

## NEEDLE REVISION OF LATE FAILING FILTERING BLEBS AFTER GLAUCOMA SURGERY

### REPERMEABILIZACIÓN MEDIANTE REVISIÓN CON AGUJA DE AMPOLLAS DE FILTRACIÓN CON FRACASO TARDÍO TRAS CIRUGÍA DE GLAUCOMA

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#### ABSTRACT

**Purpose:** To evaluate the results of bleb needling in eyes subjected to filtering surgery six months or more previously.

**Methods:** A retrospective study of 23 eyes in 21 patients subjected to bleb needling performed by means of a 25G needle, 6 months to 23 years after failed filtering surgery (mean 67.3 months). The mean number of bleb needlings was 1.2 and the mean number of 5-fluorouracil subconjunctival injections was 3.9.

**Results:** The mean intraocular pressure (IOP) before needling was 26 mmHg and the mean anti-glaucoma medications was 1.3 per eye. The mean postoperative IOP was 16.3 mmHg and mean anti-glaucoma medications 0.7. A diffuse filtering bleb was evident in 12 eyes (54.5%). The results of needling were worse in eyes subjected to previous surgery for glaucoma or other failed bleb needling procedures (75% failure).

**Conclusion:** Needle revision of the filtering bleb is a simple and safe technique that offers good results even years after a filtering surgery had been perfor-

#### RESUMEN

**Objetivo:** Analizar los resultados de la cistitomía de la ampolla de filtración en ojos operados de cirugía filtrante de glaucoma seis meses antes o más.

**Material y métodos:** Estudio retrospectivo de 23 ojos de 21 pacientes en los que se ha realizado revisión de la ampolla de filtración con una aguja de 25 G, entre 6 meses y 23 años tras cirugía filtrante (media 67,3 meses). Se realizaron una media de 1,2 cistitomías por ojo y 3,9 inyecciones de 5-fluorouracilo subconjuntival.

**Resultados:** De una presión intraocular (PIO) media preoperatoria de 26 mmHg y 1,3 fármacos hipotensores hemos pasado a una PIO media postoperatoria de 16,3 mmHg y una media de 0,7 fármacos, con una ampolla de filtración difusa en 12 casos (54,5%). Los resultados fueron peores en ojos con cirugía previa de glaucoma u otra cistitomía previa fracasada (75% fracaso).

**Conclusiones:** La revisión con aguja es una técnica sencilla y segura que ofrece buenos resultados incluso años después de una cirugía filtrante, y debe ser considerada de manera previa a la reinstaura-

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med. It should be considered before other medical or surgical treatments in patients with a previously functioning bleb and a permeable sclerectomy site at gonioscopy (*Arch Soc Esp Ophthalmol* 2006; 81: 517-522).

**Key words:** Bleb needling, failed filtering bleb, glaucoma surgery, 5-fluorouracil.

ción de tratamiento médico o quirúrgico en los pacientes operados de glaucoma con fracaso tardío de una ampolla de filtración previamente funcionando y esclerectomía abierta en la gonioscopia.

**Palabras clave:** Revisión con aguja, fallo de ampolla de filtración, cirugía de glaucoma, 5-fluorouracilo.

## INTRODUCTION

At present, trabeculectomy is still the most widely used surgical procedure to treat glaucoma; the procedure entails opening a fistula between the eye's anterior chamber and the subconjunctival area, thus generating a subconjunctival reservoir for fluid or filtering bleb. According to the series, this technique has a 67-94% success rate (1).

The procedure may fail if there is a failure of the filtering bleb, which might take place both early and late during the period following surgery. Factors leading to failure are those which in some way spur subconjunctival fibrotic proliferation, including previous conjunctival surgery, inflammation, aphakia, neovascular glaucoma and past use of anti-glaucoma drugs (2).

Use of antimetabolic drugs and careful supervision during the period following surgery, together with handling of the filtering bleb whenever necessary, may contribute to a successful filtering surgery. Several studies have shown that cystitomy or filtering bleb needle revisions combined with subconjunctival injections of 5-fluorouracil (5-FU) may restore failed blebs soon after completing the trabeculectomy (1-3). Nevertheless, evidence regarding the efficiency of such procedure late during the period following surgery is limited (4).

The present paper aims at proving the efficiency of cystitomy combined with 5-FU in treating non-operating filtering blebs 6 months or more after undergoing filtering surgery.

## SUBJECTS, MATERIAL AND METHODOLOGY

A retrospective survey was undertaken on 23 eyes coming from 21 patients who underwent glaucoma filtering surgery between 6 months and 23 years earlier (63.3 months on average) and during

which, due to bleb failure, a filtering bleb needle revision was prescribed together with subconjunctival 5-FU. The outcome of this procedure was then analyzed.

Among the inclusive criteria, a history of filtering surgery 6 months earlier and the presence of a filtering bleb with open sclerotomy confirmed by gonioscopy were taken into account. The following descriptive parameters were studied: age, gender, type of glaucoma, type of filtering surgery and time elapsed since then, intraocular pressure (IOP), number of hypotensor drugs and bleb morphology prior to surgery, subjectively assessed and classified by the observer as cupuliform, diffuse, thick diffuse, localized, multicystic, flat, deep and cystic.

The sample included 13 females and 10 males whose ages ranged from 56 to 80 years old (70.4 years on average). In 18 out of 23 cases (78.3%) diagnosis was open-angle primary glaucoma, narrow angle glaucoma in 2, while the remaining cases showed pigmentary glaucoma, post-traumatic glaucoma and pseudoexfoliative glaucoma. With respect to previous surgical procedures, 12 out of 23 cases underwent trabeculectomy, 4 non-penetrating deep sclerectomy, 4 phacotrabeculectomy, the remaining 3 corresponding to trabeculectomy revisions, one of them combined with 5-FU, plus one trabeculectomy with mitomycin C. The time elapsed since filtering surgery ranged from 6 months to 23 years (67.3 months on average).

The IOP and number of pre-surgical hypotensor drugs are shown in table I.

Bleb morphology was cupuliform in 13% of cases, diffuse in 8.7%, thick diffuse in 13%, localized in 26.1%, multicystic in 8.7%, flat in 21.7%, deep in 4.3% and cystic in 4.3%.

Several risk factors were taken into account, such as the presence of glaucoma of difficult diagnosis (inflammatory, congenital, traumatic, postkeratoplasty), previous cataract surgery, recent conjunctival surgery (less than 6 months) and reintervention.

**Table I. IOP and Treatment After and Before Surgery**

	N	Range	Average and SD
Pre-surgical IOP	23	16-38	25.3 ± 6.0
N. Cystitomies	23	1-2	1.2 ± .4
N. Injections	23	2-7	4 ± 1.5
Post-operative IOP	23	0-22	10.1 ± 6.7
1-week IOP (mmHg)	23	1-36	13.7 ± 9.3
1-month IOP (mmHg)	23	6-32	17.3 ± 7.1
2-month IOP (mmHg)	20	20-7	40 ± 17.5
3-month IOP (mmHg)	21	7-42	17.7 ± 7.4
6-month IOP (mmHg)	15	12-22	16.7 ± 3.2
Final IOP (mmHg)	23	7-26	16.3 ± 4.1
Follow-up (months)	23	16-22	10.2 ± 31.4
Pre-surgical Treatment	23	0-3	1.3 ± .9
Post-operative Treatment	23	0-2	.7 ± .8

IOP: Intra-Ocular Pressure measured in mmHg; N: number of cases; SD: Standard Deviation.

In all cases, an informed consent form was provided prior to surgery, which consisted of puncture of the filtering bleb under subconjunctival anesthesia (1% lidocaine) and controlled via slit lamp. A 25 G needle was used to perform repeated subconjunctival punctures on the filtering bleb in different directions until observing the formation of a diffuse bleb and confirming IOP reduction by means of a Goldmann tonometer. Afterwards, during a second time period, a 5-FU (5mg/0.1 ml) standard dose was injected using a 30 G needle in the subconjunctival area bordering the bleb, repeating 5-FU injections in alternate days up to a maximum of 10 doses with or without cystitomy, depending on IOP evolution and bleb morphology. Post-operative treatment consisted of corticoids and topical antibiotics.

Table I shows the number of cystitomies and 5-FU injections. In most cases, the number of cystitomies performed was 1 (19 eyes), plus 2 cystitomies in 4 eyes; the average number of 5-FU subconjunctival injections was 4.

Patients were again checked at 24 hours, 1 week, 1, 3 and 6 months, and then every 6 months. Average follow-up lasted 10.2 months (1-59 month range). Post-operative parameters under study were IOP, number of hypotensor drugs, bleb appearance and the presence or absence of complications.

Complete success was defined by IOPs smaller than 21 mmHg without hypotensor medical treatment; partial success was defined by IOPs smaller than 21 mmHg with a single hypotensor drug; and

failure was defined by IOPs greater than 21 mmHg or less than 21 mmHg but more than one hypotensor drug.

The subsequent descriptive statistical analysis showed distribution of absolute and relative frequencies. A Chi-square test was used to compare statistical significance for the different proportions. SPSS 8.0, SPSS Inc. (Chicago, Illinois, USA) was the computer program used to perform statistical analyses.

## FINDINGS

Complete success was achieved in 12 patients (52.2%), partial success in 4 (14.4%) and failure in 7 (30.4%). The average post-operative IOP was 16.3 mmHg (7-26 range). IOP evolution and the need for anti-glaucoma treatment after surgery are shown in table I.

As for the number of cystitomies, it was observed that in all cases where only one cystitomy was performed, 11 out of 19 (57.9%) were deemed a complete success, while in 4 cases where 2 cystitomies were performed, only 1 was a complete success (25%).

After analyzing the number of 5-FU injections required by each patient, no relationship was found between this number and success rate, as results were highly variable.

Regarding the type of previous filtering surgery, it was found that in all phacotrabeculectomies (4/4) and most trabeculectomies (9/12), cystitomy was successful. Nevertheless, failure rates were greater in case of reintervention or use of intra-operative antimetabolites, factors associated to surgical procedures with higher risk of failure.

The lesser the number of risk factors, the greater the success rate, with only one case of failure (1/10) among eyes free of risk and only 1 success (1/4) among eyes affected by 2 or more risk factors, the difference being statistically significant ( $p=0.026$ ). As for reintervention, those eyes not subjected to reintervention reacted better to cystitomy and had greater success rates ( $p=0.013$ ) as shown in table II.

No relationship was found between previous morphology and the outcome of cystitomy, so that any morphology may be successful. In 7 out of 12 cases of complete success, a bleb of diffuse morphology was present (63.6%). Similarly, it was observed that in 5 out of 7 failures the bleb adopted a flat morphology.

Finally, complications during and after surgery and their relationship with the outcome of cystitomy were analyzed. During surgery, we experienced two cases of blood flow into the anterior chamber. In one of those cases, cystitomy resulted in a partial success, while the other failed.

As for post-operative complications, 1 case of athalamia was a complete success and 2 cases of secondary superficial keratitis due to 5-FU toxicity were solved without further consequences. These cases resulted in one partial success and one failure.

### DISCUSSION

Generally, in our series, IOPs smaller than 21 mmHg were obtained without antiglaucoma drugs in 52.2% of cases and with just one antiglaucoma drug in 17.4% of cases. The starting point was an average IOP of 25.3 mmHg; after an average follow-up of 10.2 months, IOPs after cystitomy averaged 16.3 mmHg. Similarly, the average number of hypotensor drugs decreased from 1.3 pre-surgical drugs down to .7 post-operative drugs.

Thus, cystitomy combined with subconjunctival 5-FU may be described as a useful procedure to restore function in the event of late failure of the filtering bleb.

The literature reviewed suggests that success rates for cystitomy during filtering bleb revision vary from 28 to 92% (2). Nonetheless, conditions are not the same in all series. Ewing and Stamper (5) revised blebs with 5-FU in 12 patients with premature bleb failure, obtaining efficacy ranges for this procedure between 63.6 and 91.6% depending on the number of 5-FU injections. Ophir et al (6) submitted their results for 8 eyes early during the period following surgery, IOPs decreasing from 31

SD 5.7 mmHg to 15.5 SD 2.6 mmHg with .6 SD 0.9 mmHg hypotensor drugs. Hawkins et al (7) obtained from their 43-eye series a 53.5% success rate. Shin et al (8) studied 64 eyes and reported 45% success rate, whereas Broadway et al (9) surveyed 101 eyes with bleb failure, obtaining a 59.4% success rate.

No significant statistical relation between the type of previous filtering surgery and the cystitomy outcome. All phacotrabeculectomies and 75% of trabeculectomies responded positively to cystitomy, while in surgical revisions or reinterventions there was an increased rate of cystitomy failure. It is obvious that the existence of a greater number of associated risk factors and reinterventions, the procedure's outcome will not be as favorable. In our series, 92.3% of non-reintervenied cases and 83.3% of cases with one or no risk factor involved were successful. In both instances, the difference was statistically significant.

The majority of cases in our series responded to just one cystitomy. It seems that repeated cystitomy on scar tissue spur fibroblastic overstimulation which translates into a new and larger scar (5).

In our series, the number of 5-FU injections was customized for each patient based on changes applied to IOPs and on filtering bleb morphology. The emergence of toxicity to 5-FU requires suspending its administration, although toxicity is rare and high doses are needed to trigger an event (5). Toxic corneal epitheliopathy is the most frequent toxic effect of 5-FU. This toxic effect may be avoided by washing the ocular surface after administration and using moisturizing eye drops. Two cases were solved without any sequels. It is also the most widely reported toxic effect in other series (1-5); Ewing and Stamper (5) reported it for 5 out of 7 eyes (71.4%); Goldenfeld et al (10) reported it in 44% of cases; and Durak et al (1) reported it in 3 out of 53 eyes (5.7%). Compared to the above series, lower rates of toxic epitheliopathy associated with 5-FU were obtained through careful washing after cystitomy with plenty of saline solution and the use of artificial eye drops. Another less frequent yet more important toxic effect was corneal edema due to endothelial damage, usually reversible (11).

Swing and Stamper (5) also described the emergence of complications such as hyphema and hypothalamia. Hawkins et al (7) underlined one case of suprachoroidal hemorrhage. In any event, complications arise less frequently in all series, and

**Table II. Relationship between Cystitomy Outcome and a History of Previous Reinterventions (p=0.013)**

Reintervention	Result			Total
	Failure	Partial success	Complete success	
No	1 (7.7%)	2 (15.4%)	10 (76.9%)	133 (100.0%)
Yes	6 (60.0%)	2 (20.0%)	2 (20.0%)	10 (100.0%)
<b>TOTAL</b>	<b>7</b> (30.4%)	<b>4</b> (17.4%)	<b>2</b> (52.2%)	<b>23</b> (100.0%)

when they do they are solved in a few days with a conservative treatment.

Filtering blebs are clinically described based on their elevation, vascularization, range and presence or absence of microcysts. The ideal bleb presents a diffuse appearance, slightly elevated and localized on the bleb's wall, thus reducing the risk of gradual thinning at that level (5). Diffuse fibrosis of the episcleral tissue turns the bleb into a flat and vascularized structure which leads to failure of the filtering procedure. The use of 5-FU helps decreasing adherences between the conjunctiva and the underlying tissue, favoring the formation of diffuse blebs. Nevertheless, one should keep in mind the fact that antimetabolites may sometimes result in thin and avascular wall blebs, less than ideal traits after filtering surgery (3).

In our series, most blebs reacted to cystotomy and 5-FU by adopting a diffuse morphology.

As for complications, the technique was found to be safe and associated with very few complications. In our series, there were 2 cases of blood flow into the anterior chamber during surgery, and 1 case of athalamia and toxic corneal epitheliopathy after surgery.

Thus, it might be said that transconjunctival cystotomies or 25 G needle revisions of the filtering bleb are efficient, simple procedures with scarcely any complications, and subsequently they should be considered prior to prescribing other medical treatments or reintervention in the event of late failure of the filtering bleb after filtering surgery.

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