

RETRO — TRANS — ILLUMINATION (X)

*Classification — Technique — Advantages and Inconveniences*

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In a recent article (11) we suggested for a method of biomicroscopic examination of the eye, which seemed original to us, the name of Retro-Trans-Illumination, R. T. I. in abbreviation. Our work was still in the press when we received the 2nd. volume of BERLINER's book in which there are some references and two illustrations about this method of examination. The above referred author, however, without recognizing its better use, treats the matter superficially and makes reference to a previous work of DAVIDSON (3).

We examined also latter and verified that its Author had been able to get all the advantages that the method offers in spite of greatly praising it. It is hard to understand how he preferred not to use the corneal microscope and make the examination with naked eye, for it is exactly the microscope what gives us a greater amount of details, not only its power of magnifying the images but also by the determination of the exact location of what is being examined, and, if this were not enough, by the possibility of taking photographs it provides.

DAVIDSON (3) also mentions some older sources of information (6, 5, 2, 7, 13, 10) but does it without showing greater interest, and even stating that they are all "no encouraging", with which we agree in respect to those we have been able to examine (2, 5, 6, 10).

Under the circumstances admitting the antiquity of the method we are using, we are forced to admit that the authors who made use of it did not investigate it sufficiently, not giving it, therefore, greater practical value. BERLINER (1), who in its first volume does not even mention this method of examination admits it in the second volume, when he refers to the examination of the iris and lens, more as complement to other examinations than as an individualized and valuable method. If we consider the advantages of the R. T. I. in the semiology of the cornea, we will go far as to admit the ignorance of this method of examination by the above referred author, at the time of publication of the first volume (1943), which is exactly the one about the diseases of this membrane of the eye.

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With regard to the denomination in question, if it is true that, by a question of scientific priority, we are obliged to admit the anterior one, i. e. **DIAPUPILLARY — TRANS — ILLUMINATION**, we acknowledge more property to that proposed by us, because diapupillary will also be the **RETRO-ILLUMINATION** using as reflector the anterior crystalloid or any surface placed behind the pupillary area.

We claim, therefore, the priority of the use of this process of examination as *individualized biomicroscopic method* and call the attention of everybody interested to the actual possibilities of its use, and state further that such a method opens a new research field for the slamp. Our succeeding publications will better prove what we are now stating.

Before passing on to the appropriated technique da R. T. I., we shall make a resume of the methods used which employ the slit slamp, thus defining the position such a semeiotic means as this must have in the assemblage of examinations which constitute the biomicroscopy of the living eye.

#### CLASSIFICATION — METHODS OF EXAMINATION

The biomicroscopic examination, nowadays, be-divided into *examination of the anterior segment and examination of the posterior segment* or stereoscopic examination of the retina and vitreous, as it is better known.

For the first of these methods, the unit slit lampcorneal microscope can be of any type, even of the older ones, and the angle of incidence of the light beam is always very wide, seldom reaching an opening inferior to 30 degrees. Though this method of examination, i. e.; ordinary biomicroscopy, one can make the examination from the anterior surface of the cornea up to the anterior third of the vitreous, or little farther. This can be made in 5 different ways, depending on the incidence of light and the position of the corneal microscope. We have thus the following methods.

**DIFFUSE ILLUMINATION**

**SCLEROTIC SCATTER**

**SPECULAR REFLECTION**

**FOCAL ILLUMINATION** (with its varieties **DIRECT** and **INDIRECT**)

**RETRO-ILLUMINATION** (also **DIRECT** and **INDIRECT**)

The latter method consist of examining the cornea, the iris and part of the lens by means of reflected light, either by the anterior surface of the iris or by the anterior and posterior crystalloids whe made opaque. According to the angle of incidence of light this method can be dividet into

**DIRECT RETRO ILLUMINATION** and **INDIRECT RETRO ILLUMINATION**, depending on the obstacle to be examined being or not placed in the way of the projection of reflected light.

**RETRO ILLUMINATION** is also called **TRANS ILLUMINATION** which is a more adequate denomination to designate the **DIAPHANOSCOPY**.

The second method of biomicroscopic examination, namely that which enables us to explore the area spreading from the anterior third of the vitreous up to the retina and the choroid, requires that the angle of incidence of light is very narrow and for this it is necessary that the slit lamps are equipped with special devices. These can be grouped in two types: mirrors and prisms. Of the first, that of **KOEPPE** (8) who introduced these modifications, is still the best one. Of the prisms, that of **GOLDMANN** (4) is nonpareil for the purpose it is designed for.

Besides deviation of the light from the slit lamp there is still the eye refraction to be overcome, and for this a series of special microscopes were invented and other alterations introduced until **KOEPPE**'s (9) and his followers' "contact lenses" appeared. The deviation of the light beam and the introduction of the "contact lens" solved definitively the problem of examining the most posterior segment of the living eye with slit lamp.

The more recent slit lamps are equipped with devices capable of reducing the angle of incidence of light, and among these we should mention that of **POSER**, manufactured by Buasch-Lomb, which uses an excellent **KOEPPE**'s mirror and that manufactured by Haag-Streit which uses **GOLDMANN**'s double prism.

**IF WE USE ONE OF THESE LAMPS EQUIPPED WITH SUCH DEVICES AND IF WE MAKE THE EXAMINATION BY MEANS OF THE CORNEAL MICROSCOPE, WITHOUT USING A "CONTACT LENS", WE CAN UNDER DETERMINED CONDITIONS EXAMINE THE ANTERIOR SEGMENT OF THE EYE? IN A DIFFERENT WAY, BY A METHOD OF RETRO-ILLUMINATION OF WHICH THE LUMINOUS REFLECTION TAKES PLACE IN THE RETINA. THIS IS WHAT WE CALL RETRO-TRANS-ILLUMINATION** (see scheme in fig. 1).

By grouping all these techniques of examination we can work out the following general scheme of biomicroscopic examinations:

<b>Biomicroscopy</b>	Wide angle of incidence of light (Anterior segment only)	{	DIFFUSE ILLUMINATION	
			SCLEROTIC SCATTER	
	Narrow angle of incidence of light	{	FOCAL ILLUMINATION	{ DIRECT INDIRECT
			RETRO-ILLUMINATION	{ DIRECT INDIRECT
			STEREOSCOPY OF THE RETINA AND VITREOUS	
			RETRO-TRANS-ILLUMINAÇÃO	{ DIRECT INDIRECT

We can also place R. T. I. in the division corresponding to RETRO-ILLUMINATION, taking into consideration the fact that the light rays are reflected the retina, but this would involve the association of methods using different equipment which cannot be allowed. We have considering this possibility, the following scheme referring to RETRO-ILLUMINATION:

RETRO-ILLUMINATION (Direct and Indirect)	{	Wide angle of incidence of light	{ Reflection by the iris Reflection by the lens
		Narrow angle of incidence of light	{ Reflection by the retina (Retro-Trans-Illumination)

### TECHNIQUE OF RETRO-TRANS-ILLUMINATION

This method consists in projecting a pencil of light very close to the iris, focusing it on the retina and capture it after the retinal reflexion by means of the corneal microscope. We insist upon the of the corneal microscope because only its use makes possible to consider this method as a biomicroscopic examination, which cannot be done to what DAVIDSON (3) proposes, i. e., examination by naked eye.

For the good achievement of this examination we prefer Poser's Slit Lamp which, besides having an excellent KOEPPE's mirror already fixed up in the exact position, is equipped with an easy to handle mechanical system which allows the millimetric forward and backward move of the mirror, thus facilitating a great deal a better incidence of light. Being impossible for us to use this lamp, we adapted KOEPPE's mirror to COMBERG's (12) slit lamp, and lately to Haag-Streit's slit lamp, which has enabled us to perform excellent examinations. With the latter adaptation we have obtained the greater part of our photographs.

For good results of this method of examination there are a few essential can be summed up in the following items:

1.o) — It is preferable to use **KOEPPE**'s mirror, for it displays a quite larger illuminated pupillary area, which can be seen from the photograph in figure n.o 2. **COMBERG**'s double prism is too bulky thus allowing only the examination of a thin margin of the pupillary area.

2.o) — Light should penetrate very close to the pupillary area and the angle of incidence should be the narrowest possible. The mirror should be very near the anterior surface of the cornea.

3.o) — The corneal microscope should be in such a position as to receive the total amount of light rays reflected by the retina. When this happens the R.T.I. will be **DIRECT**, that is to say, will be at the maximum of reflected intensity.

Contrariwise it will be **INDIRECT**, and here the structures to be examined acquire a very different aspect;

4.o) — The luminous slit should be, whenever possible focused on the level of the retina in order that a more intense light reflexion is obtained;

5.o) — Light should be skilfully deviated by the free edge of the mirror, avoiding its escaping which would hamper good visibility through the corneal microscope and make impossible to obtain good photographs;

6.o) — Light reflected by the retina illuminates a little more than half of the pupillary area opposite to the point of entrance of the light beam. The pupillary area becomes thus vertically divided into two halves, one dark or poorly illuminated by the incoming beam of light, the other intensely illuminated by the outgoing or reflected light;

7.o) — The pupil should be in midriasis or at least slightly dilated. The pupil pin-hole restricts too much the area of examination;

8.o) — The stereoscopic examination is obtained with great difficulty because the distance between objective of the cornean microscope is generally too great to allow the penetration of reflected light in both axis of the apparatus;

9.o) — Luminous intensity will of course depend on its source of origin but can be modified small variations of the angle of incidence of light;

10.o) — The colour of the hemi-pupil intensely illuminated is in general orange but varies with race, age and above all with the integrity of the optical transparency. Sometimes even being almost white with those possessing lesions of the fundus, especially in cases of atrophic choroiditis without pigment of the posterior pole.

11.o) — The particularities submitted to this examinations appear illuminated by transparence and acquire the most extravagant colours tending as a rule to brown-reddish, gold or black;

12.o) — It is absolutely necessary that the optical transparence is in a condition of being easily crossed by the incident light and the reflected light and that the retina is capable of reflecting light with priceless intensity. This examination permits us to observe from the anterior surface of the cornea up to a deep region of the vitreous, thus making possible a good sense of depthness and therefore of localization.

#### ADVANTAGES AND INCONVENIENCES

In opposition to the few inconveniense, almost all of them of a mechanical nature, resulting from the equipment itself, this method offers undeniable advantages over many of the others already mentioned, at least with regard to the study of certain particularities of the pathology of the cornea. Of these advantages we can outline these which are **important**:

1.o) — *Easy handling* — Method of remarkable simplicity, requires only a certain practice in dealing with the slit lamp;

2.o) — *Well supported* by the patient so as to allow long and detailed observation;

3.o) — *Photomicrography* — It is no doubt photomicrography the best advantage offered by this method. We think that this is the only method of biomicroscopic examination which permits photography, using its own means, not requiring complicated equipment and without using any other source of light except its own. By associating the magnifying power of the corneal microscope with the possibility of recording through photography the details of pathological findings, one can immediately deduct the priceless value of this method in the study of diseases of the anterior segmente.

As to the inconveniences, which are few, we can point out the following:

1.o) — *Position of the mirror*: The constant necessity of changing the position of the mirror to examine one or the other of the pupillary area is a small inconvenience which becomes boring by repetition. We have incidentally taken steps to have a small adaptation to the slit lamp made in order to avoid this inconvenience as well in the horizontal line, which will be of great value in the study of the pannus of trachoma;

2.0) — *A bad condition* of the eye to examine is of course the greatest of all inconveniences. Thus, in cases of uveites with posterior senescence of the iris or with large exudates in the vitreous, there is great difficulty of penetration of light and the examination might become impossible many a time.

We are convinced that, in spite of the simplicity of its execution, R. T. I. is a biomicroscopic examination of high efficiency which reveals in detail certain particularities sometimes unaware of other semeiotic means. It is our purpose to give immediate publicity to the pathological findings that we have been studying for quite some time and to reveal the splendid contribution made by photography through this method, specially with reference to the vascularization of corneal diseases.

Translated by courtesy of Mr. Antonio Valiengo.