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Research Article

Micropulse Transscleral Cyclophotocoagulation as Adjuvant Therapy to Ahmed Valve Implantation at the Military Central Hospital

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Abstract

Introduction: Our goal is IOP evaluation after micropulse transscleral cyclophotocoagulation as adjuvant therapy to Ahmed valve implantation.

Methods: This is a descriptive, comparative, retrospective, observational study. The sample was divided into two groups: one group was treated with micropulse transscleral cyclophotocoagulation after Ahmed valve implantation. The other group was only treated with Ahmed valve implantation. The IOP was compared between these two groups at the preoperative visits and on the subsequent 1, 7, 30, 60 and 90 post operative visits.

Results: We registered a 70% IOP reduction (Mean 11 mmHg) on the first postoperative day. During the first week, the reduction was around 72%. Group A had 12 patients (60%) and Group B 8 (40%). When comparing IOP between groups during the 90 days of postoperative follow-up, the mean IOP on Group A was 14.54 mmHg and on Group B was 15.15 mmHg. The results showed no statistical difference (p = 0.7096).

Conclusion: When comparing the Ahmed valve implantation as an only method for IOP regulation with the adjuvant therapy with micropulse transscleral cyclophotocoagulation, the results showed no advantage when using both.

Keywords: *Glaucoma; Cyclophotocoagulation; Transscleral; Micropulse; Valve*

Introduction

Glaucoma is a pathology that affects the nerve fibers of the ganglion cells, causing direct damage to the optic nerve. It is the main cause of irreversible blindness worldwide and its prevalence in the population aged 40 to 80 is estimated at 3.5%. With the increase in the older population, it is expected that by the year 2040 there will be 111.8 million people with glaucoma [1].

The treatment of glaucoma is focused on controlling intraocular pressure, either by reducing the formation of aqueous humor or with therapy that promotes its drainage. Treatment options include: topical medication, laser therapies, minimally invasive surgeries, conventional filtering surgery, aqueous shunt implants, or cyclodestructive procedures [2].

Bypass surgeries

Review publications in recent years suggest that glaucoma drainage implants may have a similar efficacy and safety profile to trabeculectomy with antimetabolites. Drainage or shunt implants versus trabeculectomy demonstrated a similar reduction in intraocular pressure at one year of follow-up [3].

Glaucoma drainage implants provide a large surface reservoir area for aqueous humor drainage and prevent excessive scar tissue formation at the limbus, compared to conventional filtering surgery [4]. After implantation of a drainage device, a phase of ocular hypotension occurs which subsequently normalizes (intermediate period) during the early postoperative period. After several weeks, the hypertensive phase may occur [5]. This is defined as intraocular pressure > 21 mmHg in the first 3 months after surgery, and is not attributable to tube obstruction, retraction or valve malfunction [6].

Transscleral cyclophotocoagulation with micropulsed laser

Among the cyclodestructive options are cryotherapy and laser cyclophotocoagulation. In its trans-scleral application, infrared light is applied, which is absorbed by the pigmented epithelial cells in the ciliary body, resulting in its destruction and necrosis of the stroma. Some short- and long-term complications are: corneal edema, hypotonia and phthisis bulbi, which is rare [7].

The micro-pulsed diode laser has a significant short-term ocular hypotensive effect and a favorable safety profile, which is why we seek to determine the effectiveness of the application of transscleral cyclophotocoagulation with micro-pulsed laser as an adjuvant therapy in the control of intraocular pressure in patients undergoing Ahmed valve implantation [8] and whether it represents a therapeutic advantage in order to avoid the hypertensive phase after its implantation.

Objective of the Study

The study aims to evaluate intraocular pressure in patients who received transscleral cyclophotocoagulation with micro-pulsed laser together with Ahmed valve placement and compare the effect on intraocular pressure of both therapies against intraocular pressure after Ahmed valve implantation and Ahmed only.

Materials and Methods

It was carried out at the Central Military Hospital, during the period from March to October 2022. In patients with the indication to place an Ahmed valve. The population was divided into two groups: Group A includes patients who require a valve and who additionally undergo trans-scleral cyclophotocoagulation with micro-pulsed laser, and group B only includes patients with an Ahmed valve. The results of preoperative intraocular pressure and post operative evaluation on days 1, 7, 30, 60 and 90 were compared between both groups.

This is an observational, descriptive, retrospective, cross-sectional, comparative study.

Among the inclusion criteria are:

- Records of patients with glaucoma.
- Records of patients who have undergone Ahmed valve placement surgery.
- Records of patients who have undergone Ahmed valve placement surgery plus application of transscleral cyclophotocoagulation with micro-pulsed laser.
- Patients over 18 years of age.

And as exclusion or elimination criteria:

- Records of patients who underwent Ahmed valve placement surgery in combination with another ophthalmologic surgical intervention other than the application of trans-scleral cycle photocoagulation with micropulsed laser.
- Records of patients whose intraocular pressure could not be measured by Goldman tonometry.
- Patients with incomplete records.
- Patients who did not comply with follow-up on postoperative days 1, 7, 30, 60 and 90.

Results

A total of 20 patients, mostly between 35 and 65 years old, were included in the study. From the total, 70% (n = 15) were women and 30% (n = 6) were men. Likewise, 65% of the population had primary open-angle glaucoma and 40% (n = 8) had undergone some previous surgery (Table 1).

Age	**Frequency (#)**	**Frequency (%)**
18 - 35 years	1	5
35 - 65 years	15	75
> 65 years	4	20
Gender	**Frequency (#)**	**Frequency (%)**
Femenine	14	70
Masculine	6	30
Classification of Glaucoma	**Frequency (#)**	**Frequency (%)**
Primary Open Angle Glaucoma	13	65
Neovascular Glaucoma	2	10
Other	5	25
Previous Ocular Surgery	**Frequency (#)**	**Frequency (%)**
Yes	8	40
No	12	60

Table 1: *Sample's characteristics (n = 20).*

Regarding the evaluation of intraocular pressure of our sample, an average preoperative IOP of 36 mmHg was obtained and on day 1 of surgery, an average IOP of 11 mmHg; which meant a 70% reduction when compared to the initial IOP. On day 7, an average IOP of 10 mmHg was recorded, which meant a constant decrease in IOP of 72% from the initial IOP. However, after this downward trend, on day 30 an increase in IOP was recorded to 20 mmHg on average and it was maintained on days 60 and 90 with an average of 19 mmHg. Despite this increase, it is still a significant decrease compared to preoperatively IOP of 45% and 46% respectively (Table 2 and figure 1).

IOP	**Mean IOP (mmHg)**	**IOP Relative Reduction (%)**
Preoperative	36	-
Post operative day 1	11	70
Post operative day 7	10	72
Post operative day 30	20	45
Post operative day 60	19	46
Post operative day 90	19	46

Table 2: *IOP reduction.*

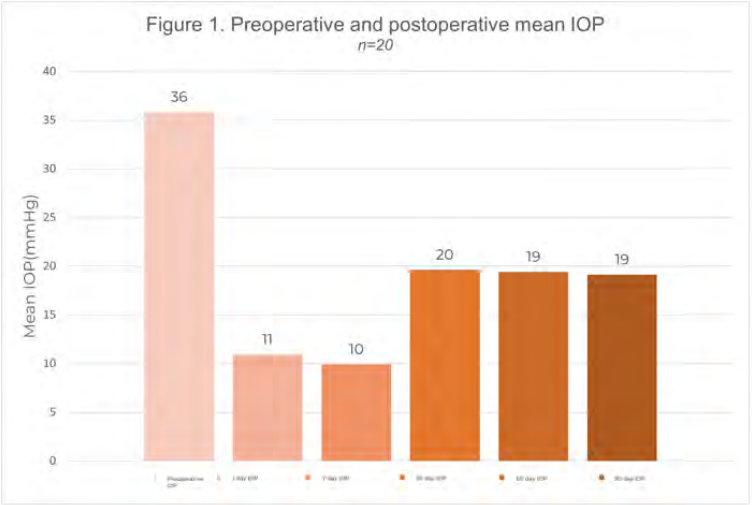

Figure 1: *Preoperative and postoperative mean IOP (n = 20).*

When comparing the results between both groups, group A, with 12 patients (60%) presented a total average IOP of 14.54 mmHg; while group B, with 8 patients (40%), had 15.15 mmHg.

Due to the small number of patients, the statistical data were not significant (p = 0.7096), which means that there is no significant difference between the intraocular pressures of group A with those of group B, thus concluding that it does not demonstrate a significant difference in the decrease in the application of transscleral cyclophotocoagulation with micro pulsed laser together with the Ahmed valve implantation (Table 3 and figure 2).

Group	No. patient	IOP: day 1	IOP: day 7	IOP: day 30	IOP: day 60	IOP: day 90
Group A: AVI + CPCMPL	1	1	18	18	12	10
	3	10	10	14	22	22
	5	47	2	12	22	22
	8	2	5	12	40	18
	9	31	13	10	10	10
	10	5	11	18	30	22
	12	8	10	12	14	25
	13	9	7	6	6	12
	16	18	18	17	17	17
	17	14	11	35	12	14
	19	7	14	12	14	12
	20	10	9	12	10	12
Mean IOP		13.5	10.7	14.8	17.4	16.3

Group B: AVI	2	5	5	20	18	18
	4	5	13	14	13	12
	6	11	12	33	14	37
	7	11	15	17	14	17
	11	10	12	22	14	14
	14	6	6	14	17	16
	15	4	12	17	23	26
	18	20	3	31	24	11
Mean IOP		9.0	9.8	21.0	17.1	18.9
T student Analysis		Group A (Mean)		Group B (Mean)		P value
	14.54		15.15		0.7096	

Table 3: *IOP group comparison.*

**AVI: Ahmed Valve Implantation; CPCMPL: Cyclophotocoagulation with Micropulsed.*

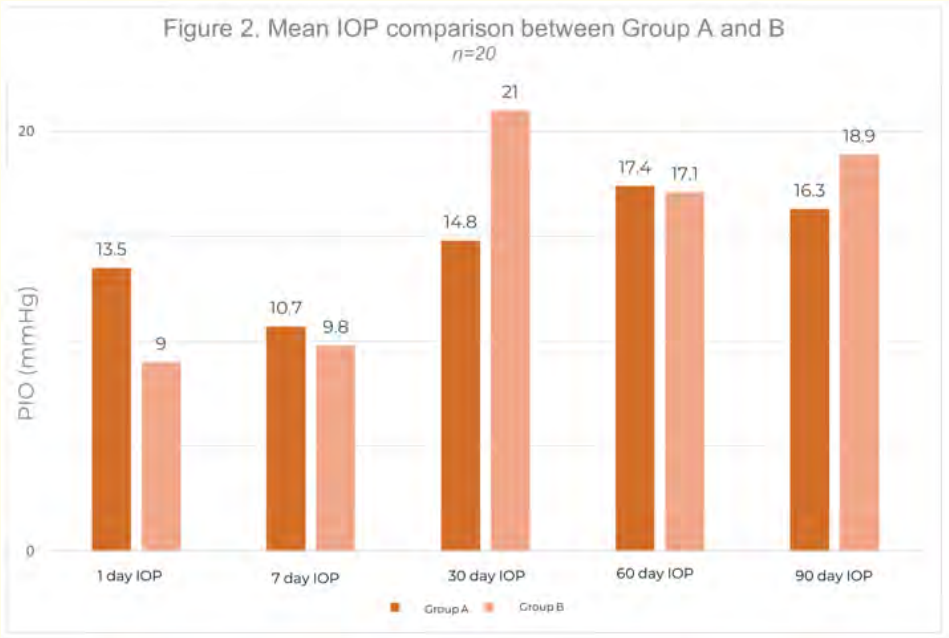

Figure 2: *Mean IOP comparison between group A and B (n = 20).*

However, during the follow-up, a hypertensive phase was found after valve implantation: group A had 3 patients (25%) and only 2 patients (25%) in group B.

Discussion

In both groups, a considerable decrease in intraocular pressure was obtained after the intervention, when compared to preoperative pressure. However, when analysing the results between both groups, no significant difference was identified (p = 0.7096).

This allows us to affirm in this study that the application of the transscleral cyclophotocoagulation with micro-pulsed laser can be ruled out to increase the hypotensive effect of the joint surgical act, and does not represent an advantage to prevent the hypertensive phase after the implantation of Ahmed valve.

In both groups, a significant decrease in IOP of 70% was obtained the day after the intervention, which remained at 72% on day 7 and 46% on day 90 after the surgical intervention. These results are similar to studies carried out by several authors such as JC Das., *et al*. (2005) [9, 10].

In our study, there was a lower prevalence of the hypertensive phase than that reported in the literature by Molteno and Dempster, as well as Nouri-Mahdavi., *et al*. (2003) [11].

The main limitation of the study is the insufficient sample of patients, as there were incomplete clinical records, which had to be eliminated from the database.

We consider as a good area of opportunity the possibility of continuing the study of adjuvant therapies to the placement of the Ahmed valve in order to determine if there is an advantage in postoperative IOP, as well as to assess a synergistic effect to avoid the hypertensive phase [12-20].

Conclusion

In this study, the intraocular pressure was evaluated in patients who received transscleral cyclophotocoagulation with micropulsed laser in conjunction with the placement of the Ahmed valve at the Central Military Hospital and compared the preoperative and post operative results versus those who only underwent surgery with the Ahmed valve implant.

With the results obtained, it is not possible to determine a significant difference in IOP within 90 days after the surgical intervention between both groups, so we conclude that combining both procedures does not represent a therapeutic advantage. We consider that further studies are needed with a larger sample, as well as evaluating the application of different therapies.

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