ACCOMMODATION

The whole physiology of the eye is centred around accommodation. Accommodation refers to the ability of the eye to focus at different distances, in order for a living organism to cope with the necessary tasks. It is one of the most inimitable and ingenious fine mechanisms of the nature.

Focusing takes place through changing the form of the crystalline lens which means changing the refraction power of the lens. The lens is attached to the eyeball and the accommodation muscle, corpus ciliaris, with a series of noncellular extensions (Zonula Zinnii), which originate in the ciliary muscle and insert to the capsule of the lens. There is a certain paradox associated with this mechanism. When m. ciliaris contracts, these fibres relax and the lens due to its elasticity becomes rounded, increasing its refraction power. To understand this mechanism it is essential to be familiar with the macroscopic structure of the m. ciliaris. On the inside of this muscle, there are small processes, processus ciliares, to which the fibres are inserted; when the muscle is working, it contracts, pulling the processes towards the lens (this phenomenon has been described as "lifting up the skirts of a crinoline") and the fibres automatically relax (Figure …).

Accommodation is a interesting series of psycho-physical occurrences. This action of the accommodation muscle represents clear-cut muscular work, continuous and such totally comparable to and as strenuous as any other muscular effort. This is why the muscles may, similarly to other muscles (writer's cramp, the cramp in an athlete's calf) experience a cramp, or a spasm of accommodation (Asp). The clear nature of accommodation as muscular work is also associated with the fact that women as the "weaker vessels" far more frequently than men are afflicted by many clinical ailments, such as migraine (in Tetralogia, this proportion is 3 to 1; in Panacea, less than one out of five patients were men in the material of 1,558).

Accommodation is a dual function, that comprises both a positive and a negative component;

a) the so-called positive accommodation, referring to the focusing achieved by contraction of the accommodative muscle regulated by the autonomic parasympathetic nerve. In the regulation of positive accommodation, there are two basic events: a partial regulation, which means the rough approaching of the object looked at; the person only aims his or her gaze in a general direction (the sea, the woods) and a second or “fine” regulation which leads to the actual focussing, on a detail (a boat, a tree) (Mütze K: Die Akkommodation des Menschlichen Auges. Berlin 1956)

b) the so-called negative accommodation, or desaccommodation, regulated by an autonomic sympathetic nerve may also be an active process (brought about by central control), and it means the relaxation of accommodation.
This is a concept of which the layman – and often also physician – rarely hears, even though both occurrences are of central importance as to their physiological consequences. It can be produced either by looking into infinity or by fogging (i.e. looking through strong plus glasses).

As accommodation is reflected to our entire organism, reducing the strain caused by it is an invaluable panacea, a veritable general cure, with the irreplaceable nature that no foreign substance needs to be brought into the organism!

HYPEROPIA (farsightedness)

Majority of human beings are born hyperopic by approx. 2.5 dioptre, meaning that the eyeball is too short. In a manner of speaking, the eye is defective, but this involves a certain purpose of the nature. If our eyes were myopic from the beginning, we could not manage such tasks as hunting, **(as the eye is incapable of reducing its refractive power),** which was vitally important at a time.

Without the effort of the accommodation muscle, not even a hyperopic eye could see accurately to the distance. Correcting this deficiency through accommodation results in a great ***stumbling block***, as vision experienced as normal hides latent hyperopia. This latent hyperopia often remains uncorrected and the patient without treatment. We must remember that a young, healthy person does not generally suffer from headaches without a reason, and headaches often are the cause of visiting an ophthalmologist!

Prerequisites for revealing latent hyperopia often is great strain of strong hyperopic eye in focussed seeing or a weakened general condition (illness, menstruation). As we age, our ability to accommodate will deteriorate, resulting in the need for reading glasses in the middle age (40 ± 5 years). I have often been concerned to see a pile of books on a patient's bedside table, but no sign of glasses! "Forgetting" to take your reading glasses off is a good sign of the need for plus glasses for distance!

In this connection, we absolutely must also mention as **causes for hyperopia being latent**, the clinically central importance of glaucoma medicines, which constrict the pupil, first and foremost the universally used pilocarpine, a circumstance that to my notice has not been highlighted anywhere else (Tetralogia p. 144, Panacea 367-8). **The vision sharpened by the small pinhole sized pupil so spoils the patient that he resists all need for glasses**, and yet it is precisely the relief of plus glasses that would alleviate his problem, or the increased intraocular pressure. I would urge those who wish to gain insights in this and make it a permanent asset for themselves to read the relevant paragraphs in my books.

EMMETROPIZATION (process attempting to reach normal refraction of the eye)

The development of inborn hyperopia results in emmetropization, the struggle of the eye towards normal refraction of ± 0, which usually takes place by the age of 6 -7 years.

The primus motor in this development is accommodation, which stretches the eyeball by the movements of m. ciliaris (the fibres reaching far inside the eyeball). An excellent illustration of this mechanism is given by Norman L Adel in his work (Electromyographic and entoptic studies suggesting a theory of the ciliary muscle in accommodation for near and its influence on the development of myopia. Am J Optom 1966;43:27.). In this work, he describes how the "stellated" muscle fibres, which resemble narrowing and widening diamond shapes, stretch the surface layers of the eyeball. This leads to the axial lengthening of the eyeball, or myopia.

How often we hear even professionals talk about emmetropes, supposedly people with normal refraction, when in fact a real emmetrope is a great rarity!

PRESBYOPIA, or OLD AGE VISION

Presbyopia also is a phenomenon closely associated with accommodation.

The lens becomes less flexible and accommodation is gradually lost.

In the middle age of 40 ± 5 years, this action starts getting less flexible, and near work becomes more difficult. This is the latest hour for finding relief in plus glasses.

"Socializing glasses"

It is hardly very unusual that, when sitting around a table in a party late in the evening, you start feeling like yawning. The distance to those you are socializing with is often short, almost the same as a long reading distance. Personally, I have a slightly stronger pair of glasses for this purpose, "socializing glasses", and I have recommended these to many others.

MYOPIA (nearsightedness)

MYOPISATION

What else would myopia be than emmetropization, which has ended up exceeding the zero point provoked by long-term accommodation!

Life tends to make us tense, this is something we all know; but relaxing and keeping it in check is much more difficult. It requires conscious resistance and guidance. Tragically, in today's society near work begins at an early age, with children under the school age, not the least with various types of games and more than anything with the computer. The emmetropization begins early, and the slide towards the minus side even earlier. It is usual for increasingly young children to complain of the deterioration of distant vision, requesting minus glasses of their ophthalmologist.

PSEUDOMYOPIA (PsM)

PsM is the preliminary phase of myopia, still reversible lens myopia as distinguished from true axial myopia (lengthening of the eyeball). Minus glasses that have not changed for years already arouse a strong suspicion of pseudomyopia. The person is at his or her extreme of accommodation.

SPASM OF ACCOMMODATION

The first adequate description of an accommodation spasm (Asp) dates back to von Graefe (1856) and Liebreich (1861), in which connection the term spurious or pseudomyopia was used.

A spasm of accommodation is a fatigue cramp in an overworked ciliary muscle caused by insufficient opportunity to relax (Panacea p.88, Ermüdung und Müdigkeit, Documanta Geigy, 1967). It is fully comparable to cramps in other muscles, such as the writer's cramp. I have even met a young male patient who had cramps in the muscles of his buttocks.

An accommodation spasm can exceed the dioptric refraction power of the eye by 25 or even 30 D

An Asp (spasm of accommodation) is usually easy to diagnose. Too often, however, it is missed, and pseudomyopia is optically corrected with minus glasses. (Duke-Elder, System of Ophthalmology, Vol.V, 1070, Kimpton, London).

One of the grossest errors an ophthalmologist can make is not mastering the pseudomyopia of a presbyope, as warned by Milder (Benjamin Milder, Melvin L Rubin: The Fine Art of PRESCRIBING GLASSES, Without Making A Spectacle of Yourself. Triad Scientific Publishers, Gainesville, Florida, 1978, s.4). This is to avoid situations such as a 47-year old patient, who has been using +1.0 reading glasses and comes to the ophthalmologist because she is no longer able to read, being told that her glasses are still adequate.

The relatively common belief that myopia will be cured in presbyopia illustrates the commonness of PsM; that is when Asp automatically begins to relax.

When dealing with the refraction error of the eye, a smart optician may be a safer choice than a less smart ophthalmologist. This should not, however, be mixed up with a visit to the ophthalmologists, as many aspects remain unexamined.

Stress is absolutely a factor provoking Asp, and stress is maintained by such as pressures of studying and rush. ***I am bold enough to declare that the most universal type of stress that concerns everyone is precisely accommodation strain.***
Very convincing proof of this is provided by the study conducted with cadets who started at the US War Academy, West Point, in 1935 (Gmelin, Robert T. Myopia at West Point: past and present. Milit Med 1976:141: 542-543.) This study found an almost linear increase in myopia in each year of attending the school. The earliest article paying attention to myopia dates back to 1813. (Ware,J. Observations relative to the near and distant sight of different persons. Phil.Trans.Roy.Soc., Part I:31-50, 1813. and Derby, H., Influence on the Refractions of four year College Life, 1873-1879. Trans Amer.Ophthal.Soc.,1879.)

PsM = Asp, but
Asp is however not synonymous with PsM, as Asp also occurs in the range of hyperopia.
Latent hyperopia means nothing but a more or less tight contraction in the muscle of accommodation.

THE FOGGING METHOD

The cornerstone for the work of an ophthalmologist and optometrist is in-depth knowledge and understanding of the accommodation event. Revealing latent hyperopia as well as pseudomyopia will always be the ***yardstick for the quality of work*** of these professionals.

A prerequisite for being successful is mastering the fogging method, which is the aim of my books Tetralogia and Panacea. The fogging method has been known and also used through the ages, but in such an ineffective form.

I have developed this method further into a ***"polyphasic fogging method",*** which will not let the examiner down. If one trick will not work, e.g. the relaxation will not progress, we must resort to another, as there are innumerable variations. Each one of the different methods is accurately described, and no detail is unnecessary. This is something you have to just believe and accept, if

you wish to achieve mastery. Experience will then bring so much illumination to the matter, that over the years the examination will become less cumbersome.

Those interested in my method can read all about it in my works. I will only mention a few central issues:
One must understand that with fogging, ***one aims at voluntary, knowing prevention of the phase of adjustment, thus also preventing the exact focussing which provokes the spasm of accommodation.*** In this, 1-2-3 dioptres will be no help, and the fogging needs to be strong enough to, for a start, make the distinguishing of even the biggest details impossible. ***There is no upper limit for the dioptres!*** One should also all the time ensure that the patients blinks as little as possible, as **blinking** also maintains accommodation tension. You often see the stream of tears starting just at the end of the blinking, and this is when the relaxation of accommodation takes place.

The examination is **always started binocularly**, with both eyes fogged and the patient not being allowed even to glance at the vision acuity test chart in beforehand. At the end you can test the acuity separately for both eyes, which the patient usually always is interested in, with whatsoever glasses, but this will not be the basis for any prescription for glasses.

We must remember that continuing merely with fogging may result in the **opposite** effect; stretching or relaxing of a smooth muscle as such provokes a contractions (Guyton. Textbook of Medical Physiology, 1964, s.256.W.B. Saunders Company. Philadelphia and London) This is why the "unsuspecting, virgin" answers at the beginning are important in the fogging method.

Confirmation test

One of the most efficient ways of getting results with fogging is the confirmation test, the name of the instrument below. I have several of these as ± 0,25, ± 0.5, ± 0,75, ± 2,0(which enables fogging of 4 dioptres instantly), and syl + 0,25 ax 90˚ syl + 0,5 ax 0˚.
As much as I have advised my colleagues to purchase them, only few have done it.
In general when prescribing glasses, we should not strive for excessive acuity (which the whole world of optic business is toting in the advertising), as this is precisely what will destroy the whole treatment. The patient usually finds relief for his **ailments** not in focussing his vision but in alleviating the accommodation strain. This is almost another dogma. ***Vision acuity of 1.0 is therapeutically adequate***. The best is the enemy of the good, even in this case.

The fogging method is also known by another name:
CYCLODAMIA

This is a non-cycloplegic (binocular) method of refraction employing a fogging technique for relaxing accommodation, especially one based on an excessive amount of convex sphere and not drugs inhibiting accommodation. This is how we can determine acuity reduction gradients, from which the refractive error can be estimated by ***extrapolation***. In other words, this is the conventional) fogging method under a different name.

PREVENTION OF MYOPIA

After these elementary concepts of ophthalmology, we will move on to the wide-ranging and challenging field of myopia and pseudomyopia prevention.

To sum up, myopia is a condition where the eyeball already has been subjected to stretching, it has become axially elongated and the state is irreversible, whereas pseudomyopia means Asp, lens myopia, which can still be reversed.

Even if most of the means for preventing myopia have been known for a hundred years, the results remain non-existent.

THE GREATEST OBSTACLE FOR THE SUCCESS OF PREVENTION HAS BEEN THE BELIEF THAT MYOPIA IS HEREDITARY.

The most important means of prevention is getting plus glasses (+3.0) for near work as ***early*** as possible.
This, however, has received less attention, as this point has been highlighted in the current form for no more than the last few decades.

We must keep an eye on children's reading distances, which many parents fortunately do understand, but if you watch a class of schoolchildren on television, for example, at least every one small child out of two draws or does sums with his nose stuck to the paper! This no longer is a case of reading glasses of even +3 d being enough! In this precise situation, the reading glasses will force relaxation of the accommodation tension and increase the distance.
Teachers have more than enough work here, and I dare say this should take ***first*** place in priorities. Looking too close is a bad habit, by no means a necessity.

If the child will not learn to keep his working distance long enough, the primary method is to teach him to regularly support his chin with his hand at ***a forearm's distance*** from the desk. The children also quite commonly seem to have the habit of lying on their tummies in front of the television, which is not at all to be recommended, as the viewing distance often is very short.

The most superior trick is to rest the accommodation by looking "dreamily" far away, and lifting the gaze from the page without focusing e.g. after every passage. This piece of advice is just as important for children and adults. The need for a good working light is self-evident, even though poor light alone is not the crucial cause in the development of myopia, unlike often suspected by laymen.

In China, where they are ahead of us in so many things, children are taught to massage the acupressure points around their eyes in order to prevent myopia, surely a tradition based on experience. This is quite right, as these are the points where the nervus trigeminus comes out, and this nerve plays a central role also in accommodation (Panacea pp. 192-3). KUVA 3

Night myopia is the result from an effort to see better at low levels of lights, such as twilight or at night. The dark period in the autumn is the ophthalmologist's nightmare. The darkness draws people being near to emmetropy to an accommodation tightness, and this makes it even more difficult to fight against adding the minus strengths, and their reduction being met with great resistance.

In those who already are myopic there is all reason to find measures that would prevent the deterioration of the situation. They include:

- Nobody at any age should ever be allowed to read with distance minus glasses; however, there is nothing to stop you from using undercorrected minus glasses at a distance.
- One should have at least two pairs of minus glasses, the weaker one to be put on as soon as one gets home, in case it is not possible to abandon the glasses altogether at home.
- One should also attempt to manage driving in the daytime with the weaker glasses, with the stronger pair kept for night time driving.
- We should watch television from as a long a distance as possible, staying as near as needed but always attempting to move the chair a little bit farther.
- Monofocal minus glasses should not even exist, and consequently
    - Up till -3.0 - -4.0 dioptre, the lower section of the glasses should either be empty (= half glass, which is the cheapest of bifocals) or the lower section should be a ±0 =, a so called plano lens). Outside these values should be used bifocal combinations with the appropriate dioptric values.
    - In a situation where a plus half-glass only is indicated, which one so often sees people wearing (these should also be worn constantly), the frame must be open at the top; “a boom” at the top in the middle of the field of vision does nothing but harm.

Even in other contexts, the reader must understand that the guidelines given here are rough generalizations, allowing applications demanded by the case and conditions.

However, such as progressive glasses, which so often are almost pushed on the customers, are the detriment of all treatment. Firstly, astigmatic distortions cannot be avoided with these; the stronger the glasses, the more disturbing they will be. Another great disadvantage that the user is not usually aware of is that when the strongest part of the spectacles is only met in a gradual manner in the lower section, its effectiveness often remains completely outside the viewing area.

Bifocals should be of the so-called Executive lens type, with a straight border as high as possible. This type is the most attractive and least noticeable, if this should be particularly important for anyone. Of course there are other fully acceptable lenses with large lower sections, but in these the border is often seen as “claws”, a less attractive line.
A good alternative for progressive lenses is trifocals, also in the Executive type; but these will only be needed by persons of a slightly more advanced age.

The wearing of minus glasses is no obligation, unlike the plus glasses, without which nobody should be. But people are so strange: you could be pleading with a myopic not to wear glasses (which would be quite possible for many), but they refuse point blank! Whereas hyperopics, no matter how much you plead with them to wear their glasses, would like to put them aside. How often have I aired my standard remark, when waiting for a patient to dig out their glasses, that they are in the wrong place. My often-repeated guideline concerning plus glasses is "from the bedside table to the bedside table!" and those who have adhered with it have found that it gives them strength.

The current enthusiasm about collecting second-hand glasses for the developing countries frightens me. A very great number of these are minus glasses of the wrong type. When people in those countries with no appropriate expertise try on the minus glasses and feel that they make the world "brighter", they become enamoured with them, and so an impetus has been given to the progress of evil – but the business will flourish!!

To get an idea of the fanatic dependence on their glasses of myopics, I would recommend reading case 306 in Tetralogia and case 306 in Panacea.

COMPLICATIONS OF MYOPIA

All I have discussed above would not be so startling, if myopia did cause not only plenty of clinical suffering but also evil that cannot be reversed. How many people could not work in their dream profession because they were myopic. How many eyes were blinded by detachment of the retina (ablatio retinae) caused by the stretching of the eyeball, even in very young people! In these cases, too, operative results have improved over the years, but the losses are still great. Myopia makes you vulnerable to degeneration of the retina, and many people have had they eyesight affected by this problem. Vitreous degeneration and glaucoma due to myopia are also common.

ACCOMMODATIVE ASTIGMATISM

Accommodative astigmatism is another entity that requires a lot of attention. When monitoring my patients, it seems to display an increasing trend and ever changing axes, the whims of which should not be followed without question. I am personally no stranger to these pitfalls, either.

My conclusion is that it is worth attempting to reduce and level out all these quantities and to straighten the axes, as they are to a great extent provoked by accommodation strain and often at least to some degree reversible and non-permanent (pseudoastigmatism).

Reinforced cylinders could indeed increase the acuity of vision, but hardly the comfort of seeing.

Like marionettes, the whole world of optometrics has in its sophisticated wisdom ended up implementing and fixating these measurement readings, creating stepping stones towards ever stronger distortions. What we need is a tremendous simplification of attitudes, a real over-simplification, a basic intuition of a whole new type. This will mean a great deal of wearing of plus glasses, or glasses altered in the plus direction, and we must emphasise, pushing them on people.

We must bear in mind the whole time that a patient usually willingly accepts glasses in the minus direction and will not complain, as they do not feel their eyesight has got any worse!

ANISOMETROPIA, REFRACTIVE DIFFERENCE BETWEEN THE TWO EYES

Dominance is also relevant to eyes, in other words one eye dominates the other. In the very same way as some people jump with the right foot and others write with their left hand, one eye of a person often is dominant, or stronger.

The stronger eye is capable of more forceful accommodation, and ends up being more tense. This is the start for anisometropia, or refractive difference between the eyes.

This can be established by an examination, but if this type of difference, which usually is minor to

begin with, is taken into consideration in a prescription, an opportunity is simultaneously created for making this difference larger. This is why it is fully justified, initially anyway, to proceed with equally strong glasses, as a person who has up till now been looking through "equal" lenses will not find this type of glasses disturbing even now.

Another consequence associated with dominance is squint.

STRABISMUS (SQUINT)

In multiform and multi-etiological strabismus cases, hyperopia often is one of the etiological factors. When a great need for accommodation and convergence strain (turning inward of eyes) become imbalanced, this may easily result in an inward squint (strabismus convergens), in a symmetrical, monolateral or alternating form, or if the person has not enough strength for the continuous convergence and he gives up, an outward squint (strabismus divergens) is the result, either alternating or monolateral.

It would seem that a monolateral squint could well be explained by the dominance of the eyes.

Let us presume that a child is strongly hyperopic for a start. He is forced to accommodate more than usual when trying to see accurately, even when looking at a distance, to say nothing about near vision. In this situation, the dominant eye may easily end up with a more tense muscular spasm, converge more (look inwards more steeply) and turn inwards unsymmetrically. What we find here is a periodical or permanent, monolateral inward squint, strabismus covergens, on the side of the dominating eye. Or the person does not have the strength for adequate convergence. What happens is that the "weaker" eye cannot match the effort and gives up, does not converge but gives in and turns outwards, resulting in an outward squint, strabismus divergens (turning outwards of sight lines), on the side of the eye that is more strongly hyperopic.

All these states would require early intervention = alleviation of the accommodation strain = plus glasses. This is why I have half in jest quipped in my book, "so that the truth should not be forgotten", that preferably we should all be born with plus glasses on! At the latest when the child starts doing near work (in addition to a number of other issues that must be considered) he should get plus glasses (+3.0; if there is distance hyperopia, this +3.0 should be added to the distance correction, as bifocals).

It is not difficult to find plenty of support in the literature for everything I have discussed above. To only mention a few examples, President of the International Myopia Prevention Association, USA Donald S. Rehm, an engineer who since the beginning of the 1970's has been speaking for the same cause.

I recently spotted a work on the Internet, according to which ”…process of emmetropisation appears to have been impeded by the consistent wearing of hypermetropic spectacle correction **from the age of 6 months**.” (Emmetropisation squint, and reduced visual acuity after treatment. R.M.Ingram, P.E.Arnold, S.Dally, J.Lucas. BRITISH Journal of Ophthalmology 1991:75:414-416).

MIGRAINE

Migraine is one of the main themes of my books. Migraine is a chaos in the autonomic nervous system. As positive accommodation irritates the parasympathetic and negative accommodation the sympathetic nervous system, the disruption in the balance of these functions results in a chaos which extremely frequently is the fundamental cause of migraine.

In an article, Friedman mentions that ophthalmologists have found correction of refractive error to result in considerable improvement in 90% of migraine patients treated.(Friedman AP: Treatment of migraine. N Engl J Med 1954:250;600-2)
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It is a good idea to remember in this connection that a migraine is not always associated with a headache.
And on the other hand, reckless and continuous consumption of analgesics may fuel a chronic headache or migraine.

I have discussed migraine in such great detail in my books that I will not repeat it all here.
I would also like to remind my readers of the fact that migraines and **epileptic** fits have a lot in common, and this is why we should think of minimizing the accommodation stress in epilepsy patients as well.
An epileptic fit often occurs e.g. when the patient is watching television.

THE AUTONOMIC NERVOUS SYSTEM

A demonstrative observation

The inseparable connection between accommodation and the autonomic nervous system, which is behind all display symptoms, became clear to me at a very early stage, of which I will never cease to be grateful. Very likely, this was the impetus that determined the orientation of my whole life's work. As I was working on my thesis, I had to drop substances irritating the parasympathetic nervous system (including pilocarpine) in the eye of a rabbit, after which the rabbit almost instantaneously had diarrhoea; in other words, a parasympathetic peristaltic reaction of the bowel caused by a small amount of a substance.

Using **atropine** to inhibit a spasm in m. ciliaris and reveal latent hyperopia is one of the first things that students of the field come across, especially with children. Already at this stage students using their brains should understand what an important factor accommodation is in the general reactions of the body. These examination drops often cause **many types of generalised symptoms**, arrhythmia, rise of temperature, and restlessness amounting to disorientation, so that the parents downright begin to panic. It is my understanding that these symptoms are in proportion to the degree of hyperopia revealed.

It is also interesting that as the increase of pluses stimulates the sympathetic nervous system, its effects are comparable to e.g. the use of amphetamine. This is why it is possible that the patient can even become **addicted** to plus increases and provoke the ophthalmologist to unnecessarily great increases in the pluses.
This kind of a situation naturally is very rare, but it is good to be aware of this possibility, too.

An important ganglion, **ganglion ciliare**, is located behind the eyeball. Despite its small size of a few millimeters, it is one of the most central ganglions in our bodies, from which extend wide-

reaching connections like branches of a tree. The attached Figure (No ...) illustrates the way neural pathways from here travel like reins both to the brain and spinal nerves and the autonomic nervous system. When the whole nervous system is entwined in it, mastering this issue requires not only an in-depth understanding of not only the accommodation event but also anatomy and physiology as well as a multidisciplinary, integrating interest.

In other words, symptoms may appear not only in the autonomic nervous system but at many levels. (The facial nerve may become paralysed when a feverish patient recovering from the flu is watching television without plus glasses); more than anything through the fifth N(ervus) Trigeminus and spinal nerves everywhere (Difficulty of straightening the back after strenuous near work; many back pains appear to be caused by muscular spasms, the spasm originating reflexly from pain impulses elsewhere in the body. Guyton, 1964, p.661).

ON THE EXAMINATION AND TREATMENT OF EYE PATIENTS

There is no-one whom spectacles would not concern at least in some stage of life.

A stressed organ will become ill
We should remember this when treating such as iritis, in which inhibiting accommodation strain is essential. The eye is made to rest by means of both atropine (drops inhibiting accommodation) and also mydriatics (drops widening the pupil). It is also important to assure that the healthy eye can rest by means of sufficient plus correction (or with an addition to plus direction).

The faces of the patients as such already reveal a lot to an expert.
.

- Frequent blinking, by which the patient without knowing it supports the maintenance of accommodation tension is disturbing.
- Winking or tightening of the whole muscle group around the eye is a sign of the same (Putin when trying to cope with his text without glasses)
- A young child frowning in a convergence test
- Small pupils and in a blue-eyed person, eyes of a peculiar blue colour = the iris stretched out wider
- Permanent vertical lines in the forehead (up to 5-6 cm in length), that almost serve as a dioptric gauge! The muscles that cause these are referred to as accessory muscles of accommodation.
- Slightly swollen, "heavy" eyelids, even in a child, or upper lid that is straight in its shape are tell-tale signs of accommodation strain.
- A tick (live blood), myocymia, (twitching or vibratory movements of individual muscle bundles following fatigue, clonic blepharospasmus in the eyelid) almost certainly is crying for a plus increase. I mention all these terms for the symptom, as patients generally are interested in it because it is highly annoying. The cause is fatigue in the muscles surrounding the eye innervated by the cranial nerve VII, n. facialis. Often just unwillingness to read, even skiving off school, stomach pains and restless sleep are symptoms of the same thing.
- Small bruises of blood under the conjunctiva, sugillatio subconjunctivalis, may tell the tale of a plus deficiency.
- Wobbling or tense wings of the nose (alae nasi) are a further sign of accommodation strain.

- Narrowing the eyes into an extremely small gap between the lids, (“pig eyes”) by which the person achieves a so-called stenopaic disk pinhole, through which it is possible to see clearly (excellent example is Johannes Virolainen)
- And what about a chin that is hard as stone, which I have observed when trying to change the position of the patient's head!

How often I have emphasized the fact that a restful expression and peaceful demeanour, are the most pleasant, and this could be achieved with spectacles alleviating accommodation.

A good way of showing to a person wearing minus glasses how great an accommodation strain he is maintaining the whole time: give him a text to hold. He will often read it from a significantly short distance. You whisk away his glasses, and the distance stays the same! In other words, they are constantly exposed to an overload to the extent of the power of their glasses.

Whereas when you give small print for a presbyopic to read, he immediately pulls further away. This is already a sign of a great defect.

The patient ombudsman might say: "wrong type of glasses"...
These do not exist, as there is no absolute truth in refraction values.
It would be wise to say e.g. that the examination has revealed a refractive power value that in the relaxation of the ciliary muscle achieved would correspond to a hyperopia of +3.5.
And thus we have glasses that are closest to the correct values, or at the discretion of the ophthalmologist, a prescription for "therapeutic" glasses.

Further, there is no absolutely correct refraction value, but whoever has shown the greatest degree of hyperopia is always closest to the truth.

This is why the strongest plus value obtained is not always indicated for the patient, but the initial situation determines the rate of progress that follows the patient reaction. Quite often it is necessary, however, also to resort to "pushing" and many types of leading strategies, as no progress can be made with a tense patient by just "hushing".

The tolerance of aged people is usually more limited, and it is a good idea to watch out for changes in the glasses that are too great.

We are learning and progressing all the time, but there is one thing that we will never learn to estimate for sure: how great a plus increase the patient will tolerate
a) immediately
b) in the longer run.
What is crucial is "previous conditioning" and sensible progress.

Even a young patient may need to be hospitalised for heart tests because of arrhythmia caused by sympathetic irritation due to too sudden a release of accommodation (Stina Häggblom).

My greatest joys achieved through this type of therapy have been seeing a patient (who used to wear strong minus glasses) getting rid of suicidal tendencies.

"Getting wise" on all these phenomena is by no means simple.
Rather large changes in dioptric strengths are required to show the causal relationships.

It equally requires years of experience and long-term follow-up of the same patients to get an idea of it. We must start by believing and following this experience as described by others.

An at least reasonable **store of glasses to lend** to patients is necessary to get the patient started, as very few people are prepared to make the financial sacrifices that relatively fast changes of glasses require in the beginning.
When talking with the doctor, the patient promises to come to the surgery "even with a paper bag over his head", if that is what it takes to make progress, but often this remains just a promise in practice.

“Red rags” for me:

- This is only about glasses!
- "As good an eyesight as possible"

This is why it is unfathomable and downright unforgivable that pain clinics and migraine treatment teams do not feature a single ophthalmologist, but that of course is their own fault. The doctor is often heard to pronounce: "This symptom has nothing whatsoever to do with eyes", which is one of the most stupid statements, after the patient often has quite correctly suspected a connection. Similarly, it is unforgivable to say that one must learn to live with one's headache, just because the doctor is unable to help!

Disrupted sleeping patterns, burnout and depression

When I think of all the concern that is at the moment felt in the world over the increasing lack of sleep of the working population and the associated sick leaves due to burnout and depression, it is hard to witness the fact that this essential additional factor in burnout, accommodation stress, does not begin to receive the attention it deserves.

When writing a prescription for glasses, it is a good idea to always check the distance interpupillary distance, often even in the beginning and end of the examination; this difference may be a couple of millimetres, depending on the tension in the patient.

If the patient is constantly lifting up his chin even when reading with bifocals, this is a sign that the border definitively is too low; if the patient lifts his chin when talking, the higher section is considerably lacking in plus correction.

n + 1 examiners often means n + 1 difference prescriptions!

“How to avoid making a spectacle of myself!” (reference: subtitle in Milder´s book)

A WORD ABOUT REFRACTION SURGERY

I will not even stoop to discuss the immorality of the flourishing and ever increasing refraction surgery, which mutilates healthy eyes. Many types of surgical complications are always possible, and even one lost eye is a catastrophe.
Thankfully, there are some honest eye surgeons who, before consenting to perform the procedure,

make sure that the patient is clear about such as the nuisance of being dazzled, which is quite common when driving at night (Ocular Surgery News, attachment).

ABOUT SCIENCE

How often you hear people enthusing about scientific evidence! We have seen the results this has achieved. Hundreds and again hundreds of myopia and myopia prevention congresses have been about nothing but exchanging statistics, without a single bit of progress. This is self-deception, because accommodation strain cannot be translated into formulae, as there are too many variables involved in the examination. We must use a much more simple approach as well as common sense, and the results will be rewarding. Quantitative and scientifically exact measurement of accommodation strain is simply impossible! It can perhaps partly be illustrated by the following demonstrative test.

Professor Meesmann examined the refraction of the eye using a cat's eye (Experimentelle Untersuchungen uber die antagonistischeInnervation der Ciliarmuskulatur). Albert von Graefe´s Arch Ophthalmol 1952;152:335-355.

Refraction of the eye sciascopically (retinoscopic, mirror reflection examination) without drops was – 0.5 D.
By stimulating the sympaticus nerves of the neck (which inhibit accommodation) hyperopia went up by 4 – 6 D.
When cranial nerve III, N. oculomotorius, which takes care of active, positive accommodation, was dissected another 3 D of hyperopia was revealed.
If at that stage, in lack of antagonistic forces, the neck sympaticus nerve was further stimulated, the total hypertopia went up to 10 D.
But, if even the sympaticus nerve was dissected the eye refraction settled back at the original - 0.5 D.

It is not for nothing that Duke-Elder already on the cover of his book on refraction (1969) emphasizes:
”It remains a simple and essentially non-mathematical presentation of basic principles of the theory and practice of correcting defects in the optical system of the eyes and their associated muscles. Clinical rather than theoretical, it is a thoroughly practical book.” It is worth reading!
However ”…the book comes nowhere near the **truly non-mathematical** viewpoint represented in the present work.”(Panacea p. 9)

LIGHT AND THE EYES

Completely aside my main theme, refraction and myopia, when talking about eyes I cannot desist from bringing up a study that in its message and power of evidence has been one of the most inspiring in my life (not only because I have been fortunate enough to personally meet the author), but which, however, I feel has over the years received too little attention.
This work was written by the Hungarian Professor of Ophthalmology Magda Radnot in year 1953, Die Wirkung der Belichtung der Augen auf die Funktion der Gonaden, (The effect of light on gonads, Ophthalmologica 1953;127:422-4).
“By nocturnal periodic illumination of the eye of the duck, a growth of the testicles and sperminogenese was provoked in the drake and a functioning of the ovary and oviduct in the female

so that eggs were laid.”, with demonstrative photos – so much as about light and eyes is otherwise discussed! (Fig)