lates the strength of the current, and contact is made by pushing forward the ivory button on the cautery handle. The battery is contained in a walnut-wood case, measuring $6\frac{1}{2}$ inches long, $5\frac{1}{4}$ inches wide, and $8\frac{1}{4}$ inches high, and which has a drawer $1\frac{1}{2}$ inch deep, to hold the conducting cords, handle and cauteries. Its external appearance is well shown in the woodcut, and I have great pleasure in strongly recommending it to ophthalmic surgeons and others requiring delicate cautery points carefully heated.

The ball-cautery, which is made on the principle of the nævus needle of Mr. Lund, of Manchester, is very useful, and retains the heat longer than Mr. Snell's, but it takes about three times longer to heat.

The application of the cautery requires some care, as if used too freely it will do harm, or if not sufficiently, the results will be disappointing. Place a cocaine disc, $\frac{1}{8}$ th of a grain, or a drop of a 5 per cent. solution, over the ulcer, until the cornea is non-sensitive, wash the cornea and lids with a solution of corrosive sublimate, then apply the cautery at a dull red heat to the surface of the ulcer, and to any points where the ulcer has spread, or if the cornea is infiltrated in one or two directions, carry the point into the different regions, incising the superficial layers of the cornea, if necessary, to enable you to destroy the infecting material. Be careful to apply the cautery lightly, so as not to harm healthy layers. Bathe the eye with corrosive solution, and apply a dry pad of absorbent corrosive sublimate wadding (in very sloughy cases a little finely powdered iodoform or boracic acid may be applied) and a bandage.

The patient must rest in bed for a longer or shorter period, according to the severity of the case. Bathe the eye daily with corrosive sublimate solution; if the ulcerative process is arrested, use calomel powder to encourage healing, and continue dry dressing; give calomel and opium to relieve pain if necessary, good nourishing food, not forgetting the addition of a malt stimulant, which the late Dr. McKenzie so strongly advised.

If the ulcer extends reapply the cautery, and if there is much infiltration or a large hypopyon, perforate the cornea, which may be done with perfect safety; the perforation at once relieves tension and puts the eye at rest, in addition to allowing free drainage. The wound in the cornea does not heal so quickly as that made by Saemisch's incision.

CASES SUITABLE FOR THE CAUTERY.

1. *Traumatic Ulcers.*—The slightest injury of the cornea may become irritated or sloughy, and therefore the sooner careful treatment is adopted the better. Whenever anyone receives an injury to the cornea it should be bathed with an antiseptic solution, atropine introduced (the ordinary liq. atropiæ is best) and a dry antiseptic pad and bandage applied. If the slightest appearance of irritation or spreading of the ulcer shows itself the cautery should at once be used, the irritation will be checked and the eye preserved.

If the ulcer has spread over the cornea, and a hypopyon formed, the cautery should be applied to the ulcer, and frequently the hypopyon disappears. If this does not take place, or if the anterior chamber is one-third full of pus, then tapping is the best addition to the treatment. Some of the best results I have had have been in cases where the cautery and tapping have been combined. If the ulcer is extensive and the corneal layers much infiltrated, then Saemisch's incision, or perforation with the cautery, ought to be practised at once, more especially if the patient is in feeble health, and above 50, as naturally the reactive powers in such cases are not great.

Idiopathic Ulcer.—Every variety of ulcer may at times benefit by the cautery—strumous, weak, rheumatic, or gouty; granular ulcer occurring as a result of granular conjunctiva; and serpiginous ulcer, to which the remarks made on traumatic serpiginous ulcer equally apply.

In strumous children and young women in feeble health, either from bad hygienic conditions or overwork of any kind, such as nursing for too long a period, ulcers of the cornea are very common. Numerous cases could be given in detail, but that would only weary you, but the general story is: An ulcer on the cornea for months, often three or even five, a variety of lotions and blisters used along with good internal treatment, with no improvement, the cautery applied, with generally a week's rest in bed, but frequently without, and the eye is quiet, the ulcer healing. In another week the patient is well.

In the strumous ulcer of children I cannot recommend this

treatment too strongly, as I have during the last two years used it to a considerable extent with the best results, even in apparently deep ulcers the cicatricial mark being very slight, and, if practised early, no trace is left.

I have frequently tried other means of treatment, such as eserine and atropine combined, with tonics, and no improvement took place until the cautery was applied.

Rheumatic and Gouty Ulcers.—In rheumatic and gouty ulcers the cautery is of great service, both in young and old patients. One very well marked case may be mentioned. A gentleman, who had had one or two rheumatic attacks, was seized with well-marked rheumatic ophthalmia with ciliary pain, and a minute ulcer of the cornea. The irritation subsided under leeching, eserine, and internal treatment; but another attack followed soon after, and again another, the minute ulcer remaining unhealed in spite of various applications. He was advised to try a change south; there he was worse, and on his return home had another attack. The cautery was applied to the ulcer; it healed, and he has not since had any irritation or trouble with his eye, which is now eighteen months ago, and he had five months of trouble with it. Since this case I have used the cautery in a number of others with marked benefit. In old gouty gentlemen a slight touch with the cautery makes their ulcers heal. Ulcers the result of granular conjunctiva heal quickly when the granulations are freely destroyed, and the ulcers themselves require touching.

How does the cautery act? By destroying the infective material, and thus the process of ulceration is arrested. Remove the cause, and Nature, with some assistance, will heal the ulcer.

REMARKS.—While advocating a more general use of the cautery in ulceration of the cornea, I am anxious to avoid the impression that I regard the other means that have been 'strongly recommended as unsatisfactory; far from that, for Saemisch's method and Mr. Teale's of scraping, with the more recent addition of iodoform afterwards, succeed admirably; but I conceive that in the vast variety of human beings and their ailments, it is of advantage to have several aids to their recovery or improvement, so that when one method seems unsatisfactory in any particular case, we may try another. We must also bear humbly in remembrance that it is not always the method that is to blame, but the man who carries it out; and it frequently ends in each surgeon fixing on the plan he succeeds best with, and keeping to it. I shall, however, feel grateful if what I have said leads to a more general use of the cautery in ulceration of the cornea, more especially in mining districts, where injuries of the cornea are so frequent, and where prompt treatment would save many eyes.

ON THREE CASES OF CONICAL CORNEA TREATED BY THE ACTUAL CAUTERY.¹

By RICHARD WILLIAMS, M.R.C.S.,
Surgeon to the Liverpool Eye and Ear Infirmary, etc.

WHEN, in October, 1886, the first of the following cases came under my care, I could not help feeling very much disinclined to adopt any of the recognised methods of treating keratoconus, because the results, in my own practice as well as what I had seen in that of others, had not been such as to give me much encouragement. While thus hesitating before again entering on a path which had only led to unsatisfactory results, it occurred to me that the loss of substance caused by the actual cautery might be utilised in producing a tough scar at the apex of the cone, which is the aim of all operative treatment of conical cornea. At that time I was not aware that the cautery had been previously employed in this affection, and I must confess it was only on reading Mr. W. L. Cant's article in the JOURNAL for July 23rd, 1887, that I became acquainted with the late Dr. Andrew's paper on The Actual Cautery in Eye Disease, which appeared in the volume of the JOURNAL for the latter half of 1884. On reference to these articles, I find the plan adopted by these operators differs in at least one important point from the method employed in the cases which I am about to relate. The essential difference consists in the fact that the two surgeons named make a point of opening the anterior chamber so as to allow a continuous drainage of the aqueous for a prolonged period, and so purposely use a needle

¹ Read in the Section of Ophthalmology at the Annual Meeting of the British Medical Association, held at Glasgow, in August, 1888.

capable of penetrating the corneal tissue; whereas I hold that complete penetration of the cornea with the discharge of the aqueous, is a result to be avoided, as unnecessary and dangerous, and believe the same object as regards reduction of conicity can be attained without the escape of the fluid. I have therefore had constructed by Messrs. Pickard and Curry, an instrument with which it is not easy to penetrate the corneal tissue. Performed in the way I do with this instrument, the operation becomes one of extreme simplicity, and the danger attaching to it is reduced to a minimum. Iritis and anterior synechiæ are practically impossible, and suppuration of the wound is extremely improbable. In fact, the only difficulty in connection with the operation is to hit accurately the desired spot on the cornea. To be able to do this well, I think it is always advisable to have the pupil well dilated, as the conicity can best be observed against the dark background. This having been done, and the cornea rendered insensitive by means of cocaine, the operator seizes the eye with a pair of fixing forceps in the left hand, while with the other he heats the cautery in the flame of a spirit lamp. When it is of a dull red heat, he dips the point in the apex of the cone, pressing slightly but not sufficiently to penetrate the whole substance of the cornea. On the withdrawal of the instrument, it will be found that the normal curvature of the cornea has been restored *on the spot*, and that instead of a cone there now appears a deep pit at the apex, lined of course with a thin eschar. The patient is hardly aware that anything has been done, and the whole process need not last more than a minute or two. The eye is then dressed as if for an ulcer. The process of healing is somewhat tedious, as in all cases of a burn, but, as far as my experience goes, there need be no anxiety whatever as to the result.

Although I arrived on theoretical grounds at the conclusion to give the cautery a trial, the aim of this paper being purely practical, I shall not detain you by theoretical considerations of any kind, but shall proceed briefly to relate my cases as they occurred.

CASE I is instructive on account of the means of comparison which it affords between the actual cautery and the plan of von Graefe, and shows, in my opinion, the undoubted superiority of the former. Miss W., aged 22, first consulted me on October 13th, 1886. Some months previously she noticed "things were misty," and lately she had suffered a good deal from the glare of the sun, and the eyes ached sometimes. She said her general health was good, and with the exception of a well-marked condition of dilatation of the capillaries of the cheeks there was nothing remarkable in her general appearance. There was very decided keratoconus, especially in the right eye, and vision had deteriorated during the summer. At the above date $V = \frac{1}{2}$ in each eye without a glass. With +2 cyl and -2 cyl at right angles to each other, V rose to $\frac{3}{4}$, partly. These glasses were ordered, and she returned home to Cumberland. Three months later, on January 18th, 1887, she called again. The apex of the cone in the right eye was now irregular, and evidently thinner than when last seen; vision had deteriorated, but I have unfortunately no exact note. On January 24th, with the assistance of my colleague Mr. Lee, I touched the apex of the cone in the right eye with the cautery in the manner already described. The conicity immediately disappeared, and a pit was formed at the apex. The eye was dressed with a pad and bandage. No drops were used. On the following day there was moderate injection and lachrymation. The ulcer healed without any untoward event, and the patient went home and returned again in May. The eye was then quite well, the resulting leucoma being about 2 millimètres in diameter. By this time $V = \frac{3}{4}$ partly, and there was no trace of conicity.

In the left eye vision had latterly diminished, and the glasses were no longer of much use to her, and I decided as a matter of experiment to try von Graefe's plan in this eye. I accordingly removed an elliptical piece of the cornea, and in doing so the anterior chamber was accidentally opened and the aqueous escaped. Atropine was instilled, and the eye was dressed with a pad and bandage. On the seventh day after the operation, the cornea became hazy, and a hypopyon formed. I immediately cauterised the wound, and in a few days the hypopyon had disappeared and the wound was healing favourably. When last seen, on September 27th, the eye was perfectly free from conicity, but owing to the rather large leucoma caused by the double operation, $V = \frac{1}{2}$ only. An iridectomy was advised, but the patient was so satisfied with the result in the other eye that this operation was postponed.

The occurrence of suppuration in the wound in this case reveals

one of the dangers of this operation, and it is not at all improbable that the eye would have been lost had it not been for the good effect of the cautery in arresting the suppurative process. An important advantage is thus gained by the use of the cautery.

CASE II is that of a young man, aged 28, who had been trephined and iridectomised in the left eye ten years before by a well-known ophthalmic surgeon, but had not been benefited by these operations. There was a central scar, but the conicity remained apparently undiminished. The right eye had not been touched. Vision with his eyes normally open was $\frac{1}{2}$, and he was not improved with glasses, but by narrowing the palpebral fissure with his finger and thumb it was raised to $\frac{3}{4}$ in the unoperated eye, and to $\frac{1}{2}$ in the other. On October 5th, 1887, I applied the cautery as above described to the right eye. In a month he was well enough to go home. On January 22nd, 1888, about three months after the operation, he returned and reported that his sight had been better than it was then, and on examination it was found that the conicity was returning at the upper end of the former scar. I accordingly applied the cautery again. This time the anterior chamber was accidentally opened, and the aqueous escaped. In six days the opening had closed and the chamber refilled without any accident to the iris. On February 5th, fourteen days after the operation, $V = \frac{3}{4}$ partly, without a glass and without blinking. Three months later it remained the same. There was no conicity, and there was a strong, firm scar. On June 1st a small iridectomy inwards and downwards was done. When the anterior chamber was opened and the aqueous escaped, it was noticed there was puckering all round the scar, showing that the surrounding cornea was more yielding and thinner than the scar itself. A fortnight later the patient was shown at the Lancashire and Cheshire Branch meeting, when $V = \frac{3}{4}$ and No. 4 Wecker, and still improving.

CASE III.—J. G., aged 22, a strong, healthy man, was first seen on March 29th, 1888. His general health was excellent, but his vision had been failing for four years. On examination, well-marked keratoconus was found in both eyes, worse in the right. $V R = \frac{1}{2}$ and letters of J 16, not improved with glasses; $V L = \frac{3}{4}$. On April 4th the right eye was cauterised and then dressed in the ordinary way. His progress was uninterrupted, and on May 24th $V = \frac{3}{4}$ and J 4 at five or six inches. When last seen on July 30th, vision remained the same. There was complete absence of conicity, and the scar appeared firm and strong. I have no doubt an iridectomy would improve this patient's vision; but even without this operation an improvement from J 16 to J 4 is an extremely good result. The left eye has not yet been operated on.

On the whole, I believe the foregoing results will bear favourable comparison with those of other operators obtained by means of either Bowman's or von Graefe's plan. Speaking from my own limited experience, I have no hesitation in recommending this operation, on the grounds, first, of its great simplicity and ease of performance; secondly, of its freedom from danger, sloughing of the cornea and anterior synechia being practically impossible; and thirdly, on account of its good results, both visually and as regards the arrest of the morbid process.

ON EXTRACTION OF SENILE CATARACT, WITH THE RESULTS OF 1,248 EXTRACTIONS.*

By DAVID LITTLE, M.D.,

Senior Surgeon, Royal Eye Hospital; Lecturer on Ophthalmology, Victoria University, Manchester.

THE question whether extraction of senile cataract should be combined with iridectomy or not is one engaging the attention of ophthalmic surgeons at the present time. I may say, at the outset, that I prefer the three-millimètre, or small upper-flap operation, with iridectomy. Everyone will admit that this operation, or one very similar to it, has achieved most excellent results, better than any previous method. Its success has been materially increased since the introduction of antiseptics, and my own experience is an evidence of the value of this additional treatment. About the beginning of 1887 I began to carry out antiseptic treatment systematically in every case of extraction, and from that period up to the end of June of the present year I have performed 133 consecutive extractions in hospital and private practice.

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