end of the spectrum be much shortened II B will be classed with blues instead of reds.

Whom are we to reject by this test? If we reject all the (so-called) partially red and green blind, we shall reject many persons who are practically competent. If we only reject the (so-called) completely red or green blind, we shall allow many persons who are dangerously colour blind to officiate as signalmen. A person with central scotoma will escape detection if examined by this test. The red end of the spectrum may be considerably shortened, so much so that a person may scarcely be able to distinguish red from black. It is obvious that this will not prevent him from matching a light-green wool with other green wools. Many colour-blind persons will escape detection by this test. It is possible to instruct a red-green colour blind so as to enable him to pass through the test with ease.

3. *Naming Colours.*—A method of testing in which a candidate is asked to name a number of coloured objects taken at random is a very inefficient and uncertain method of testing. If the examiner were experienced, and could choose his colours, he might test in this way, but under any circumstances the method is tedious.

4. *Twin Colours.*—The method of employing twin colours is useless, because there are different varieties and degrees of colour blindness.

5. *Tests in which the Complementary Colour has a Part.*—Tests of this description have very little value; they are more likely to detect the ignorant than the colour blind. The colour sense is diminished in the colour blind, but not to such a degree as to prevent them from seeing complementary colours.

ON A MODIFICATION OF THE ORDINARY METHOD OF OPERATING FOR ADVANCEMENT OF THE TENDON OF A RECTUS MUSCLE.

Read in the Section of Ophthalmology at the Annual Meeting of the British Medical Association, held at Bournemouth, July, 1891.

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WITHIN the last few years, more particularly since the simplification effected by Dr. Prince in the operative procedure, the treatment of cases of strabismus by the advancement of a rectus tendon has become more extensively employed. While it is in cases of divergent strabismus (in which, as a rule, ordinary tenotomy fails to produce sufficient effect), that this operation is most particularly indicated, there are also some cases of convergent squint, associated with enfeebled action of the external recti, in which advancement of one or both external recti is required to effect a satisfactory result.

It is not, however, my intention in this short communication to discuss the class of cases suitable for this method of treatment, but merely to describe a slight modification of the ordinary method of operation whereby its performance is rendered more easy and the effect produced is more considerable.

The procedure I adopt is as follows, supposing the case to be one of divergent strabismus: The patient is anaesthetised; no doubt the operation may be performed without the use of chloroform or ether, the sensitiveness of the eye being reduced by the local application and subconjunctival injection of cocaine, but under the circumstances the patient seldom keeps absolutely steady, and the muscular tonicity is never relaxed—conditions which materially interfere with the easy performance of the operation. The tendon of the internal rectus is exposed and caught in Prince's strabismus forceps; next the tendon of the external rectus is divided subconjunctivally. It is, I think, best to defer the division of the external rectus until the internal rectus has been fixed with Prince's forceps, as the intact condition of the external muscle keeps the eye directed outwards, and by exposing the parts operated on facilitates the first steps of the operation. The internal rectus is next divided close to its sclerotic insertion; the

muscle held up and cleared for some distance of its attachments to conjunctiva and ocular capsule. The next step consists in the introduction of the ligature. A fine waxed black-silk thread is taken, to either extremity of which a fine curved needle is attached. One of these needles is threaded in and out through the base of the tendon, which is pulled forward by Prince's forceps. This, though it seems a weak hold, has in practice proved quite sufficient. One of the needles is now passed in and out, under and over the conjunctiva, close to the upper margin of the cornea, until a point well beyond the outer margin of the cornea is reached. In like manner the other needle is passed under and over the conjunctiva, close to the lower margin of the cornea, till a corresponding point beyond the outer margin of the cornea is reached. A small bit of the extremity of the internal rectus tendon (varying in amount according to the effect desired) is then snipped off, the ends of the ligature tightened, until the cornea is well directed inwards, and tied. To facilitate the tightening of the ligature the cornea may at the time be rolled inwards by the use of forceps. The edges of the conjunctival incision are brought together by a couple of sutures, and the operation is ended. Sometimes the traction of the ligature causes the conjunctiva at some points to overlap the margin of the cornea, but this does not interfere in any way with the success of the operation. The ordinary antiseptic washings and dressings are employed. Both eyes are bandaged for twenty-four hours, so as to keep the eyes thoroughly at rest, and the eye operated on for one other day. On the fourth or fifth day the ligature is removed. This is easily effected by dividing the ligature in any part of its course, where it lies on the surface of the conjunctiva, and pulling on the knot, when the whole extent of the ligature at once comes away.

By this method of operating three advantages, in my opinion, are obtained. First, the cornea is more firmly and efficiently directed inwards by the ligature, which envelops the margin of the cornea and thus obtains a thorough hold of the anterior part of the globe. By the other methods of operating, the hold the ligature has on the conjunctiva is a very yielding one, whereby the effect apparent at the time of operation becomes materially reduced during the healing process.

Another advantage is the easy removal of the ligature. I have sometimes experienced the greatest difficulty in its removal before having recourse to this method of operating, having to burrow under the conjunctiva to remove a small disfiguring bit of ligature.

One more point in which this operation may be preferable to others lies in the circumstance that the tendon of the muscle is held as it were in the loop of the ligature, and thus may naturally lie in its ordinary plane, whereas in other methods of operating a more or less oblique direction may unwittingly be imparted to the muscle by greater traction being effected on the upper or the lower ligature.

The division of the external rectus should, as I have stated, be done subconjunctivally, as otherwise the circumcorneal ligature might interfere with the conjunctival incision. I have performed the operation now in about ten or twelve cases, and found the results very satisfactory. Unfortunately I have no record of the exact conditions before and after operation in some of the cases, while in others the notes have been mislaid. I can only lay before you a statement of these conditions in four of the patients.

CASE I.—E. J., aged 25, suffered from an attack of hemiplegia several years ago; she now is affected with excessive divergent strabismus of left eye of $37\frac{1}{2}^{\circ}$. After the operation the strabismus was reduced to 22° , the effect being $15\frac{1}{2}^{\circ}$. A subsequent tenotomy operation on the right eye almost completely corrected the strabismus.

CASE II.—J. S., aged 39, affected with divergent strabismus of right eye of 32° . After the operation 8° of strabismus remained, the effect produced being 24° .

CASE III.—J. C., aged 22, suffers from convergent strabismus of 35° of right eye, which had existed since she was 7 years old. The abduction in both eyes is incomplete from weakness of external recti. After the operation strabismus of 14° remained, the effect produced by the operation being 21° .

CASE IV.—J. H., aged 16, affected with divergent strabismus of right eye of $33\frac{1}{2}^{\circ}$. After the operation the eyes were

almost perfectly straight, the effect produced being about 30°.

I am indebted to my friend Dr. Maddox for his careful examination of the extent of strabismus before and after operation in these cases, and to my non-resident clinical clerk, Dr. Watson, for the other particulars. These were by no means the most satisfactory results obtained. In some of the other cases, of which I can find no exact notes, the strabismus was greater in degree and the effect of the operation more decided. In none was the operation ineffective or attended with subsequent annoyance, and I have confidence in commending it for adoption.

IRIDECTOMY OR NO IN CATARACT EXTRACTION.

Read in the Section of Ophthalmology at the Annual Meeting of the British Medical Association held in Bournemouth, July, 1891.

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FOR the thirteen years that I have had control of hospital beds, the operation that I have relied on for extraction of cataract has been the usual small flap lying in the cornea combined with an iridectomy, and I have been quite satisfied with the results.

Occasionally I have made the iridectomy as a preliminary step, especially where circumstances seemed unfavourable to the patient.

Meanwhile I have not been able to disregard the widespread revival that has been taking place abroad in favour of the method by simple extraction, one ophthalmic surgeon of the highest eminence after another having abandoned the iridectomy, some regarding it as an unnecessary detail, others as a positively harmful mutilation.

For rather more than two years I have practised simple extraction side by side with the modified Graefe operation. The cases under the latter method form a considerable majority; my notes are not complete, especially with regard to ultimate results, but some points of interest are shown in the records of the sixty-one simple extractions that I have done.

The problem is how to remove completely the cataractous lens with a minimum of damage to the eye structures, and with the ultimate result of good sight to the eye, which shall not have been predisposed to future trouble by the operation.

Complete removal of the lens is clearly facilitated by an iridectomy; the capsule can be lacerated with more precision the exit of the lens is not obstructed by the presence of the iris, fragments are readily seen in the pupil, and can be systematically manipulated time after time along the coloboma and through the corneal wound. Indeed, the thorough "toilette" of the eye which is thus indicated is, in my opinion, quite inadmissible under the simple operation. The fragments are lost sight of beneath the iris, attempts to extrude the *débris* drive them into the posterior aqueous chamber, and at the same time compress and bruise the delicate tissues of the iris and pupil in the corneal wound, by which means the natural tonicity is spoiled, and a tendency to after-prolapse encouraged.

The greatest care should be exercised to get all fragments to pass out along with the lens or directly after it; any remains should be left to absorb or to be dealt with by discission later on.

Twice I have done an iridectomy, as the lens did not easily escape. One was a case complicated with lime burn, the other had a result in vision of $\frac{1}{2}$; in a third case the lens had been imperceptibly loosened by a blow ten years previously. Under the capsulotomy the lens shifted and vitreous escaped. Iridectomy was done at once, and extraction made by the scoop, with but slight loss of vitreous and a good ultimate result.

I have been surprised at the ease with which the protruding iris can be replaced by the spatula, aided by eserine, which I usually drop into the eye sac directly after the corneal section. Too early application of the myotic may pre-

vent the lens from readily passing through the pupil, and in one such case I cut off the bruised iris after the lens had escaped; in two other cases, not due to myosis, I preferred to cut off the iris after the extraction, rather than to return it in a bruised condition, and these obtained vision $\frac{1}{2}$ and $\frac{3}{8}$, which could have been improved by a needle operation.

In six cases, therefore, out of the sixty-one I resorted to iridectomy, either to facilitate the extraction, or because of bruising of the iris; not of necessity, but as a precautionary measure, which further experience would probably deem needless. Where a history of past injury suggests a possible dislocation of the lens, I think iridectomy should, as a rule, be done, to render the escape of the lens easy, or to facilitate the use of the scoop when required. In addition to the one already mentioned, I have lost vitreous once by the patient making a strong movement of the head during capsulotomy; the lens was extracted by Taylor's vectis without iridectomy. The iris was pushed away from the wound by the vitreous; healing was rather slow (in hospital 31 days), but resulted in a vision of $\frac{1}{2}$ without further interference. In another case the vitreous escaping, the lens was extracted by the vectis, with considerable loss of vitreous; here the iris prolapsed, and caused a cystoid scar which required a later iridectomy inwards. In two other cases a small bead of vitreous showed in the wound at the end of the operation, and was cut off. In one of these the corneal incision was rather small, causing extra pressure to force out the lens; this eye healed without any puckering of the iris, or the faintest anterior synechia. The other was in a traumatic cataract of some months' standing, and in which I feared a foreign body might be present. Healing was perfect; no anterior synechiæ; vision $\frac{3}{8}$, which a needle operation would certainly have improved. In only two out of these five cases would iridectomy probably have lessened the risks of loss of vitreous.

A priori one would expect this complication to be predisposed to by iridectomy and removal of the natural support given by the iris; on the other hand more force is required to expel the lens when the iris is complete.

The great objection to the simple method is the occurrence, after the operation, of prolapse of the iris, and the mere possibility of this complication is sufficiently alarming, more particularly one is, perhaps, tempted to think in private practice.

I always use eserine freely at the time of the operation, and formerly had it applied in the evening and for one or more days afterwards. I am also careful not to shift the patient for a time.

Prolapse has only occurred four times in this set of cases. A very silly old man of 71, after an excellent operation, became very irritable at night and shifted his bandages, prolapsing the iris, which was removed next day. A man of 81 had a bad chronic asthmatic cough; his eye seemed comfortable, and was not looked at for seven days, when the iris was found prolapsed, and was removed, leaving a part incarcerated. When last seen his vision was $\frac{3}{8}$; the eye quite healthy, with the exception of an anterior synechia. In another patient iridectomy was done on the sixth day; and in a fourth, a point of prolapse at the angle of the wound was removed on the tenth day, patient leaving hospital ten days afterwards with a narrow anterior synechia and a good pupil.

Thus far I have quoted fourteen cases more or less complicated, of which only the four prolapses, and three in which vitreous was lost, were at all serious. In one other a small piece of iris was sliced off in making the corneal section. On the other hand, there are thirty-five eyes in which the most conscientious examination failed to detect any malformation at the corneo-iritic angle; the corneal wounds are perfectly free from any synechiæ, and the fall of the iris is perfect in all. Many of these cases show some capsule at the pupil, and in some it is more or less adherent, but hardly any of them have been submitted to any secondary operation, and no one could doubt that a discission would make most of them practically perfect.

In the remaining eleven cases there was more or less anterior synechia. Five of these show a slight adhesion of the ciliary margin to a portion of the wound near its extremities, which is only seen by careful examination.

In the other six the synechia is more considerable, but the pupil is quite free in four of them, and I do not feel that these