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SELECTIVE LASER TRABECULOPLASTY VS MICROPULSE LASER TRABECULOPLASTY FOR THE TREATMENT OF OPEN ANGLE GLAUCOMA AND OCULAR HYPERTENSION

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ABSTRACT

Controlled, prospective, longitudinal, clinical trial with the objective to compare the efficacy of the micropulse laser trabeculoplasty (MLT) and the selective laser trabeculoplasty (SLT) in patients with open angle glaucoma or ocular hypertension. Patients were divided into two groups depending on the laser procedure, the group 1 was treated with SLT and the group 2 was treated with MLT; then they were followed for 3 months. 67 eyes were included in the trial (SLT: 38 eyes of 24 patients and MLT: 29 eyes of 19 patients). The average of age of the patients treated with SLT was 68.4 ± 8.8 years and with MLT 77.7 ± 7.3 years. The previous IOP was similar in both groups (SLT: 19.53 ± 4.03 mmHg, MLT: 19.76 ± 4.23 mmHg), a week after treatment (SLT: 18.53 ± 4.08 mmHg, MLT: 17.14 ± 5.19 mmHg), at month (SLT: 14.79 ± 2.42 mmHg, MLT: 16.26 ± 3.39 mmHg) and at 3 months (SLT: 15.66 ± 2.48 mmHg, MLT: 15.83 ± 3.19 mmHg). The percentage of IOP reduction was 19.81% with SLT and 19.89% with MLT. There was no statistically significant difference between the average IOP of both groups over 3 months of follow up. There was no difference in the number of drugs previous and posterior to the procedures, and there was not observed complications at any of the groups. The IOP-lowering effect of SLT and MLT was similar over 3 months in this group of patients and both proved to be safe procedures.

Keywords: Glaucoma, Selective Laser trabeculoplasty, Micropulse Laser Trabeculoplasty, intraocular pressure.

1. INTRODUCTION

The primary open angle glaucoma is the cause of the 40.6% of all glaucomas in Mexican population [(1)] , been the most common, like around the world. This makes the innovation in the treatment of this pathology a great relevance investigation topic.

At present the treatment of glaucoma keeps being based on the reduction of the intraocular pressure (IOP), for what we have available the topical or oral medication, laser therapy and, the last option, glaucoma surgery, that can lead multiple complications. This has converted the laser trabeculoplasty, that have showed the same efficacy in IOP reduction of medication without the secondary effects, in the chosen method for the treatment of several glaucoma forms, and especially when the medical therapy is not tolerated or there is not compliance with the treatment [(2)].

In 1979 was introduced the use of laser in the glaucoma treatment, the Argon Laser Trabeculoplasty (ALT), being the first laser procedure on the trabecular meshwork (TM) to demonstrated a sustained IOP reduction [(3,4)], but having as main secondary effect the thermal damage to the surrounding tissues, generating peripheral anterior synechiae [(5)]. Later in 1995 the selective

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laser trabeculoplasty (SLT) was initiated with YAG laser, acting at the cellular level, favoring migration process, the phagocytosis of the TM debris and stimulating the healthy tissues; thereby improving the outflow of the aqueous humor without thermal damage [3].

The micropulse diode laser trabeculoplasty (MLT) is one of the most recently introduced procedures, this acts liberating energy with a low micropulse radiation to the TM pigmented cells, increasing their permeability through the liberation of inflammatory cytokines, decreasing thus IOP, without the formation of scar tissue [6].

Multiple studies have been conducted demonstrating the efficacy of SLT and MLT in reducing IOP separately, or in comparison to ALT, but the information where SLT is compared to MLT is very poor, so we carried out this study to compare these two procedures and evaluate their effectiveness in our population.

2. METHODOLOGY

Laser trabeculoplasty was performed in 121 eyes (59 SLT and 62 MLT) of 77 patients at the Hospital "Nuestra Señora de la Luz" I.A.P., in Mexico City, from March to September 2016. Previous approval of the study by the Ethics committee of the hospital and signing of consent by patients. There were included patients between the ages of 35 and 80 years old, with a diagnosis of open angle glaucoma (primary open angle glaucoma, pigmentary glaucoma, pseudoexfoliation glaucoma) or ocular hypertension, whether or not undergoing topical hypotensive treatment without Tonometric control or that they were intolerant to medical treatment, with the possibility of attending a consultation periodically during the time of study.

Patients with a history of uveitis in the last six months, poor visualization of the trabecular meshwork, advanced disease requiring surgical treatment, and those who did not agree to the procedure were excluded. In addition, those who did not continue to follow up or did not comply with the indicated treatment were eliminated. Patients were divided into two groups according to the type of laser trabeculoplasty that was performed, at the convenience of the time we have the micropulsed laser equipment. Group 1 treated with SLT, patients treated from March to June, and group 2 treated with MLT, patients treated from July to September.

All patients in the pre-procedure study had a complete ophthalmologic examination including: visual acuity with Snellen card, biomicroscopic examination with slit lamp, IOP with Goldman tonometer, gonioscopy with four mirror goniolens, clinical evaluation of the optic nerve and posterior pole with 90D lens, pachymetry and visual fields and/or OCT of nerve fibers layer.

The application of the laser was carried out by the glaucoma fellows, under the following parameters: **Group 1 SLT** (Lightlas SeLecTor deux de Lightmed): 180° of the TM (superior or inferior), exposure time prefixed 3n/s, spot size 400µm, power beginning with 0,6mJ/pulse, and increasing it 0,1mJ/pulse to the level whose effect is immediately below the production of bubbles. **Group 2 MLT** (TruScan de Lightmed): 360° of the TM, with prefixed parameters, wavelength 577nm, duty cycle 15%, power 1000mW, spot size 300µm and treatment duration 0.3 seconds.

For both groups were instilled drops of topical anesthetic of tetracaine, 2% pilocarpine, and alphaagonist to prevent hypertensive spikes, prior to the placement of a Hwang-Latina contact lens with coupling substance hypromellose 2%. After treatment, prednisolone 1%, 1 drop C / 6 hours for one week was prescribed. If the patient was under topical hypotensive treatment, it continued to be applied in the same way prior to the application of the laser. Patients were followed: At 1 week, 1 month and 3 months. In each post-laser consultation, visual acuity (VA), anterior chamber inflammation, and intraocular pressure were evaluated and the use of ocular hypotensors or treatment modification prior to laser application was determined.

Data collection was done in Excel 2016 spreadsheet, once the observation time was completed the data was emptied in the program GraphPad Prism 5 for Microsoft Windows. The difference of means was analyzed using the ANOVA test for repeated measures, taking as the dependent variable the IOP and time as independent variable (1 week, 1 month

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and 3 months). We considered statistical significance with a value of p <0.05.

Table 1. Baseline characteristics

	SLT (n=38)	MLT (n=29)	*p*
Age (years)	70.08 ± 7.79	71.84 ± 10.16	0.29
Mean baseline IOP (mmHg)	19.53 ± 4.03	19.76 ± 4.23	0.82
Mean # medications	2.90 ± 1.06	3.07 ± 1.16	0.53
Type of glaucoma			
POAG	35	20	
PFXG	2	5	
PIGG	1	4	
OHT	0	0	

IOP=Intraocular pressure, POAG=Primary open angle glaucoma, PFXG = Pseudoexfoliation glaucoma, PIGG=Pigmentary glaucoma, OHT=Ocular hypertension

3. RESULTS

Of the total of 121 treated eyes (59 SLT and 62 MLT), 67 eyes were included. Group 1 (SLT): 38 eyes of 24 patients, 35 (92.1%) had a diagnosis of primary open angle glaucoma (POAG), 2 (5.3%) pseudoexfoliation glaucoma (PFXG) and only 1 (2.6%) pigmentary glaucoma (PIGG), none ocular hypertension (OHT). Twenty-one eyes were excluded, 11 for lack of follow-up and 10 for changes or lack of compliance with their treatment in the follow-up period. Group 2 (MLT): 29 eyes of 19 patients, 20 (69.0%) had a diagnosis of POAG, 5 (17.2%) PFXG, 4 (13.8%) PIGG and no OHT. 33 eyes were excluded, 26 due to lack of follow-up and 7 due to changes or lack of compliance with the treatment.

Of the patients included in the study, 51.2% were male and 48.8% were female. The mean age for patients treated with SLT was 70.08 ± 7.79 years and with MLT 71.84 ± 10.16 years. There was no significant difference between the 2 groups treated in terms of age. The mean IOP of eyes treated with SLT prior to treatment was 19.53 ± 4.03 mmHg, a week after treatment 18.53 ± 4.08 mmHg, at month 14.79 ± 2.42 mmHg and at 3 months 15.66 ± 2.48 mmHg. A statistically significant decrease was found at month and at 3 months of treatment (p <0.0001).

For the MLT treated eyes, the mean baseline IOP was 19.76 ± 4.23 mmHg, at the week after treatment 17.14 ± 5.19 mmHg, at month 16.26 ± 3.39 mmHg and at 3 months 15.83 ± 3.19 mmHg. A statistically significant decrease was observed at a week of treatment (p <0.05), at month (p <0.005) and at 3 months (p <0.005). We did not find a statistically significant difference between the two treatment groups (SLT and MLT), neither before nor after the laser (1 week, 1 month and 3 months), but we can observe that there is a greater number of eyes with a percentage of reduction > 15% with SLT than with MLT, although with MLT there were more eyes that achieved a reduction > 20% in IOP at 3 months follow up.

Table 2. Mean baseline and posterior IOP to SLT and MLT

	IOP media (mmHg)	% IOP Reduction	*p* (ANOVA
SLT (n=42)			
Baseline	19.53 ± 4.03		
1 week	18.53 ± 4.08	5.12%	ns
1 month	14.79 ± 2.42	24.27%	p<0.0001
3 months	15.66 ± 2.48	19.81%	p<0.0001
MLT (n=16)			
Baseline	19.76 ± 4.23		
1 week	17.14 ± 5.19	13.25%	P<0.05
1 month	16.26 ± 3.39	17.71%	P<0.005
3 months	15.83 ± 3.19	19.89%	P<0.005

Table 3. Number of eyes according to reduction percentage of IOP at three months follow up after SLT and MLT.

% IOP reduction	SLT (n=38)	MLT (n=29)
> 30%	9 (23.7%)	9 (31.0%)
> 20%	16 (42.1%)	14 (48.3%)
> 15%	27 (71.0%)	15 (51.7%)
No reduction	6 (15.8%)	5 (17.2%)

In none of the 2 types of procedure (SLT and MLT) was found a significant difference in the use of prior drugs (SLT: 2.89 and MLT: 3.07) and post-treatment drugs (SLT: 2.84 and MLT: 3.07), and we did not observed complications.

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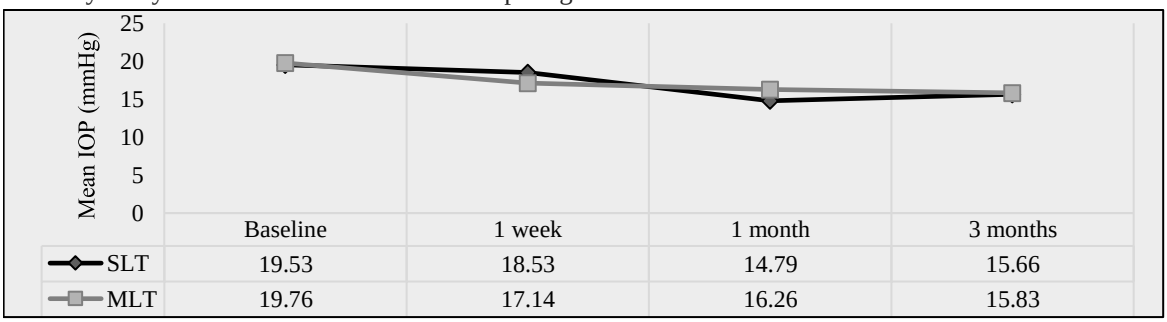
4. DISCUSSION

There was no statistically significant difference in IOP decrease between the two groups at any point in follow-up time (1 week, 1 month and 3 months). Observing at 3 months of follow-up a decrease in IOP of 19.81% with SLT and 19.88% with MLT. We can compare our results with those found by Nagar et al who conclude that with SLT a 20% reduction in IOP is achieved in most patients and without long-term complications[7]. In another study, Lee et al reported an average reduction of 23.8% in all subjects treated with MLT during a 6-month follow-up[6]. Similar results are obtained by Fea et al who report a 22.1% mean IOP reduction with MLT at 12 months follow up[4] and Gossage et al report a 24% IOP reduction in 24 months[8].

The only study we found in the literature comparing MLT and SLT is a preliminary report in ARVO, which shows that both technologies are comparable. They get a significant decrease in IOP in both groups, just like us. In the MLT group they found an average reduction of 3.9mmHg, which we can compare with our results, where we found an average reduction of 3.93 mmHg with the MLT, while with the SLT we found a difference since they reported a reduction of 2.6mmHg, while we observed an average decrease of 3.87 mmHg. They also report with the MLT a slightly greater reduction in the number of drugs compared to the SLT of 0.6 vs 0.1 respectively[5]; we found no difference in drug use in any of the two groups studied.



	Baseline	1 week	1 month	3 months
SLT	19.53	18.53	14.79	15.66
MLT	19.76	17.14	16.26	15.83

Graphic 1. Mean IOP at 3 months of follow-up posterior to SLT and MLT.

5. LIMITATIONS

Our study is limited due to the short follow-up period and sample size, because of the large number of patients who did not complete their follow-up. In addition to not being a double-blind study. We recommend to do more studies related to the topic.

REFERENCES

1. Gilbert-Lucido, ME, García-Huerta M, RuizQuintero N, Gil-Carrasco F, García-López A, Casab-Rueda H. Estudio epidemiológico de glaucoma en población mexicana. Rev Mex Oftalmol. 2010 Jun;84(N°2):86–90.

2. Stamper RL, Lieberman MF, Drake MV, Becker B, Shaffer RN. Becker-Shaffer's diagnosis and therapy of the glaucomas. 8th ed. Edinburgh: Mosby, Elsevier; 2009. 568 p.

3. Wang H, Cheng J-W, Wei R-L, Cai J-P, Li Y, Ma X-Y. Meta-analysis of selective laser trabeculoplasty with argon laser trabeculoplasty in the treatment of open-angle glaucoma. Can J Ophthalmol J Can Ophtalmol. 2013 Jun;48(3):186–92.

4. Fea AM, Bosone A, Rolle T, Brogliatti B, Grignolo FM. Micropulse diode laser trabeculoplasty (MDLT): A phase II clinical study with 12 months follow-up. Clin Ophthalmol Auckl NZ. 2008 Jun;2(2):247–52.

5. Prata T, Almeida Jr, Pinto, Fernandes. Pattern of intraocular pressure reduction following laser

trabeculoplasty in open-angle glaucoma patients: comparison between selective and nonselective treatment. Clin Ophthalmol. 2011 Jul;933.

6. Lee JWY, Yau GSK, Yick DWF, Yuen CYF. MicroPulse Laser Trabeculoplasty for the Treatment of Open-Angle Glaucoma: Medicine (Baltimore). 2015 Dec;94(49):e2075.

7. Nagar M. A randomised, prospective study comparing selective laser trabeculoplasty with latanoprost for the control of intraocular pressure in ocular hypertension and open angle glaucoma. Br J Ophthalmol. 2005 Nov 1;89(11):1413–7.

8. David Gossage. Two-year data on MicroPulse laser trabeculoplasty. EyeWorld.org. 2015 Apr;