his patients became convalescent, his view of their characters became more dispassionate; when they could relish mutton chops he began to admit that they had foibles; and by the time they had swallowed their last dose of tonic he was alive to their most inexcusable faults.

Passing from this sordid view, we have in the "Crown of Wild Olive" a noble statement of our relation to the necessary but always difficult question of fees: "A good soldier mainly wishes to do his fighting well. He is glad of his pay—very properly so—still his main notion of life is to win battles, not to be paid for winning them. So of doctors. They like fees no doubt—ought to like them; yet if they are brave and well educated—the entire object of their lives is not fees. They desire to cure the sick; and if they are good doctors, and the choice was fairly put to them, would rather cure their patient and lose the fee than kill him and get it. And so with all other brave and right-minded men: their work is first, their fee second—very important always, but still *second*. This is no small distinction. It is between life and death in a man; between heaven and hell for him. You cannot serve two masters: you *must* serve one or the other. If your work is first with you, and your fee second, work is your Master, and the lord of work, who is God. But if your fee is first with you, and your work second, fee is your Master, and the lord of fee, who is the Devil; and not only the Devil, but the lowest of Devils—'the least erected fiend that fell.' So there you have it in brief terms; Work first—you are God's servants; Fee first—you are the Fiend's. And it makes a difference, now and ever, believe me, whether you serve Him who has on His vesture and thigh written 'King of Kings,' and whose service is perfect freedom; or him on whose vesture and thigh the name written, 'Slave of Slaves,' and whose service is perfect slavery."

It is a solemn and momentous fact that no individual in the world stands alone: "For none of us liveth to himself and no man dieth to himself." Let us always remember this in our relations with patients and others with whom we are associated. It is in the bearings of our words and acts on the lives of others that the solemn responsibility of human existence lies. The ripples produced by the casting of a pebble into the sea will theoretically never cease.¹ Resolve then that your words and actions which start enduring ripples and eddies in the lives of others may be without spot and blameless. Wisdom is the principal thing, so let your influence lead to the love of wisdom, for is it not written that "She is more beautiful than the sun, and above all the order of the stars: and being compared with the light she is found before it, she is the brightness of the everlasting light, the unspotted mirror of the power of God, and the image of His goodness."

There is one word more I should like to add before concluding these remarks. The pathway of medicine is like the pathways of all other departments of life, in which the lot of man is cast. The student pilgrim of medicine has a free choice offered to him. It is the old old story of the choice between good and evil. None of us are exempt from the dangers and temptations of life. Pallas Athené in her legendary address² to Perseus demands an answer to the question as to which of two sorts of men are more blessed. "I am Pallas Athené; and I know the thoughts of all men's hearts, and discern their manhood or their baseness. And from the souls of clay I turn away, and they are blest, but not by me. They fatten at ease, like sheep in the pasture, and eat what they did not sow, like oxen in the stall. They grow and spread, like the gourd along the ground; but, like the gourd, they give no shade to the traveller, and when they are ripe death gathers them, and they go down unloved into hell, and their name vanishes out of the land. But to the souls of fire I give more fire, and to those who are manful I give a might more than man's. These are the heroes, the sons of the Immortals, who are blest, but not like the souls of clay. For I drive them forth by strange paths, that they may fight the Titans and the monsters, the enemies of Gods and men. Through doubt and need, danger and battle, I drive them; and some of them are slain in the flower of youth, and some of them win noble names, and a fair and green old age." There are still Titans and monsters to be grappled with in the spiritual and secular world, and splendid victories to be won by the students of

medicine by industry and faith over disease and death. May it be your resolve to answer with Perseus: "Better to die in the flower of youth, on the chance of winning a noble name, than to live at ease like the sheep, and die unloved and unrenowned."

The love of knowledge is natural to man. I may add that so also is the love of goodness. In the competition of life it is well to try to think always the best: not the worst of your companions and contemporaries. "Suspensions among thoughts are like bats among birds, they ever fly by twilight." Sir George Humphry's variation of the motto "Evil be to him who evil thinks" contains a great truth: "Good will be to him who doth good think." If evil is born in us, it is equally certain that we are the inheritors of a principle of goodness. "False prophets have told us for centuries that men are nothing but fiends or wolves, half beast, half devil. Believe that," says Ruskin, "and indeed you may sink to that. But refuse that, and have faith that God 'made you upright,' though you have sought out many inventions; so you will strive daily to become more what your Maker means you to be—and daily gives you also the power to be—and you will cling more and more to the nobleness and virtue that is in you, saying 'My righteousness I hold fast, and will not let it go.'"

In this great city the sweetest story of an ideal doctor's life was written.³

"Not once or twice in this rough island's story
The path of duty was the way to glory."

The Drumtochty doctor won his way to glory, but the story of his life is but one example of the sympathy, the self-sacrifice, and the essential goodness exhibited in the lives of thousands of men who have ennobled that profession on the threshold of which you stand. The Drumtochty doctor didn't trouble the Kirk often; but in the path of duty and charity he did his best, regardless of reward, in the cold and in the heat, in mist and in rain, in winter storm and in biting winds, through peat bogs, and through snowdrifts, and through rushing torrents, year in and year out, for every man, woman, and child, in the wild straggling district in which he practised.

"The sweetest canticle," says Bacon, "is Nunc Dimittis, when a man has attained worthy ends and expectations." May each of you here have that sweet music as your reward. Wherever your lot may be set and under all the changing circumstances of time the bed-rock principles of an ideal life remain unchanged. Let me, then, commend to you the life and character of the Drumtochty doctor. He went about doing good and healing the sick. He visited the fatherless and widows, and kept himself unspotted from the world, thus practising that pure religion and undefiled which won for him, and which may win for you and for me, as we pass into the silent world, the answer from the King: "Amen dico vobis, quamdiu fecistis uni ex his fratribus meis minimis, mihi fecistis."

THE OPERATIVE TREATMENT OF CATARACT.¹

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I. EXTRACTION OF CATARACT IN THE CAPSULE.

So much has been written on this subject that I fear it is difficult to add to it much of interest. However, as few writers with any considerable experience of the operation, except Major H. Smith, I.M.S., of Jullundur, have recorded their actual experience, I think it is of value for other operators to place their experience on record. My experience is based on 576 cases operated on by me, chiefly at the Civil Hospital, Jullundur, where I had the privilege of working for a year under Major Smith. 81 of these cases were done at the Cantonment General Hospital, Meerut.

General Results.

Suppuration occurred in two cases, leading to total loss of the eye. One of these disasters occurred in a case in which I had to introduce a spoon to extract the lens owing to vitreous appearing at the upper edge of the wound whilst

¹ The House of Fame. Chaucer. Liber secundus.

² The Heroes, by Charles Kingsley.

³ Beside the Bonny Briar Bush, by Ian Maclaren.

¹ A paper read at the Bombay Medical Congress, February, 1909.

attempting to extract the lens. Suppuration at the site of the wound occurred in two cases, due, I think, to infection at the first dressing, as it was left to a compounder. One of these cleared up and caused no after-effects at all. The other did not clear up readily, but curiously enough caused scarcely any pain, and the patient left hospital on the eleventh day to proceed home, thinking he was all right. I am unable to say whether the result was a permanent damage to the eye. This gives a percentage of 0·34 per cent. of eyes definitely lost by suppuration. I attribute this low percentage to the use of the 1 in 2000 perchloride of mercury douche. There is no doubt that this lotion is a strong one to use for douching the eye, as I can vouch for from personal experience of it. I had my own eye douched with it as I happened to get some pus into it. It caused me such pain that I could not open my eye for a time, and it remained painful for four hours afterwards. Of course, it must be borne in mind that the patients are all under the influence of a 4 per cent. cocaine solution, and do not, as a matter of fact, complain of more than a little pain, and that it is a potent factor in preventing suppuration I think is undoubted, as very few indeed of these cases were given any preliminary treatment for the conjunctiva. I would not have operated on some of them had I not learned from observation at Jullundur that it was safe to do so if one used the douche. Slight keratitis occurred in two cases, which yielded readily to treatment by a saline purge and *pilula hydrargyri* internally. No cases of intraocular hæmorrhage occurred in my cases. No case of iritis was seen at all.

Lacrymation.—Troublesome lacrymation occurred in several cases, but usually yielded readily to treatment by instillation of weak zinc sulphate and boric acid drops. In one case, which was not relieved at all by this treatment and which persisted for a fortnight, relief was obtained by ordering the patient to douche the eye freely with cold water twice a day. Marked injection of the conjunctiva with lacrymation occurred in a certain number of cases. I attribute it chiefly to an excess of the 1 in 2000 perchloride lotion left in the conjunctival sac. It yielded readily to local treatment. If any marked pain was present leeches were always applied and invariably gave relief.

One complication of great interest occurred, and I have not heard of a similar one. A man, aged 73 years, an intelligent carpenter, was operated on by me for an ordinary mature senile cataract. His pupillary reaction was normal and projection of light perfect. The cataract was extracted in the capsule quite easily without any complication whatever. When the eye was opened for dressing on the fourth day the man said he could not see fingers held in front of the eye. The cornea was clear and the eye looked perfectly normal. The wound healed normally and the progress of the case was in every way normal, but he was never able to distinguish more than the movements of the hand in front of the eye and left the hospital after 17 days in this condition. Before leaving the hospital the fundus was examined but appeared normal. I was quite unable to understand why he could not see, and particularly asked him to come back again later to report progress. About three and a half weeks later he came to my house looking extremely pleased and walked into the room obviously seeing, as his other eye had been lost. He stated that a week before his sight began to come back and in three days was completely restored. That is to say, after a period of three weeks, during which he could only see hand movements, his sight was completely restored. I had no time to estimate his refraction carefully but his vision was excellent, and I have no doubt will be $\frac{5}{8}$ when his cornea settles down. The fundus was quite normal. It is not possible to say what was the exact cause of this condition. In the absence of a better explanation it seems possible that the removal of the lens entire, for it was a large one, may have had some effect upon the circulation of the retina, causing a temporary interference with its functions. The man's mental condition was quite normal, and there is no doubt as to the genuineness of the history, as he was a very intelligent carpenter, who could give an excellent account of his past services.

Escape of the vitreous.—In my series of cases escape of the vitreous occurred 29 times. In 22 cases it occurred during extraction of the lens in ordinary cataracts. In two cases it occurred during extraction of the lens, which had been previously dislocated by the "rawal" or native lens coucher. Including all cases this gives a percentage of 5·03. Taking

cataracts whose lenses were not previously dislocated, this gives a percentage of 4·7 approximately. The only serious complications, due to the loss of the vitreous in my series, was drawing up of the iris, leading to occlusion of the pupil in one case. The eye has recovered, and I propose making an artificial pupil for the patient, who is still under treatment. In most of the other cases the escape of the vitreous caused no trouble at all, but in a few cases the patient suffered from lacrymation due chiefly to the edge of the iris being caught in the wound. In two cases the edges of the iris had to be snipped off. In one case, that of a very old woman, considerable flattening of the cornea resulted, and I was in despair of it getting right. In six weeks' time, however, it became all right, and she was anxious to have the other eye operated on. I am in favour of using a pad sufficiently large to exert mild pressure on the eye in cases in which escape of vitreous has occurred. In one case where this was not done I noticed when the eye was opened on the third day that the cornea at the lower edge of the wound was bent away from the upper edge and the wound gaping. This was due to a very nervous patient "squeezing" at the time of operation and after. The wound healed quite well but the iris was drawn up, occluding the pupil as described before. It is interesting that although the wound was open wide on the third day no suppuration occurred, and it healed soundly when a firm pad was applied.

The percentage of escape of the vitreous in the operation undoubtedly decreases with the experience of the operator and—a point upon which I wish to lay stress—the experience of his assistant. The first point is well illustrated by my own experience. In my first series of 63 cases at Jullundur in the spring of 1907 escape of the vitreous occurred in six cases, whereas at Jullundur in 1908 I did 64 non-selected cases in two days with only one slight escape of the vitreous in one case. In this case, moreover, the patient squeezed out the lens with a little vitreous on completion of the incision. The second point is illustrated by my Meerut experience in 1908. In a series of 81 cases I had escape of the vitreous in seven. I had to start operating with assistants who had no previous experience of eye operations at all and very little of surgery. I should mention also I was handicapped by having to operate out of doors for the first 40 cases owing to want of proper light. I am quite sure that had I had a good assistant at least half of the escapes of the vitreous would not have occurred. I think, therefore, it is impossible to lay too much stress on the importance of fully training your assistant. Every operator should if possible first act as an assistant himself to become fully familiar with all the details. When seeing a really good assistant at work one hardly realises what an important part he plays in the operation. It is only when having to train one for personal aid, particularly if he be not too intelligent, that the importance of his part and how much damage he can do are realised. He should be taught that not only should he keep the orbicularis muscle well under control, but that when placing his thumb in position for this purpose he should draw up the loose skin of the upper lid so as to keep the eyelids well open. If he does not do this the operator will not have such a good view of the field of operation—a very important desideratum. He should be taught that he must always watch the patient's expression, and the moment the patient shows any sign of straining he should take hold of the speculum lightly and be prepared to raise it, so as to prevent the patient putting pressure on the eyeball by closing of the lids and causing escape of the vitreous. A good assistant will anticipate this and avert it.

Results as regards vision.—It is quite impossible to give a statement of the exact vision obtained by every patient operated on in Indian hospitals in the provinces. At Jullundur, owing to deficient accommodation, the patients are allowed ordinarily to leave the hospital on the sixth day. The eye is still weak and cannot tolerate light well enough to allow the vision to be tested at a distance. In Meerut my patients are discharged on the tenth day, but that also is too early to allow their vision to be tested other than roughly. I show the patients groups of small dots, varying in size from one readily seen down to one as big as the ordinary full stop in print. They are asked to count these with a + 10 D. lens. If they can count down to the last size but one I am sure from experience their vision will be about $\frac{5}{8}$ when the cornea has settled down. This may not appear very scientific, but it is all one can do and it is for all practical purposes

sufficient. I have had the opportunity of seeing and testing many cases of my own and of Major Smith which came back for various reasons, and from an experience which is based on certainly not less than 250 of these cases, I should say that the average vision obtained after this operation, provided the eye was healthy before operation, is $\frac{5}{8}$.

Astigmatism.—I have worked out the refraction of a number of cases and find the resulting astigmatism is usually from $+0.75$ D. to $+1.0$ D. To European ideas this statement of results will appear unsatisfactory, as it has not the usual table giving the vision obtained by each case. To those, however, who know the East, and that the native of India is as well able to appreciate the value of an operation as the people of other countries, seeing that he judges by the result only, which after all is the essential point to people of any nationality, the fact that in six months (and that broken up into two periods through enforced absence) I was able to get 81 people to come forward for operation, will appeal as an argument of the first importance. It should be mentioned that this was in a small cantonment hospital, where no eye work at all had been done in the preceding year, and that all around are found in every station operators for cataract by the ordinary method of wide experience. Had my results been worse than those of others near me, no one who has any knowledge of India will deny that my cases would have fallen off as the results became known.

I will now make a few remarks on certain points of importance in connexion with the operation.

Technique.—My technique was exactly that of Major Smith, to whose kind tuition I owe almost all that I know of this operation; it has been fully described already, so I shall not describe it here, but a few observations on matters which my experience suggests may be of interest. I think that the most important thing in the operation is for the operator to have an exact knowledge of the particular way in which to extract each class of cataract. It is extremely difficult to give a description of the different classes of cataracts classified from the point of view of the operator. It is quite easy to point them out clinically, and I cannot too strongly emphasise the importance of the operator being able to tell at a glance which class of cataract he has to deal with, and how it will behave. For instruction on this point I advise him to see Major Smith's book, which is coming out shortly, as space forbids me to go into it here.

I strongly recommend anyone commencing to do this operation to spend some time with a surgeon who has a large clinique, and to acquire this knowledge practically, which, in my opinion, is the only satisfactory way. The knowledge doubtless can be acquired by an intelligent operator by actual experiment, a course which is, however, fraught with danger to the patient—a fact which is obvious when we read of the experiences of operators in America and elsewhere who have tried this operation without a full practical knowledge of the details. It does not surprise me at all that they condemn it and give it up. I admit at once that the operation is more difficult to learn and more dangerous to the patients in the hands of a beginner than is the ordinary operation. I consider, however, that in the hands of an experienced operator the freedom from complications, the avoidance of a secondary operation, and the better vision obtained are of such importance as to render it the ideal operation. When the fact that immature cataract can be operated on at any stage with absolute safety is taken into account, thereby saving patients sometimes years of weary waiting, and, as sometimes happens, loss of sight whilst waiting, from glaucoma or other diseases (an occurrence which I have seen several times myself), I think the advantages of this operation are so enormous as to render it the most important advance in ophthalmic surgery since the time of Daviel. To estimate the value of knowing the exact method of procedure in this operation, I may mention that on several occasions when operating at Jullundur, where both eyes are usually operated on at the same time, I have extracted the lens and had escape of the vitreous; the fact has been pointed out to me that I failed to modify the technique quickly enough. Major Smith has then operated on the other eye to show me where I had failed and has had no escape of the vitreous at all. Both eyes almost always, if the cataract be of the same degree of maturity, behave in the same manner in this operation. One of the ways in which escape of the vitreous occurs and may be prevented is in the operation for fairly immature cataracts. These cataracts are usually

extracted by dislocating the upper edge first, which comes first through the wound. The operator by pressure directed backwards dislocates the lens and keeps the pressure up, but the lens does not come out. If the pressure be continued, as it must be, and the lens does not emerge, the vitreous may appear above the upper edge of the lens. If when the vitreous is seen in this position the pressure be still kept up, but its direction instantly changed so as to cause the lens to be carried upwards and its posterior surface to pass over the posterior edge of the incision, the escape of the vitreous will be averted. Escape of the vitreous occurred in this way two or three times to me whilst operating before I learned to modify my technique instantly so as to avert it. Sometimes the manœuvre has to be combined with counter pressure with a flat spoon above the wound. It is by slight variations of technique such as this, which are carried out by the experienced operator almost automatically, that the various difficulties which arise are overcome and escape of the vitreous and other accidents are avoided in this operation. The operator who is able to anticipate the various modifications of technique required in the course of the operation is the one who will have the best results. If in doubt as to how a particular cataract should be extracted, my opinion is that the safest way to proceed is to see if the lower edge of the lens can be dislocated first and the cataract made to turn over and come out with the lower edge first. This is done by pressing with the strabismus hook over the lower third of the cornea with a moderate pressure, the direction of the pressure being towards the patient's feet. If the lens is going to turn over, the lower edge will be seen commencing to dislocate and should not be hurried. As it dislocates, the pressure with the hook should be changed to the upward direction and the lower edge of the lens be followed up, to help it out and prevent its falling back again. If, however, it is not going to turn over and the upper edge of the lens dislocates first, the direction of the pressure should be immediately carried backwards and upwards, following up the lens as it passes out through the wound. It is the failure to instantly change the direction of the pressure and to modify its degree which accounts so often for escape of the vitreous and bursting of the capsule in this operation.

The importance of quickness.—I think it is very important, if the patient is very nervous, and particularly if a woman of the higher classes in India, who are I find usually very nervous, to extract the cataract as speedily as possible. I find I am most liable to get escape of vitreous in this class of case. It has occurred to me several times, whilst extracting one of the large white-looking mature lenses, which have to be extracted lower edge first, as previously mentioned, that all has gone well until the slow pressure of the lens turning over has pressed on the iris. Pain results, the patient strains, and if care is not taken the vitreous is very apt to be squeezed out, or the lens capsule to burst. I think the two best ways of guarding these occurrences in this class of case are: 1. To be sure you have a large enough incision. In a patient likely to give trouble I take care to give plenty of room for the lens to slip out easily. If the incision be made a shade larger than usual the lens comes out more quickly, a very desirable thing in patients with small self-control. 2. I have lately given chloroform in these cases. I was led to try it first by having a "purdah nashin" woman of a highly nervous type brought to me for operation. Her other eye had been unsuccessfully operated on by the ordinary operation elsewhere. I concluded she had behaved badly at the time of operation, and that she would do so for me. I decided to give chloroform. I had no difficulty and the case did perfectly. I think I should have not succeeded so well without chloroform. This case led me to try chloroform in other cases of the same class with equally good results. I have done too few to be able to come to a definite conclusion, but I think chloroform merits further trial. I put the patient fully under, completing all preliminary preparations as she is going under. I operate the moment anæsthesia is complete. The eyes are usually turned up, but this does not cause the least difficulty in this operation. The patient soon comes round, and usually is allowed to go to sleep if possible, as there is then less liability to vomiting, I find. The patient should, of course, be carefully watched until the anæsthesia passes off. I am fully aware of the increased danger of intraocular hæmorrhage from vomiting and do not advocate the general use of chloroform.

but it has been of great service to me in the class of case mentioned, and I mention it for that reason.

Iridectomy.—I prefer always to do an iridectomy. The skilful performance of the iridectomy is of special importance in this operation, as you have a large wound and greater liability of the vitreous to escape consequently. The iris should be very lightly caught; in fact, scarcely held at all by the forceps, as it is a sticky membrane and adheres to the forceps. If squeezed, the patient is very liable to strain and force out the lens or vitreous, or both. The edges of the iris are rather liable to prolapse, even when they have been carefully replaced, owing to the large wound. This may be suspected if the patient complains of excessive lacrymation when the eye is dressed. If very small the prolapse may be left alone, but if large the eye should be cocainised, and gently washed out with boracic lotion. The upper lid should be raised by an assistant by means of a strabismus hook and the projecting piece of iris snipped off with a sharp scissors. The lacrymation will soon cease if this be done, and the eye will settle down and give no further trouble.

II. THE AFTER-EFFECTS OF ESCAPE OF THE VITREOUS DURING THE OPERATION OF EXTRACTION OF CATARACT IN THE CAPSULE BY SMITH'S OPERATION.

In the various discussions which have taken place from time to time, as to the advantages and disadvantages of this operation, it has been contended by the opponents of the operation for the extraction of the cataract in the capsule that one of the chief objections to this operation is the frequency of escape of the vitreous. This being the only complication which is at all frequent, and the one which is most commonly met with by beginners in this operation, I inquired from Major Smith on my arrival in Jullundur in 1906 if any series of cases had ever been published in which the after-effects of escape of the vitreous in this operation were given. Major Smith informed me, that as far as he was aware, no such series of cases had ever been published either after this or the capsulotomy operation. I then offered to undertake a research into the subject and received permission from Major Smith to make every use of his hospital records which were placed at my disposal for this purpose. Every assistance was rendered me by Major Smith, whom press of work alone had prevented from carrying out this work before. Many thousands of cases in the operation books were gone through and the names of patients in whose eyes escape of the vitreous had occurred were noted. Each patient was then written to, and of them 95 presented themselves for examination. In certain of the tables it will be seen that the amount of vitreous and the remarks made at the time of operation are not given. The reason of this is that in the operation book a note only was made of the fact that vitreous had escaped. The details are noted by Major Smith on the patients' tickets always under four headings: (1) drop = 2 to 4 minims; (2) trace = 4 to 5 minims; (3) slight = 5 to 10 minims; and (4) some = 10 minims to one-third of the vitreous. The cases will be found classified in the tables appended under these headings.

As the cases went back as far as nine years, it is not surprising, considering the many thousands of hospital tickets there were, that all the tickets could not be found. Native patients are very apt to take the ticket home with them when they go, and in a large hospital with many hundreds of patients and a very small staff, such as there is at Jullundur, it is not always possible to prevent this. Some patients being satisfied with their condition do not wait to be discharged, but depart, taking the tickets with them. These facts will be well known to surgeons in India, but they are mentioned to make the matter clear to any who do not know India. Three were found to have had escape of the vitreous in both eyes, so the number of eyes examined was 98. In 90 of these cases no portion of the capsule of the lens was found to remain; in eight a portion of it or the whole was found to be present.

Method of Examination.

The vision of the patients was tested by Snellen's test-types, if they were able to read; in the case of those unable to read, who formed the bulk of the cases, by groups of dots, which they were asked to count. Special test-cards, with dots of various sizes, corresponding to

Snellen's distant test-types, were kindly supplied for this purpose by Messrs. Lawrence and Mayo of Calcutta. I found it more convenient to cut out various groups of dots and to mount them on cardboard, one or two for each corresponding line of Snellen's test-types. When dealing with patients lacking in education and advanced in years, this plan will be found an advantage. I have many times tested the results given by the same people when asked to read the Snellen's test-types. I find that on the whole the dots are slightly the harder test of the two, so that all the results given may be taken as absolutely correct. I found the use of these dots more convenient than Landolt's optotype, which I also used for some cases. At first I endeavoured to test the vision with the glasses found by determining the refraction of each case by retinoscopy. I found after doing a number of cases that the astigmatism was scarcely ever over one dioptré, so to save time I gave up doing a retinoscopy in every case, and gave them the plus lens they preferred, which in almost every case was a plus ten dioptré lens. The excellent results obtained proved the correctness of my observations, as the results obtained were all without the use of cylindrical lenses. I have noted in the column of remarks the cases in which the spherical lens other than + 10.0 D. was preferred.

The patients in most cases insisted on returning the day they arrived, so that on account of press of work I was unable to do a retinoscopy in the majority of the cases. As excessive astigmatism has been alleged to be caused by this operation, it may be well to call special attention to these facts. I have also observed a number of cases in which escape of vitreous had not occurred, and I found that in them also the average astigmatism was one dioptré. Owing to enforced absence on several occasions 25 of the cases were kindly examined for me by Major Smith. I had also the advantage of the opinion of Major Smith on the few cases in which disease of the fundus was present, which will be mentioned later. The chief facts revealed by this research are as follows. The total number examined was 98; in no case was any detachment of the retina present. Disease of the fundus was found to be present in eight eyes. A detailed account of these is given. The exact time which had elapsed since the operation was known in every case. It averaged 3.706 years. The different periods since the time of operation ranged from six months to nine years.

Vision of Cases.

Tables will be found at the end of the paper giving the exact vision of each case, with one exception, in which by an oversight I forgot to note it at the time of examination. It may be wondered why the vision of the cases in Table A does not quite correspond with that of those in Table B, being in the form shown chiefly as $\frac{6}{3}$; the answer is that at first I did not test a patient further if he had a vision of $\frac{6}{3}$. Later, when I found what excellent vision they had, I endeavoured to estimate it exactly. It will be noted that the average standard of vision is very high indeed; thus in 61 cases in which there was no opacity of the cornea, capsule left behind, or disease of the fundus, it will be found that the vision was as follows:—

$$\frac{6}{3} = 4, \quad \frac{6}{3.5} = 6, \quad \frac{6}{4} = 4, \quad \frac{6}{4.5} = 5.$$

$$\frac{6}{5} = 4, \quad \frac{6}{6} = 33, \quad \frac{6}{8} = 2, \quad \frac{6}{9} = 3.$$

I may remark here that I find in India, owing to, I think, the better light and clearer atmosphere, the patients who come to me for examination usually read a line or two more of the Snellen's test-types than they do in England. I find very many British soldiers read $\frac{6}{3.5}$ quite readily. This may

account to a certain extent for the excellent vision of these cases, but it is not the chief reason, which is the absence of an after-cataract, leaving a perfectly free pupil and also the low degree of astigmatism. An important question is, Does the amount of vitreous lost exercise a marked effect on the vision obtained by the patient? The figures at my disposal are too small to admit of any definite conclusion, but they indicate, as far as they go, that it does not have any marked influence. Reference to the tables shows it does not appear to have any marked influence. Thus we find in five cases in

which the largest amount of vitreous is lost the vision was :—
6 6 6 6 and 6
3' 5' 6' 6' and 9' Taking six cases classed as
"Trace" and "Slight" we find the vision to be
6 6 6 6 6 6
3' 3'5' 5' 6' 8' 9' The number of cases is far too
small to be conclusive, but they are sufficiently striking to
point out the need of further investigation on this point.
Thus it does not appear from these cases that the amount
of vitreous lost, provided that the eye recovers from the
immediate result of the operation, is the important factor in
determining the ultimate vision of the patient that might be
expected.

I repeat that the number of cases is too small to be con-
clusive, but they are sufficiently striking to call for further
investigation. Those operators who have observed cases in
which a large amount—i.e., more than one-third—of the
vitreous has been lost will have noticed that the vision of such
patients is often much worse at the time of leaving hospital
than the vision of those patients in whom a smaller amount
has been lost. I have had the opportunity of observing these
patients in a number of cases after leaving hospital, and
have come to the conclusion that the vision of these patients
is eventually much better than one might expect at the time
of their leaving hospital; this observation is in accordance
with the above facts, and will be of interest to those who
may be intending to adopt the operation of extraction in the
capsule. I think it is due to the greater distortion of the
cornea which results temporarily, and to the fact that the
normal tension and conditions of circulation and nutrition of
the eye take longer to be re-established after loss of the
vitreous than when it is not lost. I have noticed this to be
particularly the case in very old and feeble patients. This
fact may have led ophthalmologists who have not had the
opportunity of seeing the number of cases in which escape of
the vitreous has occurred, at a time when the eye has had
sufficient time to completely recover, to regard escape of the
vitreous as more serious than this paper tends to prove
it to be.

Cases in which Disease of the Fundus was Present.

In eight eyes of the 98 cases examined disease of the
fundus was found to be present. It may be of use to future
observers to mention these in detail. They will be found in
Table E. I will proceed to make a short comment on
each :—

CASE 1.—Is one of syphilitic disease of the fundus and
needs no comment.

CASE 2.—Presents the ordinary history and signs of
malarial optic neuritis. I have seen many cases with a
similar history and fundus condition. Major Smith says it
is quite common in the Punjab and my smaller experience
coincides with this.

CASE 3.—Is an ordinary case of disseminated choroiditis.
As it was present in both eyes, and escape of the vitreous
only occurred in the right eye, it cannot be attributed to
escape of the vitreous fairly. To discuss the question fully
as to whether the condition of the fundus was caused by the
extraction of the lens in its capsule, as may be suggested by
the opponents of this operation, is beyond the scope of this
paper. I will only say in passing I do not think it was.
Disseminated choroiditis is so commonly seen in the Jullundur
clinic that I do not see any reason to connect it with the
operation.

CASES 4, 5, and 6.—These were all cases in which the
lens had been previously "couched" and presented the
typical appearance of the condition, which always follows
couching of the lens. This condition has been described
fully in the medical press by Major Smith. It is interesting
to note, however, that apparently in some cases at least
removal of the lens does not prevent the progress of this
serious condition.

CASE 7.—Is a case of bilateral optic atrophy. Escape of
the vitreous occurred in one eye only, so it could not have
been the cause of the condition in one eye, and it is
reasonable to assume it did not cause it in the other.
It may be said that the optic atrophy was caused by the
operation for extraction of cataract in the capsule, in
both eyes. The disease is such a common one in the
Jullundur clinic in old men that I think it is quite as
reasonable to say it was unconnected with the operation
as with it. This matter needs a separate investigation.

It should, however, be noted here, in connexion with
this and the preceding case, that Major Smith always
extracts a cataract if there is any hope of improving the
vision for a time and that the condition may have been
present in its earliest form at the time of operation.
In Case 4 the condition may possibly have been caused
by the escape of vitreous, but as the eye was operated

TABLE A.—36 Cases, with Record of Amount of Escape of Vitreous.

Number.	Name.	Years since operation.	Vision.	Amount of escape of vitreous.	Astigmatism.	Remarks at time of operation.
1	Khara.	5	$\frac{2}{3}$	Trace.	—	Iridectomy.
2	Akho.	4	$\frac{2}{3}$	"	—	Iridectomy. "Very nervous."
3	Harnam Singh.	5	$\frac{2}{3}$	"	—	Iridectomy. Lens lifted on spoon.
1	Kara.	6	$\frac{2}{3}$	Slight.	—	Slight escape of vitreous. No iridectomy. He shot out lens and some vitreous on completion of incision from nervousness.
2	Bhagwani.	2	$\frac{2}{3}$	"	—	Iridectomy. Lens extracted on spoon.
3	Dani.	5	$\frac{2}{3}$	"	—	No iridectomy.
1	Mammon.	1	$\frac{2}{3}$	Drop.	—	Iridectomy.
2	Fata.	1	$\frac{2}{3}$	"	—	"
3	Tabo.	1	$\frac{2}{3}$	"	—	"
4	Deva Ditta.	2	$\frac{2}{3}$	"	—	Lens dislocated by "rawal."
5	Jhandoo.	7	$\frac{2}{3}$	"	—	Iridectomy.
6	Fateh Din.	5	6 $\frac{3}{5}$	"	+ 0.75 D. cylinder.	Iridectomy. Very nervous patient.
7	Achroo.	1	6 $\frac{4}{5}$	"	—	Iridectomy.
8	Mosaddi.	2	$\frac{2}{3}$	"	+ 0.75 D. cylinder.	(Note—Left eye operated on by "rawal." Never saw well with it. Now only sees hand movements.)
9	Sharo.	5	$\frac{2}{3}$	"	—	Iridectomy.
10	Atra.	1	$\frac{2}{3}$	"	—	Lens expelled on completion of incision with drop of vitreous.
11	Kalo.	2	6 $\frac{3}{5}$	"	—	Iridectomy. (Vision $\frac{6}{3.5}$ obtained with + 9.5 D.)
12	Bhagwana.	6	$\frac{2}{3}$	"	+ 0.75 D. cylinder.	No iridectomy. (Vision $\frac{2}{3}$ with + 9.0 D. Sp. + 0.75 cylinder.)
13	Ranji Das.	2	6 $\frac{3}{5}$	"	—	Iridectomy. Cornea slightly hazy from old trachoma above.
14	Ako.	1½	$\frac{2}{3}$	"	+ 1.25 D. cylinder.	Iridectomy.
15	Ganda.	1	$\frac{2}{3}$	"	—	Iridectomy. (Vision $\frac{2}{3}$ with + 9.0 D. lens.)
16	Ganpat.	2	$\frac{2}{3}$	"	+ 0.75 D. cylinder.	Iridectomy. (Vision $\frac{2}{3}$ with + 9.0 D. Sp. + 0.75 cylinder.)
17	Daswandhi.	7	6 $\frac{3}{5}$	"	—	No iridectomy.
18	Inchri.	1	$\frac{2}{3}$	"	—	Iridectomy.
19	Biro.	1	$\frac{2}{3}$	"	—	Iridectomy. Lens extracted on spoon. Very bad patient.
20	Hukram.	1	6 $\frac{4}{5}$	"	—	Iridectomy.
21	Jamal Din.	6	6 $\frac{4}{5}$	"	—	No iridectomy.
22	Natha.	2	$\frac{2}{3}$	"	—	Iridectomy.
23	Gangoo.	5	$\frac{2}{3}$	"	+ 1.25 D. cylinder.	Iridectomy. Very nervous patient.
24	Raman San.	7	$\frac{2}{3}$	"	—	No iridectomy. (Vision $\frac{2}{3}$ with + 9.0 D. Sp. lens.)
25	Harnam Singh.	7	6 $\frac{4}{5}$	"	—	No iridectomy.

TABLE A.—36 Cases, with Record of Amount of Escape of Vitreous—(Continued).

Number.	Name.	Years since operation.	Vision.	Amount of escape of vitreous.	Astigmatism.	Remarks at time of operation.
1	Mamon.	2	2/3	Some.	—	No iridectomy. Lens expelled with some vitreous on completion of incision.
2	Rahmat Ali.	1	2/3	„	—	No iridectomy. Lens expelled on completion of incision with some vitreous.
3 & 4	Gulaba (two eyes).	6 ms.	2/3	„	—	—
5	Harnam Singh.	1	2/3	„	—	Iridectomy. Lens extracted on spoon. Very bad patient.

on five years before and as the vision was $\frac{6}{15}$ when seen, it seems, taking into consideration the fact that in no other case in the series has any effect been proved to have followed escape of the vitreous, that it is quite as likely to have had another cause. On examining these cases critically it will appear that the case mentioned last, Case 4, Table E, only may be due to escape of vitreous. This condition, however, I have seen so commonly in the Jullundur clinic that I do not regard it as being due to loss of vitreous. Major Smith shares this opinion. I, however, leave the truth of this opinion for other observers to prove or disprove. It may be argued that the cause of some of these conditions may, if not loss of vitreous, be due to the disturbance of the conditions of the eye caused by the extraction of the cataractous lens in the capsule. This argument, I think, can only be advanced as regards two of the cases. Optic atrophy and disseminated choroiditis are very common conditions in patients attending the Jullundur clinic, and I regard these cases as attributable to ordinary causes, but on this point also further investigation is required. We arrive therefore at the conclusion that of the series of 98 eyes examined one case of retinal degeneration may possibly be due to loss of vitreous, or to the operation of extraction of the cataractous lens in the capsule, or to a combination of the two, and that one case of optic atrophy and one disseminated choroiditis may possibly be due to extraction of the cataractous lens in the capsule. If we take the escape of vitreous occurring during this operation as being about 5 to 6 per cent. in the hands of skilled operators and allow that one case out of every 98 in which this accident happens develops subsequent disease of the fundus, we arrive at the conclusion on the foregoing facts that loss of vitreous in this operation, provided the eye recovers from its immediate effects, is not the serious complication which it at first sight appears. It is interesting to note that this is the opinion arrived at by Major Smith from a general experience of these cases, apart from any definite research in this subject, some years ago.

It is specially interesting to note that detachment of the retina, the condition so generally feared as liable to occur after escape of the vitreous, did not occur in a single case. I suggest, in conclusion, that those ophthalmologists who state that loss of vitreous is such a serious accident in cataract operations have been guided by the facts as known to them in operations other than in which the cataractous lens is extracted in its capsule. It is quite probable that the eye in these operations hampered with debris and the capsule of the lens, which apart from those cases in which definite iritis occurs, must usually cause some degree of irritation, does suffer more serious damage when loss of vitreous also occurs than does the eye which is free from any irritating material. The fact that in the eight cases in which capsule was left there was disease of the fundus is interesting, but it should be remarked that in only one case was there a large amount of capsule—i.e., Case 10, Table C—the other cases having only a small amount as Major Smith always endeavours to remove as much of it as possible. On account of having a large wound it is possible to remove most of the debris, so that the condition in these cases was not quite the same as it is in the ordinary capsulotomy operation. Having regard to the facts given here, I maintain that though the number of cases is far too small to be conclusive it is sufficiently large to make

us hesitate before we accept any conclusions formed by ophthalmologists, who do not extract cataract by Smith's operation, as to the seriousness of loss of vitreous in this operation. Further investigation will doubtless throw more light on this important subject. I repeat, however, let us be careful before we accept any dicta by any ophthalmologist, however distinguished he may be, on this important subject, unless supported by a series of cases, an account of the operation performed, especially a statement as to whether the capsule was left behind or not, and if iritis or iridocyclitis followed.

The accompanying tables show (1) number of years since the operation; (2) vision; (3) amount of escape of vitreous; (4) astigmatism; (5) remarks noted on case sheet at time of operation; and (6) notes on points of interest in brackets in last column.

TABLE B.—25 Cases, with Amount of Escape of Vitreous Unknown.

Number.	Name.	Years after operation.	Vision.	Amount of escape of vitreous.	Astigmatism.	Remarks at time of operation.
1	Hira Singh.	1	$\frac{6}{4.5}$	Unknown.	+ 0.75 D. cylinder.	—
2	Miran Bux.	$7\frac{1}{2}$	2/3	„	—	—
3	Ghulam Haider.	7	2/3	„	+ 0.75 D. cylinder.	—
4	Roha.	$4\frac{1}{2}$	2/3	„	+ 1.25 D. cylinder.	—
5	Mohammed Din.	1	2/3	„	—	—
6	Roda.	6	2/3	„	—	—
7	Omra.	2	2/3	„	—	—
8	Mali.	$5\frac{1}{2}$	2/3	„	—	—
9	Devi Ditta.	3	2/3	„	—	—
10	Ghanja.	5	2/3	„	—	—
11	Badh Singh.	9	2/3	„	—	—
12	Kaka Shah.	6	$\frac{6}{3.5}$	„	+ 0.75	—
13	Iddoo.	6	2/3	„	+ 0.5	—
14	Shah Din.	$7\frac{1}{2}$	2/3	„	+ 0.5 D. cylinder.	—
15	Mehtab Singh.	$5\frac{3}{4}$	2/3	„	+ 0.75 D. cylinder.	—
16	Mamon.	7	2/3	„	+ 0.5 D.	—
17	Dania.	3	2/3	„	—	—
18	Hakko.	4	2/3	„	—	—
19	Mammond.	2	2/3	„	—	—
20	Abdulla.	2	2/3	„	—	—
21	Juna.	$3\frac{1}{2}$	2/3	„	—	—
22	Naonid.	4	2/3	„	—	—
23	Tabo.	$3\frac{1}{2}$	2/3	„	—	—
24	Edoo.	$6\frac{1}{2}$	2/3	„	—	—
25	Shadi.	3	2/3	„	—	—

TABLE C.—10 Cases (9 Patients, 1 double) in which Opacity of the Cornea was Present.

Number.	Name.	Years since operation.	Vision.	Amount of escape of vitreous.	Remarks at time of operation. (Notes in brackets.)
1	Nathu.	7	2/3	Drop.	Iridectomy.
2	Sabho Davia.	5	2/3	„	„
3	Hurkan.	4	$\frac{1}{2}$	„	„
4 & 5	Gulaba.	6 ms.	$\frac{1}{2}$	Some.	No iridectomy.
6	Harkan.	5	$\frac{1}{2}$	—	—
7	Suchet Singh.	1	$\frac{1}{2}$	Drop.	Lens extracted on spoon.
8	Jhandoo.	6	$\frac{1}{2}$	„	Iridectomy. — Nervous patient.
9	Hakam Singh.	1	$\frac{1}{2}$	„	Iridectomy.
10	Ramai Dai.	6 ms.	*	„	(Cornea opacity very marked, caused by small-pox.)

* Counts fingers at 1 yard.

TABLE D.—8 Cases in which the Capsule of the Lens was Left Behind, owing to Bursting at the Time of Operation.

Number.	Name.	Years since operation.	Vision.	Amount of escape of vitreous. (6 cases only.)	Remarks at time of operation. (Notes in brackets.)
1	Ako.	6 ms.	$\frac{1}{2}$	—	(Capsule needled previously.)
2	Ahmad Khan.	1½	$\frac{1}{2}$	Drop.	No iridectomy.
3	Nihala.	4½	$\frac{1}{2}$	—	—
4	Natha.	5	$\frac{1}{2}$	Drop.	—
5	Ahmed.	6	*	"	Drop of vitreous taken out of right eye on account of tension.
6	Diwan Singh.	2	$\frac{1}{2}$	"	Iridectomy.
7	Gaunsa.	6	$\frac{1}{2}$	"	No iridectomy.
8	Shib Dial.	1	†	Some.	Iridectomy. (Dense after-cataract seen.)

* Not noted by error. † Counts fingers only at 2 yards.

TABLE E.—Detailed Notes on 8 Cases (7 Patients, 1 Double) with Diseased Condition of the Fundus.

CASE 1.—Name, B—. Operated on one and a half years ago. "Drop" of escape of vitreous in both eyes—both extracted on spoon. Vision = $\frac{1}{2}$. States that he had very poor vision in both eyes before cataract developed. Had syphilis. On ophthalmoscopic examination signs of old neuro-retinitis.

CASE 2.—Name, Para Singh. Operated on five years ago. Vision: Can only count fingers. Sight was all right for two years after operation. Then had high fever with delirium. Pupillary reaction very sluggish. Disc pale. Retina atrophied, probably caused by malarial optic neuritis.

CASE 3.—Name, Utman Dai. Operated on one year ago. Vision: Can only see hand movements. Both lenses well extracted in the capsule with a "drop" of escape in the right. Disseminated choroiditis seen in both eyes on ophthalmoscopic examination.

CASE 4.—Name, Edoo. Operated on five years ago. Trace of escape of vitreous in right eye. Left eye lost previously from trachoma. Vision = $\frac{1}{2}$. Very stupid old man. Could give no clear history of his condition. Retina presents appearance of retinitis pigmentosa sine pigmento in an early stage.

CASE 5.—Name, Ram Singh. Operated on one and a half years ago. The right lens is noted as having been previously dislocated by the "rawal" or lens coucher at the time of operation. It was noted also as having been expelled on completion of the incision with a "drop" of vitreous. Note made "bad patient." Vision = $\frac{1}{2}$. On ophthalmoscopic examination the typical condition of retinitis pigmentosa sine pigmento, which always follows couching of the lens.

CASE 6.—Name, Hako. Operated on two years ago. Vision: Nil. Drop of escape in the left eye. Lens noted as dislocated at the time of operation. The same fundus condition as in Case 5, but more advanced.

CASE 7.—Name, Khuda Bux. Age 60 years. Operated on four and a half years ago. Escape of vitreous in one eye only, amount not noted. Both lens extracted in the capsule. Primary optic atrophy in both eyes.

A REPORT OF SOME CASES OF VENOUS ANÆSTHESIA.

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Professor Bier, in April, 1908, read a paper at the German Surgical Congress entitled "On a New Method of Producing Anæsthesia in the Extremities." The procedure is applicable to either extremity, any part of which can be shut off from the general vascular system. The method consists essentially in the introduction of an anæsthetising fluid into one of the superficial veins of a given area of a limb, which area has previously been depleted of blood and isolated by tourniquets. The whole of the tissues of the isolated area are in this way infiltrated by exudation of the medium from the capillaries of that area. The cases recorded by Professor Bier were chiefly operations on the upper extremity, only one case of amputation of the leg having been performed. We have employed the method for nine operations, seven of these being major amputations and most of them cases in which general anæsthesia was considered inadvisable.

The details of the technique are as follows: the skin is prepared in the usual manner; a sterilised Esmarch's bandage

is then firmly bound round the limb, from the periphery upwards, as high as the upper limit of the operation area. Above this, and in contact with its last turn, is placed another rubber bandage, sufficiently tight to check the arterial circulation. The bandage covering the distal part of the limb is now removed, and a third bandage is wound firmly round the extremity at the lower limit of the operation area. This bandage must be tight enough to prevent diffusion of the injected fluid into the distal part of the limb. After a preliminary skin infiltration an incision a couple of inches in length is made across the line of the vein chosen in the leg, usually the internal saphenous. (This incision may be made at any convenient level, though Professor Bier advises that the vein be picked up in the upper part of the operation area.) The vein is isolated and a cannula tied into it firmly, as for an intravenous infusion. The cannula should be directed centripetally if the vein be opened low down in the operation area, centrifugally if opened high up. Any small vessels that may have been divided are now secured to prevent leakage, and a good syringe of about 100 cubic centimetres capacity is attached by a short piece of pressure tubing to the cannula. The fluid is then injected gradually, a varying but considerable amount of pressure being required. As infiltration occurs the area swells and turns dusky white in colour. Complete anæsthesia of the isolated area appears in from five to 15 minutes from the commencement of the injection. It may be accelerated by gentle massage of the part to facilitate diffusion of the fluid, or, if necessary, by the injection of more fluid. When anæsthesia is complete the cannula is removed and the vein is tied off. The skin incision, unless it falls into line with the operation incision, is sutured, and operative measures are then proceeded with.

This anæsthesia of the infiltrated area Bier terms "direct anæsthesia." After 15 to 30 minutes, however, from the time of injection the rest of the limb below the isolated area also becomes anæsthetic. This he terms "indirect anæsthesia." It is due to the establishment of a "block" in the nerve trunks as they pass through the infiltrated area. Indirect anæsthesia, however, seems to be of limited practical value, on account of the uncertainty of the time required for its completion. At the termination of the operation the upper bandage is slowly removed in order that vessels divided during the operation may be secured. If more than ten minutes be required for suturing the wound this bandage should be replaced, as sensation returns in the infiltrated area in eight to ten minutes after its circulation is re-established.

Should an infective focus exist in the lower part of the limb to be operated upon it would obviously be inadvisable to bandage the whole extremity. In such a case the limb is first elevated, and then the first Esmarch bandage is placed entirely above the septic focus, extending centripetally from the lower level of the operation area. The hæmostatic bandage is next applied at the upper limit of the operation area, and, before removing the first Esmarch bandage, a third bandage is applied at the lower limit of the operation area. If the latter proceeding be omitted blood will regurgitate from below into the area to be infiltrated, and imperfect anæsthesia will result. It is of the utmost importance that the vessels in the operation area be completely emptied before the injection be commenced. With regard to the incision for finding a vein, it is obviously better in amputations either to make this in the lower part of the isolated area, or to make it in such a position that it will fall into line with the amputation incision.

A limit to the extent of the tissues which can be infiltrated is set by the undesirability of injecting more than a certain quantity of the anæsthetising fluid; 200 cubic centimetres of a 0.5 per cent. novocaine solution (which may be regarded as a maximum dose) should suffice to anæsthetise the field for most set operations; the area cannot conveniently be increased once operative procedures have commenced. As anæsthetic Bier recommends "novocaine" on account of its relative non-toxicity. A 0.5 per cent. solution in normal saline gives reliable results. We have used a 0.25 per cent. solution successfully in one case, though anæsthesia was somewhat more slowly produced. The amount injected varies with the size of the limb and the extent of the area to be infiltrated. From 50 to 75 cubic centimetres suffices for a moderate-sized elbow, while 150 cubic centimetres are required for a knee area. More can