THE BOWMAN LECTURE ON THE ABANDONMENT OF IRIDECTOMY IN THE EXTRACTION OF HARD CATARACT.

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[AFTER a few preliminary observations, in which Mr. Teale observed that he was one of the very few now living who had witnessed from beginning to end the great modern revolution in ophthalmic science of which Sir Wm. Bowman "pars magna fuit," he said that he would devote the lecture to stating some conclusions on points in ophthalmic practice at which he had arrived, and then continued as follows:—]

On the abandonment of iridectomy in extraction of hard cataract I have spoken or written on several occasions, but have never given an authoritative description of rules to be followed in the operation I advocate, or of that which I deem to be its cardinal point—namely, the exact method of making the incision; in fact, the whole question of the abandonment of iridectomy seems to me to hang upon the exact incision that shall be selected. Those who fall back upon the old semilunar flap and Beer's or Sichel's knife, and carry their incision close up to the sclero-corneal junction, will hesitate and doubt whether they have not landed themselves in greater difficulties and disadvantages than were involved in the operation with iridectomy. On studying the records of operations for cataract in my private practice, the only records which are practically available, I find that up to the year 1863 my only operation for removal of hard cataract was the original method by semilunar flap made with a Beer's knife or Sichel's narrower modification. Then during the years 1866-7-8-9 the forms of operation prevailing are Graefe or Graefe-Critchett, of which, unfortunately, I have no sketch, but which was, I believe, an extraction without iridectomy, in which Graefe's knife and incision were used. Then the old semilunar flap reappears, and finally, in 1871-2, I definitely adopted the form of operation entered in my earlier notes as a "shallow flap," which it is my aim to describe to-day, Graefe's operation with iridectomy being reserved for exceptional cases. With the "old flap" my results were very satisfactory indeed. With the modified operations, combined with iridectomy, they were less satisfactory on the whole; but what unsettled my mind more than anything was the fact that in two or three cases, in which the operation was as perfect as I could make it, the eye went wrong and sight was either lost or the result was very imperfect. About the same time the late Mr. Critchett and Dr. Liebreich were extracting without iridectomy; they were, I believe, making incisions well within the cornea, sometimes an upper section, sometimes a lower section, with a narrow Graefe's knife, such as had been used for "linear extraction" of soft cataract. The incision was in the main linear, with puncture and counter-puncture in the sclero-corneal junction. The example of Critchett and Liebreich, and my own dissatisfaction with the "iridectomy extraction," led me by degrees to adopt as a settled practice the form of incision which I shall describe as the one which I have steadily employed in a large majority of cases during the last twenty years.

DETAILS OF THE OPERATION OF EXTRACTION BY SHALLOW FLAP.

The Society will, I trust, pardon me if I enter somewhat minutely into the details of the operation, partly as a guide to those who may be disposed to adopt the method herein recommended, partly as a pattern which others may take for interesting comparison with the details they themselves employ, but chiefly because of my conviction that in surgery as a whole, be the principles of an operation ever so good, success is frequently not obtained owing to the imperfect carrying out or the inadequate selection of detail.

1. *Antiseptics.*—Carbolic acid still maintains its supremacy in my surgical work. The eyelids, eyelashes, conjunctiva, and conjunctival recesses are well cleansed with a solution of 3 minims to the ounce, a little more than $\frac{1}{2}$ per cent., in which also all instruments except the knife are soaked.

2. *Anæsthesia.*—Cocaine exclusively. For this purpose the drops to be used are specially prepared just before the operation. A small tube containing a grain of sterilised cocaine receives 10 minims of distilled water, and this is instilled into the eye once or twice.

Fig. 1.

3. *The Lid Holder.*—This is a spring speculum of a pattern which was brought to me from the Continent about twenty years ago. It is large, strong, and well curved, and yet it allows ample room for the finger and thumb of an assistant to hold it firmly and by means of it to control the eyelids and defend the globe from injurious pressure or spasm of the orbicularis. The spring speculum having been introduced is put in charge of a competent assistant.

4. *Fixation of the Eyeball.*—The surgeon then by means of conjunctival forceps with broad teeth takes hold boldly of the conjunctiva and subconjunctival tissue about 3 millimetres below the cornea, rolls the eye downwards, and commences the incision.

Fig. 2.

5. *The Knife.*—My earlier shallow flap operations were made with the narrow Graefe's knife. This in my hands was not quite satisfactory, as I could not easily retain the aqueous humour up to the moment at which the knife edge reached the posterior surface of the cornea, and so sometimes the iris was washed over the edge and wounded. Some of my friends have succeeded with Graefe's knife. I, however, did not acquire the knack of using it to my satisfaction, and therefore fell back upon the long narrow knife of Sichel, which by its wedge shape retains the aqueous up to the moment at which its edge is turned forward against the cornea. For the last

Fig. 3.

three or four years I have used a still narrower form of Sichel's knife suggested by and made for Mr. R. N. Hartley, which is almost identical with Taylor's, marked No. 822 in Weiss's catalogue. This has proved to be admirable for the purpose, combining the wedge principle of the Sichel with a close approximation to the narrow Graefe.

6. *The incision* is made as follows: The point of the knife enters the cornea just within the outer margin at its equator and emerges at a counter puncture just within the inner margin of the cornea at a level about 2 millimetres above the equator. As soon as the counter puncture is well accomplished and the point of the cataract knife has passed out of the cornea to the extent of about 4 millimetres, the next step is taken. This is the most critical part of the operation.

Fig. 4.

The knife is, somewhat rapidly and with a sort of knock, turned directly forwards so that the blade, which up to this point has been parallel with the iris, comes to a right angle with the back of the cornea. The section is completed by cutting directly forwards, this final cutting being vertically through the corneal thickness, absolutely linear, and in position about midway between the horizontal equator and the upper margin of the cornea. The "knack" of this part of the operation consists in so managing the knife that, as soon as it is turned from a plane parallel with the iris—in which, by its wedge shape, it retains the aqueous humour—to a plane vertical to the back of the cornea, which at once allows the aqueous to escape, the edge of the knife shall rapidly reach the posterior surface of the cornea and be in contact with it before the iris can fold over its edge. Whilst this final part of the incision is being made an assistant controls the eyelids by the speculum, holding them slightly off the eyeball so as to avert any sudden pressure on the globe during the completion of the incision. The incision thus made is practically a shallow flap, chiefly linear, with a small limb at an obtuse angle corresponding to the heel of the knife, at the outer edge of the cornea, and a still smaller hardly perceptible limb corresponding to the point of the knife at the inner edge of the cornea. At the limbs the knife passes through the cornea obliquely, but in the horizontal linear part it cuts vertically through the corneal structure.

7. *The Section.*—I always make the section in the upper half of the cornea, using the right hand for the right eye and the left hand for the left.

8. *Extraction of the Cataract.*—The operation is completed as follows: Whilst the assistant continues to control the eyelids by the speculum, the operator, still keeping a grip of the conjunctiva below the cornea, so presses the holding forceps against the eyeball as to steady the lens towards the cornea whilst he ruptures the capsule with the cystotome. By this manoeuvre he avoids the risk of damage to the suspensory

Fig. 5.

ligament by pressure of the cystotome. After the rupture of the anterior capsule the delivery of the lens is effected by the mutual manipulations of the two hands, the one maintaining the conjunctival hold with the forceps below whilst the other exercises pressure above the cornea by the convex surface of the curette. By this means, and more especially by the pressure of the curette just above the cornea, the upper edge of the cataractous lens is made to present itself through the pupil and wound, and a very slow gradual delivery can be accomplished by the combined or alternated pressure of forceps and curette. Great pains are taken to

remove by the curette any remnants of the cortical portion of the lens, so as to completely cleanse the anterior chamber and the conjunctiva of all *débris*.

9. *Dressing of the Eye.*—The spring speculum is only now removed. The eyelids and eyelashes are then smeared with vaseline, over which iodoform is dusted. A pad of absorbent cotton wool with an outer layer of black cotton wool is applied to each eye, and made firm with strapping. I have for many years discarded every form of bandage as having no advantage over adhesive strapping (except for men with a very hairy face), and as having the serious disadvantage that if there be any swelling of the eyelids there is no yielding, and, therefore, a possibility of injurious pressure. If all goes on well, and if there is but little pain and little watering of the eye so that the pad remains dry, I leave the eye undisturbed and unlooked at until the eighth day, when I change the pad of the eye that has been operated upon and remove the pad from the other.

I have gone minutely into the details of the operation from the belief that, if we are to have improved results by the abandonment of iridectomy, it will not be by returning to the old semilunar flap, nor by incision at the sclero-corneal junction, but by reducing the incision to as near an approach to linear extraction as the integrity of the iris and the bulk of the cataract will permit. The incision I have described has proved to me a faithful servant, and will, I trust, prove to be so to others until a better method can be invented. The advantages of the incision here described are as follows:—

1. In as far as it approaches the flap operation, it possesses with that operation the advantage of extrusion of the cataract without any cutting of the iris. In as far as it approaches the linear it obviates to a great extent the disadvantages of the flap, which were the great liability to serious prolapse of the iris, and to the displacement of the flap by the upper eyelid.

2. The position of the greater part of the incision across the middle and not at the base of the iris allows the lens more readily to present at the wound, as there is less of the body of the iris to be displaced.

3. The greater part of the wound being linear and vertical to the corneal thickness, as soon as the lens has escaped and all cortical matter has been removed the wound closes absolutely and fits, leaving a level surface, which permits early sealing of the aqueous chamber.

4. The greater part of the wound being away from the base of the iris and rather towards the pupil, there is a remarkable facility for the escape, or rather the extrusion, of cortical portions of the lens, the reason for which is discussed later on.

5. The incision being entirely in the cornea, and away from the ciliary region, there is probably much less risk of irido-cyclitis, or of subsequent glaucoma.¹

TEARING (DISCUSSION) OF OPAQUE AND CRUMPLED POSTERIOR CAPSULE AND ITS RISKS.

There is, according to Landolt, great diversity of opinion as to the danger involved in needling posterior capsule. Knapp and others consider it absolutely without danger if done with proper precautions, whereas a large number of operators only do it when compelled, because it is occasionally followed by irido-cyclitis or panophthalmitis.

The question is of considerable importance, and amounts to this, Are we, with those who fear bad results, to rest content with vision second rate from opaque capsule, or shall we, with Knapp, freely give such cases the chance of good vision, venturing a certain amount of risk? And what is the degree of risk? Judging from my own experience I should say that the risk is small, as I have rarely had any trouble in consequence. A more important question perhaps is, What is the nature of the risk? This I believe to be, in its beginning, increased tension, which unrelieved may in some instances drift into irido-cyclitis or panophthalmitis. How are we to deal with this increasing tension? This is an interesting point, and one which perhaps is not so fully appreciated as

¹ The knife is made by Weiss, the spring speculum (Graefe's) is made by Down Brothers, the cystotome curette (the original Moorfields pattern) is made by Down Brothers, and the conjunctival forceps (Schmidt-Rumpler) is made by Krohne and Sesemann (catalogue 3,993).

it deserves to be. Let me illustrate by two cases which recently happened in my practice. In both instances I tore with needles opaque posterior capsule, the one after an extraction of traumatic cataract by suction, the other after an extraction of hard cataract by a shallow flap. Within forty-eight hours each suffered intense pain, and dimness of vision from increased tension. On the third day in one case and on the fourth in the other I punctured with a broad needle through the upper part of the cornea, and through the iris into the vitreous humour. The needle, turned sideways, allowed a few drops of vitreous humour to escape. In a quarter of an hour in each case intense agony was converted into perfect ease. There was no relapse of pain nor of increased tension, and in a fortnight the subject of the extraction of hard cataract read J.2. Unchecked both cases would most likely have ended in panophthalmitis. All I know about the foregoing method of dealing with such cases is this. In the year 1864, when in London, I told Sir William Bowman of a case of extraction by the semilunar flap which was causing me anxiety because, having gone on well for a fortnight, it was falling off in condition on account of increased tension. He told me of the simple plan of puncture with a broad needle "through the iris into the vitreous humour." As soon as I returned home I acted upon this advice; normal tension was restored, and vision was saved.² I have now and then repeated the proceeding, though only rarely, but the two instances I name occurred within the last six months.

THE LESSONS TO BE DEDUCED FROM A SERIES OF CASES.

Let me now read the lessons of my own experience by analysing as far as my notes will permit the last 100 cases. These notes are less complete than I could wish, not having been taken with any view to publication, and are sometimes defective from the omission to record the final result in vision. Yet we may deduce from them at least certain broad lessons which are of use in estimating the value of the operation employed.

1. *Anæsthetics*.—Of the 100 cases, the first 4 were under ether; all the rest were under cocaine.

2. *Iridectomy*.—In 10, a preliminary iridectomy was performed, and in 1 an iridectomy at the time of operation, leaving 89 operations without iridectomy. Of the 10 cases of preliminary iridectomy, 5 were done in order to artificially ripen immature cataract. The other cases were as follows: (1) A feeble woman with diabetes; (2) a woman with only one eye; (3) a man of 84 recently recovered from pneumonia; (4) an old man with subacute glaucoma; (5) a man in whom the lens had been forcibly dislocated by a quack, with consequent glaucoma.

3. *Accidents at the Time of Operation*.—Out of the 89 "shallow flap" operations vitreous was lost in three instances, in all of which there was a fluid vitreous, implying defective suspensory ligament. In 2 cases the iris was grazed by the knife. The remaining 84 are recorded as without accident, that is, that the operations were completed without a flaw. There is not a single record of dislocation of the vitreous from damage to the suspensory ligament during the operation. On this point I shall say more presently.

4. *Failures*.—In the 89 cases there were 6 failures. One occurred in the case of a drunkard; a second in a lady who had an outburst of hysterical weeping two days after the operation; in a third the iris was wounded; a fourth was in a man aged 84, whose other eye was also lost after an operation combined with iridectomy; the fifth and sixth failed without obvious cause.

5. *Subsequent Iridectomy and Artificial Pupil*.—This is noted in 11 out of the 89. In all these cases except two the resulting vision was good. Five read J.1 easily; 4 are stated to have "good vision;" 2 are recorded as "poor," reading only very large print such as J.10.

6. *Prolapse of Iris*.—It is difficult to be quite certain in what proportion of cases this occurred, and I do not feel sure that every instance has been recorded. Probably the cases in which subsequent iridectomy was required represent nearly all the more serious instances of prolapse, and there have been a few cases with a small adhesion of the iris to the corner of the incision, without serious prolapse.

7. *Glaucoma as a Sequel to Extraction*.—I can only recall one case. This may be explained perhaps by the fact that where a large prolapse occurs the case usually demands a subsequent iridectomy. The slighter occasional adhesions to the scar do not appear to produce glaucoma, nor to be any material disadvantage, and are not to be reckoned as substantial objections to the "shallow flap" operation.

8. *Needling*.—Of the remaining 72 cases tearing (discission) of opaque or crumpled capsule is noted in 14 cases, which leave 58 free from any secondary operation. Needling has therefore been an exceptional operation. That this is not a general experience may be inferred from a review of the new edition of Mr. Berry's work in the *Lancet* of April 29th, 1893. The reviewer says: "As a matter of the fact the operation of needling is almost always required, if the patient desires to read ordinary type. Even when the lens has slipped out without leaving more than a trace of cortical substance the posterior capsule and membrane of the vitreous humour become wrinkled and seriously interfere with accurate vision of either near or distant objects." De Wecker, speaking of the iridectomy extraction says: "In another class of cases, the cortical masses left behind remain unabsorbed, and the capsule becomes opaque in a few days. Afterwards capsulotomy or iridotomy often gives excellent results." He considers "these complications to be less common after the simple extraction, and that when they do occur the secondary operations are more successful than when extraction with iridectomy has been performed." The final results of the 14 cases in which needling of the capsule was required are that ten read J. 1, one read $\frac{3}{8}$, another $\frac{2}{8}$, another is stated to have "very good" vision, and in the last vision is not recorded.

9. *Retention of Cortical Masses*.—This difficulty seems to me to have disappeared under the operation by the "shallow flap," in which the incision is at a distance from the margin of the cornea. And there seems to be a reason for this. Take an illustration from hypopyon. If we try to let out the pus from the anterior chamber by making an incision at the margin of the cornea we find it very difficult to evacuate, partly no doubt from the iris presenting at and blocking the incision. But if we make an incision, especially a radial one, towards the centre of the cornea, the pus and debris escape at once. The emptying of the anterior chamber allows the lens and iris to advance towards the cornea and to compress and empty the angle between the iris and cornea. So, in extraction of cataract by an incision away from the angle, the body of the vitreous presses forwards towards the back of the iris and forces the cortical portions of the lens away from the angle behind the iris into the pupil and so towards the incision. Hence the dealing with cortical portions of lens ceases to be a practical difficulty under the operation by the "shallow flap." Landolt and De Wecker both speak of retention of cortical masses, as if such retention were not uncommon, and as if the dealing with them were a serious practical difficulty.

10. *Dislocation of Vitreous Humour*.—This is a point of considerable moment in extraction of cataract. It occurs in cases in which the vitreous humour is healthy, and is caused by straining of the ocular muscles during the operation, whereby the upper portion of the suspensory ligament is damaged so that the unprotected vitreous bulges against the back of the iris and forces the iris between the lips of the wound, interfering with proper fitting and making it gape. This, no doubt, is what Knapp of New York refers to when he advises an iridectomy "whenever there is a tendency to prolapse and it is difficult to replace the iris." Fuchs of Vienna made the same remark to Mr. H. Secker Walker of Leeds, to whom I am indebted for extracts from foreign journals bearing upon the question of retention or abandonment of iridectomy. In my series of 89 there is not one instance of damage to suspensory ligament, not a single case in which there was any difficulty in replacing the iris. I attribute this immunity in a great measure to the use of cocaine, which allows very free manipulation of the eye without producing muscular spasm, combined with the support given to the base of the iris and the suspensory ligament by the portion of the cornea between the incision and the angle of the anterior chamber. There are two periods when this accident may occur—one is at the completion of the incision.

² I communicated this case to the BRITISH MEDICAL JOURNAL, 1864, vol. i, p. 404.

This may be guarded against by the care of the assistant in charge of the speculum, who, by judicious leverage of the thumb and finger, can control and hold the eyelids away from the globe. The other is when the surgeon is using the cystotome for rupturing the anterior capsule, and a certain amount of pressure is of necessity made upon the lens. This danger may be avoided by making the holding forceps which grasp the conjunctiva below the cornea so to press against the eyeball as to steady the lens towards the cornea and cystotome.

THE TENDENCY TO ABANDON IRIDECTOMY IN EXTRACTION OF HARD CATARACT.

Having been for many years convinced that for all but exceptional cases an operation involving iridectomy is not the best method of extraction of hard cataract, it has been a matter of interest to observe the increasing tendency of ophthalmic surgeons to move towards the same opinion.

One of the earliest ophthalmic writers in England to publish a series of operations by a "shallow flap" without iridectomy was Mr. Snell of Sheffield, who was my assistant and house-surgeon in 1870-72 at the time when I was beginning to adopt the shallow flap and to abandon iridectomy. He tells me that of his last 200 extractions at the Sheffield Infirmary there were but 13 combined with iridectomy, of which 10 were preliminary to Förster's operation for immature cataract, and two or three were accidental at the time of operation.

In 1885 Galezowski began to operate without iridectomy. Of 1,365 cases reported, 1,173 were without iridectomy, 179 with iridectomy, and 13 with sphincterotomies (division of the circular fibres of the iris).

In 1886 Knapp, of New York, began a series of operations without iridectomy, reporting 450 "simple extractions," against 371 cases "with iridectomy."

In 1888 Professor Schweigger, of Berlin, began to abandon iridectomy, reserving it for special cases. Of 465 operations, 400 were "simple extractions."

De Wecker (Paris) writes, in November, 1892,³ on "simple extraction" and the "combined operation." He says: "The extraction of cataracts with iridectomy is not—and M. Fuchs, of Vienna, agrees with us—the safest. The safest to avoid a large prolapse, yes, but there its advantages cease." He lays down the rule that "with a perfectly ripe cataract in a healthy patient simple extraction is the proper operation to perform, but if the cataract is not ripe, or the hygienic conditions are unfavourable, an iridectomy should accompany or precede the extraction." On the other hand, Landolt (Paris), having written to a large number of ophthalmic surgeons to ascertain their views on extraction of cataract at the present date, sums up in favour of extraction preceded by iridectomy. It is clear, therefore, that the confidence of ophthalmic surgeons in iridectomy as an adjunct to extraction is being seriously shaken, and that opinion is ripening in the direction of some form of simple extraction.

The operation of so-called "simple extraction" to which some have reverted has been apparently the old semilunar flap with the incision close to or even within the sclero-corneal junction. It was in order to obviate the disadvantages of this "simple extraction" that Graefe invented his "linear extraction with iridectomy." It would seem, however, from published records that even with all its disadvantages the simple extraction by semilunar flap without iridectomy attains results equal to those obtained by Graefe's operation. But the exact method of operation which I am advocating differs essentially from both of these in that the incision is entirely within the cornea, almost linear, and yet without iridectomy. And if I am right in advocating a method of operation which I have employed for so many years, and which has been attended in a very large proportion of cases with most satisfactory results as to vision, and comparative freedom from complications as well as to perfection of scar, pupil, and anterior chamber, I cannot but think that a surgeon, who would give a full trial to the method described and the rules laid down, would surpass, in visual results and in freedom from complications, his former successes with either the so-called "simple extraction" or the Graefe operation with iridectomy.

³ Archives d'Ophthalmologie.

THE BACTERIOLOGY OF VACCINE LYMPH, WITH SPECIAL REFERENCE TO AN IMPROVED METHOD FOR ITS STORAGE AND PRE- SERVATION.

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DURING the last two or three years I have been engaged in an experimental research on the pathology and inter-relations of variola and vaccinia, certain of the results of which I have published elsewhere. In the present paper I desire to direct attention to the study of the bacteriology of vaccine lymph, and to the lessons which may be learnt from such a study, as to the means of storage best adapted for securing sustained purity of the lymph and the unimpaired manifestation for indefinite periods of the action peculiar and essential to its use.

In the volume recently published of the *Transactions* of the Bacteriological Section of the International Congress of Hygiene, held in London in August, 1891, will be found two papers dealing to a greater or less extent with this subject; the first by myself, the second by Professor Crookshank.

Although working quite independently, we both arrived at the conclusion, in which we are corroborated by Pfeiffer and many other observers, that although numerous bacteria can be grown in various nutrient media from specimens of vaccine lymph obtained in the ordinary way, yet that to none of these could be assigned the rôle of the actual vaccine virus, which as yet remains unidentified. For this reason I had assigned to these bacteria the term "extraneous," signifying thereby that their presence is not in any way essential to the successful action of the vaccine lymph. In this also Professor Crookshank agrees with me, for he says:

None of these different species of bacteria are peculiar to vaccine lymph; there is no bacterium constantly present in human and calf vaccine, and there is not one which can be regarded as the contagium. To sum up, most of them are well-known saprophytic bacteria, and some are identical with bacteria commonly found in suppuration. Vaccine lymph is a most suitable cultivating medium for micro-organisms, and bacteria invariably get access to the contents of the vaccine vesicle.

A lengthy list is given by Crookshank of the various bacteria which may be isolated from human or calf lymph by the method of plate cultivations, but he does not state whether any—and, if so, what—precautions had been taken with regard to the collection of the lymph with which he experimented, neither does he attempt to distinguish between those bacteria which are commonly to be found and those whose presence is exceptional. I have shown, however, that there are three species of micro-organisms, one or all of which are almost universally to be found in every specimen of vaccine lymph examined, of which one—the staphylococcus albus—is usually to be found in the upper layers of healthy skin. Of more importance is the fact that in certain cases, though rarely, I have been able to satisfy myself as to the presence of the streptococcus pyogenes, and, moreover, it is on record, in certainly one instance at least, that the streptococcus of erysipelas has also been isolated from a specimen of vaccine lymph.

That untoward results should occasionally, and, in certain cases, follow the inoculation during the act of vaccination of one or other of the various "extraneous" organisms which may be present in the lymph employed is not to be wondered at; indeed, I take it that it is rather a matter for wonder that the evil results following the present somewhat empirical practice of vaccination have been in the past so few in proportion to the vast numbers that have undergone the operation. Still, in view of the feeling against vaccination which is prevalent at the present time, it is most desirable that we should not, if it be possible to avoid it, run any risk of performing a septic inoculation on a patient under the guise of vaccination.

If only it had been possible to isolate the contagium of vaccinia (or variola), and to carry on, without loss of specificity, pure cultures of it in some nutrient medium from generation to generation, this portion of the problem would be solved;