of the orientation of the bars is the morphoscopic threshold. The normal values of the nocturnal morphoscopic threshold vary as a function of age. They are:

< 0.12 cd/hm² before thirty years old

< 0.22 cd/hm² after thirty years old

1) Ergovision Test

Determination of the time necessary to recuperate visual acuity from 3/10 after a brief flash of 10 seconds as well as can be presented under certain circumstances.

a) Measuring mesopic visual acuity.

A scale of visual acuity is shown to the subject at a brightness of cd/hm² in intermediate binocular vision corresponding to the crepuscular brightness. Each subject normally sees his acuity decrease from 2/10 to 4/10 when passing from photopic vision to mesopic vision.

These Ergovision tests were done with two different lighting ambiances:

- Standard – 15 cd/hm²
- Glaring – 300 cd/hm²

These different tests for glare resistance and adaptation to brightness are done in two steps in 5-week intervals and not by the experimenter but by someone unfamiliar with the existence of the study.

The control group allowed us to eliminate improvement in the vision performance stemming from having learned the tests from the second series of exams.

RESULTS

1) The Unfolding of the Study

One hundred participants took part in the trial, fifty in each center. Two subjects dropped out, another didn't make the second consultation for reasons independent of the study. Another subject left for being wrongly included in the test. Another subject left because of side effects. The statistical analysis of the nymtometric results were done on 95 subjects (46 treated and 49 controls).

As outlined in our protocol, the study of the morphoscopic threshold was only done at Center One. The tests for Ergovision were only done on certain subjects at Center Two.

2) The Treatment

For all of the subjects no anomaly marking the distribution between the groups appeared concerning sex, professional activity, time in that activity and average workday time (table 1).

On the other hand an important difference in the average age of the subjects between the two groups appeared in Center One. The control subjects were on the average 10 years younger than the treated subjects, which would explain in part their better visual performance at their inclusion. Thus, the maximum visual acuity recuperated after submitting to a global flash in the retina is in Center One 1/10 superior than the control group at inclusion.

At Center Two the comparability of the groups from the beginning was satisfactory for general characteristics as well as the nymtometer parameters. The comparability default of the groups at the inclusion at Center One not found at Center Two leads us to study the evolution of the visual performances in a separate fashion in each center.

2) Variations of the Visual Performances Under Treatment

- a) Variations of the kinetic parameters of the nymtometric lines after a central glare on the retina (table 4a and 4b)

In the Center One the treated subjects had improved by 1.22 tenth over the control while those in the control showed a negligible variation in the maximum visual acuity recuperated after exposure to a glare. The two groups had an equivalent recuperation in the control.

At Center Two maximum visual improvement is 1/10 in the treated group and negligible in the control group. The two groups were very alike in the beginning so this improvement in the capacity of visual recuperation after a glare makes the treated group significantly better performers ($p = 0.004$).

Resistance to glare can manifest itself also in a gain of time in recuperating maximum visual acuity attained in the inclusion (fig 5).

Maximum visual acuity recuperated at the beginning was attained at the end 40 seconds sooner by those treated with Endotelon and about 13 seconds sooner than those not treated.

b) Variations in Visual Acuity Depending Upon the Intensity of the Lighting in the Lateral Glare (fig 6).

The treated group gained more than 0.7/10 visual acuity between the beginning and the end from 8 to 64 apostilbs. The gain of visual acuity in the non-treated group was negligible.

c) Variation of the Morphoscopic Threshold

The night vision of the treated group improved significantly compared to those who were not treated. As the morphoscopic threshold was lowered to 0.083 cd/hm² at the end in the treated group it stayed relatively the same in the non-treated group. The lowering observed in this group was 0.004 cd/hm² ($p < 0.001$).

d) The Ergovision Test with Variations of Ambient Lighting

The determination of the time necessary to recuperate 3/10 visual acuity after being exposed to a brief glare was done at the beginning of the test and after five weeks in 12 subjects treated and 13 non-treated in Center Two. At the beginning the two groups comparable visual performances whether the test was done in normal lighting or from a glaring light (fig 7).

It is interesting to note that the visual recuperation 3/10 is much slower in the two groups when a subject is placed in glaring light. The recuperation time after a brief glare improves by 10 seconds in a standard ambience and 22 seconds in a glaring light ambience in the treated group while in the non-treated group it stays the same.

The best resistance to glare can be appreciated by a much more rapid recuperation than 3/10 of visual acuity, which occurs when we vary the exterior lighting. In the treated group at the beginning 17 extra seconds for the subject in a glare atmosphere to recuperate determined visual acuity. After treatment six seconds more are enough to equalize the visual performances after varying the ambient lighting. In the control group increasing exterior lighting to the equivalent of a glare slows down the recuperation by 16 seconds by 3/10 at both exams (16.46 at the beginning – 15.36 at the end – fig 8).

e) Mesopic visual acuity was determined in binocular intermediary vision in 11 of the subjects treated with Endotelon and in 12 in the non-treated group. The

tests took place during two consultations under two lighting conditions: standard and glaring (fig 9).

Ambient Lighting	Endotelon Beginning	Endotelon Ending	Non-Treated Beginning	Non-Treated Ending
Standard	8.31 (0.38)	7.95 (0.45)	8.17 (0.46)	7.5 (0.45)
Glare	5.69 (0.38)	6.78 (0.31)	5.83 (0.52)	5.5 (0.22)

At the beginning the two groups could be considered to be equivalent as far as this test was concerned and only one ambient effect was evident ($p < 10$).

At the end in standard ambient lighting the average mesopic visual acuity stayed the same. The opposite occurred in a glaring ambience; the treated subjects showed a clear improvement of more than 1/10 while those not treated with Endotelon showed no change.

A glare will bring with it a lowering of the mesopic visual acuity of more than 2.5/10 at the start for both groups. Under treatment glare adaptation improves significantly ($p < 0.01$). Regarding this test the glaring atmosphere did not vary the mesopic acuity more than 1/10.

TOLERANCE

Out of the 47 subjects treated with Endotelon only two reported any undesirable side effects. The first reported gastrological problems and the second reported some dizziness and hypertension. The dizziness stopped when the treatment stopped

DISCUSSION

Sensitivity to glare varies from one subject to another and there exists any number of susceptible factors that are out of the detectable retinal pathology (age, fatigue, stress, etc.).

We took it upon ourselves to research retinal phenomenon glare protection using Endotelon in 98 subjects not suffering from any retinal pathology or major eye problem. The efficiency of this medication on glare resistance and the improvement of visual performances in low light is demonstrated by using three tests: 1) Comberg nyctometer, 2) Beyne scotometer and 3) Ergovision.

The nyctometer proved that those exposed to glare and treated with Endotelon had their vision restored significantly faster than those who were not treated had. This was also observed in Center One where the non-treated subjects were younger and had better natural capacity for sight restoration and in Center Two where both groups were virtually equivalent from the beginning.

Visual adaptation in low light is greatly improved using Endotelon since the morphoscopic threshold lowers 0.083 cd/hm^2 while in the non-treated group it stays unchanged.

The Ergovision tests were conducted under two lighting ambiances: Standard and Glare and they support the previous results. There exists a straight correlation between the lowering of visual performance, mesopic acuity and the recuperation of 3/10 of visual acuity after retinal exposure to a flash and the increase of lighting to which the subject is exposed to in the beginning. At the end the group taking Endotelon experienced a stabilization of these performances while varying the ambient lighting, further proof that the efficiency of Endotelon in helping diminish glare sensitivity.

CONCLUSION

The efficiency of a five-week treatment using 200mg a day of Endotelon on glare resistance and visual performance in low lighting using 98 subjects showing no signs of major eye or retinal problems was undertaken using the objective testing of the Comberg nyctometer, the Beyne scotometer and the Ergovision. The 98 subjects were divided into two groups. One group was treated with Endotelon and the other was not, which allowed us to eliminate those who supposedly had improved vision only through having grown used to the testing. Those treated with Endotelon felt their sensitivity to glare diminish, their night vision improve and their visual performance stabilize during varying ambient lighting and all these were significant when compared to those who did not take Endotelon.

The vascular protective properties of Endotelon permit us to assure a better nutrition of the retinal structure and to react quickly on the visual purple.

Therefore, the efficiency of Endotelon and its good tolerance that were observed during this study allows us to recommend Endotelon on those exhibiting an accrued sensitivity to glare and a diminishing of night vision performance, notably a separating ability to reduced weak lighting.

THE END

