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Journal of Eye Diseases and Disorders

Research Article

Treatment of the Refractory Glaucoma by the MicropulseTranscleral Diode Laser Cyclophotocoagulation

Mehdi Khamaily*, Imane Tarib, Yassine Mouzari, Joumany Brahim Salem, Taoufik Abdellaoui, Fouad El Asri, Karim Reda, Abdelbarre Oubaaz

Department of Ophthalmology, Faculty of Medicine, Mohammed V Military Teaching Hospital, Rabat, Morocco

ABSTRACT

Purpose: To describe our clinical experience with the efficacy and safety of micropulse transscleralcyclophoto coagulation as a alternative treatment for refractory glaucoma.

Methods: It is a prospective, non-comparative, longitudinal interventional study conducted on 26 eyes, which presented refractory glaucoma, treated and followed at the Mohammed V Military Teaching Hospital, for a period of one year, between January 2019 and January 2020.

Eligible patients underwent a standardized cyclophoto coagulation treatment with micropulsed diode laser by placing the probe 1 mm from the limbus, for 90 seconds over 360 ° while sparing the meridians of 3h and 9h to avoid the branches of the anterior ciliary artery and the posterior ciliary nerves, we used a power of 2000mw, a cycle of 35 ms.

Results: We included 18 men and 8 women in our study, the average age is 62.78 ± 6.33 years, 19 patients who were under an average of 3.21 ± 1.33 treatment molecules.

19 patients were on 4 or more treatment molecules and the visual acuity was between negative light perception and 3/10.The average IOP at 6 weeks postoperatively decreased with an average of 17.31 ± 4.91 mmHg which is a decrease of 56.08% .The decrease in IOP at 6 weeks as well as the number of therapies per patient experienced a significant drop with a p value <0.001 in comparison with the preoperative values.

Conclusion: The transcleral Micropulsecyclo coagulation proved good results in the management of refractory glaucoma, in comparison to the Nd: YAG laser technique. Certainly, further follow up for long-term results is essential.

Keywords: Refractory glaucoma; Intraocular pressure; Laser micropulse

INTRODUCTION

Glaucoma is a major cause of irreversible blindness worldwide.

Existing therapies aim either to increase the flow of aqueous humor or to decrease its production in order to decrease intraocular pressure and preserve the residual function of the optic nerve.

Refractory glaucoma is known as glaucoma resistant to medical and / or surgical management [1].

Between non-compliance with lifelong medical treatment and invasive surgery, from classic trabeculectomy to state-of-the-art microinvasive glaucoma surgery MIGS, the emergence of lasers in the treatment of glaucoma has been developing in recent years given its ease of use, the non-invasive nature of the treatments, repeatability, cost effectiveness and long-term disease control.

Cyclo weakening with micro pulsed laser is a final solution for the management of this type of glaucoma especially after having used all the methods of medical or surgical management.

This type of laser consists in weakening of the ciliary body by targeting the melanin contained in its pigmented epithelium, thus resulting in a decrease in the secretion of aqueous humor [2].

Correspondence to: Khamayli M, Department of Ophthalmology, Faculty of Medicine, Mohammed V University, Rabat, Morocco, E-mail: mehdi.khamaily@gmail.com

Received date: July 02, 2020; **Accepted date:** July 15, 2020; **Published date:** July 22, 2020

Citation: Khamayli M, Tarib I, Mouzari Y, Salem JB, Abdellaoui T, Asri FE, et al. (2020) Treatment of the Refractory Glaucoma by the MicropulseTranscleral Diode Laser Cyclophotocoagulation. J Eye Dis Disord 5: 136. DOI: 10.35248/2684-1622.20.4.136

MATERIALS AND METHOD

Patient selection

It is a prospective, non-comparative, longitudinal interventional study conducted on 26 eyes, which presented refractory glaucoma that was non responsive to maximum medical treatment. All patient were seen, treated and followed at the Mohammed V Military Teaching Hospital, for a period of one year, between January 2019 and January 2020.

Informed consent was signed by all of our patients after explaining the entire procedure, alternatives, benefits and risks of this surgical technique.

We included in our study, all advanced glaucomatous patients, with high IOP not controlled by maximum treatment, with decreased visual acuity.

We have excluded congenital glaucoma and any patient who has undergone cyclo-destruction or filtering surgery.

Preoperative examination

All patients underwent a pre-operative eye exam, starting with meticulous anamnesis revealing all medical and surgical history and the list of hypotensive treatments used.

Then, we performed in all patients examination of the anterior segment with the slit lamp, with gonioscopy and IOP measurement with Goldman's applanation tonometer, as well as a fundus.

All patients stopped prostaglandin analogs eyedrops 24 hours before surgery.

Transcleralcyclophotocoagulation with micopulsed laser

In the operating room, under retrobulbar anesthesia (Lidocaine 2% and Bupivacaine 0.75%), our patients underwent a standardized cyclophotocoagulation treatment with micropulsed diode laser by placing the probe 1 mm from the limbus, for 90 seconds over 360 ° while sparing the meridians of 3h and 9 h to avoid the branches of the anterior ciliary artery and the posterior ciliary nerves, we used a power of 2000 mw, a cycle of 35 ms.

An eye patch for 24 h was prescribed d with a prescription of Dexamethasone eye drops in decreasing doses for 1 month.

Post-operative examination

A postoperative follow up examination on Day 1 was indicated to watch out for inflammatory complications, with measurement of the IOP on Day 1, Day 7, 1 month and 3 months postoperatively.

RESULTS

We included 18 men and 8 women in our study, the average age is 62.78 ± 6.33 years, 19 patients who were under an average of 3.21 ±1.33 treatment molecules, except for one patient who had an allergy to all eye drops.19 patients were on 4 or more treatment molecules. The visual acuity was between negative light perception and 3/10, Preoperative IOP was an average of 39.42 ± 5.6 mmHg.

At Day 1 post op the IOP was 25.12 ± 7.43 mmHg on average, at Day 7 post op it was 20.44 ± 6.02 mmHg, and 22.06 ± 7.41 mmHg thirty days post op. Corticosteroid therapy was stopped on this Day 30 post op visit.

The average IOP at 6 weeks postoperatively decreased with an average of 17.31 ± 4.91 mmHg which is a decrease of 56.08%. All patients switched to an average of 1.60 ± 0.91 treatment molecules.The decrease in IOP at 6 weeks as well as the number of therapies per patient experienced a significant drop with a p value<0.001 in comparison with the preoperative values.

DISCUSSION

At one point, Nd YAG laser cyclodestruction was the treatment of choice for refractory glaucoma followed by cyclo-cryotherapy, despite their serious side effects, major inflammatory reactions as well as the phtysis of the eyeball.

The transcleralcyclo-weakening of the ciliary body by the use of the diode laser (810 nm) has been found to be as effective with less post-operative inflammatory reaction and this is due to the melanin absorption of the pigmented epithelium which is three times greater for a wavelength at 810 nm than for a wavelength at 1064 nm, thus resulting in a similar histological effect for a lesser diode laser energy.

The protocol followed

Douglas E. Gaasterland suggested a therapeutic protocol based on iris pigmentation.

In the vast majority of published studies, the power used was 2000 mw, with a variable duration ranging from 50 sec to 130sec, an average of 90 sec per hemi-meridian while avoiding the meridians of 3h and 9h, and this is the protocol we followed in our study [4].

Results on the IOP

Several studies have shown the effectiveness of micropulsetranscleralcyclophotocoagulation with a variable IOP reduction rate ranging from 27% (Yelenski and Al 2018) to 63% (Abderrahman and Al 2020) [5,6].

We have found that the more advanced the glaucoma is; the lower the response to the treatment, especially in neovascular glaucoma, congenital and juvenile glaucoma.

In our series, the decrease in IOP was 51% at 1 month post-operatively and which further decreased after resuming local corticosteroid therapy, these results are similar to those in the literature [7]. Additionally, the definition of therapeutic success is not yet well defined, but the significant drop in IOP remains the benchmark for success of this surgery.

A recent study by Abdallah Mohsen showed the interest of the UBM in controlling the effectiveness of transscleralmicropulsecyclocoagulation by monitoring the reduction in the size of the ciliary process in the treated area

compared to the virgin area, and thus used the absence of this reduction as a parameter to prescribe a second treatment [6].

Complications

They are dominated by the inflammation of the anterior chamber which occupies the first place, and which is most often moderate and resolving under local anti-inflammatory treatment, followed by conjunctival hyperemia.

The color of the iris, in particular the dark irises, is often incriminated as a factor favoring post-operative inflammation, something that was contradicted by Medow who found no difference in ciliary pigmentation between brown eyes and light eyes by endoscopy [8].

Ocular burns are less described in the cyclo weakening with the diode laser and this is because of the use of a probe which allows to exert a scleral pressure to increase the percentage of energy transmitted to the ciliary body while decreasing the retro-diffusion, thus avoiding damage to adjacent tissue [9].

In our series we had no cases of eye burns.

Another factor reported in literature is the presence of peri-limbic pigmentation, being a factor of decreased success rates of the treatment, the conjunctival pigmentation absorbing enough energy to cause surface burns and decreasing the energy transmitted to ciliary body [10].

Hyphemas, especially in cases of neovascular glaucoma were described, chronic uveitis persistent as well as ocular hypotonia [11].

No case of sympathetic ophthalmia has been reported as it is the case with Nd: YAG laser photocautery (7 cases) [12].

CONCLUSION

The transcleralMicropulsecyclocoagulation proved good results in the management of refractory glaucoma, in comparison to the Nd: YAG laser technique, by its effectiveness in significantly reducing IOP, as well as its tolerance and efficiency. Avoiding serious complications including major hypotonia and phthisis of the globe.

Certainly, further follow up for long-term results is essential, however, all these encouraging results allow to consider extending the indications of transscleralmicropulsecyclocoagulation in particular for less severe glaucoma.

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