Original Article

Long-Term Outcome of Transscleral Diode Laser Cyclophotocoagulation for Refractory Glaucoma

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ABSTRACT
Objective: To study success rate and long term efficacy and complications of the transscleral diode laser Cyclophotocoagulation in refractory glaucoma.
Patients and Methods: In a noncomparative interventional case series, eyes of 9 patients with glaucoma resistant to conventional medical and surgical therapies were treated with transscleral diode laser Cyclophotocoagulation from 2004 to 2007. Criteria for success included intraocular pressure (IOP) of 21 mmHg or less with no devastating complications or need for further glaucoma surgery.
Results: Mean IOP had dropped by 50.6 % from 47.03±11.22 mmHg before treatment to 13.2±7.1 mmHg after surgery (P<0.001). The mean number of antiglaucoma medications per eye dropped from 2.78±0.92 to 1.83±1.25 (p=0.0001). Twenty-five (31.6%) eyes suffered deterioration, 14 (17.7 %) maintained stability and 23 (29.1 %) exhibited improvement of visual acuity.
Conclusions: Treatment with cyclophotocoagulation in patients with refractory glaucoma lead to increase in acuity and lower intraocular pressure. (Rawal Med J 2008;33:173-175).
Key words: Refractory glaucoma, cyclophotocoagulation, diode laser.

INTRODUCTION
Ablation of the ciliary body (cycloablation) is a recognized therapeutic approach to the management of refractive glaucoma.1-4 Cryotherapy, the original technique, is increasingly being supplanted by laser photoablation, originally with the 1064-nm Nd:YAG laser and lately with the portable 810-nm semiconductor diode laser.2-3 Laser cycloablation is generally considered to be better tolerated and perhaps more effective than cyclocryotherapy.3,4 Because of variable success in adults (34-92%) and significant postoperative pain and complications including phthisis and retinal detachment, transscleral neodymium:YAG (Nd:YAG) and diode lasers are replacing cyclocryotherapy as the preferred form of cyclodestruction in these eyes.5-7 The cyclophotocoagulation has a lower incidence of complications such as pain, postoperative inflammation and phthisis bulbi, possibly because of better absorption of this wave length by the pigmented tissues of the ciliary body.7,9 Several methods of diode laser photocoagulation have been reported to lower IOP and reduce pain in the eyes of refractory glaucoma.10-11 This study has done to highlight the long-term results of transcleral diod laser
cyclophotocoagulation in refractory glaucoma eyes.

PATIENTS AND METHODS
Case records of patients aged 40-80 years undergoing cycloablation between January 2004 and December 2007 at Nicokari Eye Specialist Hospital, Tabriz Medical Sciences University were studied. Only patients with refractory glaucoma who had no previous cyclodestructive procedure were included in the study. Cyclophotocoagulation was performed under local anaesthesia (peribulbar or retrobulbar) with the Oculight Sx with semiconductor diode laser system (810 nm laser wavelength) with a spherical polished tip oriented by a handpiece, “G-Probe.” Duration was set at 2000 ms (2 seconds), and the initial power setting was 1750 MW. The power was increased in 250 MW increments to a maximum of 2000 MW until an audible “pop” was heard, then the power was reduced by 250 MW and treatment was completed at this power. The number of spots used was typically five per quadrant for 270 degrees of treatment. In all cases, the probe tips were carefully examined. All patients signed an informed consent for the procedure, after an explanation of the risks and benefits. The hospital research committee approved the study. SPSS version 15.0 was used to perform the statistical analysis. A p<0.05 was considered significant.

RESULTS
Mean age of patients was 59.92±13.26 years and there were 27 women and 52 men. The most common indications for cyclophotocoagulation were chronic glaucoma, neovascular glaucoma and post-surgical glaucoma (Table 1). Patients were followed for a mean of 25.3 months (25.31±5.14 years). Mean IOP dropped by 50.6 % from 47.03±11.22 mmHg before treatment to 13.2±7.1 mmHg after treatment (p<0.001). Mean number of antiglaucoma medications per eye dropped from 2.78±0.92 to 1.83±1.25 (p =0.0001).

Table 1. Forms of Glaucoma treated (Total 79 eyes of 79 patients).

<table>
<thead>
<tr>
<th>Glaucoma Type</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary chronic open angle glaucoma</td>
<td>24 (30.4%)</td>
</tr>
<tr>
<td>Primary chronic angle-closure glaucoma</td>
<td>6 (7.6%)</td>
</tr>
<tr>
<td>Secondary chronic open angle glaucoma</td>
<td>4 (5 %)</td>
</tr>
<tr>
<td>Neovascular glaucoma</td>
<td>25 (31.6 %)</td>
</tr>
<tr>
<td>Post-surgical glaucoma</td>
<td>20 (25.4 %)</td>
</tr>
</tbody>
</table>

Twenty-five (31.6%) eyes suffered deterioration, 14 (17.7 %) maintained stability and 23 (29.1 %) exhibited improvement of visual acuity. Forty of the 79 eyes (50.6 %) achieved IOP < 21 mmHg. Thirty-two of the 79 eyes (40.5 %) eyes achieved IOP reduction 30% from baseline levels. Eleven eyes (13.9) exhibited visual acuity increase of more than 1 to 4 meter counting fingers, and visual acuity improved in 9 eyes (11.4) one Snellen line and in 3 eyes (3.8) two Snellen lines but 56 eyes (70.9) maintained stable acuity. The percentage of eyes requiring oral acetazolamide dropped from 82.3 % to 8.1% (p<0.005). The most complications of cyclophotocoagulation were conjunctival burns (Table 2).
DISCUSSION
Transscleral Diode laser cycloablation is a recognized therapeutic approach to refractory glaucoma that involves photocoagulation of the pars plicata of the ciliary body with consequent reduction of aqueous secretion.\textsuperscript{7,11} An unqualified success after cycloablation would be the attainment of a target IOP without the need for further medication, coupled with preservation of visual function. Cyclodiode therapy appears to be effective in lowering IOP, in both the short and long term. Previous studies have demonstrated this, with ocular hypotensive responses.\textsuperscript{7-9} Our study showed that in 50.6\% of patients the IOP was below 21 mmHg.

Table 2. Complications of treatment with transscleral cyclophotocoagulation (n=79).

<table>
<thead>
<tr>
<th>Complication</th>
<th>number</th>
<th>(%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctival burns</td>
<td>7</td>
<td>8.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Prolonged uveitis</td>
<td>1</td>
<td>1.2</td>
<td>NS</td>
</tr>
<tr>
<td>Phthisis bulbi</td>
<td>1</td>
<td>1.2</td>
<td>NS</td>
</tr>
<tr>
<td>Postoperative pain</td>
<td>2</td>
<td>2.5</td>
<td>NS</td>
</tr>
<tr>
<td>Hyphema</td>
<td>1</td>
<td>1.2</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS = not significant

Complications of transscleral diode CPC include conjunctival surface burns that may occur if tissue debris becomes coagulated on the tip and chars. We inspected all tips for this and found no debris. In addition, increased perilimbal conjunctival pigmentation may occur. One of patients had hypotony and phthisis after treatment 21 months after treatment. The risks of hypotony and phthisis are directly proportional to the dosage of laser energy delivered in a treatment session,\textsuperscript{7} although, a clear relationship between treatment energy and IOP response, which is essential to accurate prediction of desirable effect, remains to be demonstrated. The published literature suggests that this type of treatment is usually reserved for eyes with end stage disease and poor visual potential. In conclusion, this study showed an increase of visual acuity after transscleral diode laser cyclophotocoagulation therapy.

REFERENCES
5. Lai J, Tham C, Chan J, Lam D. Diode laser transscleral cyclophotocoagulation as


