Arch. Soc. Oftal. Optom. (1984)-18-239

Forum Ophtalmologicum Centenarii
marzo/84

SODIUM HYALURONATE [HEALON®] IN CYCLODIALYSIS

JOHN J. ALPAR, M. D., F.A.C.S., F.I.C.S.*
Texas, U.S.A.

Key words: Aphakia, Cyclodialisis, Glaucoma, Healon®, Pseudophaqua

ABSTRACT Because of surgical complications and the unpredictability of the end results, cyclodialisis is very rarely used today. The discovery of sodium hyaluronate [Healon®] and improved microsurgical techniques and instrumentation permit the reintroduction of this surgery in selected aphakia and pseudophakic cases. It might become the operation preferred over cyclodiathermy or cyclocryotheraphy

INTRODUCTION

The success of the viscoelastic material sodium hyaluronate [Healon®] as a tissue separator and space maintainer suggested the possibility of reintroducing cyclodialysis as an operation in aphakic or pseudophakic glaucoma.

MATERIAL AND METHOD

In this prospective study, all patients were treated preoperatively with echiothiophate iodide 0.25% every 12 hours, pilocarpine 4% every 6 hours,

Clinicial Professor, Dept. of Ophthalmology Texas Tech University School of Medicine

Medical Director Panhandle Ophthalmological Research Foundation

15 Medical Drive Amarillo, Texas 79106

timolol 0.5% every 12 hours, and acetalzolamide 250 mg per mouth every 6 hours. All patients also had previously performed 180 degree laser gonioplasty.

Group I consisted of 14 patients aged between 65 and 75 who were aphakic following intracapsular cataract extraction.

Group II had 10 patients with pseudophakoi. Three patients had intracapsular cataract extraction followed by the implantation of iris fixed lenses. Seven patients had extracapsular cataract extraction with implantation of posterior chamber lenses. Four of these patients had pigmentary glaucoma. In the second group, the patients were also between 65 and 75 years of age.

In the immediate preoperative period, in addition to the medications described, chloramphenicol eyedrops were given every hour during the waking hours and dexamethasone eyedrops every 6 hours for 24 hours. At bedtime, erythromycin ointment was applied to the eye to be operated and to the lids of that eye.

Intravenous drip of 20% mannitol began one hour prior to the surgery. Anesthesia was given, using 1% lidocaine hydrochloride and 0.75% bupivicaine hydrochloride as retrobulbar and regional block, preceded by the inhalation of nitrous oxide for 15 minutes to minimize the discomfort from the injection.

SURGICAL TECHNIQUE

The following surgical technique has been developed, using the original Heine and its Kukan modification for the cyclodialysis itself.

I. A limbus-parallel conjunctival incision was made about 7 mm from the limbus in the area pre-chosen based upon gonioscopic evaluation of the angle. The most common site of the incision in this series was in the upper temporal quadrant. However, in one case in each group, the upper nasal quadrant was used. The sclera was exposed in this area.

II. A beveled discission knife incision was made at the limbus at 6 o'clock [if the cyclodialysis is done below, the incision can be made above] or at the temporal limbus.

III. A 4 mm limbus-parallel incision was made 4-5 mm from the limbus. Under microscopic control, this incision of the sclera was carried down to the level of the choroid. If a large choroidal vessel was seen, this was treated with gentle cauterization.

IV. A cellulose sponge soaked in 1:1,000 intracardiac adrenalin was touched to the incision and applied to the sclera in front of it to assure vasoconstriction in the surgical field.

V. A small amount of Healon® was injected between the sclera and the underlying tissues with a blunt cannule directed toward the limbus.

VI. While carefully injecting sodium hyaluronate, the cannule was passed at the nasal end of the incision toward the angle by pushing it firmly against the sclera. The appearance of Healon® preceded that of the cannule. As soon as the tip of the cannule was barely visible, the cannule was moved parallel to itself toward the nasal end of the incision [for a righthanded surgeon] and slowly withdrawn while the injection of the Healon ® was continued. In the last four cases, we did not see the tip of the cannule at all, only the Healon®. Before the cannule tip left the wound, it was readvanced toward the angle and slowly, while the injection of Healon® was continued, moved, toward the other corner of the wound. Thus, the Healon® created and filled a tunnel about 4 mm wide. Actually, however, the Healon® extended the surgical detachment of the ciliary body slightly toward both the nasal and the temporal side.

If much larger surgical detachment is desired, the cannule may be reintroduced at the corner of the wound and advanced almost parallel to the limbus to the desired length, then rotated toward the angle while injecting the Healon®. Such a maneuver, however, may be neccesary only rarely. (We did it twice. In these, two cases, we did not introduce the cannules into the chamber, allowing the Healon® to complete the detachment of the ciliary body).

VII. The scleral wond was closed with a 7-0 vicryl suture in alternate patients, leaving the wond open in the others. No significant difference could be found between the two techniques.

VIII. The conjunctival flap was closed with vicryl suture. The conjunctival incision was further back then the scleral incision, preventing exposure of the wound in the cases of inadequate conjunctival healing and preventing the

growth of conjunctival surface into the wound, as well as permitting the development of a filtering bleb if leakage is present.

IX. The 6 o'clock (or temporal) limbal incision was used for chamber control when it became necessary. In case of hemorrhage, for instance, Healon® or air bubble can be injected to tamponade the angle. Air, Healon® , and blood could be evacuated through it, and the chamber could be filled with balanced salt solution when the need arose. Its closure is spontaneous and required suturing in only one case.

X. Forty-eight hours prior to the operation, topical dexamethasone was given four times a day. This dexamethasone was continued postoperatively every 6 hours for a week, every 8 hours for a week, every 12 hours for a week, and then according to need. This dose was also adjusted according to inflammatory changes (iridocyclitis) postoperatively. Phenylephrine hydrochloride 2 1/2% was given together with 1% pilocarpine every 12 hours following surgery for a week, every 24 hours for two weeks, and every other day indefinitely. In the case of iridocyclitis, short acting pupillary dilation with 1% tropicamide was given in addition to the above treatment. The Healon® left in the cleft and the angle seemed to prevent the closure of the cleft during the short time the pupil was dilated and the ciliary body relaxed.

At the end of the surgery, 1 ml of 0.1% dexamethasone was injected subtenonly. Chloramphenicol-polymyxin-hydrocortisone acetate ointment and a drop of 2% pilocarpine was applied on the table and the eye patched.

The chloramphenicol was reduced postoperatively to every 6 hours for a week and then discontinued. Timolol 0.5%, one drop every 12 hours, was given when necessary. Vitamin C, 1,000 mg was given daily for a week; 500 mg per mouth was administered every 12 hours (PRN only).

The intraocular pressure in this series was checked both preoperatively and postoperatively with applanation tonometer.

The postoperative pressure test schedule was as follows: 4 hours, 12 hours, 24 hours, 48 hours postoperatively; then one week, two weeks, one month, three months, six months, nine months and one year, 18 months, and two years postoperatively, or on any visit that occured during this period of time. The visual acuity was tested on every visit, and gonioscopy was also performed on every visit.

RESULTS
GROUP I
APHAKIC - ICCE

14 patients aged 65 - 75

INTRAOCULAR APPLANATION PRESSURE IN MM OF MERCURY BEFORE SURGERY:

35, 34, 34, 32, 30, 30, 30, 28, 36, 36, 34, 40, 32, 32

INTRAOCULAR APPLANATION PRESSURE IN MM OF MERCURY AFTER SURGERY:

4 Hours:	34,	36,	34,	30,	32,	32,	30,	30,	30,	30,	30,	32,	30,	28
12 Hours:	26,	26,	26,	24,	20,	18,	18,	16,	24,	22,	22,	20,	18,	18
24 Hours:	18,	16,	14,	14,	12,	12,	12,	10,	18,	16,	16,	16,	16,	14
48 Hours:	12,	10,	10,	10,	8,	8,	8,	8,	14,	14,	12,	12,	10,	10
1 Week:	12,	12,	10,	10,	10,	8,	8,	6,	10,	10,	10,	8,	8,	10
2 Weeks:	12,	14,	10,	10,	8,	6,	6,	6,	8,	6,	6,	8,	6,	6
1 month:	10,	10,	10,	8,	6,	6,	6,	6,	6,	8,	6,	6,	6,	6
3 months:	10,	10,	8,	8,	8,	6,	6,	6,	6,	6,	8,	6,	8,	8
6 months:	10,	8,	8,	8,	8,	8,	6,	6,	8,	10,	8,	8,	6,	6
1 year:	10,	8,	8,	8,	8,	6,	6,	6,	8,	8,	8,	8,	8,	8
18 months:	10,	10,	8,	8,	6,	6,	6,	8,	8,	6,	8,	8,	6,	6
2 years:	10,	10,	8,	8,	6,	6,	8,	6,	6,	6,	6,	8,	6,	6

RESULTS
GROUP II
PSEUDOPHAKIC

10 patients aged 65 - 75

ICCE IRIS FIXED LENSES 3
ECCE POSTERIOR CHAMBER LENSES 7

INTRAOCULAR APPLANATION PRESSURE IN MM OF MERCURY

BEFORE SURGERY:

36, 37, 34, 32, 32, 30, 30, 34, 36, 36

INTRAOCULAR APPLANATION PRESSURE IN MM OF MERCURY AFTER SURGERY:

4 Hours:	32,	32,	34,	30,	32,	30,	32,	30,	32,	30
12 Hours:	28,	26,	26,	24,	24,	16,	16,	24,	24,	24
24 Hours:	16,	16,	14,	14,	14,	12,	12,	18,	18,	14
48 Hours:	12,	12,	10,	10,	10,	8,	8,	10,	10,	12
1 Week:	12,	10,	10,	8,	8,	6,	6,	8,	8,	8
2 Weeks:	10,	8,	8,	8,	8,	6,	6,	8,	10,	8
1 Month:	8,	8,	8,	8,	6,	6,	6,	8,	6,	6
3 Months:	10,	8,	8,	6,	6,	6,	6,	6,	6,	6
6 Months:	10,	8,	8,	8,	8,	6,	6,	6,	6,	6
1 Year:	8,	8,	8,	8,	6,	6,	6,	6,	6,	6
18 Months:	8,	8,	6,	6,	8,	6,	6,	8,	8,	6
2 Years:	10,	8,	8,	6,	6,	8,	8,	10,	12,	10

RESULTS
COMPLICATIONS
(severity: 1 + TO 4 +)

APHAKIC INTRAOPERATIVE HEMORRHAGE ++, +, +, Rest 0	PSEUDOPHAKIC INTRAOPERATIVE HEMORRHAGE ++, +, Rest 0
APHAKIC POSTOPERATIVE HEMORRHAGE (FIRST DAY) +, Rest 0	PSEUDOPHAKIC POSTOPERATIVE HEMORRHAGE (FIRST DAY) 0
APHAKIC VITREOUS HEMORRHAGE +, Rest 0	PSEUDOPHAKIC VITREOUS HEMORRHAGE 0
APHAKIC IRIS ROOT DAMAGE +, Rest 0	PSEUDOPHAKIC IRIS ROOT DAMAGE 0
APHAKIC MACULAR EDEMA +, Rest 0	PSEUDOPHAKIC MACULAR EDEMA +, Rest 0
APHAKIC DISC EDEMA 0	PSEUDOPHAKIC DISC EDEMA 0
APHAKIC, VISIBLE LENGTH OF CLEFT (GONIOSCOPY) 7 mm, 6 mm, 5 mm, Rest 4 mm	PSEUDOPHAKIC, VISIBLE LENGHT OF CLEFT (GONIOSCOPY) 6 mm, 5 mm, Rest 4 mm

DISCUSSION

Cyclodialysis is one of the oldest and was, for a long time, one of the most popular anti-glaucoma operations. It fell into disrepute for several reasons[1,2] which will be described bellow:

I. Although it is a simple operation, it requires great skill

A. To prevent perforation into the vitreous cavity.

B. To avoid detachment of the iris root.

C. To avoid dislocation of the crystalline lens.

D. To prevent puncturing the lens capsule.

II. Its results are unpredictable and seemingly in no relationship to the size of the cleft created during surgery.

III. It gives the best results if considerably less than a 360-degree separation between the ciliary body and the sclera occurs. If, however, the separation is 360 degrees, in a large number of patients extreme hypotony develops,[3,4] leading to macular damage, optic nerve swelling and poor vision and to cataract formation within one to two years.

IV. If the cleft is too small, a large number of them will close up, leading to a sudden and very high (80 mm of mercury or higher) rise of intraocular pressure, presenting signs of acute glaucoma.

V. The intraocular pressure of many of the failed eyes is more difficult to control than it was prior to the cyclodialysis operation[5].

VI. In order to keep the cleft open, the patient needs to be kept on miotics indefinitely, which treatment may also increasse cataract formation in phakic eyes and the danger of retinal detachment.

VII. Reoperation is not infrequent. Since the angle findings of the failed cyclodialysis cases closely resemble those seen after severe ocular contusion, reoperation should be done in the previously operated area to avoid damaging the rest of the trabecular meshwork.

VIII. Hemorrhages during, but occasionally even after, surgery are common[2]. The redder the eye during surgery, the greater the chance of and the more severe the hemorrhage is. Although, usually, the intraocular bleeding can be stopped by injecting air bubble into the anterior chamber and the clot evacuated later, it can be a very serious complication, especially in the case of postoperative hemorrhage. It can lead to peripheral synechia formation, closing the cleft and

the rest of the angle. It can seep into the vitreous cavity and cause other problems similar to severe anterior chamber hemorrhages from other causes.

The mode of action of the cyclodialysis is not quite clear. Success probably comes when a combination of decreased aqueous humor secretion and increased absorption through the subchoroidal and subciliary space and the sclera occurs.

Cyclodialysis is now rarely used in phakic and not too often in aphakic eyes. Yet, under certain circumstances, it is a useful procedure. In aphakic or pseudophakic eyes, if and when laser gonioplasty fails or if there are too many peripheral anterior synechiae present, it can be the preferred operation versus cyclocryotherapy.

In our series, repeated gonioscopy revealed a 4 mm cleft opening in nine patients, a 6 mm cleft opening in four patients, an 8 mm cleft opening in two patients. The size of the cleft opening did not seem to have any effect on the intraocular pressure in this series.

Aphakic intraoperative hemorrhage was not serious in any of these cases. In one patient in the aphakic and one in the pseudophakic operation, a small blood stream appeared in front of the Healon®. This was easily controlled by putting pressure on the sclera or the cleft. These hemorrhages occurred in the first two operations performed. Much smaller hemorrhage in the form of a tinted Healon® appeared in two of the aphakic and one of the pseudophakic patients. No further hemorrhage was observed. The postoperative hemorrhage on the first day in the aphakic patient occurred in the same patient who had hemorrhage during surgery. This hemorrhage presented itself as a small trickle of blood that started during tonometry and, again, it was easily controlled upon putting pressure on the sclera. In the same patient, a small amount of blood appeared in the vitreous body. Later gonioscopy showed this patient to have demage to the iris root, which is the area the hemorrhage probably came from.

Aphakic and pseudophakic macular edema appeared in one patient in each group. It was easily controlled upon the discontinuation of pilocarpine for a few days.

It appears that using Healon® as a tissue separator during the cyclodialysis procedure increased the safety and perhaps the efficacy of the operation. Our series is small, but further investigation is certainly worth conducting.

This paper was first submitted on Mar. 16, 1983. In May of 1983, I visited Dr. Georg Eisner of the university of Bern, who gave me some slides which showed a similar concept developed by him. In a letter dated Sept. 27, 1983, and received on October 5, 1983, professor Eisner informed me that he had mentioned Healon® in cyclodialysis in an article in the **Klinische monatsblatter für Augenheilkunde** 178:303-305, 1981, but he did not describe it extensively[6].

One may use Healon® to detach the ciliary body from the angle side during cataract operation. We had one such patient, who has been observed for six months with very good results. The technique we employed was similar to that described by Gills. Once we ascertained that the spatula was in the proper place, Healon® was injected and the Healon® needle spatula moved to the side 4 mm to achieve the proper opening. We used 1 / 10 of a ml of Healon® and did not push the cannula too deeply between the ciliary body and the sclera, to avoid injecting the Healon® into the retrociliary body base.

BIBLIOGRAPHY

1. JOHN G., BELLOWS: *Glaucoma*. Ed., Masson Publishing, U. S. A. Pág. 406. 1979.

2. CHANDLER PA., GRANT WM. *Glaucoma*. Lea and Febiger. Pág. 307. 1979.

3. CHANDLER PA., MAUMENEE AE: *A Major Cause of Hypotony*, Transamerican Academy of Otolaryngology, 65:563, 1961. American Journal of Ophth. 52:609, 1961.

4. SCHAFER RN, WEISS DL.: *Concerning Cyclodialysis and Hypotony*. Arch of Ophth. 68:25, 1962.

5. GOLDMANN, H.: *Kilinische studien zum glaucomproblem*. Ophthalmologica 125:16, 1953.

6. EISNER, G.: *Der raumtaktische Einsatz viskoser substanzen*. Klin. Mbl. Augenheilk. 178:303-305,
1981.