Evidence is produced that the position for the new insertion of the inferior oblique is important, and that the positions already described for recession of the muscle do not give reliable and accurate results.

The results of cases are given.

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STATISTICAL DATA OF MY CATARACT OPERATIONS PERFORMED WITH A NEW SUTURE OF THE SCLERA

BY

F. PAPOLCZY

BUDAPEST

WHEN studying the history of cataract operations we can see that this most important and most frequent of eye operations has undergone very great changes since the first operations, performed almost 2,000 years ago, up to now. This process, however, was not made equally, but in periods of progress more or less defined by certain great medical discoveries.

The oldest cataract operations which quacks performed during many centuries were depressions or reclinations. They were carried out by inserting a pointed, awl-like needle through the sclera into the eye, and pushing the opaque lens backwards or downwards into the vitreous body. As a consequence of this operation at least 60 per cent. of the patients lost their sight after a longer or shorter time owing to infection, haemorrhage into the vitreous and glaucoma. It often happened that sooner or later, after surgical intervention, the cataract either returned to its original place, or luxation into the anterior chamber took place.

In the middle of the eighteenth century Daviel found out that

much better results could be obtained by removing the cataract through a corneal wound. But after this operation, in 15-20 per cent. of the cases, another complication arose: suppuration of the wound, in consequence of which the eye was often lost.

The perfecting of operative methods, in the present meaning of the word, became possible only when, in the earlier part of the nineteenth century, Davy, Wells, Jackson and others discovered narcosis, and in the latter part of the nineteenth century, local anaesthesia was discovered by Koller and Schleich. Almost simultaneously, Lister found out, on the basis of the research work of Pasteur, that infection caused suppuration of the wound, and that sterilisation and asepsis were the only means of protection against it.

Under these favourable conditions Snellen's cataract operations performed with a conjunctival flap after careful pre-operative treatment were a great advance at the end of the nineteenth century.

At that time everywhere complete iridectomy and extra-capsular operations were done by making a large incision above the iris and then removing the nucleus and cortex as far as possible with a spoon. When, however, part of the capsule and a great part of the cortex remained, inflammation of the operated eye ensued, and it often demanded weeks of treatment. Frequently a dense secondary cataract developed. It was observed that if the capsule forceps was blunt, or the capsule was very thick and resistant, the cataract could be removed together with the capsule. In this case there is no danger of inflammation or after-cataract.

After this experience, Torök, Elschmig and Stanculeanu, at the beginning of the twentieth century, devised forceps with which in a great number of cases the cataract could be removed entirely, that is to say with the capsule. Not long afterwards it was found that even better results could be obtained by performing not an entire, but a basal iridectomy, thus leaving the pupil untouched. This led to the round pupil intra-capsular extraction.

The round pupil operation has, however, the disadvantage that in case of rupture of the wound prolapse of a greater or smaller part of the iris can occur, or this may be wedged in the wound. In 1867 Williams found that this complication with its unpleasant and sometimes tragic consequences could be avoided by suturing the wound. The first successful suture was described by Mendoza in 1889. Liégard, in 1913, published a new method which, with a few smaller modifications, still proves useful. Later Kuhnt's conjunctival flap employed by Blaskovics, and Elschmig's, Horváth's and lately McLean's sutures were the most successful and most frequently used.

By using the above-mentioned and many other similar sutures the danger of prolapse of the iris or the iris getting wedged in the wound was considerably diminished, but not completely eliminated. Experience shows that these sutures may bring about certain disturbances or even serious complications regarding the healing of the wound, so naturally ophthalmologists endeavoured to find newer methods which would yield still better results.

The requirements of a suture which is to close the cataract wound well and to ensure its undisturbed healing are :—

1. The suture should not be inserted directly into the corneo-scleral wound, because suppuration of the suture may cause infiltration of the cornea, and wound infection. But it should not be inserted too far from the wound either, because then it is impossible to avoid rupture of the wound with all its consequences.

2. It must unite the edges of the wound exactly in their original place lest gross astigmatism arise.

3. The conjunctival flap must be large enough to cover the wound entirely.

The insertion of the suture should not complicate or unduly prolong the operation, lest ophthalmic surgeons of limited experience should be unable to perform it.

Bearing in mind these considerations and requirements I have now been using for years a new suture for my cataract operations, the original idea of which was given to me by Imre's method. In cases of complicated cataract he made a semi-circular flap into the bulbar conjunctiva, and severing it as far as the limbus turned it back upon the cornea. At 12 o'clock, about 2 mm. from the limbus, he inserted a thread horizontally in the superficial layers of the sclera, then inserted the same thread in that part of the conjunctival flap which was originally above these points. Then pulling the thread out of the wound, he formed a loop. The cataract incision was made in the usual way with Graefe's knife. After extraction the conjunctival flap was replaced upon the sclera, smoothed down, and then the thread was knotted twice.

This method has the disadvantage that, as the detached conjunctiva is elastic and shrinks, it is impossible to insert the suture exactly at the corresponding places in the sclera and the conjunctiva. In consequence the edges of the wound cannot be fixed exactly in their original position. Another disadvantage is that it is very difficult to make the cataract incision after having made and turned back the conjunctival flap previously.

I endeavoured to eliminate these difficulties by inserting the thread through the conjunctiva into the superficial layers of the sclera, and making the incision and the conjunctival flap afterwards. Thus my method is the opposite of Imre's operation.

The following is a detailed description of my operation. After the usual preparation I open the palpebral fissure with Oláh's speculum. The use of this and other similar instruments is of great advantage in intra-ocular operations, because the assistant need not trouble to retract the lids during the whole of the operation.

I fix the eye from above by a suture inserted in the superior rectus, from below by fixation forceps next to the limbus. Then I insert a 6-0 black nylon suture at 12 o'clock, 1 mm. from the limbus, parallel to it through the conjunctiva into the superficial layers of the sclera (Fig. 1). After this I proceed to make the cataract incision with Graefe's knife. But when the corneal part of the incision has been made, and the knife, still under the conjunctiva, has reached the level of the suture, I do not continue the incision, but carefully withdraw the knife from the wound (Fig. 2). Then, above, I make a semi-circular conjunctival flap with scissors, and detaching it from the sclera to the thread, turn it back on the cornea (Fig. 3). After drawing out both threads through the conjunctival tissue with anatomical forceps, I form a loop and cut through the shreds of tissue around the wound with scissors (Fig. 4).

Then after making a basal excision in the iris above, I grasp the capsule from below with Arruga's forceps, and if it is very tense, I use Imre's or Blaskovics' forceps. Afterwards I draw the lens slowly outwards with lateral movements. I expel it by exerting

FIG. 1.

FIG. 2.

FIG. 1. Insertion of the needle through the conjunctiva into the sclera.

FIG. 2. Making the corneo-scleral incision with Graefe's knife.

FIG. 3.

FIG. 4.

FIG. 3. Making a conjunctival flap with scissors. FIG. 4. The cutting of the subconjunctival tissue, which keeps the wound together.

slight pressure upon the cornea at the lower limbus in the opposite direction with Imre's ring-instrument. I endeavour to remove the cataract by tumbling. If this proves impossible, as for instance with large, flat, hard cataracts, or with a narrow pupil, the assistant lifts the iris slightly off the lens from above with a cyclodialysis spatula or with the finer hook of Horvath's zonuloruptor, so that its edge will fit into the pupil. I do not lose hold of the capsule during the extraction. With tumescent or liquefied cataracts, when it is impossible to grasp the capsule, I make a small horizontal incision as recommended by Csillag with a keratome, and subsequently remove the capsule after the extraction; this usually succeeds. After the removal of the cataract I replace the conjunctival flap, smooth it out, knot the thread three times, and replace the iris with a cyclodialysis spatula.

Should rupture of the capsule occur, I remove the remnants of the cortex with a spoon, and finally irrigate the anterior chamber and remove the remnants of the capsule with capsule forceps. I seldom have to make a complete iridectomy after extra-capsular operations.

I cover the operated eye with small squares of gauze, loose cotton-wool and Snellen's perforated aluminium cup, held in place with two straps of adhesive plaster fixed to the forehead and cheek. Both eyes are bandaged and the patient is put to bed for the first day. I change the dressing after 24 hours, and later once a day. The patient may sit up in an arm-chair on the second day. I remove the sutures on the tenth day. Until then the operated eye is kept bandaged.

In the years 1941-1946 I performed 325 senile cataract operations, employing my suture. At first I was not very sure of its success, but after much experience, I have found that this suture has a very favourable influence upon the healing of the wound.

On account of the prevailing opinions, I performed operations with a round pupil only rarely in the beginning, but more and more frequently later on. During the first two years, *e.g.*, in cases of exophthalmos, tumescent cataract, or when the pupil could not be dilated widely enough, or when the other eye had already been operated in this way, and also in cases of extra-capsular operations I made a complete coloboma. The first table shows the results of my operations in 1941-42.

TABLE I

152 operations performed in 1941-1942

INTRA-CAPSULAR		EXTRA-CAPSULAR	
Round pupil	Coloboma	Round pupil	Coloboma
68 =	45 =	15 =	24 =
44.7 %	28.6 %	10.0 %	15.7 %
113 =		39 =	
74.3 %		25.7 %	

Of these WITH ROUND PUPIL: 44.7 % + 10.0 % = 54.7 %

Of these WITH COLOBOMA : 29.6 % + 15.7 % = 45.3 %

During this time I performed 54.7 per cent. operations with a round pupil and 45.3 per cent. with an iridectomy ; 74.3 per cent. were intra-capsular, 25.7 per cent. were extra-capsular operations. At that time I was not yet satisfied with the results of my operations. But later I acquired more practice with this method, and I also found out that the generally accepted opinions regarding operations with a round pupil were out of date. I saw that they could be performed much more frequently without the least danger, even as routine operations. In the following years I made a coloboma only in cases of complicated cataract, prolapse of the vitreous body, or unintentionally, as, for instance, in the case of a markedly tumescent cataract, or if escape of the aqueous floated the iris before the knife. The second table shows the results of my operations performed in 1943-46.

TABLE II

173 operations performed in 1943-1946

INTRA-CAPSULAR		EXTRA-CAPSULAR	
Round pupil	Coloboma	Round pupil	Coloboma
136 =	11 =	22 =	4 =
78.6 %	6.3 %	12.7 %	2.4 %
147 =		26 =	
84.9 %		15.1 %	

Of these WITH ROUND PUPIL : 78.6 % + 12.7 % = 91.3 %

Of these WITH COLOBOMA : 6.3 % + 2.4 % = 8.7 %

During this time I performed 91.3 per cent. operations with a round pupil and only 8.7 per cent. with iridectomy ; 84.9 per cent. were intra-capsular, 15.1 per cent. were extra-capsular operations.

My statistics prove that with the help of these sutures I endeavoured always to use the intra-capsular method, and from 1943-1946 with a round pupil ; the combination was nearly always successful. In view of these favourable possibilities the indications regarding operation will have to be altered. Nowadays it is not necessary to wait for the cataract to be completely "mature." The operation should be performed as soon as the patient's vision has deteriorated to such a degree that he is unable to carry on his work, or becomes a burden to his family and himself. In many cases I operate for cataract when vision is 5/15 or 5/10 when the patient is a person whose occupation demands good eye-sight, such as mechanics, printers and chauffeurs, etc. When there is cataract in both eyes, I operate first on one eye and only 10-12 days later on the other. Operation can be performed on both eyes then at the same time without the slightest risk or difficulty, but I have found that having both eyes bandaged for several days had a very bad effect on the patients.

The use of my suture makes the operation longer, and for this reason many surgeons are against it. But it is not to the detriment of the patient, and therefore we may not grudge these few minutes if by taking a little longer to operate we are able to improve the results substantially.

The most dangerous complications which may arise during or after cataract operations are loss of vitreous, expulsive

haemorrhage, infection, rupture of the wound, prolapse of the iris, and finally secondary glaucoma. In the older statistics of operations these complications appeared in a considerable number of cases, but nowadays they are much rarer owing to careful pre-operative treatment, to asepsis, to the development of operative technique and to correct post-operative treatment.

The third table shows the complications of the cataract operations which I performed in the years 1941-1946.

TABLE III

Number of operations	...	...	...	325
Loss of vitreous	...	...	...	3 = 0.9 %
Expulsive haemorrhage	...	...	...	0 —
Infection	...	...	...	0 —
Haemorrhage into the a.c.	...	...	...	45 = 13.8 %
Prolapse of the iris	...	...	...	4 = 1.2 %
Glaucoma	...	...	...	1 = 0.3 %

Thus loss of vitreous occurred in 3 cases (0.9 per cent.). With one patient who was highly myopic, liquefied vitreous prolapsed from the anterior chamber when the section was made. In another case, also that of a highly myopic patient, the zonular fibres were extremely weak, and in consequence the lens slipped into the vitreous when the capsule was grasped. In both cases the cataract was removed with Weber's loop. In the third case the patient was very nervous, the palpebral fissure was exceptionally narrow and could not be widened by canthotomy. In these three cases I made a complete iridectomy.

I had no case of expulsive haemorrhage or infection. After careful pre-operative treatment these complications do not arise nowadays.

Haemorrhage into the anterior chamber occurred in 45 cases (13.8 per cent.), usually 3-6 days after the operation. The cause was either spontaneous haemorrhage or rupture of the wound. At first I was very perturbed by rupture of the wound when performing operations with a round pupil, but later I saw, to my great surprise, that even in cases when the anterior chamber was entirely filled with blood, no prolapse of the iris occurred. In one case the iris was wedged in the wound; it could be freed from the cicatrix a few weeks later by cyclodialysis. In connection with rupture of the wound the pupil was distorted in four cases (1.2 per cent.).

As the above-mentioned data show, my suture does not prevent rupture of the wound, but it considerably decreases and limits the possibility of the opening of the wound, so that the aqueous of the anterior chamber cannot escape with such force as to carry the iris with it.

Prolapse of the iris or its milder form, wedging of the iris in the wound, may occur a few hours after a cataract operation with round pupil performed with this suture.

Immediately after the operation, or a few hours later, when the edges of the wound are not yet glued together, the iris may slip out of the wound if the eyelids are pressed together. This happened in 4 cases (1.2 per cent.) of my cataract operations. I had this unpleasant surprise when changing the bandage for the first time, 24 hours after the operation. After anaesthesia with pantocain and careful opening of the wound I could replace the iris with a cyclodialysis spatula in two of the cases, but in the other two cases, the lips of the wound were already glued together so firmly that I could only excise the prolapsed part of the iris with forceps and scissors.

On account of this experience I think it would be better to change the bandage for the first time in the afternoon of the day of the operation, because then the wound is not yet firmly closed, and it is easy to replace the prolapsed knuckle of the iris.

Apart from rupture of the wound, distortion of the iris occurred in another 6 cases (1.8 per cent.), probably as a consequence of the eyelids having been strongly pressed together in the hours following the operation, as in the case of prolapse of the iris, or because of inefficient reposition. It is of no importance, and can be considered merely as a minor cosmetic disadvantage.

Secondary glaucoma occurred in 0.3 per cent. After an intra-capsular cataract operation with a round pupil a widespread detachment of the choroid occurred, but three weeks later it was attached again. Six weeks after the operation the tension had increased to 60 mm. Hg. Pilocarpine was ineffective, so an iridectomy had to be performed. After this the tension decreased for some time, but six months later it was again 56 mm. Hg, so I decided to perform a cyclodialysis, which permanently reduced the tension. No case of secondary glaucoma occurred in consequence of iris prolapse, impacted iris, or displacement of the pupil, as might have been expected.

Among other less important complications I saw detachment of the choroid in 5 cases, but this always disappeared after a while. I never observed detachment of the retina.

After extra-capsular operations and rupture of the wound a slight irritation of the iris sometimes developed, but with mydriatics and warm compresses it was possible to quieten the eye so that other treatment proved unnecessary.

From all this we can see that the round pupil cataract operations performed with adequate sutures yield much better results than the older "flap method" carried out with a complete iridectomy and

without sutures. The operation with a round pupil is quite free from danger when performed according to my method. I wish to emphasise that this operation may be done even in cases upon which we would not have dared to operate formerly.

This is proved by the fact that among the operations mentioned in my statistics there were 25 cases of patients with impaired hearing, 4 cases of stone-deafness, 6 cases of high myopia, 1 case of advanced Graves' disease, 2 patients suffering from emphysema and severe attacks of dyspnoea, 2 cases of nystagmus—even during the operation—2 cases of deaf and dumb persons, 1 epileptic patient and one with senile tremor of the head. In all these cases I performed successful operations with round pupils, and the state of the patients had not the slightest influence either upon the operation or upon the healing of the wound.

I must mention, however, that operations with a round pupil should be performed by skilful and experienced eye surgeons only. Beginners should practice the flap operation with a complete iridectomy and perform this technically more difficult operation only after considerable experience.

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THE ILLUMINATION OF THE SNELLEN CHART*

BY

M. GILBERT and R. G. HOPKINSON

THE problem of adequate lighting in schools, homes, offices and buildings in general has given rise to a study of the effect of illumination and contrast on visual performance. The programme of work has been carried out in close collaboration with Mr. H. C. Weston, of the Medical Research Council, to whom the authors' thanks for the benefit of valuable discussions are due, and under the aegis of the Joint Committee on Lighting and Vision of the Building Research Board and the Medical Research Council.

It was thought that clinicians would be interested in particular in the effect of illumination level on the visual acuity of observers as assessed by the standard Snellen chart.

The subjects of the experiment were 15 adults from the staff of the Building Research Station, in the age group 20-40. They

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