Outcome of Micropulse Laser in Treatment of Open Angle Glaucoma in a Peripheral Hospital in Rivers State, Nigeria: Our Initial Experience

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Authors’ contributions

This work was carried out in collaboration between both authors. Author EAA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author BF managed the analyses of the study and literature searches. Both authors read and approved the final manuscript.

ABSTRACT

Aims: To determine the Intraocular Pressure (IOP) and visual acuity changes before and after Micropulse laser treatment among patients with open angle glaucoma.

Study Design: A quasi-experimental study design.

Place and duration of Study: The Ophthalmic Specialists, a peripheral ophthalmologist group practice in Rivers State between February 2018 and December 2018.

Methodology: Twelve eligible patients with moderate and advanced open angle glaucoma on medical (topical) treatment were recruited after they gave informed consent. Baseline visual acuity (VA) and intra ocular pressure (IOP) were obtained prior to the use of the micropulse laser treatment. Following the laser treatment, VA and IOP were assessed at one day, one week, one month and 6 month post laser. p=0.05 was regarded as statistically significant.

Results: A total of 12 patients were followed up for 6 months. Mean age was 37.42±7.00 years. Age range was 24-46 years with M: F ratio =1.4:1. Mean change in visual acuity across the time periods was statistically significant (p=0.0001). Mean IOP change over 6 months was 10.46mmHg.

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(38.20%, p=0.0001). Median number of drugs used by participants dropped from 3 to 1. (P=0.002) Conclusion: Micropulse Trans- scleral cyclophotocoagulation is a safe and effective way of managing glaucoma. It caused a mean drop in IOP of 10.46mmHg (38.20%) over 6 months in our study.

Keywords: Cyclophotocoagulation; intraocular pressure; micropulse; visual acuity.

1. INTRODUCTION

Glaucoma continues to be a real threat to sight and more so in the developing world. Available evidence shows that the glaucoma needs in our region are still unmet [1]. Newer approaches for diagnosis and treatment are rapidly evolving.

Trabeculectomy is the gold standard surgical option for achieving intraocular pressure control in glaucoma despite the risks [2].

Minimally invasive glaucoma surgery (MIGS) is largely unavailable in our region and medical treatment is the mainstay of management albeit fraught with a lot of issues of compliance.

Laser therapy is a useful non invasive option in the management of glaucoma. Trans scleral diode laser cyclophotocoagulation (TSCPC) is a method of ciliary body ablation which was initially reserved for eyes with little or no visual potential. Its main drawbacks were its unpredictable laser effects such as hypotony, phthisis bulbi, hyphaema, choroidal and retinal detachment [3].

A new form of ciliary body laser procedure termed Micropulse P3 (MP3) Trans scleral diode laser cyclophotocoagulation using 810nm infrared diode has been developed which delivers repetitive short pulses of energy with rest periods in between. Its mechanism of action has been postulated to be by enhancing existing uveoscleral outflow channels without photocoagulation [3,4].

This new technology is a form of MIGS and has been noted to cause a reduction in IOP of up to 45% from baseline with minimal or no side effects [3,4,5,6]. This form of non invasive glaucoma treatment in the developing world holds great promise.

To the best of our knowledge there is no documented data on this form of laser treatment in our region.

2. MATERIALS AND METHODS

Eligibility criteria included patients with primary open angle glaucoma on medical therapy 18 years and above. They were counseled and those willing to be included signed a written consent to undergo MP3 laser procedure. Ethical approval was obtained prior to the study. All patients who had a history of ocular infection, inflammation or ocular surgery 2 months prior to the laser procedure were excluded from the study. MP3 laser was done under peribulbar anaesthesia (2% Xylocaine and Adrenaline) with laser settings at 2000mW, 90 secs in each quadrant using a sliding motion, and avoiding the 3 and 9 o’clock positions. Baseline visual acuity (VA) and Intraocular pressure (IOP) were obtained prior to use of Micropulse laser treatment. Following the laser treatment, IOP and VA were assessed at day 1, one week, one month and 6 months post treatment.

Data was analyzed using the SPSS Version 20. Normality of data was assessed using Kolmogorov-Smirnov statistics. Descriptive statistics was employed to summarize data. Comparison of mean IOP and visual acuities across the five periods (baseline, day one post op, one week post-op, one month post-op and six month post-op) was done using Friedman ANOVA statistics. Independent t-test was used to compare means across sex category while the Wilcoxon test was used to compare the number of drugs used by patients’ pre laser treatment and post laser treatment. p = .05 was considered statistically significant.

3. RESULTS AND DISCUSSION

The Table 1 shows the demographics of the study population.

The Fig. 1 shows the mean change in visual acuity over time.

The mean change in VA was highest at 1 day post-op, followed by 1 week post-op after which it remained unchanged at both 1 month and 6 month follow-up periods. These observed differences in the mean changes across the time periods was statistically significant (Friedman ANOVA = 19.846; p-value = 0.0001).
Table 1. Demographics of study population

<table>
<thead>
<tr>
<th>Study population</th>
<th>Gender</th>
<th>M/F ratio</th>
<th>Median age of participants</th>
<th>Mean age of participants</th>
<th>Age range of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 eyes of 12 participants</td>
<td>7 males</td>
<td>1.41:1</td>
<td>37.50 years</td>
<td>37.42±7.00 years</td>
<td>24 – 46 years</td>
</tr>
<tr>
<td></td>
<td>5 females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows the comparison of mean change in visual acuity of respondents across the time periods and was significant. Friedman ANOVA = 19.846; p-value = 0.0001* (SD – Standard deviation *Statistically significant).

Micropulse technology in glaucoma therapy has paved the way for efficient and safe treatment of glaucoma.

The mean change in Intra ocular pressure is reflected in the Fig. 2. There was a significant drop day one post op which was sustained over 6 months of the study.

Our study revealed an IOP drop of 38.20% over 6 months.

It is in a pilot study by Chew et al. [4] it was found to reduce IOP by an average of 45% from baseline and also with little or no complications after 18 months of follow-up.

Micropulse transscляр cyclophotocoagulation is one of the new minimally invasive surgical mode of treatment for glaucoma. It has a good safety profile when compared with filtration surgeries in lowering IOP [5]. Moster, et al. [6], Noecker, et al. [7] and Radcliffe et al. [8] demonstrated IOP drop of 51%, 41.6% and 29.8% respectively.

Micropulse laser can be used for a wide variety of patients including those with primary open angle glaucoma, congenital glaucoma, pigmentary glaucoma and steroid induced glaucoma [9]. Schlote, et al. [10] in a prospective study of 100 patients demonstrated a high success rate with inflammatory glaucoma, POAG, and Neovascular glaucoma while Emanuel, et al. and Zaarour, et al. [11,12] studied its used in patients with uncontrolled glaucoma. Zaarour et al reported 81.4% success rate in IOP reduction at 6 months with no vision loss or major complications. These findings were also corroborated by Kuchar et al. [13] in

Fig. 1. Comparison of mean change in visual acuity in LogMAR units
advanced glaucoma patients, who reported a mean IOP drop of 40.1% and a mean follow up time of 60 days with minimal complications. Singh et al. [14] studied its use as a temporary measure to lower IOP before trabeculectomy in refractory glaucoma and reported 51% reduction in IOP by one week. Our study population was however made up of only POAG patients.

Complications following use of Micropulse laser are usually very minimal and transient and may include but not limited to, redness, hyphaema, serous choroidal detachment, hypotony, cystoid macular oedema, decreased vision and vision loss.

In our study, 61.5% of participants complained of redness. There was a slight drop in vision on the first day post laser but pre laser levels were achieved by 6 months.

Aquino et al, Chew et al and Moster, et al. [3-5] also reported a similar pattern of a slight drop in vision and minimal complications. Other studies reported a higher level of vision loss with more profound side effects [11,15].

In our study 7(seven) eyes were on 3 topical ocular hypotensives while 6(six) eyes were on 2 ocular hypotensives prior to laser procedure.

Table 2. Mean change in visual acuity of respondents across the different time periods

<table>
<thead>
<tr>
<th>Time periods</th>
<th>Mean change ± SD</th>
<th>Median (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day post-op</td>
<td>0.10±0.10</td>
<td>0.10 (0.00 – 0.30)</td>
</tr>
<tr>
<td>1 week post-op</td>
<td>0.02±0.06</td>
<td>0.00 (0.00 – 0.20)</td>
</tr>
<tr>
<td>1 month post-op</td>
<td>0.00±0.00</td>
<td>0.00 (0.00 – 0.00)</td>
</tr>
<tr>
<td>6 months post-op</td>
<td>0.00±0.00</td>
<td>0.00 (0.00 – 0.00)</td>
</tr>
</tbody>
</table>

Friedman ANOVA=30.510; p-value=0.0001
A beneficial effect of laser is the reduction in the number of ocular hypotensives needed to control IOP. Yelinskiy, Toyos and Toyos [15,16] reported a mean reduction from 3 to 2, 3.3 to 1.8, which was similar to our study (3 to 1).

Eleven (11) out of thirteen (13) eyes in our study showed a marked reduction of at least 50% in number of drops needed to achieve target IOP by 6 months. Siegel et al. [17] however reported an increase in number of medications from 2.9 to 3.0 after a follow-up of 6 months.

Table 3 shows the mean number of drops used by the study population pre and post laser intervention.

There is paucity of data from Nigeria and indeed Africa on use of Micropulse Trans scleral cyclophotocoagulation. A few studies have been done on the continuous mode Trans scleral cyclophotocoagulation [18,19] as a viable form of laser treatment for glaucoma. The patients however had complications ranging from hypotony to loss of vision.
The major limitation of our study is the small number of study population but despite this the results are still valid and should stimulate more research.

4. CONCLUSION

The Micropulse Transscleral cyclophotocoagulation provides consistent and predictable lowering of IOP with minimal ocular complications. In our study the mean IOP change over 6 months was 10.46mmHg (38.20%). There was no remarkable change in the visual acuity at 6 months post laser treatment and the median number of drugs needed by participants to achieve target IOP dropped from 3 to 1. It is a less invasive method of IOP control and is worth including in our armamentarium in treatment of glaucoma in Africa.

CONSENT

As per international standard or university standard, patient’s written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

Ethical approval was obtained prior to the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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