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CYCLOCRYOCOAGULATION VS. TRABECULECTOMY IN PRIMARY GLAUCOMA: A LONG-TERM INTRA-INDIVIDUAL COMPARISON OF INTRA-OCULAR PRESSURE

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ABSTRACT

This study compares long-term efficacy (up to 48 months) of cyclocryocoagulation and trabeculectomy in lowering the intraocular pressure (IOP). Intraocular pressure evolution after cyclocryocoagulation in one eye and trabeculectomy in the fellow eye for the treatment of primary open- and narrow-angle glaucoma was monitored in five patients. After 4 years both interventions were still active. Cyclocryocoagulation was slightly less effective in lowering IOP but associated with considerably less complications than trabeculectomy.

SAMENVATTING

In deze studie wordt de efficiëntie op lange termijn (tot 48 maanden) van cyclocryocoagulatie en trabeculectomie vergeleken voor wat de intra-oculaire drukdaling betreft. De intra-oculaire drukevolutie werd gevolgd na cyclocryocoagulatie van het ene oog en na trabeculectomie van het contralaterale oog bij 5 patiënten met primair open-of nauwe hoek glaucoom. Na 4 jaren waren beide interventies nog steeds werkzaam. Cyclocryocoagulatie was iets minder efficiënt in het verlagen van de intra-oculaire druk maar was eveneens geassocieerd met minder complicaties dan trabeculectomie.

RESUME

Dans cette étude l'efficacité à long terme (jusqu'à 48 mois) de la cyclocryocoagulation et de la trabéculectomie est évaluée dans la baisse de la tension intra-oculaire. L'évolution de la tension intra-oculaire est suivie après une cyclocryocoagulation dans un oeil et une trabéculectomie dans l'autre pour le traitement de glaucome primaire à angle étroit ou ouvert chez 5 patients. Après 4 ans, les deux interventions avaient encore un effet détectable. La cyclocryocoagulation était moins efficace pour diminuer la tension intraoculaire, mais elle était aussi accompagnée de moins de complications.

ZUSAMMENFASSUNG

In dieser Studie wurde die Langzeitwirkung (bis zu 48 Monaten) der Druckverminderung durch Zyklokryokoagulation und Trabekulektomie zur Behandlung des primären Weit-und Engwinkelglaukoms verglichen. Der intraoculare Druckverlauf nach Zyklokryokoagulation in einem Auge und Trabekulektomie am Partnerauge wurde bei fünf Patienten beobachtet. Ein Effekt konnte selbst nach 4 Jahren bei beiden Methoden noch nachgewiesen werden. Die Zyklokrykoagulation war geringgradig weniger effektiv bezüglich der Drucksenkung, dafür aber mit deutlich weniger Komplikationen behaftet als die Trabekulektomie.

KEY WORDS

Cyclocryocoagulation, primary glaucoma, trabeculectomy, glaucoma therapy.

MOTS CLES

Cyclocryothérapie, glaucome primaire, trabéculectomie, traitement du glaucome.

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INTRODUCTION

Although today some ophthalmologists are still reluctant of applying cyclodestructive techniques in primary glaucoma (because of the bad experience in secondary glaucoma (2,7,8), it has been advocated that cyclocryocoagulation in primary glaucoma (5,6,9,12,13) has less complications than trabeculectomy (6,14,15). About its long term efficacy (11), however, little is known. In this context we want to add some data on cyclocryocoagulation and trabeculectomy done on the same patient i.e. in an intra-individual comparison of trabeculectomy in one eye and cyclocryocoagulation in the fellow eye.

SUBJECTS AND METHODS

A randomized study was done in five patients, three women and two men with an average age of 74,2 years varying from 62 to 84 years. They underwent a cyclocryocoagulation in one eye (right eye) and a trabeculectomy in the other (left) eye. All had primary open- or narrow-angle glaucoma which could not be sufficiently controlled by medical treatment. The interval between both interventions was 1-11 days. IOP was considered to be under control if maximal diurnal tension was below 23 mmHg. If not, topical medication was started again.

Both interventions were done under local (retrobulbar) anaesthesia (mixture of 2,5 ml. lidocaïne 2% and marcaïne 0,75%). Six cryoapplications were made in the lower circumference and with an approximate 3 mm limbus distance. The diameter of the cryoprobe was 2,5 mm and the temperature was –80°C. The duration of each application was 1 minute. Each patient received 500 mg acetazolamide intravenous peroperatively. Postoperatively topical corticosteroids were given six times daily.

Trabeculectomy was done under a fornix-based conjunctival flap: after exposing the sclera a lamellar (half scleral thickness) flap of 3 × 4 mm was made in the superior temporal quadrant. The sclera and the trabeculum were excised with microscissors and a peripheral iridectomy was made. The anterior chamber was filled with viscoelastics and the scleral flap secured with nylon sutures. The conjunctival flap was sutured with vicryl 8/0 at the end of the intervention. Methyl-prednisolone (40 mg.) and netromycine (15 mg.) were injected subconjunctivally. Antibiotic ointment was given postoperatively three times daily for at least one week and corticosteroids drops three times daily for at least one month. Occasionally atropine 1% was given for the prevention of malignant glaucoma.

CASE REPORTS

CASE 1

An 84-year old woman with chronic open-angle glaucoma, known for more than 3 years, had an insufficient control of her intraocular pressure under topical medication. A lasertrabeculoplasty had been done on the right eye three years earlier. Best corrected visual acuity (BCVA) was 5/10 on the right and 4/10 on the left eye. Intraocular pressure was 32 mmHg and 26 mmHg respectively under topical beta-blockers. Because of a severe lack of compliance (Parkinson's disease) further topical treatment seemed to be of no sense. Biomicroscopic examination revealed a bilateral cataract and a cup/disc ratio of 0.8-0.9. Significant progressive scotomata were found in the visual field of both eyes. Cyclocryocoagulation was done in the right eye and trabeculectomy followed eleven days later in the fellow eye. Postoperatively a moderate anterior chamber flare was found in the "cyclocryocoagulated" eye and the trabeculectomy eye developed a superior choroidal detachment which resolved spontaneously after 10 days. Cataractextraction by phaco-emulsification via a clear corneal tunnel was done 4 months after the interventions in both eyes.

CASE 2

This was a 62-year old man with narrow-angle glaucoma and an IOP of 29 mmHg under topical beta-blocking and sympaticomimetic agents in both eyes and progressive Bjerrum scotomata nearly symmetrically on both sides. He had had a YAG-laser iridotomy six months earlier. A trabeculectomy was done in the left eye and followed by a cyclocryocoagulation in the right eye 4 days later. Postoperatively there were no

Tab. I: *Summary of the preoperative data and postoperative results of each patient at the end of the follow-up period. No further visual field deterioration was found after both interventions. Note two major complications after trabeculectomy and none after cyclocryocoagulation.*

		PRE-OP			POST-OP			
		BCVA	C/D	Vis. field	Severe complications	Vis. field	BCVA (months)	Remarks
Pt 1	CC	0.5	0.9	scot.	none	idem	0.6 (48)	Cat. op. 4 m
	TE	0.4	0.9	scot.	chor. det.	idem	0.5 (48)	Cat. op.4 m
Pt 2	CC	1.0	0.3	scot.	none	idem	0.9 (42)	N.A.G.
	TE	0.9	0.3	scot.	none	idem	0.9 (42)	N.A.G.
Pt 3	CC	1.0	0.3	scot.	none	idem	1.0 (48)	
	TE	LP	0.9	scot.	mal. glaucoma	idem	LP (48)	
Pt 4	CC	0.7	0.7	scot.	none	idem	0.7 (18)	
	TE	0.4	0.7	scot.	none	idem	0.4 (18)	
Pt 5	CC	0.3	0.9	scot.	none	idem	0.4 (42)	Cat. op. 18 m
	TE	CF	0.9	scot.	none	idem	CF (42)	

significant complications, both eyes had mild anterior chamber flare the left eye had a well formed bleb.

CASE 3

A 68-year old man with chronic open-angle glaucoma had an IOP of 30 and 50 mmHg under maximum topical medication in the right and left eye respectively. Best corrected visual acuity (BCVA) was 10/10 in the right eye and finger counting in the left eye. Funduscopy showed a cup/disc ratio of 0.3 of the right disc and a total excavation of the left disc combined with a terminal stage of age-related macular degeneration. A trabeculectomy was performed in the left eye 2 days after cyclocryocoagulation of the right eye. Postoperatively there were no major complications in the "cyclocryocoagulated eye", in the "trabeculectomy eye" an imminent malignant glaucoma could be reversed by topically applied atropine.

CASE 4

A 73-year old woman had bilateral chronic open-angle glaucoma, cataract and significant progressive arcuate scotomata. IOP was 40 mmHg in the right eye and 37 mmHg in the left eye with topical beta-blockers and pilocarpine drops. BCVA was 7/10 on the right and 4/10 on the left eye with a cup/disc ratio of 0.7 on both sides. Cyclocryocoagulation was done in the right eye followed by a trabeculectomy 4 days later in the other eye. There were no postoperative complications.

CASE 5

An 84-year old woman with bilateral chronic open-angle glaucoma and age-related macular degeneration experienced a further deterioration of the visual field on both sides with a bilateral IOP of 24 mmHg under maximum topical treatment. Further examination revealed a bilateral cataract, a cup/disc ratio of 0.9 and a BCVA of 3/10 in the right eye and finger counting in the left. First a trabeculectomy was done on the left side and one day later a cyclocryocoagulation was performed on the right eye. No postoperative complications were found. Cataractextraction by phaco-emulsification was done 18 months after intervention in the right eye.

RESULTS

Table I. summarizes the preoperative data and postoperative results of each patient at the end of the follow-up period. No severe complications were found after cyclocryocoagulation. Two of the five eyes treated by trabeculectomy, however, had severe side effects, one had a choroidal detachment, the other eye began to develop a malignant glaucoma that could be reversed by topical mydriatics. One patient had to undergo a bilateral cataract operation (phaco-emulsification) with implantation of an

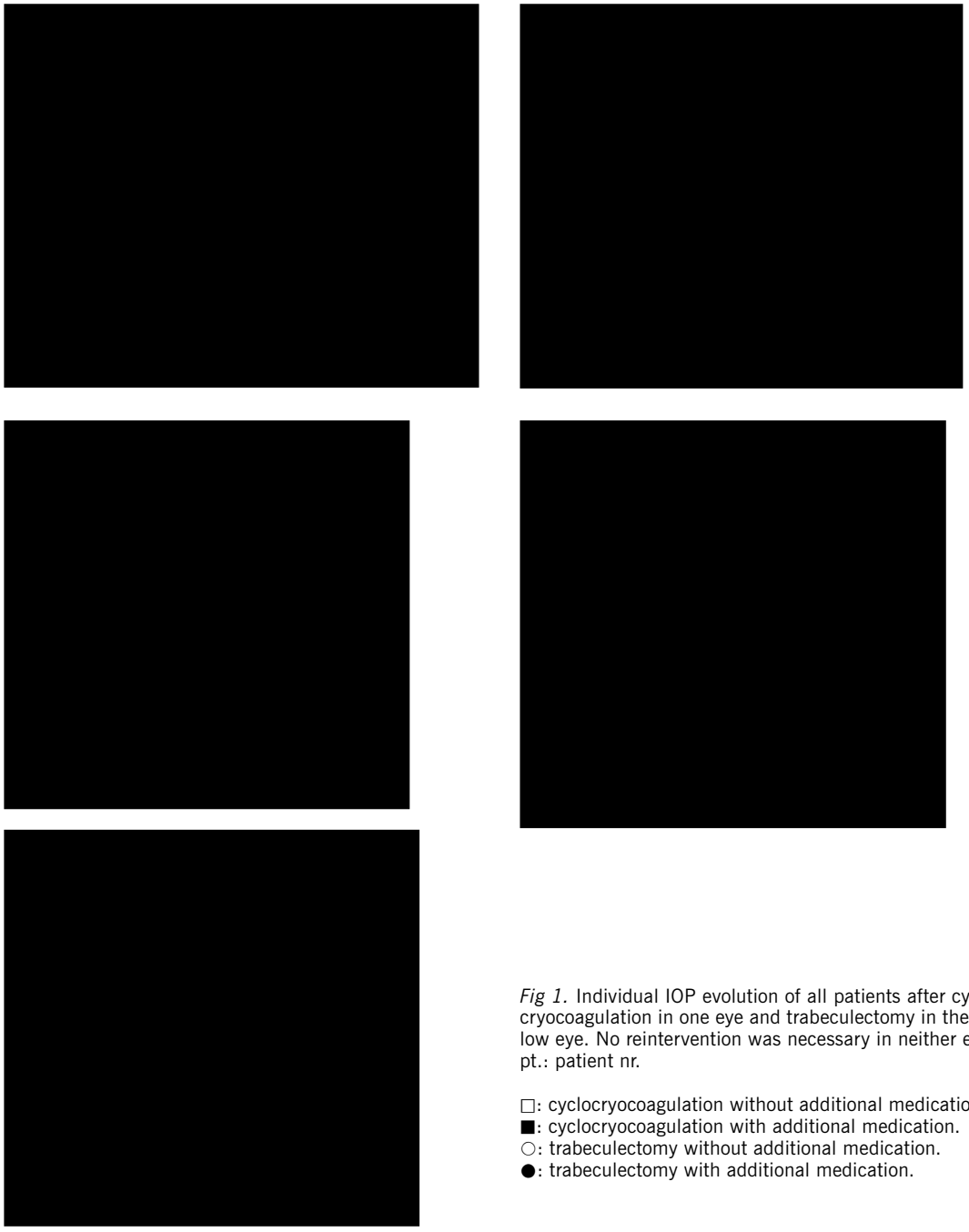

Fig 1. Individual IOP evolution of all patients after cyclocryocoagulation in one eye and trabeculectomy in the fellow eye. No reintervention was necessary in neither eye. pt.: patient nr.

□: cyclocryocoagulation without additional medication.
■: cyclocryocoagulation with additional medication.
○: trabeculectomy without additional medication.
●: trabeculectomy with additional medication.

intraocular lens in both eyes 4 months after the glaucoma interventions, another patient 18 months later in the "cyclocryocoagulated" eye. Visual field evaluation showed no further deterioration in all eyes. At the end of the follow-up period 2 out of 5 patients in the trabeculectomy group and 4 out of 5 in the cyclocryocoagulation-group had to use topical medication to control their pressure.

Figure 1 shows the individual pressure profiles

Fig 2. Relative individual IOP evolution (IOP post-op/IOP preop × 100) after trabeculectomy (upper part) and cyclocryocoagulation (lower part). After cyclocryocoagulation 4 eyes needed additional topical medication, only 2 after trabeculectomy.
Symbols as in Figure 1.

after cyclocryocoagulation in the right eye and after trabeculectomy in the left eye. A sufficient intraocular pressure control (peak IOP $<$ 23 mmHg) was found in all eyes including those with topical additional medication. Neither a reintervention was necessary nor was there a progression in visual field deterioration.
Figure 2 shows the relative individual intraocular pressure evolution of the trabeculectomy eyes (upper part) as opposed to the cyclocryocoagulation eyes (lower part) i.e. the post-operative intraocular pressure as a function (percentage) of the preoperative values. IOP after cyclocryoagulation varied between 35% and 87% of the preexisting values and between 20% to 108% after trabeculectomy.
To elucidate the difference between both interventions more clearly, the average pressure evolution of both groups is shown in figure 3 regardless whether topical additional medication was used or not. It is obvious that the post-operative pressure is lower in trabeculectomy than in cyclocryo treated eyes.

DISCUSSION

Applying cyclodestructive techniques for the treatment of primary glaucoma is still controversary today. It seems that its severe side effects, reported in secondary glaucoma, are attributed to the severe underlying pathology rather than the method itself. Phthisis bulbi, which occurs in up to 34% of the cases of secondary glaucoma (1,2,3,7,8) has not yet been reported in primary glaucoma (1,9,12,13). Also severe intraocular hemorrhage, a common feature in the treatment of secondary neovascular glaucoma, is neglectable as far as cyclocryocoagulation treatment of primary glaucoma is concerned (6).
Cyclocryocoagulation for the treatment of primary glaucoma has to compete with the

Fig 3. Average IOP evolution of both groups (CC and TE) regardless of additional topical medication. Mean IOP of the 5 eyes after TE was significantly less than mean IOP after cyclocryocoagulation.

surgical alternative most commonly applied, i.e. trabeculectomy. The literature teaches that trabeculectomy, although up to now the standard method of choice for the treatment of primary glaucoma and highly effective in lowering intraocular pressure, is not without side effects (4,10,14). Postoperative hypotony, choroidal detachment, malignant glaucoma, intraocular hemorrhage and endophthalmitis are problems one has to deal with. A literature-based comparison of the two methods is only possible by comparing the results of different authors. Data published on this subject by one single author or one single group are not frequent (6) and there is no study to compare the two interventions directly and prospectively. Thus it seems to us that for the sake of thoroughness any single datum available on this topic is of great value. This is the main reason why we started with a comparison of the two methods even in the same subject. We are well aware of the fact that five patients (ten eyes) are not enough to draw any statistically significant conclusion. Keeping in mind, however, the difficulty of conducting a randomized study under the conditions outlined (short interval between both interventions, sufficiant visual performance for follow-up, long-term cooperation of the patient, ethical responsibility, etc.) we think that even this small number is worthwhile to report on.

The results of our intra-individual comparison, which rules out the interindividual differences (i.e. the individual response of each patient as far as the disease and its treatment is concerned) is compatible with the idea that cyclocryocoagulation for the treatment of primary glaucoma has a long-lasting tension lowering effect which seems to be comparable with the intraocular pressure time course after trabeculectomy, although less effective. A detectable tension lowering long-lasting effect of cyclocryocoagulation in primary glaucoma can also be derived from the studies of Pham Duy et al. (11) which followed their patients up to 9 years, although not systematically. A lower efficacy of cyclocryocoagulation than trabeculectomy in reducing intraocular pressure for the treatment of the same pathology has also been reported by Hennekes and Belgrado (6). Our observations even in this small number of patients also support this idea: cyclocryocoagulation for the treatment of primary glaucoma, although less effective than trabeculectomy, is very safe and of long-lasting efficacy.

This could be of great importance for the future when less invasive cyclodestructive techniques like cyclophotocoagulation might

possibly (at least partly) replace cyclocryocoagulation.

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