COMMUNICATIONS

SURGICAL TREATMENT OF DISLOCATED LENSES*†

REPORT OF TEN CASES USING THE BARRAQUER METHOD

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THE early literature on dislocated lenses frequently failed to indicate a satisfactory differentiation in the treatment and prognosis of congenital as contrasted with traumatic dislocations.

This distinction is of vital importance, particularly from the viewpoint of the management and treatment of the condition. Although the common factor is a mechanical dislocation of the lens, the underlying pathology of the two conditions is markedly different. The degree of trauma necessary to dislocate the lens of a normal eye is such that grave damage to other structures is almost always an inevitable accompaniment.

The pathology of traumatic dislocation has been described in detail by Wolff and Zimmerman (1962). They showed the incidence of chronic secondary glaucoma associated with retrodisplacement of the iris root and deepening of the anterior chamber angle to be a result of a contusion of the eye. This is a not uncommon though rarely recognized form of chronic uniocular glaucoma which may develop insidiously. This pathological process is not a feature of congenital dislocation of the lens since the dislocation occurs spontaneously as a result of a weakness of the zonule and not as a result of trauma. The type of secondary glaucoma that occurs here is usually associated with a dislocation of the lens into the anterior chamber. Clarke (1939) has reviewed the literature on ectopia lentis and classified the cases into three categories: congenital, traumatic, and secondary. The secondary dislocations are those which follow uveitis or degenerative changes in the eye.

Each type should then be considered from the standpoint of partial or complete dislocation. In this presentation I shall follow the distinction drawn by McDonald and Purnell (1951), in that the terms "subluxated" or "dislocated" will be used synonymously, and the term "luxated" will imply complete dislocation with loss of all zonular attachments.

Until recently the removal of subluxated and luxated lenses presented hazards so great that most ophthalmologists avoided a lens extraction unless complications occurred. Masterly inactivity was usually the method of choice, the alternative being optical iridectomy or needling. Franceschetti (1955) states:

"Nearly all the authors agree that the extraction of the lens is dangerous, and that the loss of vitreous and other complications are frequent".

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Lloyd (1948) was of the opinion that any surgical interference was ill-advised, as he believed that the lowered vitality of the eye makes any procedure dangerous:

"Needling is difficult, and absorption slow and incomplete".

Although Franceschetti (1955) advocated double-needling, he wrote:

"On the other hand we know that the ectopic lens is generally surrounded by vitreous, so that a single discission does not allow one to obtain satisfactory resorption. The number of operations necessary to obtain a free pupil varied between two and five in each eye".

Although frequently giving good immediate results, the needling operation has definite limitations:

(1) A discission can be done effectively only on children and young people.

(2) In cases done with one-discission needling, the anterior capsule is not easily opened as the lens is frequently too mobile for this procedure to be effective, and there is a danger that the lens may even be pushed back into the vitreous.

The two-needle method recommended by Zeeman (1942), Stallard (1958a), and Franceschetti (1955) is a considerable improvement on the one-needle method as a means of opening the anterior capsule, and good results have been reported. But in some cases the lens matter does not absorb readily because it is not infrequently bathed in vitreous and is thus not exposed to the lytic action of the aqueous humour. In cases requiring more than one discission, disturbances of the vitreous face must inevitably occur, with a resultant predisposition to detachment.

(3) Shapland (1957) showed that eyes rendered aphakic by needling in infancy and early childhood frequently developed detachments at between 20 and 35 years of age, and that the prognosis for successful surgery in these cases was poor. Shapland (1934) wrote:

"On account of the frequency with which the periphery of the fundus is inaccessible to ophthalmoscopy because of remnants of posterior capsule, the operative prognosis is consistently bad".

Because of the time lapse of two to three decades, the connexion between the needling and the detachment is not infrequently lost sight of. This correlation is further complicated by the fact that detachments frequently occur spontaneously with ectopia lentis. It is therefore difficult to assess which detachments are due to needling and which to pathological conditions present in an eye with a subluxated lens.

It may be argued that, with modern needling techniques and less disturbance of vitreous, detachments will not occur, but only time will prove the truth of this statement. Even if we assume that most of the detachments are due to pathological conditions in the eye, the fact remains that one very seldom obtains a clear view of the whole fundus after a needling operation because of the presence of non-absorbed capsule and lens matter. This decreases the chances of successful detachment surgery. For this reason a complete removal of the lens is advisable.

Several recent advances have made the surgical removal of dislocated lenses a far safer procedure than before. These may be divided into three main groups:

(1) Reduction of intra-ocular pressure;

- (2) Fixation of the lens in the required position by the method of Barraquer (1962);
- (3) Accurate suturing of the wound to prevent post-operative complications.

(1) **Reduction of Intra-ocular Pressure.**—In cases of luxated lenses, and especially when the luxation is of traumatic origin, the hyaloid membrane is rarely intact and there is frequently vitreous in the anterior chamber. Very great care must be taken to avoid loss of vitreous, an ever-present hazard when removing the lens and fraught with dangerous sequelae.

Vitreous loss can almost always be avoided or markedly reduced by lowering the intra-ocular pressure. This is, in my opinion, of such importance that one should never embark on opening the anterior chamber with a dislocated lens unless all possible measures have been taken to reduce the tension to almost atmospheric pressure. Careful timing in the administration of drugs to reduce the intra-ocular pressure is necessary. It is advantageous not to have the eye too soft when inserting the Barraquer needle, otherwise some difficulty may be experienced and the shape of the globe may be distorted.

Any or all of the following methods may be used to achieve this purpose:

(a) *Acetazolamide* (Diamox).—Urrets-Zavalía (1961) has presented evidence that Diamox causes hypotony, not only by decreasing aqueous secretion but also by withdrawing water from the vitreous. Starting 2 days before surgery, Diamox should be administered according to the following schedule:

On the first day 48 hours before surgery 15 mg./kg. bodyweight every 6 hours. Then 24 hours before surgery, the dose should be raised to 20 mg./kg. every 8 hours, the third or last dosage in these 24 hours being given 2 hours before surgery. One hour before the operation, an additional dose of 250–500 mg./kg. may be given, preferably by a very slow intravenous injection.

(b) *Retrobulbar Anaesthesia.*—This should be used in addition to general anaesthesia, with a view to lowering the intra-ocular pressure; 3 ml. of a 4 per cent. solution of Novocain or a similar local anaesthetic with Hyalase and adrenaline should be injected retrobulbarly. This should be followed by rotary massage and pressure over the eye, as described by Atkinson (1961).

To prevent retrobulbar haemorrhage it is advisable to use a rounded-point 23 gauge needle, 3.5 cm. long. Pressure on the globe should be interrupted frequently to avoid interference with the retinal circulation.

(c) *Urevert.*—Javid and Settlege (1956) recorded a marked fall in intra-ocular pressure after the intravenous administration of urea. Tarter and Linn (1961) observed the mode of action of urea in reducing intra-ocular pressure:

“The clinical observation that the anterior chamber of the eye deepens as the reduction of the intra-ocular pressure occurs during urea infusion suggests that fluids are removed from a posterior route, rather than from the anterior chamber, thus permitting the anterior chamber to deepen”.

Intravenous infusion of 30 per cent. lyophilized urea in invert sugar and water should be administered. A total dose of 1 g./kg. bodyweight should be given one hour before surgery (Javid, 1958). The rate of infusion advocated is 90 to 120 drops per minute. Tarter and Linn further note that urea has been found not to interfere with other methods of reducing the intra-ocular pressure.

Javid emphasizes that one should avoid stale solutions of urea because it decomposes to form free ammonia. Also, the solution should not be warmed above 50°C. as ammonia will be formed and this in itself will have a toxic effect. Urevert must not be used if there is any renal or hepatic disease.

(d) *Controlled Hypotension*.—Provided that there are no contraindications, the intra-ocular pressure can be reduced in most cases by lowering the blood-pressure (Hill and Goodwin, 1952). This can be done by the use of intravenous Arfonad as advised by Enderby (1958), and Bentel and Ginsberg (1954). It has the added advantage of creating a bloodless field, and is particularly advisable when using the method of fixation of the lens about to be described, as minute vessels may be punctured inadvertently while inserting the Barraquer needle. It is important that these hypotensive drugs should be given only in suitable cases, and only by an anaesthetist experienced in their administration. (Hypotension would probably have lessened or even prevented the vitreous haemorrhage that occurred in Cases 3 and 10.)

(e) *Relaxants*.—Curare should be used to relax the extra-ocular muscles.

(2) **Fixation of the Lens**.—This is the method described by Barraquer (1962), whereby the fixation of a luxated or subluxated lens is achieved by inserting a double-pronged needle 6 mm. behind the limbus through the pars plana (Fig. 1).

If the lens is luxated and lies free in the vitreous (Fig. 2), it is necessary to turn the patient to the prone position. This allows the lens to fall behind the iris (Fig. 3).

FIG. 1.—Position of double-pronged needle.

FIG. 2.—Luxated lens.

FIG. 3.—Luxated lens with patient in prone position.

The double-pronged needle as described by Barraquer is made in two sizes, 20 and 25 mm. long. Calhoun and Hagler (1960) have modified the needle by adding a small handle to facilitate insertion (Fig. 4).

FIG. 4.—(i) Barraquer needle (ii) Modified needle (Calhoun and Hager).

FIG. 5.—Conjunctival incision for introduction of needle.

A recent modification has been the addition of a detachable guide, so that the bipronged needle can be inserted in the correct plane parallel to the iris. It is of paramount importance that the needle be razor-sharp. To begin with one should use a simple speculum and then incise the conjunctiva at the site where the double-pronged needle is to be inserted, *i.e.* 6 mm. behind the limbus (Fig. 5, previous page). The exact position can be marked on the sclera with a heated probe or diathermy; the latter has the added advantage of controlling possible bleeding from the deeper tissues, and is therefore to be preferred.

FIG. 6.—Stretcher alongside operating table.

FIG. 7.—Patient prone on operating table.

FIG. 8.—Head in head-rest.

FIG. 9.—Head-rest.

As it is difficult to turn a patient round on a narrow operating table, it is more convenient to do the preliminary part of the operation on a stretcher alongside the operating table (Fig. 6), and then to roll the patient over onto the table and into the prone position (Fig. 7). The chin should project over the end of the table with the head supported in this position (Fig. 8). This will allow the lens to fall forward and to lie on the posterior aspect of the iris in the pupillary area (Fig. 3). For this manoeuvre, the writer has devised a simple head-rest (Fig. 9) which can easily be made in any hospital workshop. The head-rest is placed on an operating table equipped with hydraulic control. The patient's forehead is fastened onto a cross-bar which can be moved up or down or tilted sideways by the adjustment of the screws marked A and B. To adjust the screw and to insert the needle, the operator takes up a position underneath the patient's head, lying on his back on a platform (Fig. 10, overleaf).

The writer devised this special platform after trying out various methods of working below the patient. An essential feature is the raised head-rest which allows the operator to work comfortably at an angle of vision of 45° , thus avoiding the discomfort of looking straight upwards. Lying on this platform instead of sitting on a stool enables the operator to work with far greater

FIG. 10.—Operator's platform.

FIG. 11.—Operator in position.

ease and accuracy. While working under the patient (Fig. 11), it is usually possible to manoeuvre a lens accurately into its physiological position behind the iris; once this has been achieved, the globe is held in place with a fixation-forceps and the double-pronged needle is inserted through the mark made on the exposed sclera. The needle is first directed towards the centre of the globe so as not to injure the lens, and is then redirected to come out at approximately the corresponding position on the other side of the globe (Fig. 12). The patient is then gently turned back into the supine position as for a cataract extraction.

FIG. 12.—Introduction of double-pronged needle.

It is advisable at this stage to replace the speculum that has been used with one that does not press on the globe, *e.g.* a Traquair or Arruga speculum. It is also important at this juncture to make sure that the lens is in position. If the lens is not opaque, it is necessary to use an ultra-violet light as described by Hildreth (1934). A torch with a Kodak ultra-violet filter will also serve the purpose. This precaution is necessary as a congenitally dislocated lens is not infrequently irregular in shape and smaller than usual (Varga, 1961), and may thus easily slip behind the double-pronged needle when the patient is turned on to his back.

(Where it is known beforehand that the lens is smaller than normal, the operation may be simplified by coaxing the lens through a widely-dilated pupil into the anterior chamber, and then imprisoning it in this position by the administration of powerful miotics. Although this procedure has not been attempted deliberately, the fact that it occurred spontaneously in one case (No. 3) makes one believe that it could possibly be used to advantage under certain circumstances.)

After the lens has been satisfactorily fixed in position, an incision is made in the upper and temporal half of the conjunctiva around the limbus from 7 to 1 o'clock (Fig. 13, opposite).

A conjunctival flap is drawn up out of the operating area so as not to interfere with subsequent manoeuvres. It is important not to make a conjunctival flap until just before opening the anterior chamber as otherwise this may foul the operating field, especially while inserting the Barraquer needle.

FIG. 13.—Conjunctival incision for lens extraction.

FIG. 14.—Corneo-scleral incision.

After a pre-placed single corneo-scleral suture with a substantial knot on the corneal arm as described by Stallard (1958b) has been inserted to enable closure of the eye in an emergency, the anterior chamber is opened at the limbus between 7 and 1 o'clock by means of a keratome or an ab externo incision (Fig. 14). The depth of the anterior chamber determines which method is advisable. The incision is then enlarged by means of corneal scissors. I prefer to make a corneo-scleral incision in the upper and outer quadrant, as with this incision one can gain greater access to the eye and no superior rectus suture is needed to pull the eye down. Traction on such a suture could in some cases cause distortion of the globe with resultant vitreous loss.

In my opinion a broad iridectomy in the upper outer quadrant is advisable, as this will also allow a good view of the fundus in the event of the not infrequent complication of retinal detachment. Furthermore, administration of preventive light-coagulation is facilitated if found necessary.

At this juncture, the writer uses an erisophake to remove the lens, but if the lens is covered with vitreous, an intracapsular forceps or a vectis is used. The vectis is the instrument of choice if the vitreous is already fluid and the vitreous face not intact. The cornea is accurately sutured with 5-0 silk on a very sharp Grieshaber or similar needle, at least seven sutures being inserted (Fig. 15). Only after the wound has been very securely closed, should the double-pronged needle be removed and then only with counter-pressure against the two arms of the needle. For this purpose a vectis can conveniently be used (Fig. 16). If this precaution is not taken, distortion of the globe is liable to occur, with gross disturbance and even loss of vitreous. If the anterior chamber has not been re-formed at this stage of the operation, saline or air should be injected by means of a very thin Rycroft needle. The conjunctival apron is then drawn and sutured over the incision by means of two conjunctival sutures.

FIG. 15.—Corneo-scleral sutures.

FIG. 16.—Use of vectis for counter-pressure.

A similar technique can be used in cases of subluxation of the lens. It will, however, in these cases probably not be necessary to turn the patient into the prone position. The double-pronged needle is inserted as before, 6 mm. from the limbus on the side on which the zonule is still intact. It is directed in such a manner that it will enter the vitreous behind the lens. Once the needle has been passed beyond the lens, the lens can be levered up, preferably through a widely-dilated pupil. The needle is then impaled into the substantia propria of the cornea, thus supporting the lens from below. When this has been achieved, the operation can be continued as described for luxation of the lens.

The clinical particulars of the ten cases described below are summarized in the Table.

TABLE
RESULTS IN TEN CASES

Case No.	Sex	Age (yrs)	Type of Dislocation	Date of Operation	Visual Acuity		Complications
					Before	After	
1 (Right eye)	M	37	Congenital dislocation Subluxated	9/3/60	6/60	6/6	No vitreous loss
2	M	43	Congenital dislocation Luxated into vitreous	7/1/60	6/6	6/6	No vitreous loss
3	M	35	Congenital dislocation (a) Luxated into vitreous (b) Luxated into anterior chamber	(a) Nov., 1961 (b) March, 1962	—	6/18	No vitreous loss
4	M	35	Traumatic dislocation Luxated into vitreous	22/8/62	—	6/12	Slight vitreous loss
5	F	30	Traumatic dislocation	23/1/63	No perception of light	No perception of light	Slight vitreous loss
6	M	60	?Congenital dislocation plus trauma	11/3/63	—	Satisfactory but not accurately assessed	No vitreous loss
7	M	26	Traumatic dislocation Subluxated opaque lens	28/2/63	Perception of light	6/6	No vitreous loss
8 (Left eye of Case 1)	M	39	Congenital dislocation Subluxated	13/12/62	6/36	6/6	No vitreous loss
9	M	40	Traumatic dislocation Luxated into vitreous Opaque lens, blind eye Atrophic iris	26/2/62	No perception of light	No perception of light	No vitreous loss
10	M	52	Traumatic dislocation Posterior subluxation	9/12/63	—	6/9 with correction	No vitreous loss

Case Reports

Case 1, a white male, aged 37 years. This patient presented himself with deteriorating vision of one year's duration.

Examination.—He had a slight dislocation of the right lens anteriorly and laterally. With correction he had normal vision. Over a period of 9 months his vision deteriorated rapidly, and the anterior chamber became progressively more shallow. Eventually lenticular opacities developed and it was not possible to improve the vision with glasses.

Surgery.—On March 9, 1960, he was operated on under general anaesthesia with hypotension and a preliminary retrobulbar injection. The pupil had been fully dilated before the operation. A double-pronged Barraquer needle was then inserted from the lateral aspect with the patient in the supine position. The needle was used to lever up the lens through the dilated pupil. The needle was then impaled into the substantia propria of the cornea.

The anterior chamber being very shallow was opened on the lateral side by means of an ab externo incision enlarged with scissors. A broad iridectomy was performed in the upper temporal region. An attempt to remove the tense lens with capsule forceps was unsuccessful, but it was successfully removed with a powered erisophake. There was no loss of vitreous. The cornea was accurately sutured with eight sutures of 6-0 silk.

Result.—The patient made an uninterrupted recovery; 2 months later, as there was a suspicion of degenerative changes in the periphery of the fundus, light-coagulation was applied to prevent a possible detachment.

Visual acuity with correction was 6/6. This patient has been seen at regular intervals since the operation. There have been no complications and the outcome has been entirely satisfactory.

Case 2, brother of Case 1, aged 43 years, was already blind in the left eye when first seen in August, 1959. From the history it appeared that he had had a dislocation of the lens into the anterior chamber with a secondary glaucoma. He had undergone several operations both for the dislocated lens and for subsequent detachment.

Examination.—The visual acuity was perception of light, and the luxated lens was freely movable in the vitreous.

The patient was warned that if he ever developed symptoms similar to his previous attack he was to report back immediately, and 5 months later he presented himself with severe pain and a lens partially dislocated into the anterior chamber, the lens being trapped by the pupil.

Surgery.—An emergency operation was performed under a general anaesthetic after preliminary retrobulbar injection of local anaesthetic. A Barraquer needle was inserted behind the lens and a broad iridectomy was performed. As the vitreous was already fluid and its face not intact, a vectis was used to remove the lens. There was no loss of vitreous. The cornea was securely sutured with seven 6-0 silk corneo-scleral sutures, which were removed after 4 weeks.

Result.—Visual acuity with correction was 6/6 partly. As there was a suspicion of degenerative changes in the periphery of the retina, he was treated with light-coagulation.

He has been under observation ever since; the intra-ocular pressure has remained normal and his condition is satisfactory.

Case 3, a male Bantu, aged 35 years, reported to hospital with a recent history of markedly defective vision in the right eye. There was no history of trauma.

Examination.—A clear luxated lens was freely movable in the vitreous.

Surgery.—He was operated on in November, 1961. He was first placed in the prone position to allow the lens to gravitate into the pupillary area. His head was held in position over the edge of the operating table by a nurse. Difficulty was experienced in inserting the Barraquer needle because the preliminary corneo-scleral conjunctival apron flap obscured the operating field, and the operator sat underneath the patient's head on a low stool, which was uncomfortable and did not allow precise and accurate manoeuvres. However, the needle was withdrawn and inserted again, this time with success.

When the patient was turned back into the supine position and the anterior chamber was opened, it was found that the lens had slipped back into the vitreous, and that he had also developed a vitreous haemorrhage. It was thus decided to discontinue the operation, and the corneo-scleral incision was carefully sutured. There were no post-operative complications and after the vitreous haemorrhage had shown some clearing the patient was discharged from hospital.

Progress.—About 4 months later he returned with severe ocular pain of about 5 hours' duration. The whole lens was luxated into the anterior chamber and the ocular tension was very high.

Surgery.—Miotics were administered and a retrobulbar injection was given followed by a general anaesthetic with hypotensives. A corneo-scleral incision was made after a pre-placed knotted corneo-scleral suture had been inserted. No iridectomy was performed as there was vitreous in the anterior chamber and it was very difficult to grip the iris. The lens was removed with a vectis, and there was a very slight loss of vitreous. The lens was found to be almost oval in shape, the largest diameter being 7.5 mm. and the smallest 4.5 mm. This abnormal shape no doubt accounted for the lens slipping past the double-pronged needle at the first operation, and also explained why the lens entered the anterior chamber through the pupil.

Result.—The patient made an uninterrupted recovery. The vitreous haemorrhage that had occurred at the first operation had improved to such an extent that the fundus could be seen fairly clearly and the visual acuity with correction was 6/18.

This operation was most instructive and there is much to be learnt from the handling of this case:

(a) If the lens is transparent, it is necessary to have an ultra-violet or similar lamp available. Thus one can see whether the lens has slipped back behind the fixation needle before opening the anterior chamber.

(b) It is not advisable to make a conjunctival flap before the insertion of a Barraquer needle, as this may foul the operating area especially when the patient is in the prone position. All that is required before the insertion of the Barraquer needle is to cut the conjunctival and subconjunctival tissues down to the sclera at the predetermined site.

(c) Diathermizing the sclera at this site is advisable and in this case might have prevented the vitreous haemorrhage.

(d) Sitting on a stool under the patient is uncomfortable. The surgeon should preferably lie under the patient's head on a board with a back-rest as described above.

It would appear from the shape of the lens that this patient had a congenital ectopia lentis and that the history of trauma was not the entire cause of the dislocation.

As the site of the counter-puncture cannot be anticipated, it cannot be diathermized, and this may be a potential source of haemorrhage (Case 10). For this reason, I would suggest the use of hypotensive anaesthesia in suitable cases by an anaesthetist skilled in its administration, to reduce not only the intra-ocular pressure, but also the blood pressure. The possibility of intra-ocular bleeding when inserting the needle is thus reduced.

Case 4, a male Bantu, aged about 35 years, was seen with a traumatic dislocation of the left lens which was freely movable in the vitreous.

Examination.—There was vitreous in the anterior chamber and the intra-ocular pressure was high.

Surgery.—General anaesthesia and hypotensive drugs were administered. The Barraquer needle was inserted after the patient had been put into the prone position. Difficulty was experienced in manoeuvring the lens behind the pupil as it was difficult to position the head correctly. This was eventually done by placing cushions under the head and tilting the table, but it was not possible to get the lens into the optimum position behind the pupil.

[This difficulty was overcome at subsequent operations by the use of the specially constructed head-rest described above.]

On opening the anterior chamber, a small bead of vitreous presented. The section was immediately closed by pulling on a pre-placed knotted corneo-scleral suture.

An attempt was made to reduce the intra-ocular pressure still further by the administration of Arfonad. When this was achieved, the lens was removed with a vectis. Very little fluid vitreous was lost.

Result.—The patient had visual acuity 6/18 with an approximate aphakic correction 3 weeks after the operation. He was not seen again* and thus an accurate refraction and a tonometer reading were not done.

Case 5, a female Bantu, aged about 30 years, gave a history of having been hit over the eye with a bicycle-chain about 2 months previously. She complained of very severe pain in the eye.

Examination.—The lens was partially dislocated into the anterior chamber. There was considerable corneal oedema and no perception of light. The Schiötz tonometer indicated a tension so high that no accurate reading could be recorded. Instead of removing the blind painful eye, it was thought worthwhile to try to save it by removing the lens. Every possible measure was taken in an endeavour to lower the intra-ocular pressure; these included Diamox by mouth, intravenous Urevert, retrobulbar anaesthesia with Hyalase, massage of the globe, general anaesthesia with hypotension, and cure.

Notwithstanding all these measures, the intra-ocular pressure of the injured eye remained unaffected, although the other eye showed a very marked reduction.

Surgery.—A Barraquer needle was inserted 6 mm. from the limbus after the sclera had been diathermized at this site. A pre-placed suture was inserted and the anterior chamber was opened by an ab externo incision at the limbus, enlarged with scissors. A very small amount of vitreous escaped and the cornea was immediately closed by pulling on the pre-placed suture. A fornix-based conjunctival flap was used and a limbal section made in the upper outer quadrant from 7 to 1 o'clock.

* Transfer of the Bantu section of the Hospital to another site prevented follow up of the five Bantu cases.

A preliminary wide-based iridectomy was performed and the lens was extracted with a vectis. The lens was adherent to the cornea so that difficulty was experienced in its removal, but no further loss of vitreous occurred and one got the impression that the few cubic millimetres of vitreous that had escaped had been trapped in the anterior chamber in front of the lens.

The anterior chamber gradually filled with blood and this was irrigated with normal saline before closing the incision with seven corneo-scleral sutures.

Result.—The patient had a post-operative hyphaema which gradually cleared. Apart from the cornea becoming opaque, the patient made a gradual but uninterrupted recovery; the intra-ocular pressure was lowered to an average of 28 mm. Hg, and she remained free from pain.

Comment.—Notwithstanding the fact that the tension was so high that it could not be measured, almost no vitreous was lost. This fact would seem to indicate that the high tonometer reading was not a true reflection of the intra-ocular pressure. The error was probably due to the fact that the lens, imprisoned in the anterior chamber, prevented the cornea from being impressed by the tonometer.

The patient was lost sight of before any further attempt could be made to lower the ocular tension.

Case 6, a Bantu male, aged 60 years, presented himself with a blind right eye of many years' duration.

Examination.—The left eye had a freely-movable lens in the vitreous. It was decided to remove the lens to prevent it from dislocating into the anterior chamber; previous experience with Cases 1 and 2 indicated the necessity for this, since the patient's circumstances would probably preclude him from reporting to the hospital immediately in such an emergency.

Surgery.—Diamox and intravenous Urevert and a retrobulbar injection with massage of the globe were given before a general anaesthetic.

With the patient on the trolley alongside the operating table, an incision was made down to the sclera 6 mm. from the limbus on the temporal side and the area was diathermized.

The patient was then turned onto the table into the prone position with the head resting on the special apparatus previously described, and this was adjusted to allow the lens to fall over the pupillary area, while the surgeon lay on the specially-prepared couch underneath the patient's head as illustrated above in Fig. 11.

The needle was inserted behind the lens and the patient was turned back into the supine position. After a conjunctival flap had been made and a pre-placed suture had been inserted, an ab externo incision was made in the upper outer quadrant and a wide iridectomy was performed. The lens was extracted with a vectis from the temporal side. No vitreous loss occurred.

Seven corneo-scleral sutures were inserted, the apron flap was pulled down and sutured over the wound, and the Barraquer needle was removed with counter-pressure.

Result.—The patient made an uninterrupted recovery. Restoration of vision was satisfactory but was not accurately assessed as the patient was illiterate and unco-operative.

Case 7, a white male, aged 26 years, had been injured in an explosion about 6 years previously.

Examination.—There was a small hole in the iris and a traumatic cataract with posterior dislocation of the lens, which was densely opaque and unsightly.

Surgery.—Diamox and Urevert were given before a general anaesthetic. The conjunctiva was incised 6 mm. behind the limbus and the sclera was diathermized before inserting the Barraquer needle. After a pre-placed corneo-scleral suture had been inserted and a conjunctival flap had been dissected up from the limbus, an ab externo incision was made at 11 o'clock and was enlarged with scissors. As the patient was young and it was felt that some of the zonular fibres might still be intact and possibly resistant to the removal of the lens, it was decided to use Zonulysin, which was injected behind the iris and washed out after 3 minutes. A broad iridectomy was then made at 11 o'clock.

An attempt was made to remove the lens with an erisophake, but the lens was found to be firmly attached to the vitreous, and it was necessary to peel it off the vitreous by gently inserting a vectis between the lens and the vitreous face.

It was possible to do this slowly and with great care as the intra-ocular pressure was so low that there was very little risk of vitreous loss. The corneo-scleral incision was accurately stitched with seven corneo-scleral silk sutures, and sterile air was injected into the anterior chamber.

Result.—The patient made an uninterrupted recovery, and the visual acuity was 6/6 with correction. He has been kept under observation at 3-monthly intervals and up to date has had no complications.

Case 8 concerns the left eye of Case 1, who had been kept under observation for some time for deteriorating vision. The anterior chamber had become more and more shallow with the lens dislocating anteriorly and laterally. The iris diaphragm eventually lay almost up against the cornea.

Surgery.—Diamox, Urevert, and retrobulbar anaesthesia and massage were administered before a general anaesthetic, with Arfonad to lower the blood pressure and intra-ocular pressure. The tension was considerably reduced and the Barraquer needle was inserted from the lateral side of the sclera 6 mm. from the limbus. By levering the lens up through the pupil and impaling the needle into the cornea on the opposite side, the lens was fixed in the anterior chamber against the cornea.

A lateral ab externo corneo-scleral incision was made with a razor-blade and enlarged with scissors. Before the incision was enlarged a corneo-scleral suture had been inserted to close the cornea in case of emergency. A broad iridectomy was made laterally, and as there was no vitreous in the anterior chamber the lens was removed with an erisophake. Seven corneo-scleral sutures were inserted for accurate apposition of the incision, and air was injected into the anterior chamber.

Result.—The patient made an uninterrupted recovery. Under slit-lamp examination there was a minute vitreous strand attached to the endothelial surface of the cornea where the one blade of the needle had punctured it. The visual acuity is 6/6, and there have been no further complications so far.

Case 9, a male Bantu, aged 40 years, reported with a painful eye.

Examination.—The lens was opaque and floating freely in the vitreous, the visual acuity being perception of light. The iris was atrophic in parts. The ocular tension was 35 mm. Hg. There was no specific history of recent trauma, and no signs of arachnoidectomy.

Surgery.—On February 2, 1962, he was operated on by the method previously described, under general anaesthesia, with Urevert and retrobulbar anaesthesia to reduce the ocular tension and Arfonad to reduce the blood pressure. After the lens had been fixed in its physiological position behind the iris with the Barraquer needle, an iridectomy in the upper and outer quadrant was made and the lens was successfully removed without loss of vitreous.

Result.—The visual acuity remained unchanged.

Case 10, a white male, aged 52 years, was admitted to hospital with a history of injury to the right eye with a "knuckle-duster" 3 weeks before. There was no perception of light in the left eye as a result of an old injury received 20 years previously.

Examination.—The right lens was dislocated into the vitreous but still hinged by the zonule in the infero-medial quadrant. The intra-ocular pressure was 70 mm. Hg, but a considerable reduction was achieved by the use of glycerol administered orally as described by Virno, Cantore, Bietti, and Bucci (1963). Diamox and miotics were also administered. There was vitreous in the anterior chamber and pupillary block.

Surgery.—As soon as the tension was low enough to permit surgery, a peripheral iridectomy was done to relieve the pupillary block; this further reduced the ocular tension and relieved the pain.

The lens was removed 2 months later as described in previous cases. As the lens was hinged below, an attempt was first made to insert the needle from the infero-medial border upwards, but it was not possible to do so because the back of the needle impinged on the infra-orbital margin and could not be positioned behind the lens. The needle was therefore removed and re-inserted from the lateral aspect. An ab externo incision was made after a fornix-based flap had been cut and the lens was removed with a vectis. There was no loss of vitreous.

Result.—A vitreous haemorrhage was found post-operatively, probably the result of having to insert the needle twice. This haemorrhage cleared slowly over a period of about 6 months. The visual acuity was 6/9 with correction.

Summary

- (1) The surgical handling of ten cases of dislocated lens is described.
- (2) Measures taken to prevent vitreous loss are detailed.
- (3) Barraquer's method of lens fixation in the physiological position was used.
- (4) Two modifications to ensure better manoeuvrability and easier access to the site of the operation are described.

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