

THE CATARACT OPERATION IN ANCIENT GREECE

It is not known exactly when the first cataract operation was performed in Greece. The first relevant mention of this operation is to be found in the 3rd century B.C. in the « *Simplicii in Aristotelis Categorias Commentarium* » (Ed. Kalbfleisch, vol. 8, p. 401) and in the « *Stoicorum Veterum Fragmenta* » (Ed. H. v. Armin, vol. 2, p. 52) — (Knapp 1930). It is in the extract that refers to the stoic Chrissippus (280-206 B.C.), which is as follows : « ... Hence, Chrissippus has investigated if we should call blind those suffering from hypochyma and who can see again after being subjected to a paracentesis, and those whose eyelid are closed : because (I think) that, since the power of vision exists, they may be likened to those that close their eyes tightly or to those that are prevented from seeing because of something like a curtain before their eyes which, on being removed, does not obstruct the vision any more. » This of course is a free translation of the extract in our own words, for one should know ancient Greek to realise how naturally Chrissippus speaks about paracentesis as a surgical method of treating cataracts in the 3rd century B.C., as if it was routine.

However, before we come to the surgical treatment of cataracts by the ancient Greeks, we feel obliged to give their own definition of this disease in order to be able to completely understand this subject.

Firstly, the father of medicine Hippocrates mentions the term « glaucosis » in his texts, but not with the present-day meaning of this term. According to Sichel, Hippocrates was referring to what we today know as a cataract (Sichel 1841). The confusion about these two terms, glaucoma and cataract, also continues in the works of later Greek doctors, where we will meet these two terms.

Let us see exactly what they meant. Rufus of Ephesus (98-117 B.C.) expresses the opinion that his predecessors considered hypochyma and glaucoma as the same disease. Later on, Rufus says, the subject was clarified and it was realised that two separate diseases were concerned. Consequently later doctors considered glaucoma as a disease of the crystalloid humour (of the lens), that took a sea-green (*γλαυχου*) colour because of the liquidity, while hypochymas were considered as a suffusion and coagulation of humours between the cornea and the crystalloid.

The same author considers all glaucomas incurable while believing hypochymas curable, « though not all of them » (Daremborg 1879). Galen (130-200 A.D.) expresses the opinion that hypochyma is the coagulation of the aqueous humour that obstructs vision to a greater or lesser degree. However, hypochyma differs from glaucoma in that the hypochyma is the coagulation of the aqueous humour, while glaucoma is the transformation of the humours existing naturally in the eye into a sea-green colour. (Kühn, XIX, p. 438). Among later doctors, Oribasius (325-

403 A.D.) and Paul of Aegina (625-690 A.D.) give definitions of glaucoma and hypochyma based on Rufus' opinions (Bussemaker et Ch. Daremberg 1873 — Pauli Aeginetae, III — Daremberg 1879). Aëtius of Amida (502-574 A.D.), who relies on the ancient doctor Demosthenes, believes that two kinds of glaucoses exist and notes : « The term glaucosis has two meanings : that is, the first and main glaucosis which arises from a dryness and concretion of the crystalline humour, which is changed to a sea-green colour, and the other kind of glaucosis which arises from a pre-existing hypochyma, when the humour in the region of the pupil has extensively congealed and become dry ; and this kind of glaucosis is incurable, while the main glaucosis in its early stage may occasionally be cured. Hypochyma, on the other hand, is a suffusion of humours that congeal in the region of the pupil, so that, when this hypochyma matures, vision is obstructed (Olivieri, 1950). Similar definitions are also given by Theophanes Nonnos (10th century A.D.) in his « Epitome » (Bernard, 1794), by Michael-Constantine Psellos (11th century) in his poem « Opus Medicum » (Boissonade, 1962), by Leon the Philosopher (Ermerins and Hakkert, 1963) and finally by John Actuarius (13th century A.D.) (Ideler, 1842).

According, then, to Galen's view, but also according to later opinions, glaucosis is the change of colour of the lens towards a whitish or sea-green so that vision is obstructed completely i.e. we have here the cataract according to the modern meaning of the term and not the glaucoma. On the other hand, hypochyma is not the cataract according to the modern point of view, but the coagulation of the aqueous humour or the suffusion of a pathological humour in the region of the pupil (the interposition of a humour between the lens and the cornea), that congeals there and partially impedes vision or obstructs it altogether. Glaucoma, according to its meaning today, is confused in the ancient texts with the latter entity. What was then the purpose of the surgical treatment of hypochyma, referred to by the many ancient authors that we are going to mention later on ? Undoubtedly they did not remove the imaginary congealed humour that, they believed, comprised the hypochyma. What they actually removed must have been the opaque eye lens. They could not even have conceived of the removal of the lens from the pupil and consequently the therapy of what they called glaucosis. This is why nearly all of them write that glaucosis (cataract according to us) is an incurable disease. Let us bear in mind that the removal of the lens from its position was contrary to the well known theory of vision formulated by Hipparchus and Plato, and accepted by Galen and other later doctors. According to Galen's view the lens is the main organ of perception « *οὐρανίου τοῦ ὀφθαλμοῦ ὁμοιωμένη* », an opinion that is also accepted by Byzantine doctors.

Of course, it must have seemed inconceivable to ancient doctors that, with the various surgical methods that we are going to mention later on, they removed the actual lens, the main organ of vision.

How could they have accepted that patients can see, and see even better, after the lens's removal from the pupil which is what they in fact achieved without being aware of it. So they found it more plausible that they were removing the hypochyma, a foreign body, useless as far as they were concerned.

Let us see now in what ways ancient Greeks managed to remove the cataract :

I. Paracentesis

We think that the oldest method used was paracentesis, which, according to legend, man learned from a goat.

Concerning this, Galen writes the following : « And they say that some treatments were discovered by chance, as for example paracentesis for those suffering from hypochyma, that is, a goat suffering from hypochyma saw again when it fell upon a thorn that pierced its eye » (Kühn, XIV, p. 675).

Galen mentions this method as a way of treating hypochyma and writes : « ... what doctors call hypochymas, are to be found between the crystalloid humour and the cornea, and obstruct vision, until they happen to be treated by paracentesis » (Kühn, III, pp. 760-761). Paracentesis is carried out in the following way, according to Galen's texts : « We pierce the cornea with a needle (an instrument called « *κεντητηρ* ») on the periphery until it has entered the anterior chamber. Then we pierce the hypochyma, which we push aside. »

The ancient Greeks used the same method for the treatment of hypopyon (Olivieri, 1950 — Kühn, X, p. 1019).

II. Depression of the hypochyma

The operation of depression is described by many ancient authors and it seems to have been the main surgical treatment of hypochyma. Galen describes depression in the following way : « ... as far as hypochymias are concerned, we depress them by performing a paracentesis near the limbus on the side of the temporal angle until (the instrument) reaches an empty space (in the region between the front surface of the lens and the back surface of the iris, i.e. in the posterior chamber) ; then, after we have laid (the instrument) horizontally on the limbus, we depress the humour that exists on the pupil (the hypochyma) with the instrument's tip and we wedge it so that it does not return to its previous position » (Kühn, XIV, p. 784). The method of depression is also described by Antyllus, « The Greek ophthalmologist » as he is called by the Arabs. Unfortunately, however, Antyllus' original text has been lost and we are obliged to deduce the method from medieval latin translations from the Arabic, which as we know, are not famous for their accuracy. Antyllus' description according to the Arabic Codex of Razis' « Al-Hawi », in the Escorial Library is translated into German by Hirschberg (1906).

A more detailed description is given by Paul of Aefina, which is as follows : « After we have placed the patient facing the light but avoiding direct sunlight, we bandage his sound eye with care and after we have dilated the lids of the other eye, we place the tip of the instrument (*παρακεντητηριου*) at a distance from the so called iris (i.e. limbus) equal to the size of the tip of a probe, on the side of the temporal angle in the middle, and then we make an imprint on the region where we are going to do the paracentesis using the right hand on the left eye and the left hand on the right eye. After we have rotated the tip of the round instrument, we push with courage through the region that we have previously marked, until we arrive in an empty space. As a measure of the depth you may proceed to, you should have the distance existing between the pupil and the limbus. Then we move the instrument upwards, towards the tip of the hypochyma where the bronze instrument can be seen owing, apparently, to the transparency of the cornea. We will depress the hypochyma with this instrument onto the underlying regions, and if it sinks immediately, we must persist for a while, immobilising the hypochyma (with the instrument). On the other hand, if the hypochyma floats up again we have to depress it once more and after the depression of the hypochyma we remove the instrument by turning it slightly, and after this, we briefly dilute some cappadocian salt in water and clean the eye and then we place on the eyelids wool impregnated with the white of eggs and attar of roses. We bandage the eye, binding the sound one at the same time, so that they do not move together. After that, the operated patient is made to lie down in a dark room, we command him to relax completely and to go on a liquid diet and to keep his eyes bound until the seventh day, unless something else should prevent this. After the seventh day and after we have unbound the eyes, we try to check visual acuity by pointing out to him a few of the things visible in his surroundings.

This step, however, should be avoided during the operation or immediately after it, as a sudden glance may easily cause the hypochyma to return to its previous position. If, on the other hand, an inflammation sets in which requires our urgent attention, we may unbind the eyes before the seventh day and struggle against it (Pauli Aeginetae, VI, 83).

We should confess that this description by Paul of Aegina, who is the only Greek author to describe this operation so analytically in the Greek language, comes as a surprise to us for its details and the exactness of the operation and the post operative treatment which includes cleaning the eye with an antiseptic solution, binding both eyes, quiet and immobility of the patient, a procedure which in general lines comprises accepted practice today.

We should also stress the postoperative checking of visual acuity that had, of necessity, to be carried out by showing objects to the patient, since optotypes did not exist in those days.

Celsus gives a similar description which complements that of Paul of Aegina in his work « De Medicina » translated into English by Adams (1846).

It is curious that Aëtius of Ameda, although engaged in detail with other serious ophtalmic operations, does not deal with the cataract operation itself. For this disease he recommends conservative treatment and phlebotomy. Anagnostakis, ascribes a description of lens depression to Aëtius (Anagnostakis, 1872), we think by oversight.

III. Phacotrypsy or dissection

This method is described by Galen, who writes in this regard : « ... besides the above, some of them, of the hypochymas, I mean of course, have a more watery type (i.e. they are softer) : those then, when they are pierced at many points dissolve immediately, and precipitate like mud » (Kühn, X, pp. 1019-1020). The method of dissection of the anterior lens capsule used nowadays in traumatic or juvenile cataracts is based on the same principle.

We think that dissection comprises a separate method of operating on cataract, which as we can deduce from Galen's text as Anagnostakis remarks, was rarely used for soft cataracts and does not constitute here a treatment of complications following a depression of lens as Gabrielides (1931) maintains. On the contrary, the phacotrypsy carried out when the hypochyma reappeared after the depression of the lens may indeed be considered as treatment of a complication (Gabrielides, 1931).

IV. Extraction of the cataract

A lot of conflicting opinions have been expounded concerning the extraction of cataracts in ancient Greece by those engaged in the history of ophtalmology, especially in the last century. V. Graefe writes that it is regrettable that Antyllus' extract is the only proof that cataract extraction was carried out in antiquity. Nevertheless, this extract is neither the most important nor the only one. First of all the following are known from Galen who writes : « Because the hypochyma is a foreign body in the organism, just like bladder stones, when pharmaceutical treatment fails it should be removed to a region of secondary importance (where it does not obstruct vision, i.e. he means the hypochyma should be depressed) » (Kühn, X, p. 987). And he says later : « However, some have tried to empty hypochymas, as I will mention in my work on surgical topics. » From Galen's

extract we conclude that the operation was rarely carried out and its success was doubtful. An extract from Antyllus, rescued by Razis in Al-Hawi, also refers to cataract extraction.

According to the manuscript in the Escorial Library this may be translated as follows : « And some have torn the lower part of the pupil and have removed the cataract. This is possible in cases of soft cataracts but in cases of thick ones the extraction is not possible because in this case the liquid (a prôtein substance perhaps ?) would flow out. » (Hirschberg, 1906 — Gabrielides, 1931). This extract is not very clear, probably because of the bad translation from greeœ to arabic and because the meaning of « liquid » is not exactly known (i.e. if it concerns the acqueous or vitreous humour).

Avenzoar also mentions the method of cataract extraction in « De extractione cataractarum ab oculis » (Anagnostakis, 1878). From this text it may be deduced that Avenzoar had heard about hypochyma extraction, but had no personal experience of this kind of operation, because, as Anagnostakis states, the art of operating had retreated in this period. Avicence, who mentions the method of depression by copying Paul of Aegina, also refers to Antyllus' well known extract and mentions cataract extraction which is carried out by a few with a cut of the lower part of the cornea, which procedure he does not approve of himself.

He writes, according to Sichel : « Some paracentise the lower part of the cornea and remove the liquid by discision. This is a dangerous method because as they remove the liquid, the acqueous humour comes out with it. »

Many authors believe that because the Arabs were not very expert hellenists, Antyllus' text has not been accurately translated from greek to arabic and thence to latin. So, they believe, the use of the term « extraction » was mistaken. However even if we ignore the Arab doctors' opinions, we must rely on Galen's extract that we have already mentioned. The clarity and structure of Galen's writing leave no doubt that a number of doctors did, indeed, remove cataracts by opening the cornea, a procedure which, in any case, was not unknown, to the ancient Greeks, since they practised it in the surgical treatment of hypopyon.

All that we have mentioned above seems to indicate that the idea of cataract extraction is an ancient one, whose origins are to be found in ancient Greece. This rarely practised, risky operation of dubious effectiveness cannot, however, overshadow the achievement of Jacques Daviel, who established cataract extraction as the main surgical method of treatment, rendered it safe and imposed it on scientific circles of his time.

This was the real starting point for all later improvements in the method, which, in their turn, have led to the spectacular successes of the present, such as the implantation of intraocular pseudolenses. *Palmam qui meruit ferat.*

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