Long Term Visual Outcomes of Glaucoma Patients Following a Single Episode of Transscleral Cyclodiode Laser Treatment

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Outline

Aim: The aim of this study was to document the efficacy and visual outcome of a single cyclodiode laser photocoagulation treatment in refractory glaucoma.

Methods: A retrospective chart review of all patients who underwent trans-scleral diode laser cyclophotocoagulation over a 7-year period was carried out in a tertiary referral centre.

Results: The mean intraocular pressure (IOP) after a single treatment decreased from 39.5 ± 1.3 mmHg to 17.8 ± 1.5 mmHg at 6-week follow-up period (P = 0.001). This reduction in IOP was maintained over a 3-year period. 61.5% patients were able to reduce the number of medications used, with a mean reduction from 2.6 to 1.5 medications (P = 0.05). Mean initial visual field loss was 8.74dB at 3 months post-treatment, field loss however had decreased to 9.05dB (P = 0.05). Prior to treatment, average visual acuity was 0.57 LogMAR units. The vision remained unchanged or improved for 93.8% patients (P = 0.05) over the follow up period in 5.3% of patients, predominantly in patients receiving high laser energy treatment. No patient required enucleation following cycloidiode laser therapy.

Conclusion: In our cohort, a single session of cycloidiode laser therapy was sufficient to maintain IOP reduction and preserve visual potential. IOP control and may be considered in eyes with relatively good visual potential.

Introduction

Transscleral diode laser cyclophotocoagulation (cycloidiode) has been shown to be an effective and safe alternative treatment for glaucoma. Cycloidiode is often used in refractive glaucoma, where stromal scarring such as metastatic, post-trabeculectomy and tube shunt surgery, may sometimes be judged less appropriate. It has been shown to be safer than other cyclodesicative procedures, such as Nd:YAG laser cyclophotocoagulation and cyclocryotherapy, which present a significant risk of hypotony and phthisis because of excessive ciliary body ablation. However, the outcome of cycloidiode therapy is unpredictable and multiple treatments may be required to achieve long-term IOP control.

Currently there is no consensus for an optimum treatment protocol. Furthermore, cycloidiode therapy is often reserved for eyes with poor vision probably as it has been reported to cause vision loss in the control eye. This study was to evaluate the long-term safety and efficacy of transscleral diode laser cyclophotocoagulation for raised intraocular pressure at a UK Teaching Hospital over a 7 year period.

Methods

The departmental electronic medical record system (Medisoft Ophthalmology, Medisoft Ltd) was used and the clinic notes were examined for the period 08/2004 to 08/2011 to identify patients who had undergone cycloidiode treatment. Any patients who had undergone repeat cycloidiode or alternative treatments for IOP control during the follow up period were excluded from further analysis.

Cyclophotocoagulation was performed in the Operating Theatre under subtenon, peribulbar or general anaesthesia using standard treatment protocols. All treatments were performed using contact G probe (Medisoft Instruments, Inc.). Standard settings were 1500ms duration and 1500mW power. Tranilumation was performed for ciliary body identification. Usually 10 applications were applied per quadrant for 180 to 360°, with the applications spaced approximately one half-width of the probe tip apart. The 3 and 9 o'clock positions were avoided to spare the long ciliary body identification. Visual acuity (VA) prior to treatment was assessed for all patients using Snellen line after 6 weeks post-treatment. Any patients that received low energy treatment (45J) were continued after cycloidiode treatment and adjusted later according to patients’ status.

Success was defined as an intraocular pressure (IOP) of 6–21 mmHg at the last follow-up visit without the need for oral acetazolamide and an IOP reduction of at least 30% compared with pre-treatment. Hypotony was defined as an IOP of 5 mmHg or less. The laser energy used was classified as either low energy (median power 45J, range 22.5J–67.5J) or high energy (median power 90J, range 19J–160J). The long-term IOP follow up was 3 years. Visual acuity (VA) prior to treatment was assessed for all patients using LogMAR scale. Visual field testing was performed with the Humphrey Visual Field Analyser® using the SITA 24-2 threshold programme. Mean deviation of visual field sensitivity was calculated in descents that were taken as our surrogate measure of visual field loss. Data was analysed using Microsoft Excel®.

Results

From our records, we were able to identify 104 patients who underwent a single episode of cycloidiode therapy in the period from 09/2004 to 06/2011 at Addenbrookes Hospital, Cambridge. Of these, complete medical records were available for 87 patients and they were followed up over 3 years. Preoperative patient data is summarised in Table 1.

Cycloidiode effect on glaucoma medications (Fig 2A)

A significant proportion of the patients (61.5%) were able to decrease the number of medications they are taking for IOP control following cycloidiode. A decrease of 2 medications or more was achieved by 34.6% of patients, while 26.9% of patients decreased their medication by one.

Change in VA (Fig 2B)

A single episode of cycloidiode treatment had no effect on visual acuity (VA). Mean VA changed from 0.57 Log MAR units before cycloidiode therapy to 0.54 Log MAR units post treatment (P = 0.05).

Change in visual fields (Fig 2C)

The average visual field loss in the patients that received low energy treatment (45J) was much lower than that noted improvement of at least 1 LogMAR line in 26.9% of patients.

Methods

Table 1

<table>
<thead>
<tr>
<th>Age, yr</th>
<th>Mean ± SE</th>
<th>Median ± SD</th>
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<tbody>
<tr>
<td>65 ± 6</td>
<td>64 ± 6</td>
<td>65 ± 5.5</td>
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Long term maintenance of IOP reduction in patients receiving a single cycloidiode treatment (Fig 1C)

The IOP reduction was maintained long-term over the period of 3 years in 63.9% of the patients. Measurements were taken pre-operatively (39.5 ± 1.3 mmHg) and 6 months (19.6 ± 1.5 mmHg) for all patients. In our study 14 patients (16.1%), required additional procedures in that eye after the measurements at 6 months post-treatment and were excluded from the subsequent analyses. The follow-up measurements at 1 year (18.9 mmHg), 2 year (22.1 mmHg) and 3 years (21.7 mmHg) were all after a single cycloidiode treatment.

Conclusions

In conclusion, diode cyclodioptocoagulation is a safe and effective treatment for refractory glaucoma characterised with low incidence of complications. IOP pressure can be effectively reduced in patients with glaucoma after a single cycloidiode treatment without adverse effects on VA over a 3 year period. Hypotony is the main risk of treatment and might be limited by reducing the laser energy applied to 45J, particularly for patients with neovascular glaucoma.

There are no previous studies evaluating visual field measurements peripherally in patients undergoing cycloidiode treatment and this most likely reflects the difficulties associated with performing the tests in patients with poor VA. However, the results of this study suggest that the IOP reduction after cycloidiode treatment could prevent further deterioration in the glaucoma patients’ vision.