Ophthalmology & Vision Sciences
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Endothelial cell density after Micropulse Transscleral Cyclophotocoagulation

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Glaucoma is the second cause of blindness worldwide and is estimated to affect more than 409,000 canadians.(I) Advanced glaucoma consists of an Optic nerve head with a Cup/Disc ratio > 0.9 and/or visual field defects within the central 10 degrees of fixation, and it demands a low target IOP.(II)

The first available laser treatment for advanced and end-stage glaucoma was Continous Wave Transscleral diode laser cyclophotocoagulation (cwTSCPC). This is a cyclodestructive procedure achieved by transscleral application of infrared light (wavelength, 805–810 nm), which is mainly absorbed by the pigmented epithelium of the ciliary body resulting in destruction of the ciliary epithelium and coagulation necrosis of the ciliary body stroma, the tissue responsible for production of aqueous humor.(III)

Micropulse Transscleral diode laser cyclophotocoagulation (mTSCPC) employs a fractionated continuous wave diode laser which targets melanin in a non-destructive way in ciliary body tissues.(IV)This fractionated energy delivery method allows a clinically efficacious amount of heat to be applied to target tissues while allowing the heat to dissipate between pulses, preserving the efficacy while preventing unwanted inflammation, scarring, and hypotony. A second mechanism of action has been proposed: an increase in the aqueous humor drainage through the uveoscleral pathway. Finally, mTSCPC acts on the longitudinal fibers of the Ciliary muscle (CM), causing a displacement of the Scleral Spur (SS) in a posterior and inward direction, which in turn modifies the configuration of the TM and the outflow tract of the aqueous humor.(V)

Because of the perceived risk of morbidity from hypotony, visual deterioration and phthisis bulbi coupled with the unpredictability of effect and the frequent requirement for repeat treatments, cwTSCPC is often used as a treatment of last resort. On the other hand, no significant anterior segment anatomical changes have been detected with either UBM or AS-OCT in eyes treated with mTSCTC. (VI)

The safety profile of mTSCPC has become of particular interest because it has been widely used to treat patients in diverse settings such as retinal, corneal, uveitis patients and even patients with good visual prognosis.There is increasing evidence of glaucoma-associated corneal endothelial changes. Corneal endothelial cells have limited proliferative capacity in vivo. Endothelial cell loss is attributed to both glaucoma itself and treatment that lowers IOP, both medication and surgery.(VII)

To our knowledge, only one study has been done to **assess change in endothelial cell density after micropulsed transscleral cyclophotocoagulation.**(VIII)

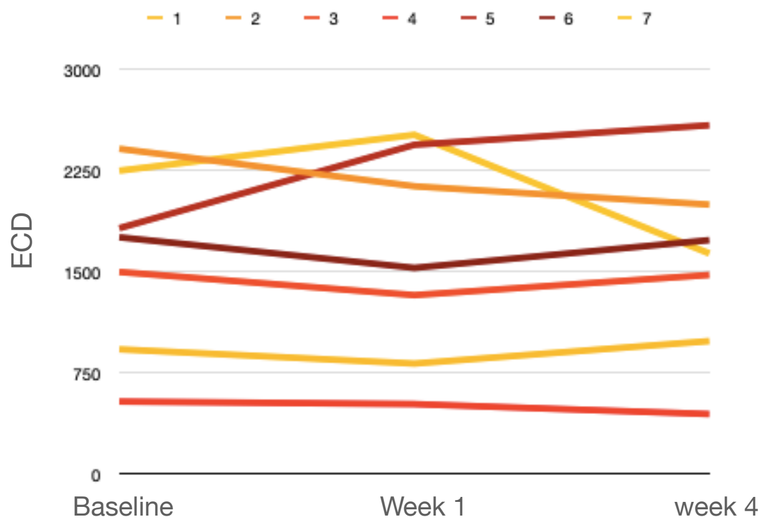
We performed a **prospective, non-randomized, observational, single center study to describe the changes in Endothelial Cell Density (ECD) in patients with no previous corneal procedures.**

Patients included in the study were the ones with a diagnosed advanced glaucoma with either intractable IOP, or topical medication intolerance that are not good candidates for incisional glaucoma surgery in whom the cornea was suitable to get endothelial images. EDC was measured by specular microscope in the center of the cornea using the Konan non-contact specular microscope before and after mpCPC. Secondary outcomes are visual acuity(VA) and IOP.

Results:

Seven eyes of 7 patients have received been recruited so far. Mean age of the participants was 63.1. Six patients were pseudophakic and one was phakic. Diagnosis was Primary open angle glaucoma (3), chronic angle closure glaucoma (2), Pseudoexfoliation glaucoma (1) and Secondary angle closure glaucoma (1).

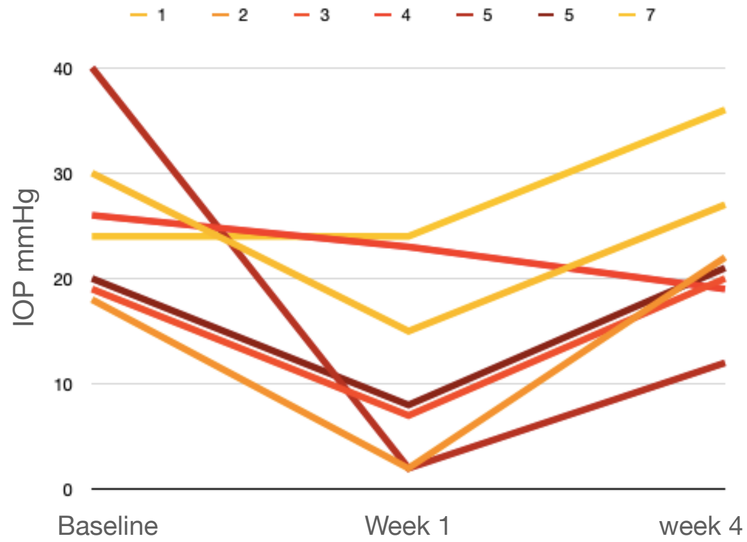
At baseline, mean ECD was 1598, and 1610 and 1550 at week one and week four after the procedure respectively. Median ECD loss was 3.09% at week four.



Regarding the morphology of the endothelial cells, hexagonality at baseline was 51.71 and 50.42 at week 4

Baseline VA was 20/30 for 2 subjects, 20/100 for 2 subjects, 20/120 for one subject, and Counting Fingers (CF) for two subjects. No changes were documented at week 1 after the procedure but at week 4, one patient had a decrease of more than two lines, and one of the CF patient decreased to No light perception.

The mean baseline IOP was 25.28 mmHg and 11.5 mmHg and 22.42 mmHg at week one and week four respectively after the procedure.



To our knowledge, this study is the first one to assess change in ECD in patients with no previous corneal interventions. Our findings regarding change in VA and IOP are similar to those reported in the literature. Changes in ECD are also comparable to those previously reported and seem to be safe at this point but further investigation is needed.

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