

Assessment of Pain During Laser-based Procedures in the Treatment of Glaucoma

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Our study aimed to determine pain levels and the state of welfare connected to laser-based procedures in the treatment of patients diagnosed with uncontrolled glaucoma. The study group included 100 eyes of 100 patients diagnosed with glaucoma, 50 of them being treated with micropulse transscleral laser cyclophotocoagulation, and the other 50 eyes being treated with continuous transscleral laser cyclophotocoagulation. We used visual analog scale to gather information from each patient. After analysing the individual information the following results were obtained: the pain level for the micropulse transscleral laser cyclophotocoagulation was 60.23 mm, signifying moderate pain; and the pain score for the continuous transscleral laser cyclophotocoagulation was 76.34 mm, corresponding to moderate-intense pain. Pain level generated by minimally invasive laser procedures is discussed.

Keywords: *uncontrolled glaucoma, transscleral laser cyclophotocoagulation, visual analog scale*

Glaucoma is defined as a group of diseases presenting as a common feature optic neuropathy. Increased intraocular pressure is the main risk factor in the occurrence of glaucoma, but the existence or absence of an increased intraocular pressure does not define this disease. Glaucoma is characterized by the progressive destruction of optic nerve fibers, which is responsible for the transmission of visual information from the eye to the brain [1].

According to the Romanian Society of Ophthalmology, it is estimated that the number of glaucoma patients worldwide is between 65 and 105 million [2]. Of these, 10% are currently in the bilateral blindness stage. It is estimated that 7.5 million patients with open-angle and dark-angle primitive glaucoma, compared to a population of 1.15 billion [3].

In Romania, there are no official statistics on the number of patients with glaucoma. By correlating with European data, it can be approximated that the number of patients in Romania is approximately 140,000, out of which 132,000 patients with open-angle primitive glaucoma [3].

Intraocular pressure (IOP) can be controlled by using the procedure of the destruction of the ciliary body epithelium that produces aqueous humor. These cyclodestruction techniques have been used since 1930, and include cyclodiathermy, cyclocryotherapy, ultrasonic ablation of the ciliary body, and surgical ablation of the ciliary body. Even though these procedures had a certain level of success, many resulted in high rates of hypotony and other complications. Laser cyclophotocoagulation emerged as a safer and more selective method to decrease intraocular pressure. Clinicians have been using in the last 20 years the solid-state diode lasers 810 nm [4]. Nowadays, two forms of cyclophotocoagulation are used, continuous

and micropulse. Although, the two techniques are done under local retrobulbar anesthesia, patients reported different levels of pain during the procedure.

The aim of this study is to evaluate the level of pain induced by the two laser procedures, in patients with glaucoma using the visual analog scale (VAS).

Experimental part

Material and Method

We consisted a lot of 100 eyes, of 100 patients, who underwent laser transscleral cyclophotocoagulation for the treatment of refractory glaucoma in 2018. We conducted a prospective, interventional, comparative study with consecutive enrollment. We divided the lot in two groups, the first group consisted of 50 eyes was treated with micropulse transscleral laser cyclophoto-coagulation (mTSCPC) and the second group, consisted of 50 eyes, was treated using continuous transscleral laser cyclophotocoagulation (TSCPC). The study was approved by the local Ethics Committee. All patients signed an informed consent. Patients clinical findings are presented in table 1.

The laser procedures were performed in the operating room. Povidone iodine was applied to the eyelid and periocular skin. 4 mL of retrobulbar anesthesia with 2% lidocaine and 0.5% bupivacaine was done. After the sterile field and lid speculum were positioned, the cyclophotocoagulation procedures were performed. The surgical protocol applied was custom to the laser therapy used. We used the CYCLO G6 device, Iridex, Mountain View, CA for all the treatments.

For the mTSCPC, the laser parameters used in the study were: micropulse mode, wavelength - 810 nm, power - 2000 mW, application time between 80s and 120s per

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hemisphere [5]. The operating cycle is 31.3%, which means 0.5 ms of *on* transmission and 1.1 ms of *off*, pause.

For the TSCPC, the following standard starting parameters were: continuous mode with power 1750–2000 mW and exposure time 2000 ms, which are the equivalent of 3.5–4 J/ application (eyes with darker pigmentation need less intensity to obtain similar results). The laser power is adjusted in 250 mW steps: the appearance of excessive *pops* during the application imply setting downward the laser power (*pops* mean that the power is too high) [6].

Ten minutes after the laser procedures were completed, patients were asked to evaluate the pain felt during the procedures. In order to assess the level of pain felt by the patient we used the Visual Analog Scale (VAS). Each patient marked on the VAS scale the correspondent of the pain felt (fig. 1).

The Visual Analog Scale is composed of a straight line with the endpoints describing extreme limits such as *no pain* and *intensive* [7]. The patient is asked to mark his pain level on the scale between the two endpoints. The distance between *no pain* and the sign made by the patient defines the subject's pain.

We also evaluated the IOP decrease for the two groups of patients, three months after the procedure. Our target is to increase the follow up period up to one year.

Topical drops of prednisolone acetate 1%, netilmicin and cyclopentolate were prescribed for two weeks.

Results and discussions

Laser cyclophotocoagulation is a safe, repetitive and effective procedure as a treatment option for different types of glaucoma [8,9]. There are several published articles concerning continuous and micropulse cyclophotocoagulation that report IOP decrease and treatment success [10 - 12]. To our knowledge, none of the existing data deals with the pain subject, that the laser procedure induces. Even though the procedure is done under local retrobulbar anesthesia, some patients express a degree of pain during the procedure. This is a key factor, when it comes to deciding whether to repeat the laser treatment or not, in order to obtain the target IOP. We obtained an average IOP value after the treatment of approximate 20 mmHg for the mTSCPC group and of approximate 19 mmHg for the TSCPC group.

In the mTSCPC group the average score of 60.23 mm on the VAS scale is observed, which corresponds to moderate pain.

In the TSCPC group the average value was 76.38 mm on the VAS scale, which is assigned to moderate-intense pain.

The differences between the two groups is shown in figure 2. There is a statistically significant difference, the obtain p value being <0.001 (t-test). Patients did not report a persistence of pain longer than one hour, after the laser

	mTSCPC (n=50)	TSCPC (n=50)
Age (mean)	66 years	68 years
Sex	Female 31, male 19	Female 26, male 24
BCVA	LP - 0.7	WLP - 0.3
IOP	44.24 ± 10.72 mmHg	48.14 ± 4.25 mmHg
Number of laser treatments	1	1
Mean glaucoma medication	3.63	3.24
BCVA – best corrected visual acuity LP – light perception WLP – without light perception		

Table 1
CLINICAL FINDINGS

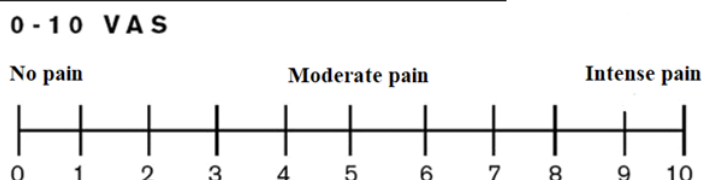


Fig. 1. Visual analog scale

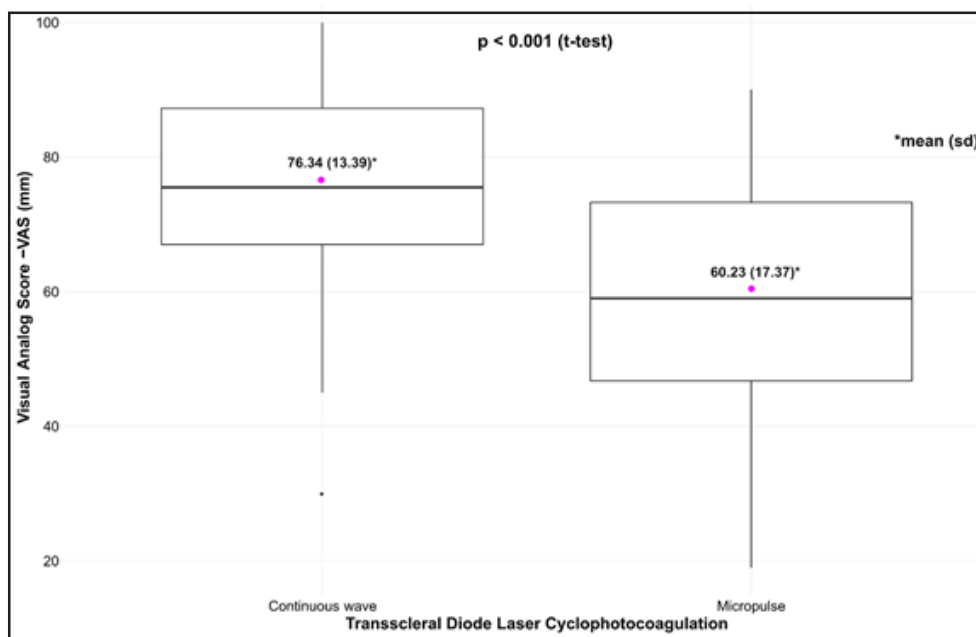


Fig. 2. Mean values on VAS for the two groups

treatment. For the patient's benefit and correct evaluation, before performing the laser treatment a general and ocular examination was made, also interdisciplinary consultations were scheduled. The enrolled patients had several ocular and general pathologies, but none in direct connexion or side effects on their glaucoma diagnosis [13-15].

Conclusions

In spite of the fact that the IOP average decrease was important in both groups, 54% for the mTSCPC and 60% in the TSCPC group, the pain level being higher in the TSCPC group, patients would opt for the mTSCPC procedure in the future.

According to The International Association for the Study of Pain, pain is defined as *an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage* [16]. Due to its subjective aspect, pain is to be considered when treatment options are decided for each patient.

In some cases of glaucoma, noninvasive or minimally invasive treatment procedures induce an unexpected level of pain, and maybe the opportunity of classical surgery should be evaluated. Both procedures report a range of complications such as hypotonia, ocular inflammation, presumed choroidal thickness, decrease of visual acuity [17,18]. More consistent research should be conducted involving risk and benefits of different treatment options for patients with glaucoma.

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