Contact trans-scleral diode laser cyclophotocoagulation for treatment of refractory glaucoma, a prospective study

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Disclaimer:

No financial interest in any aspect of this study.
Coagulation or destruction of the CB to reduce the rate of AH production has been advocated in the 1930s, when penetrating cyclodiathermy was introduced\(^1\).

Trans-scleral cyclodestruction by light energy was developed by Weekers in 1961\(^2\).

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**Introduction:**

- When all med. & surg. therapies fail to control IOP, it may be necessary to ablate a part of the CB.

- Cyclodiath. and cyclocryo. belong to the past because of the severe side effects.

- These methods are being replaced by contact transscleral infrared 810nm diode laser cycloph. (TDLC)\(^2,3\).

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**Introduction:**

- The energy of this wave length is excellently absorbed by melanin pig. epith. of the CB.

- Diode laser equipment is not costly; it is mostly portable and easy to use.

- TDLC is simple, safe and easy to learn\(^3\).
**Introduction:**

- TDLC has been evaluated for years as 1ry surg. ttt in developing countries as one of gl. therapies\(^4\).

- Histopathological studies have shown its coagulative effect on the CB stroma\(^5\).

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**Introduction:**

- Many studies believed that IOP lowered by disruption of pars plicata stroma, subsequently decreasing AH production\(^6,7\).

- Some studies have suggested that cyclopho. also lowers IOP by causing an increase in outflow through the uveoscleral therapy\(^8,9\).

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Introduction:

- TDLC using typical gl. probe is the cyclo-destructive procedure of choice because of the reduced incidence of compls. compared to the other cyclo-destructive procedures\textsuperscript{10}. 

- It is now currently used and efficacy of contact method has been well established\textsuperscript{11}.


Aim of the work:

The aim of this study is to evaluate the results of TDLC in term of efficacy on IOP control, pain relief and safety on eyes affected by refractory glaucoma in a prospective manner.
Patient and Method:

- 25 pts (32 eyes) were included in this study.
- 14 males (56%) and 11 females (44%).
- TDLC 810nm for ablation of the CB was used for ttt of pts presented by refractory glaucomas (neovascular, pseudophakic, aphakic, uveitic, and post-keratoplasty glaucoma).
Patient and Method:

<table>
<thead>
<tr>
<th>Glaucoma type</th>
<th>Number of eyes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neovascular glaucoma</td>
<td>14</td>
<td>43.8%</td>
</tr>
<tr>
<td>Pseudophakic glaucoma</td>
<td>9</td>
<td>28.1%</td>
</tr>
<tr>
<td>Angle closure glaucoma</td>
<td>5</td>
<td>15.6%</td>
</tr>
<tr>
<td>Uveitic glaucoma</td>
<td>3</td>
<td>9.4%</td>
</tr>
<tr>
<td>Post-keratoplasty glaucoma</td>
<td>1</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

The preop IOP was ranged from 46 to 64 mmHg, mean \((52 \pm 4.36 \text{mmHg})\), in spite of max. med. ttt.

BCVA were assisted for all pts, it was ranged between LP and 0.1.

It was explained for all pts that VA may be same postop, decreased or rarely improved.
Patient and Method:

- All pts were received peribulbar LA e or s sedation.

- Diode laser was used with the classic probe, with fixed parameters of **25 pulses** with power of **1400-1800mW** for **2000ms**.

- For repeated *ttts* only **15 pulses** were given with the same parameters.
Patient and Method

Operation 1
Patient and Method:

- The machine that used in this study is **Oculight SLx "Iris Medical Instrument"**, contact delivery mode laser with 810nm wavelength max. power output of 1.0-3.0W, and a max. duration of 9.9sec.

- The probe "G-probe" consists of 600µ quartz fiber-optic, producing 0.7mm from a hand-piece, w is fabricated to center the fiber-optic 1.2mm behind the surg limbus and parallel to the visual axis.

Patient and Method:

- Preop. exam. of BCVA, IOP, gonioscopy, glaucoma type, cor and conj state.

- Technique was previously cleared, but 3 & 9 o'clock meridians were not treated to avoid lesions of long post. ciliary nerves.
Patient and Method:

- Postop. ttt in the form of topical steroids, antibiotics and cycloplegic ED for 2-3 wks.
- Systemic antiinflamm and analgesics were given for all pts. Also, antigl. drugs were given postop and decreased gradually according to IOP level.

Success was defined as postop IOP less than or equal to 22mmHg or s antigl. drugs.

Follow up were done in the first postop day, 1 wk, 4 wks, 6, and 12 ms, follow up for 1 year was attempted for 27 eyes and only 5 eyes for 6 ms.
Results:

- **Mean** follow up of *(12±2.36)*, *(27/32)* eyes, *(84.4%)*, and 6 ms only for *(5/32)* eyes *(15.6%)* after TDLC.

- IOP, antigl. meds, BCVA and postop compl. were analyzed as seen in table *(2)*.
Results:

- **IOP control:** as shown in **table (2),**

- **IOP** were decreased from mean **(52±4.36mmHg)** to **(19±3.83mmHg).**

- After **first ttt,** **26 eyes (81.2%)** were achieved control of IOP to less than 22 mmHg e or s antigu. ttt.

- While **5 eyes (15.6%)** were treated twice after 6-12 wks of its 1st ttt.

- **One eye (3.2%)** were treated for 3 times after 8 ms from the 1st ttt.
**Results:**

- IOP were controlled in 28 of 32 eyes (87.5%), and failed to be controlled in 4 eyes (12.5%).

- **Repeated ttt** for these 6 eyes, 3 of them were neovascular, one eye uveitic, one eye angle closure and one eye pseudophakic siliconised glaucoma.

**Results:**

- **Regarding to antiglaucoma medications:**

  - Mean preop drugs were decreased from (mean: $4 \pm 0.48$ to $1 \pm 0.43$) at the last visit of follow up.

  - The good thing in this study is the **stoppage of systemic CAIs postop for all pts.**
Results:

- **Visual acuity:**
  - BCVA preop were ranged between LP to 0.1.
  - **Postop,** BCVA were improved in 15 eyes (46.8%), mostly due to IOP reduction, stable in 13 eyes (40.6%) and decreased in 4 eyes (12.6%).

Results:

- **Complications:**
  - **Major compls.** as phthisis bulbi, hypotony or vitreous hage were not happened.
  - Only 1 eye (3.2%) that treated for 3 times, were presented by severe uveitis after third ttt and improved e meds. within 2 ms and VA improved again to the same level like preop.
  - Two eyes (6.4%) were presented by severe pain for 3 wks postop.
Results:

- **Complications:**
  - Four eyes (12.8%) shows reduction of VA.
  - Hyphaema reported in 7 eyes (21.8%).
  - The remaining 18 eyes (55.2%) showed no significant compls, just conj congestion and mild cor edema for few days.

Discussion
Discussion:

- CB ablation has been used as a method of controlling IOP in refractory gls for many years.\(^\text{12,13}\)
- It has now replaced other more traumatic or invasive cycloablative procedures as cyclocryo.\(^\text{14}\)
- TDLC has exhibited better efficacy, safety, reliability and convenience compared to previous methods of CB ablation for the ttt of the different gls.\(^\text{15}\)

\(^\text{15}\) B N Noureddin, W Zein, C Haddad, R Mafuf and Z Bashashur: Diode laser transscleral cyclophotocoagulation for refractory glaucoma a one year follow up of patients treated using an aggressive protocol. Eye 2006;20:329-335.

Discussion:

- In the present study, an \textbf{audible pop sound} was a priority in machine settings; in other study this pop sound was not mandatory to be audible.\(^\text{16}\)
- \textbf{Success rate} in this study were achieved in high number of treated eyes \textbf{28/32 eyes (87.5%)}, mostly due to fixed moderate parameters and number of diode laser applications.
- This high success rate very comparable to a recent study that reported \textbf{87%} success rate,\(^\text{15}\) also, Murphy et al\(^\text{19}\) reported a higher success rate \textbf{89%} but in a retrospective study. Also, Spencer and Vernon\(^\text{22}\) reported \textbf{81%} success rate, other previous studies reported variable success rates as \textbf{77.3%} with nearly same parameters and follow up period.

\(^\text{15}\) B N Noureddin, W Zein, C Haddad, R Mafuf and Z Bashashur: Diode laser transscleral cyclophotocoagulation for refractory glaucoma a one year follow up of patients treated using an aggressive protocol. Eye 2006;20:329-335.
\(^\text{22}\) Anne F Spencer and Stephen A Vernon: Cyclodiode: results of a standard protocol. Br J Ophthalmol 1999;83:

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Discussion:

- In the present study, 6 eyes (18.8%) needed re-ttt for a second time and 1 eye only (3.2%) were treated for 3 times.

- In comparison to other studies, re-ttt was done in 16% in one study, 25% in another recent study.

- Branacato et al and Bock et al reported a higher rate of re-ttt up 65% and 70% respectively. Lastly, Spencer and Vernon were reported 45% re-ttt rate, most probably due to different parameters of laser machine and number of laser shots.

Regarding to visual acuity, in the present study, it was improved in 15 eyes (46.9%), stable in 13 eyes (40.6%) and worsen in 4 eyes (12.8%).

- In comparison to other studies, one previous study reported 18 eyes (30%) getting better VA, 5 eyes (8%) getting decreased.

- Another study reported nearly same percent for vision reduction after ttt in 5.8%.

- In a third study, remained stable in 55%, improved in 20.8% and worsen in 24.2%.

References:

**Discussion:**

- For antiglaucoma tttts, in the present study, numbers of antiglaucoma drugs were reduced from 4±0.48 to 1±0.43 and all pts stopped systemic use of CAIs.

- By comparison to other studies, one study reported 48.8% reduction in daily medication postop.

- Another study reported significant reduction of the number of antiglaucoma from 2.81 to 0.89 and only 3 pts required oral CAIs.

- In a third study, they reported a limited reduction of systemic use of CAIs from 47% to 37% only.

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**Discussion:**

- For postop complication, in this study, one eye (3.2%) compl by severe uveitis, 4 eyes (12.8%) with VA reduction and 7 eyes (21.8%) by hyphema but no major compls were reported as phthisis, hypotony or vit hage.

- In comparison to other studies, Edmund et al reported only low incidence of transient relatively minor side effects.

- In contrast, James et al reported visual loss in 3 of 77 eyes (4%) and uveitis in 8/77 eyes (10%), may be due to high number of applications (40 laser applications).
Discussion:

- Vincenzo et al\textsuperscript{14} reported phthisis in 1.6% (2/120 eyes).
- Murphy et al\textsuperscript{19} reported a relatively high percent of hypotony 9.5%.
- Spencer and Vernon\textsuperscript{22} reported 3.4% but in another study\textsuperscript{15} only mild to severe conj inj and cor edema were reported.
- In a recent study\textsuperscript{17} more or less like the present study, they reported only mild uveitis in 21/83 eyes (25%) and moderate anterior uveitis only in (1%) and no conj burns were seen.


\textsuperscript{15} B N Noureddin, W Zein, C Hadlab, R Malaf and Z Bashashur: DLCC for refractory glaucoma a one year follow up of patients treated using an aggressive protocol. Eye 2006;20:329-335


Conclusion

- TDLC is very effective and less traumatic for the eye especially for eyes that are not suitable for filtering surgery.
- Even with higher power settings, it is still safe and reliable method for treating advanced gls with lesser need for antigl. meds postop.
- Also, minimal compls. were reported and VA still preserved to a good extent.
THANK YOU

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