Miotics or mydriatics for atony of the ciliary muscle with delayed re-formation of anterior chamber after cataract extraction with complete iridectomy

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In cases of delayed formation of the anterior chamber after intracapsular extraction of senile cataract, the cause must be searched for:

(1) The incision should be carefully examined for leakage, a procedure aided by the instillation of fluorescein. If there is a leak the ocular tension will be low. A tiny subconjunctival leak may be difficult to diagnose.

(2) The fundus must be examined for the presence of choroidal detachment, a condition also accompanied by hypotony.

(3) The eye must be examined with the slit-lamp for pupillary block by vitreous. Chandler (1954) described four types of pupillary block:
   A ring synechia of the pupil to an intact vitreous face;
   A plug of vitreous occluding the pupillary aperture or any iridectomy that may be present;
   The formation of a pupillary membrane;
   Blocking by vitreous of a gap in the pupillary membrane after an extracapsular extraction.

In such cases the ocular tension is usually raised and the condition may be treated by mydriatics or complete iridectomy and air injection into the anterior chamber.

In all the above three instances the iris diaphragm is in contact with the posterior surface of the cornea with a risk of peripheral anterior synechiae and secondary glaucoma.

The three conditions (wound leak, choroidal detachment, and pupillary block) may form a vicious circle. A leaking wound, lowering the ocular pressure, may favour dilatation of the choroidal vessels, giving suprachoroidal exudation and detachment of the choroid, and the latter will push the vitreous forwards giving rise to vitreous pupillary block. Choroidal vascular engorgement may push the vitreous forwards increasing the pressure in the anterior chamber on the healing wound, giving rise to a wound leak and loss of the anterior chamber.

In the following 100 cases of intracapsular extraction of senile cataract using the multiple-methods technique (Mortada, 1963, 1965), all the causes of delayed formation of the anterior chamber were prophylactically treated, preoperatively, operatively, and postoperatively. Even so in four cases the re-formation of the anterior chamber was delayed for 4 days without clinical evidence of a leaking wound, choroidal detachment, or pupillary block. The effect of miotics and mydriatics on the quickness of re-formation on the anterior chamber was studied.

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Prophylactic preoperative, operative, and postoperative treatment for non-formation of the anterior chamber after cataract extraction was as follows:

(A) PREOPERATIVE PROPHYLACTIC TREATMENT

(1) Improving the general condition of the patient by diet, vitamins, and treatment of hypertension, albumin in the urine, or diabetes.

(2) Treatment of any cause of strain such as cough or constipation.

(3) Use of hypnotics, tranquilizers, sedatives, and anti-histaminics before operation up to the tolerated dose. This helps to prevent uveal vascular engorgement.

(4) Reduction of ocular pressure by acetazolamide (Fine, 1965), or osmotic pressure factors by the use of oral glycerol (Radian, and Radian, 1967), purgatives, or local massage.

(B) OPERATIVE PROPHYLACTIC TREATMENT

(1) The corneo-scleral section must not be irregular or larger than is necessary to get the lens out easily. A von Graefe knife section is better than that done by keratome and scissors (Swan and Campbell, 1946). The best method is a von Graefe knife section on the corneal side of the limbus, 1 mm. above the horizontal meridian on either side with a very small conjunctival flap. This section is best for quick wound healing.

(2) The cautery must not be applied to the lips of the wound.

(3) The three or four conjunctivo-corneo-sclero-conjunctival sutures must be properly placed and equally distributed, using sharp atraumatic needles and virgin silk, and not deeply placed so as to cause necrosis or fistulization. After lens extraction the sutures must not be tied too tightly.

(4) In this series a basal iridectomy was performed to prevent pupillary block by vitreous (Chandler, 1961; Swan, 1963).

(5) The iris must be properly repositioned at the end of the operation. No vitreous or lens capsule tissue must be left in the wound in case of complications.

(6) Gauze and cotton threads must not be left between the lips of the wound. Care must be taken not to leave subconjunctival tissue in the lips of the wound after saline irrigation or air injection into the anterior chamber.

(7) Alpha-chymotrypsin must be used only when indicated and must be followed by immediate washing of the wound lips (Kuchle, 1962; Hughes, 1965).

(8) Air must be injected to reform the anterior chamber at the end of the operation. If air does not enter the anterior chamber at the end of operation in the presence of a hermetically sealed wound this means that vitreous is pushing the iris forwards against the back of the cornea. This is usually due to engorgement of the uveal vessels, especially the choroidal vessels, or from reduction in ocular pressure. The engorged choroidal vessels may lead to suprachoroidal exudation and choroidal detachment. Also in the rare event of scleral collapse the air may not enter the anterior chamber.

(9) Care must be taken to avoid separation of the ciliary muscle attachment to the scleral spur and injury of the scleral spur by scleral section, severe mechanical zonulotomy, or pulling the scleral lip of the wound outwards with the forceps during the application of the scleral part of the corneo-scleral suture, especially when the sclera is tough or the needle is not sharp. This will avoid suprachoroidal drainage and choroidal detachment.

(C) POSTOPERATIVE PROPHYLACTIC TREATMENT

(1) Prevention of lid spasm that may occur because of a strong orbicularis muscle, retention of lacrimal fluid in the conjunctival sac, dressing by irritant drops or ointment, release of a suture in the conjunctival sac, entrance of a piece of cotton or gauze into the conjunctival sac, or after the removal of sutures.
(a) Lid spasm or general strain presses the anterior chamber evacuating its contents through a small wound leak.

(b) The corneo-scleral sutures must not be removed before the 12th day, especially in old debilitated patients.

In the four cases in which re-formation of the anterior chamber was delayed for 4 days (in spite of all the above precautions and the absence of clinical evidence of wound leak, choroidal detachment, or pupillary vitreous block,) the effect of miotics and mydriatics was tried.

(1) In two cases pilocarpine eye ointment 1 per cent. was applied twice daily, and in both the anterior chamber was formed on the next day.

(2) In other two cases atropine eye ointment 1 per cent. was applied twice daily. In these two cases there was no improvement. The atropine was then replaced by local pilocarpine and eserine ointment twice daily, and the anterior chamber reformed after 3 days.

These observations favour the theory that atony of the ciliary muscle may be a cause of delayed formation of the anterior chamber after cataract extraction. The atony is due to the pressure of the strabismus hook on the ciliary muscle during extraction of the lens, or pulling on the ciliary body during separation of the zonule, or injury of the ciliary muscle insertion to the scleral spur during a badly-performed scleral section or the introduction of a scleral suture.

Summary and conclusions

In 100 cases of intracapsular cataract extraction with complete iridectomy, elaborate precautions were adopted to prevent delayed formation of the anterior chamber through wound leakage, choroidal detachment, or vitreous pupillary block.

In four cases the formation of the anterior chamber was delayed for 4 days. Local miotics favoured quick formation and mydriatics delayed formation, thus supporting the theory that the condition was due to atony of the ciliary muscle caused by the trauma of the operation.

Atony of the ciliary muscle caused closure of the trabecular meshwork impeding aqueous outflow, and stagnation of the choroidal circulation.

These factors suggested that there was a tiny wound leak under the conjunctival flap.

Miotics contract the ciliary muscle, opening the trabecular meshwork and encouraging choroidal circulation. This reduces the relative aqueous tension in the anterior chamber and assists the closure of the leak.

References

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