

## The effectiveness of Diode laser in management of glaucoma patients at King Hussein Medical Centre

Ali Alawneh MD \*, Mohannad Q. Albdour MD \*, Ghadeer A. Al-Humimat MD \*, Ibrahim M. Al-Kilany MD \*, Mohammad N. Al-Aqarbah MD \*

\*Ophthalmologist, Department of Ophthalmology, Royal Medical Services

### Abstract

**Aim:** To evaluate the role of diode laser in the management of glaucoma patients at King Hussein Medical Center.

**Method:** this is a retrospective study which was conducted at the ophthalmology department of KHMC. All glaucoma patients who underwent diode laser between Jan 2015 and Aug. 2017 were included in this study. The medical records of the patients were reviewed regarding age, sex, medical diseases, surgical history, past ocular history, type of glaucoma, visual acuity, intraocular pressure before and after treatment, number of medications used, and postoperative complications. The obtained data were collected, analyzed and compared. Patients with thin sclera, who underwent previous trans-scleral cyclo cryoablation and patients with short term follow up (less than 4 months) were excluded from the study.

**Results:** A total of 96 eyes (90 patients) were enrolled in this study. The age of patients ranged between 16 and 73 years (mean  $51.2 \pm 4.2$  years ) and 48 of them were males. The most common indication was failed trabeculectomy (45%), The most common complication of this procedure was pain which occurred in 86 eyes (90% ) of cases. The overall success rate was 82% and at 4 months there was a reduction in intra ocular pressure by 52% and the use of eye drops dropped from 3.7 pre-operatively to 1.3.

**Conclusion:** Cyclodiode laser was highly effective, safe and well tolerated procedure for dealing with refractory glaucoma with a success rate of 82%. It was able to reduce intra ocular pressure by 52%.

**Key words:** cyclodiode laser, refractory glaucoma.

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### I. Introduction

Glaucoma is a common worldwide disease that affects the eye and results in damage to the optic nerve head and subsequent visual field loss. In 2010 it was reported that glaucoma accounted for 2% of visual impairment and 8% of global blindness.<sup>(1)</sup> It is estimated that 70 million individuals are affected by glaucoma in the world and it is ranked as the second leading cause of blindness.<sup>(2,3)</sup> The treatment of glaucoma is mainly medical through topical eye drops.<sup>(4)</sup> Other modalities of treatment include: Trabeculectomy, Tube-shunt surgery, Laser trabeculoplasty and cyclo-destructive procedures.<sup>(5,6,7,8)</sup> Refractory glaucoma has been defined as a condition where satisfactory intraocular pressure (IOP) is not achieved by conventional maximum medical and surgical treatment, or where such management is not tolerated. This may occur in uveitic, neovascular, traumatic, aphakic glaucoma and previous failed trabeculectomy.<sup>(9)</sup> Cyclodiode laser treatment is used as a cyclodestructive procedure, where the ciliary body is ablated in order to reduce aqueous production, and is widely used in ophthalmology for such cases.<sup>(10)</sup> Most studies report that the success of cyclodiode according to the reduction in IOP and medications required for IOP control.<sup>(11)</sup> In this study we used the criteria used by Huang MC et al in 1999 in which they considered the procedure to be successful where the IOP was between 5-21 mmHg with or without medication, no further glaucoma surgery is needed, no devastating complications occurred, and no loss of light perception.<sup>(12)</sup> Complication of this procedure may include: choroidal detachment, retinal detachment, conjunctival burns, uveitis, phthisis bulbi, corneal graft decompensation, hypotony and pain.<sup>(13)</sup> The aim of this study was to evaluate the role of Diode laser in the management of refractory glaucoma cases at King Hussein Medical Center (KNMC) and to compare those results with that found worldwide and with other modalities of treatment for such cases in KHMC.

### II. Method

This is a retrospective study to be conducted at the ophthalmology department of KHMC. All glaucoma patients who underwent diode laser between Jan 2015 and Aug. 2017 were included in this study. The medical records of the patients were reviewed regarding age, sex, medical diseases, surgical history, past ocular history, type of glaucoma, visual acuity, intraocular pressure before and after treatment, number of medications

used, and postoperative complications. The procedure was done as follow: Local anesthesia in the form of peribulbar injection using lidocaine 2% was used in patients 18 years or older or by general anesthesia in younger patients. Laser energy was applied using the G-probe placed 1.5mm from the limbus.. 25-30 laser burns were applied for 270 degrees; energy settings were (1.8 – 2.0 Watt) applied for 1.5 seconds duration resulting in a power delivery of 1.8 – 2.1 J per application (45 – 60 joules per session).

The obtained data were collected, analyzed and compared. Patients with thin sclera who underwent previous trans-scleral cyclo cryoablation and patients with short term follow up (less than 4 months ) were excluded from the study.

### III. Results

A total of 96 eyes (90 patients) were enrolled in this study. The age of patients ranged between 16 and 73 years (mean 51.2±4.2 years ) and 48 of them were males. The most common indication for this procedure was failed trabeculectomy which accounted for 45% of the cases, table 1 summarizes the types of glaucoma found among the patients in this study.

**Table 1,** types of glaucoma found among the patients.

Type of glaucoma	Number of eyes	Percentage
Failed trabeculectomy	43	45%
Following cataract surgery	24	25%
Uveitic	15	16%
Neovascular	10	10%
Trumatic	3	3%
Congenital	1	1%

The number of eye drops and the mean IOP post operatively are summarized in table 2.

**Table 2,** the mean number of eye drops and IOP pre-op and at 1week,1 month and 4 months post-op.

Type of glaucoma	Mean number of eye drops/IOP (pre-op)	Mean number of eye drops/IOP (1week post-op)	Mean number of eye drops/IOP (1month post-op)	Mean number of eye drops/IOP (4months post-op)
Failed trabeculectomy	3.7/27	2.2/22	2.0/18	1.1/13
Following cataract surgery	3.8/29	2.3/20	1.8/16	1.0/14
Uveitic	3.9/32	3.4/28	2.8/21	2.0/17
Neovascular	3.9/34	3.2/27	2.7/20	2.0/17
Trumatic	2.8/26	2.0/20	1.5/18	1.3/14
Congenital	3.1/30	2.6/25	2.2/ 21	2.0/19
Total	3.7/29	2.5/23	2.1/18	1.3/14

There was slight insignificant drop in visual acuity post operatively. The most common complication of this procedure was pain which occurred in 86 eyes (90%) of cases; this pain was mild and transient in 77 eyes, moderate in 15 eyes and severe in 4 eyes which continued for 24-48 hours and then became mild to moderate. Other complications are summarized in table 3.

**Table 3,** complications of the procedure.

Complication	Number of eyes	percentage
Pain	86	90%
Redness and swelling	20	21%
Glare	17	18%
Ocular hypotony	14	15%
Uveitis	9	10%
Choroidal detachment	3	3%
Conjunctival burns	1	1%
phthisis bulbi, retinal detachment.	0	0%

### IV. Discussion

Destruction of the ciliary body has been used to treat glaucoma since the 1930s.<sup>(14)</sup> It was used mainly in treatment of refractory glaucoma to relief pain and to prevent further deterioration of vision secondary to elevated IOP.<sup>(15)</sup> The overall success rate of this procedure was 82% at 4 months. The success rate varies among different studies it ranged between 48% and 92% depending on the criteria used to define success and the energy setting of the procedure.<sup>(16)</sup> Our success rate was comparable to other studies used similar energy setting and criteria for success.<sup>(17)</sup> The overall reduction in IOP was 21%, 38% and 52% at one week, one month and 4 months respectively. In addition, there was a significant drop in the number of eye drops used at 4 months ( 1.3) compared to that pre-operatively (3.7). This was much closed to that found in other studies.<sup>(17,18)</sup>

The most interesting part of our study is that we used the same success criteria used by Al-Shabaki et. al. to evaluate Ahmed glaucoma valve used to treat such cases which revealed a success rate of 90%. This was slightly better than that of cyclodiode procedure used in our study. However, taking in consideration that cyclodiode ablation is simple, quick and non-invasive procedure this will make it more preferable for the management of such kinds of glaucoma. In addition, the possible complication which may occur with it is rare and less hazardous. The most complication occurred in our study was pain, redness and glare which were transient in all cases and tolerable in most of them. Ocular hypotony occurred in 15% of eyes but it was transient and it did not continue for more than one month. Uveitis occurred in 10% which was mild in all of the cases and respond well to topical steroids.

It should be mentioned that 22% and 6% of eyes needed 2 and 3 sessions respectively. Those results are much less than that of other results. <sup>(17,19,20)</sup> Spencer and Vernon repeated this procedure up to five time in their study. <sup>(21)</sup> The need for repeated cyclodiode laser sessions was noted more in younger ages, this is attributed to the higher ability of the ciliary body for regeneration among this age group.

The reduction in IOP and success of treatment were better achieved in patients with previous failed trabeculectomy and previous cataract surgery than in patients with other types of glaucoma.

This study showed that cyclodiode ablation is highly effective, safe and well tolerated procedure for dealing with refractory glaucoma. Its efficacy is much closed to that of invasive surgical techniques like Ahmed glaucoma valve. Although this procedure is mainly reserved for managing refractory glaucoma in patients with low vision it is the time to re consider it for managing glaucoma patients with good vision.

## V. Conclusion

Cyclodiode laser was highly effective, safe and well tolerated procedure for dealing with refractory glaucoma with a success rate of 82%. It was able to reduce intra ocular pressure by 52%.

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