Original Communications.

ON THE RECENTLY IMPROVED METHODS OF EXTRACTING IN CASES OF CATARACT.

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CHARMING as have been the results obtained from ordinary extraction by simply making a flap of one half of the cornea, and successful as the operation has been in restoring sight to thousands of blind persons, the inevitable percentage of failures which has ever attended that method, even in the hands of the most skilful and accomplished surgeons, has always left something still to be desired in this, one of the most brilliant and delicate of surgical operations.

Not only do we find a series of cases where premature escape of the aqueous humour, laceration of the iris, protrusion of the vitreous body, hæmorrhagic effusion, and prolapse, are causes of disaster in the hands of unpractised operators; but there are others also still numerous where, in spite of the most skilful operation and solicitous after treatment, acute suppuration of the cornea, preceded by slight iritis, and coming on soon after the completion of the operation, entails inevitable loss of sight. In cases such as these, the most accomplished operator is perfectly helpless, and can only witness with regret the entire failure of his most sanguine expectations. As might be anticipated, ophthalmic surgeons have, since the introduction of the operation, been endeavouring to diminish the risks attending extraction. Various forms of knife have been employed—convex, concave, and sickle-shaped. The upper, lower, and lateral sections have been adopted, and the general mode of operating varied *ad infinitum*. All this has been done, however, without materially diminishing the average of failures; which, in some cachectic conditions of body, extreme age, marasmus, and certain diseased and deteriorated conditions of the eyeball itself, becomes swelled to so great an extent as to render the operation one of such gravity that many surgeons decline these cases altogether. Certainly, the improved methods now at our disposal may be reckoned as not among the least important additions to ophthalmic science, which has of late years, especially since the introduction of the ophthalmoscope, been so greatly enriched by the labours of our professional brethren in Germany.

My attention was first directed to this subject by the following observation, which occurs in Von Græfe's classic memoir on *Iridectomy*. He says, when speaking of extraction in cases where glaucoma was complicated with cataract, and where iridectomy had been performed for the relief of the former condition: "It is evident that it is not very pleasant to extract under such circumstances, and yet the results are more successful than would *à priori* be expected; and I believe that extensive statistics would show results not inferior to those of extraction under normal conditions." As these were cases essentially of eyes in advanced stages of disease, and consequently in most unfavourable conditions for surgical interference, the success attending the double operation could not fail to occasion surprise. While pondering on this important observation, however, my attention was directed, by the kindness of my friend Mr. Carter of

Stroud, to a pamphlet, published by Albert Mooren, M.D., *On the Diminished Risks of Corneal Suppuration after Extraction of Cataract*; and, as no translation of this paper has yet been published, it will be necessary for me to avail myself largely of the facts therein detailed, in the course of my observations on his method. Mooren was led to conclude that the occurrence of slight iritis was the starting point of all the inflammatory phenomena which led to acute suppuration of the eyeball and consequent loss of sight, and that the inflammation always commenced in that part of the iris compressed during the exit of the lens. He says:

"One is led by these facts to consider whether it be not possible either to prevent the occurrence of iritis in extraction, or at least to deprive this inflammation of its dangerous characters. Through an exact study of my operation cases, I believed myself to have arrived at a solution of this problem. Some years ago, in two cases in which the iris was much pulled in the passage of the lens, I had cut off the injured portion as in iridectomy; and, remarkable to say, no reactionary symptoms followed. In this procedure I saw at that time only an evil, and practised it through extreme necessity; not with any idea of preventing inflammation, but only to guard against prolapse. For a long time I remained in the same view; and until I obtained additional similar experience, I gave the matter no more attention. . . . In March 1859, I had occasion, through the unfortunate result of two extraction-cases, to observe what an extraordinarily important part is played by the iris in the healing of the corneal flap. There came to me a big, fat, corpulent, full-blooded peasant's wife, entering on her sixtieth year, to undergo extraction in both eyes; the removal of the lenses was accomplished without any difficulty. After completing the operation, the idea struck me that this patient, on account of the great plethora of her head, might probably suffer from iritis, and the more as her enormous corpulence forbade her to remain long at rest, and compelled her to spend part of her time sitting upright in bed, even at the very point of applying the bandage. I introduced an iris-hook under the cornea, in order to withdraw and cut off a portion of the iris; on one side the manœuvre was completed; on the other, the pupillary margin slipped from me before I could seize the moment to cut it. In consequence of the pulling which the iris had sustained, this part inflamed with such severity, that on the second day the cornea was already totally infiltrated with pus. The other eye healed without any disturbance, and the patient to this day enjoys with it unimpeachable vision.

"Three days later, the same unpleasant accident occurred to me with another patient. Here, also, the iris slipped from the hook, and the rapidly developed iritis produced likewise destruction of the cornea. I had thus gained the knowledge that the seizure of the iris with a hook was a dangerous manœuvre, from which evil consequences might be expected; just as perfectly as the instrument satisfied every desire when the iris is immediately secured and cut, so extraordinarily dangerous is it, when the membrane slips off again, and is thus exposed to repeated traction. The application of the common iris-forceps, such as the one commonly used in iridectomy, would from time to time entail this consequence, that, in great unsteadiness of the patient, or by strong turning of the eye in an opposite direction, complete dialysis would be produced. In order to render deviation of the eye, and consequent slipping of the iris impossible, it would be necessary to hold the globe with a hooked forceps. But let us think of the extreme danger involved in such a proceeding. Nearly half of the cornea has been separated from its periphery by the section; the lens is removed; the vitreous body

is only held in place by the thin posterior wall of the capsule. How light soever might be the pressure, and on whichever side it came, when the traction of the forceps was felt, bursting of the empty capsule and escape of the vitreous humour would be the first, and most natural result; at all events, to complicate the operation in such a manner for the sake of avoiding inflammation, would double the risks of extraction rather than diminish them. The procedure would be dangerous, and consequently is inadmissible. Another solution of the problem was therefore necessary.

"The first opportunity offered itself in May 1859. A woman, past seventy years of age, with faded wrinkled skin, and of such weakness that she could only walk when supported by a stick, compelled on account of great exhaustion to spend most of her time in bed, presented herself to me for extraction. Under these circumstances, it was evident that the least iritis would be followed by sloughing of the cornea; plainly speaking, the state of things seemed to me so desperate, that I did not undertake to operate without some feeling of repugnance. I determined, therefore, to divide the operation into two parts. Acquainted with the small risk attending iridectomy, I first made this from below. The healing process was completed without disturbance, and the patient was ordered the most strengthening diet. Three weeks later I performed extraction by an inferior flap. I thus had the advantage, first, that in premature escape of the aqueous humour the iris would not be pinched between the lens and the knife; secondly, that the cataract itself had not to be pressed through a narrow pupillary opening. In this way were two conditions obviated, which in the ordinary method of operating greatly promote the occurrence of iritis; as a fact, the fortunate result entirely surpassed my expectations. The healing process went on without any signs of reaction; and, fourteen days later, the eye no longer shewed a trace of vascular injection.

"In the month of June, a second eye was offered to me for extraction, in which the chances of success by the use of the usual operation would have been very small. Encouraged by the favourable result I shortly before obtained, I determined to practise again the same method. This case occurred in a lady of 76, my own aunt. The patient had been blind for several years, and shewed that delicate skin upon the face and hands at which, with reason, all operators become alarmed. This sign may be observed in more than three-fourths of the instances of threatened sloughing of the cornea. First, iridectomy was performed; fourteen days later, extraction. The cornea proved to be extremely thin, and wrinkled itself upon the completion of the section, the centre and the cut edges sinking in; on the third day, the eye was opened. An insidious iritis had developed itself without pain, and had produced grey exudation masses in the pupillary space. The whole treatment consisted in the administration of decoction of cinchona. Three weeks later, all inflammation had subsided; but under its influence the pupil had become in great part closed, and the patient had only a very small amount of vision.

"A long illness that shortly afterwards befell me, did not allow me until autumn to think of opening the pupil by operative means. The patient underwent the renewed iridectomy without any inflammatory reaction. Four weeks later, with $2\frac{1}{2}$ convex, she read No. 3 of Jäger's test-types; and this lady still enjoys such excellent vision, that at present she occupies nearly all her time in reading and writing. This case proved to me, more than the former had done, that the supervening iritis which, under other circumstances, would have totally destroyed the eye, had been deprived of its dangerous characters.

"Likewise, it seemed established that, by this me-

thod, the occurrence of disturbing processes might be prevented. It remained, therefore, to determine the limits within which it should be preferred. Speaking for myself, I could not but arrive at the feeling, that extraction, as it had heretofore been taught and practised, was no longer to be desired in opposition to my method of diminishing its dangers. *I saw my method, not only as a supplement, but as an absolute necessity in extraction.*"

I have preferred, in the above extract, to give Dr. Mooren's reasons for the adoption of a preliminary iridectomy as nearly as possible in his own words. He does not recommend his operation, however, to the entire exclusion of the ordinary method; but only in cases where, from the state of the patient's health, or the condition of the eyeball itself, the ordinary operation is almost certain to fail. Thus, he always makes a prior iridectomy, in cases of great age, complicated with general debility; in cases of disease likely to interfere with, or prevent, the healing process, such as severe cough, asthma, persistent vomiting, or affections which preclude long maintenance of the recumbent posture; a thin, silky, debilitated state of skin; or such an amount of constitutional cachexia as would lead the surgeon to anticipate disaster as the result of any operation.

The existence of pupillary adhesions, a diseased or deteriorated condition of the lens or eyeball itself, are also indications for his method of operating. Thus, if the pupil be thoroughly dilated with a drop of atropine solution, the lens will readily pass through the pupillary aperture, and there is so much the less indication for a preliminary iridectomy. Again, if the cataract have a small nucleus, surrounded by much cortical matter in coherent masses, the escape of some portions of this soft matter into the anterior chamber is so apt to provoke an insidious iritis, with subsequent suppuration of the globe, that, in this condition of the lens, a careful prior iridectomy is the only safe method of operating. The worse the patient's condition, the longer must the interval between the iridectomy and subsequent extraction be. In Mooren's cases, a fortnight or three weeks only was allowed to elapse; but six weeks is the shortest interval now adopted. I may mention that Mooren's practice, with the exception of Von Gräfe's, is the largest in Prussia, if not in the whole of Germany; he having had 578 operations in 1860, and 622 in 1861.

Since 1859, up to the period of the publication of his pamphlet (1861), Mooren practised his method in every case where the ordinary operation appeared certain to fail, with such brilliant results that he feared the incredulity of his readers; and, instead of contracting his narrative to a simple percentage proportion between successful and unsuccessful cases, thought it necessary to verify his statistics by giving the names and addresses of all the patients operated upon in this manner. Here are one or two average specimens.

"Frau Greis, from Eberfeld. Iridectomy, October 14th. Extraction, October 22nd. Very pasty individual, with thin skin, and very insufficient dilatation of pupil. She is so asthmatic, that she seems every moment on the verge of suffocation, and is always, therefore, in the highest state of agitation. On completing the section, the cornea wrinkled itself very much; the removal of the lens was attended by very great difficulty, both from the unsteadiness of the patient, and also from firm adhesion between the cataract and posterior capsule. Tedious healing. Granulation, with much spasm of the lids. Recovery, with tolerable vision.

"Frau Berger, from Viersen, only fifty years old; but a picture of weakness, decrepitude, and anæmia. The left eye had undergone reclamation elsewhere,

and the uprisen lens irritated the eye. I attempted its removal. Upon introducing the knife, however, the aqueous humour and the vitreous humour of like consistence trickled forth, and the sclerotic fell into wrinkles. These conditions, together with circumscribed capsular opacity of the right eye, led to the conclusion that the vitreous humour was perfectly fluid in the right eye, also. Iridectomy, Sept. 8th. The cornea wrinkled itself; the effused blood required fourteen days for its absorption. The patient was so feeble as to be kept in bed for three weeks. She left her bed for the first time on the day before the extraction, which was performed on October 1st. Full diet. A secondary cataract remained, and, together with an insidious iritis, produced an obstructed pupil. In the beginning of December, therefore, a second iridectomy was required. Very satisfactory vision. In both the operations, the cornea fell completely; and the patient's condition of marasmus was so extreme, that my assistants, and also Dr. Ruschhaupt, who witnessed the operations each time, earnestly endeavoured to dissuade me from performing them."

Without quoting further from Dr. Mooren, I will now detail two or three cases in which I have performed his operation; which will, I doubt not, be all the more satisfactory, as I shall be able to show you the patients.

CASE I. Ann Allwood, of Mansfield, a feeble, cachectic individual, in her 56th year, consulted me in May last year on account of an amaurotic condition, with partial lenticular opacity of the left eye. On ophthalmoscopic examination, I found the retina extensively diseased; the vitreous body fluid, and crowded with shred-like patches, which floated freely to and fro; and her vision so much impaired that she required a guide in the street. The right eye had been useless for some years; having, in addition to a perfectly fluid vitreous body, indicated by a remarkably tremulous iris, a hard, calcareous cataract. As she had some perception of light with this eye, I thought it possible that she might be benefited by extraction; and, accordingly, proposed the operation. I also considered this an excellent case to test Mooren's method, as the patient's health was very bad, the eyeball extensively diseased, and an ophthalmic surgeon had assured her that any attempt at extraction would be followed by suppuration of the globe. Iridectomy was performed early in June; extraction three weeks later. The patient recovered without a bad symptom. Ten days after the operation, there was scarcely a trace of vascular injection; and it was only on careful inspection that the fact that she had recently undergone extraction could be ascertained. After the operation, she had increased perception of light, but no useful vision. The ophthalmoscope revealed extensive disease of the retina and vitreous body.

CASE II. Alice Duffield, Nottingham, a decrepid, pasty individual, in her 77th year, with thin wrinkled skin, and so feeble that she had required the support of a stick for some time past, had been in very bad health, and had suffered three slight paralytic attacks. Her medical attendant assured her that she was not fit to undergo the operation. I thought this a good case for Mooren's method; and accordingly performed a superior iridectomy on the left eye early in August last year, extracting a month later. The patient was very unruly; and the cornea was wrinkled and depressed in the centre. The lens was extracted without difficulty. She was perfectly comfortable, and without a bad symptom for five days; when, contrary to orders, she got up, removed the pad, and exposed her eye by looking out of an open window. Acute catarrhal ophthalmia, culminating in a very sharp attack of iritis with closed pupil, was the re-

sult. Three months later, therefore, when the eye was quiet, I performed a second iridectomy, opening up the pupil, and restoring good vision. Eighteen months previously, when she was in much better condition, I performed ordinary extraction on the right eye. There was an escape of fluid vitreous humour, and considerable prolapse of the iris, followed by general iritis, turbidity of the humours, and the establishment of a corneal fistula through which the aqueous humour drained slowly for months. The eye was, however, ultimately saved, after she had undergone considerable pain and discomfort.

CASE III. Josiah Falconbridge, a very feeble patient, wasted by poverty and disease, in his 68th year, was suffering from chronic psoriasis, with patches of ulceration on the skin, and had recently been an inmate for three months of a general hospital on account of chronic disease of the bladder, which necessitated his rising several times each night. He was also afflicted with ingrowing lashes, which had caused a patch of ulceration on the lower half of the cornea of the left eye, which was the site of a hard senile cataract. This was altogether one of the most unfavourable cases for operation that could well be conceived. Iridectomy was performed on July 2nd, 1863. Owing to a very prominent brow and great emaciation, the eyeball (very small and hypermetropic) was so sunken, that I had great difficulty in introducing the iridectomy-hook. Extraction was performed three weeks later. On opening the eye on the seventh day, the corneal surface was covered with pus, the result of severe conjunctivitis, caused apparently by the irritation of the lashes. The wound was quite healed; the cornea perfectly clear. The conjunctivitis yielded in a few days; and the patient recovered with excellent vision.

CASE IV. Mary Rame, a feeble patient, with thin, wrinkled skin, in her 65th year, was much reduced by poverty, confinement, and depression of spirits, the result of blindness caused by hard senile cataracts in both eyes. Iridectomy was performed in the left eye early in August last year; extraction six weeks later. The lens was very large, and surrounded by soft coherent matter, some of which floated into the anterior chamber, and which, owing to her unsteadiness, it was impossible to extract. She did exceedingly well for five days; when, owing to the irritation of the lens-matter or to some unexplained cause (I did not see her after the operation), severe iritis was developed, ending in closed pupil. I have not yet had an opportunity of remedying this defect; but do not doubt that a second iridectomy will restore her excellent sight.

CASE V. Ann Fox, aged 65, with hard senile cataracts in both eyes, was in reduced health, owing to depression and confinement, the consequence of blindness; and very obese, so that she could not maintain the recumbent posture for any length of time. She would probably have done well with the ordinary operation; but, as she was excessively anxious as to the result, I gave her the choice, and she selected the safer procedure by Mooren's method. Iridectomy was performed on the right eye early in August last year; extraction six weeks later. She recovered without the least unfavourable symptom; has excellent distant vision, and reads diamond type.

I found in these cases that the coloboma iridis was completely concealed by the upper lid; that the pupil was about the normal size; that it was influenced by a strong light, dilated by atropine, and contracted by Calabar bean. The patients did not complain of dazzling; and the only inconvenience attending the operation was its division into two parts, separated by a somewhat long interval.

Mooren publishes sixty selected unfavourable cases,

of which the two I have quoted are fair specimens. These cases, he states, would have been lost with certainty by any other proceeding—an opinion confirmed by Dr. Rusbaupt and his two assistants, Drs. Meisner and Josten. The operations were attended by the remarkable result of only two failures. In one of these, when not under the doctor's care, the eyelashes became inverted, and raised the corneal flap; in the other, there was, at the time of the operation, complete retraction of the corneal flap—in itself, tantamount to a local mortification. Prior to the adoption of his method, eleven failures in ninety-seven operations, or more than one in ten, was the average of failures with ordinary cases presumably favourable in the hands of the same operator.

The cases most likely to fail by the ordinary, or indeed any method, are those where the cornea is extremely thin—a condition mostly observed in cachectic and aged individuals; a condition, moreover, which it is impossible to diagnose with certainty prior to the completion of the section. We may always, however, suspect its existence when the skin is extremely fine and thin. There are three degrees of this condition; the first, marked by a central depression of the cornea, often with transverse wrinkling immediately on completing the section; a second, where the shrinking is such as to cause withdrawal of the flap; and a third, where there is more or less positive retraction. This complete retraction implies absolute loss of the elastic properties of the cornea; and, whenever it exists, leads to total destruction as soon as the ordinary reaction attains the height of an inflammatory process.

My experience of Mooren's method is, that there is much less danger of subsequent inflammation; and that, when this does occur, it is robbed of its dangerous properties. The preliminary iridectomy affords a permanently large pupil, through which the capsule of the lens is very readily incised, and through which the lens itself passes with the greatest ease. After the operation, the edges of the corneal flap are most easily replaced, and there is no chance of that *bête noir* of extraction, prolapse, to disturb the healing process. If the inferior section (the one always used by Mooren) be adopted, the remains of the lens are removed more easily; any portions left, too, are less liable to press upon and irritate the iris, when this membrane offers to them a diminished bearing surface.

There are three objections to Mooren's method. The first is, the deformity occasioned by the removal of a portion of the iris; the second, the liability of the patients to unpleasant dazzling through the enlarged pupil; and the third, the inconvenience attendant upon the division of the operation. The first two cease to be objections when the upper section (the one which I have always adopted) is used. The last is indeed a most serious contraindication, and one that must necessarily limit the operation. This is so palpable a fault in Mooren's operation, that in the two other improved methods of extracting to which I have briefly to direct attention (Jacobson's and Schuffe's), the iridectomy and extraction are combined. Jacobson makes the iridectomy the last step of extraction, and gets rid of the obvious dangers of manipulating the globe after incision of the cornea, pointed out by Mooren, by doing the whole operation when the patient is profoundly under chloroform. He, like Mooren, by continually inspecting the healing process after ordinary extraction, established the fact that the portion of iris corresponding to the flap, and compressed by the lens in its exit, is that in which inflammation always commences. This is the centre of all risk to the eye; and, to be danger-free, this must be got rid of. He

keeps his patient for twenty-four hours without a large meal, and for some hours without solid food. He pours chloroform on a compress with a wax cloth back; hold it at a little distance, until the fauces and larynx have become accustomed to the vapour; and then moulds its edges (after a fresh supply of chloroform) to the face, so as to admit very little air, and to push anæsthesia rapidly. When the patient is nearly fit for operation, the compress is somewhat removed, and more air given with the last portion of chloroform. The patient being in such a condition that the contact of instruments produces no action whatever of the muscles of the globe or lids, the latter are held apart by an assistant, and Jacobson proceeds to make an inferior flap, with the line of incision not in the transparent tissue, but in the vascular limbus corneæ, so as to get a larger opening for the lens, and to place the wound nearer than usual to the materials for repair. For a large or externally softened lens, he makes his puncture and counter-puncture half a line below the horizontal meridian; for a smaller or hard lens, somewhat lower. This being premised, and also that he selects a knife of a breadth corresponding to the semidiameter of the cornea, he proceeds, sitting on the edge of the bed in a convenient position, to seize the conjunctiva and subconjunctival tissue with toothed forceps, below and to the inner side of the cornea; with the disengaged hand he enters the knife at the junction of the cornea and sclerotic, carries it quickly through and out at a corresponding point, and pushes it gently on with its edge inclined slightly towards the iris, so that nearly all the external wound will be in the conjunctiva. The knife, being carried on as far as convenient, is gently withdrawn, leaving a central isthmus undivided. If the blade be too narrow, this isthmus will contain a bit of cornea; but if it be of right width, it will consist of conjunctiva alone. Von Græfe's fleam-shaped cystotome is then introduced, and the capsule freely opened; and then the isthmus is divided; its corneal portion, if any, with the point of the knife, in the line of the original incision; and its conjunctival portion with scissors, two lines farther down on the globe. The lens is started by digital pressure through the lids, directed in the first instance from above backwards and downwards, so as to make it rotate and present its lower edge at the pupil; and any *débris* are eased out with the scoop in the most delicate conceivable way. The lower segment of iris is then drawn out with proper forceps, and cut off close to the ciliary margin. The conjunctival space and the line of incision are cleared of blood and coagula; and the lids are closed. If the cornea be in right position, Arlt's compress is applied immediately; but if it be depressed, Jacobson waits from five to thirty minutes for a resorption of aqueous humour to elevate it. The operation being a bloody one, there is a little delay between its stages, on account of conjunctival bleeding obscuring the parts and requiring removal. Between each two stages, the anæsthesia must be noted, and, if necessary, more chloroform given; the lids being, in the meantime, closed and supported by a ball of charpie and gentle pressure. No step must be taken without certainty that it can be completed with passive ocular muscles. If vomiting occur, the lids must be closed, supported by a ball of charpie and the hand; and the patient raised to a sitting posture, to vomit; then laid down again, and more chloroform given. The anæsthesia is to be maintained until after the application of compresses, which are applied in every case to both eyes.

For twenty-four hours after the operation, each patient has the undivided attention of a nurse, who anticipates all his movements, supports his eye if he

should vomit, and so forth. If any pain, or especially any *heat*, be felt in the eye, iced poultices are applied over the compresses, and changed every few minutes for hours together. If this be insufficient to give speedy relief, and if the patient will bear depletion, four leeches are applied in front of the ear, and each replaced by a fresh one as it falls, so as to take blood continuously until benefit is derived. From forty to eighty leeches have been used in this way to a single case; and this treatment is had recourse to promptly, before mischief is allowed to make head. Jacobson does not hesitate to open the eye for inspection on the second day, and, after the third, commences the systematic instillation of atropine, to prevent adhesions between the pupillary margin and the coagula left for absorption after iridectomy. Jacobson claims ninety-eight cures in one hundred operations, presumably ordinary cases. I have not tried his method, as I conceive that chloroform vapour, concentrated to the required extent, must of itself entail some risk, especially in patients whose health is such as to render the ordinary operation inadmissible. Again, I think escape of the vitreous humour would be favoured by the position of the incision; while the excessive attention to minutiae, the risk of vomiting, and the extraordinarily careful nursing required, are all such self-evident contraindications, that I need not dwell upon them. None of these, however, apply to Schufte's, or more properly Waldau's, method of scooping out grey cataracts—an operation which, first received with caution, afterwards, owing to several failures, viewed with disfavour, is now rising so rapidly in estimation as to threaten, in the words of Mr. Critchett, to supersede the old method of flap-extraction altogether. In this operation, the lids are kept apart by the ordinary wire speculum; the operator then fixes the eye with a pair of forceps; and, with one of Jäger's bent iridectomy-knives, proceeds to incise the cornea close to the sclerotic, so as to form a curved slit from three to four lines in extent. With a hook or forceps, a portion of the iris is then drawn out, and about one-fifth of its extent removed. It is well, in doing this, to leave a slight belt at the ciliary margin, so as to afford support to the vitreous, and prevent its escaping or prolapsing. The capsule of the lens is then freely opened, and any superficial softened matter coaxed out with the scoop of the ordinary curette. Critchett's vectis-spoon is then glided between the posterior surface of the cataract and the hyaloid membrane. As it passes behind the equator of the advancing lens, the handle is slightly sloped backwards; and, when its centre has reached the posterior pole of the lens, with a gentle lever movement it is cautiously lifted into the anterior chamber, and extracted. The greater part of the cataract is removed at once. Any remaining portions, however, must be carefully fished out with the spoon; while the globe is lightly rubbed with the lids from time to time, so as to wash any fragments concealed behind the iris into the pupillary area. Critchett's spoon brings away the cataract, or, at any rate, its firm nuclear portion, unbroken, and does not take up more room than a thin metallic layer. The introduction of this instrument has greatly facilitated the performance of Schufte's operation, and will render it much more general. It also enables us to deal with all varieties of cataract, however dense. The risks attending this method are, that the hyaloid may be ruptured, and the vitreous allowed to escape. There is also danger of bruising the iris between the cornea and spoon; and also that fragments of the lens may be left in the anterior chamber, probably concealed behind the iris. Any of these accidents may retard the progress of the case, or even seriously compromise the eye. If they are avoided, however, and

there is much less risk of such accidents since the introduction of Mr. Critchett's spoon, there can be no question that the patient's chances with a comparatively small elastic slit in the cornea are far greater than with a large semicircular flap. Scarcely any after-treatment is necessary, and the eye need not even be closed. There are many objections to the old scoop with flat bottom and steep edges, originally used by Schufte. It was apt to become entangled in the substance of the lens before it had passed behind its posterior surface; to break it up, and push portions into the space behind the iris, where they excited destructive inflammation. Hard senile cataracts also could not thus be removed.

These facts will perhaps account for the ill success which has attended this operation in the hands of many surgeons. Mooren adopted it in thirty-two cases, with the decidedly unfavourable result of losing ten eyes. He also states that other surgeons were similarly unfortunate. A friend of mine performed the operation in two cases—in both the globe suppurated; and an eminent London ophthalmic surgeon informed me that he had tried it in three cases, the eye being lost in each. The only case in which I have performed the operation was one of traumatic cataract, in which, owing to the development of glaucomatous tension, it became necessary to perform iridectomy; and I subsequently extracted the lens with Mr. Critchett's spoon. In spite of the above facts, Schufte's is just now the operation *par excellence* at Moorfields; and I do not doubt that it will ere long occupy a similar position elsewhere.

I must not omit to mention that linear extraction, with and without iridectomy, is fast superseding the old operation of solution by needles, drilling, and dissection, in a number of cases of fluid and semifluid cataracts. There is no risk of escape of the vitreous humour, collapse of the globe, or hæmorrhagic effusion; and the results are, as Mr. Hart observes, in some respects incomparable. Of the various modifications of this operation, none yield such speedy and charming results, as Mr. Teale's revival of the ancient Persian method of extraction by suction. The operator must first, with two needles, tear up the anterior capsule, so that it may curl back from the area of the pupil, and be lodged behind the iris. Then, opposite the margin of the fully dilated pupil, make an incision in the cornea with a broad needle; through this opening, the suction-curette is introduced, and is gently buried in the opaque lens, which is then extracted by suction. Mr. Krone makes a very useful valve instrument for this purpose; and Mr. Weiss has two—one with a valve, and the other with a mouth-piece. I prefer the latter. Great care is required, to avoid injuring the posterior capsule. This instrument may also be used in cases where extraction by flap is contraindicated, such as, *e. g.*, diabetic cataract. The patient sees after the second or third day, and moderated light may be admitted in forty-eight hours after the operation.

In conclusion, I may perhaps be permitted to mention that I have endeavoured to simplify the ordinary operation of extraction by semicircular flap, by carefully dividing the capsule with a fine cutting needle, as the first step of the operation, when the pupil was fully dilated with atropine; extracting as soon as the few drops of aqueous evacuated had been resecreted. I have thus avoided what always appears to me a difficult and dangerous part of the operation—incising the capsule when one-half of the cornea is converted into a flap; the patient's eye rolling in all directions; the iris in contact with the cornea; and the pupil, *in spite of atropine*, reduced to a point. The risks of pressure in this condition almost preclude the possibility of fixing the eye; and the difficulties of incising

the capsule freely and carefully, the dangers of scratching the iris, obscuring the operation with blood, oppressing the eye, breaking up the lens, and thus exciting the first steps of what may prove a destructive inflammatory process, are self-evident.

Since the above was written, I have had further opportunities of testing both Schufte's and Mooren's operations, with excellent results. I may also mention that, at the recent Heidelberg Ophthalmological Congress, Professor Jacobson stated that, in 140 operations, he had only lost three eyes. In one remarkable case, a patient, aged 85, was kept narcotised for three hours, and inhaled upwards of six ounces of chloroform. In an animated discussion which ensued, concerning various points connected with extraction, the general feeling appeared to be in favour of iridectomy only in special cases such as I have pointed out above. Von Gräfe also expressed an opinion contrary to the generally received notion, that of two cataracts the less ripe one afforded the best results from operation. Mr. Critchett, at this meeting, also stated that he had met with such success with Schufte's method and his own modified spoon, that he now never thought of performing the usual flap operation.

PROTRUSION OF THE EYEBALL: BEING THE SUBSTANCE OF A LECTURE.

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PROTRUSION OF THE EYEBALL.

PROTRUSION of the eyeball arises from several mechanical causes, which are very dissimilar in their kind, and in each there is an amount of detail that could never be supposed by any one not much engaged in ophthalmic practice.

Every one does not know the difference between a protruded eyeball and an enlarged one, and an error is very excusable in the inexperienced. Congenital enlargement has been met with, but very rarely; and, while the proportions of all parts remain the same, the greater absolute magnitude is very apparent. Enlargement from disease always carries the evidence of diseased action, if not in the altered form of the cornea, or in the increased size of the chambers of the eye from greater aqueous secretion, certainly in the bulging and altered colour of the sclerotica. In mere protrusion of the eye without distinction of causes, the upper eyelid covers the eye, and hangs down lower than usual, is more or less paralytic and puffed, with its surface generally of a dusky red colour, and traversed by large veins. On the other hand, in actual enlargement the eye is remarkably uncovered, and presents a staring appearance, while the upper eyelid is merely pushed forward and retained in that position, but is in other respects unchanged.

For the sake of convenience, I shall arrange the causes that thrust the eye out, under those that exist within the orbit, and those that are external to it. It occurs to me to remark that, in no other subject in the range of ophthalmology is the knowledge of anatomy and surgery so needed, alike for diagnosis and for treatment. He must be a well educated and practical surgeon, accustomed to surgical operations in general, who is justified to undertake all the instances of disease that should come under this classification. It is here that the limited province of the

"oculist" of old is so apparent. First, then, of causes within the orbit.

Venous Congestion. Under this head I venture to place the projecting eyeballs of the anæmic person. Different opinions still prevail about the origin of it. However, I believe in the cause assigned.

Few persons can have failed to notice in some females, for the most part pale, more or less prominent eyes, which are usually rolled about in a vague and hysterical manner, especially while speaking. There are marked degrees of the prominence. Sometimes you are attracted by a peculiarity merely, and you look twice before you are sure what is wrong; and sometimes the prominence horrifies you at a glance, and disagreeable enough it is then. The eyelids are generally puffy, and the conjunctiva reddened, and the pupils dilated. Males are not exempt from the disease; but so seldom does it occur in them, that I have never met with an example.

Associated with protruding eyeballs is enlargement of the thyroid gland; not always, it is true, but nearly always. I have not seen it absent, and the increase seems due to the simple enlargement of the glandular structure. In a single case only that I find on record, was the goitre of the cystic variety; and here it was very large.

There is generally some heart-disturbance, or, more correctly, disturbance of the circulation. The cardiac impulse is great; the sounds are loud and audible over the entire chest; and in the large vessels a systolic venous murmur is perceptible. It is difficult to judge of the natural pulse, as there is such susceptibility to excitement, that the asking of a few questions produces emotion.

My colleague, Mr. R. Taylor, has published an analysis of twenty-five cases, collected from his own practice and that of others. Of these, twenty were females and four males; of one, the sex is not mentioned, but from the context, the patient appears to have been a male. Three deaths occurred, in each instance in males. In two, there was a *post mortem* examination. Both of these had long suffered from extensive organic disease. In one, related by Sir Henry Marsh, there was considerable dilatation with hypertrophy, chiefly of the left side of the heart, and some amount of valvular disease, chiefly of the right. The right internal jugular vein was very much dilated. In the second, detailed by Dr. Begbie, the heart was large and soft, and flaccid; all the cavities, but especially the ventricles, were dilated; the valves were larger than usual, having accommodated themselves to the increased size of the cavities, but they were otherwise normal. The internal jugular veins were much dilated.

As a rule, however, it does not appear that organic disease of the heart is at all necessary to the production of this peculiar condition of the eyeball. The palpitation, which is invariably complained of, is due to anæmia. This, in the few instances in which the affection occurs in males, may result from extensive disease of the internal organs, from extensive and long continued loss of blood from piles, or from any other cause productive of destruction of the red corpuscles. In females, the starting point of the disease is almost invariably some form of exhausting discharge in connection with the uterine organs.

I cannot say that the impairment of sight is a consequence of this affection. It has never existed in any of the cases that I have so examined; in fact, there is no disease of the eyeball proper.

Of the actual nature of the pathological change in the orbit causing the protrusion, we are certainly ignorant so far as demonstration goes. It has been attributed to inflammatory swelling of the orbital contents, not sufficiently active to produce suppura-