CLINICAL STUDY

Efficacy of lignocaine gel for outpatient laser treatment in inflamed eyes

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Abstract

Purpose **To evaluate the efficacy and safety of topical 2% lignocaine gel in providing analgesia during outpatient transpupillary or trans-scleral laser treatment of inflamed eyes.**
Methods **A prospective study was carried out of consecutive eligible eyes undergoing laser treatment using 2% lignocaine gel as a topical anaesthetic and a coupling medium. At the conclusion of each procedure, patients were asked to grade a pain score (0 = no discomfort, 1 = mild discomfort, 2 = mild pain, 3 = moderate pain, 4 = severe pain).**
Results **Twenty eyes in 19 patients received laser treatment. No pain was reported in 95% of cases treated (no discomfort in 75%, mild discomfort in 20%) and only mild pain in 5% (one patient). No adverse reactions were encountered in any of the patients. There were no complications associated with the procedures.**
Conclusions **Lignocaine 2% gel is safe and effective for outpatient transpupillary and trans-scleral laser treatment in inflamed eyes, providing adequate analgesia and serving as a coupling medium at the same time.**

Key words Anaesthesia, Inflamed eye, Laser, Lignocaine gel, Outpatient

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Transpupillary laser therapy is a common and effective form of outpatient treatment for many ocular conditions. In most cases, the procedures are performed with a coupling agent such as methylcellulose, after instillation of a topical anaesthetic solution shortly beforehand. However, in the setting of inflamed eyes, in cases where a treatment area is close to the fovea centre or in pain-sensitive patients, other additional modes of regional anaesthesia may be required, such as retrobulbar or peribulbar injections. These injections carry uncommon but important risks. Globe perforation is one of the most serious ocular complications,[1,2] and is particularly dangerous in eyes of long axial lengths and staphylomas of sclera. Systemic complications include brain stem anaesthesia, respiratory arrest, seizures and even death.[3–5] Other ocular complications include retrobulbar haemorrhage, optic nerve trauma and retinal vascular occlusions.[6–8] Peribulbar block has been advocated to reduce the incidence of these complications,[9,10] but this procedure has also been associated with globe perforation, retrobulbar haemorrhage and extraocular paresis.[11–13]

2% lignocaine gel has been shown to be a simple, safe and effective anaesthetic agent in topical cataract surgery.[14,15] This study was conducted to assess the suitability of topical 2% lignocaine gel in both providing analgesia and acting as a coupling agent during outpatient transpupillary or trans-scleral laser treatment of inflamed eyes.

Materials and methods

Patients listed for transpupillary or trans-scleral outpatient laser treatment were recruited prospectively over the period from March 2000 to June 2000 at the Hong Kong Eye Hospital and Queen Mary Hospital, Hong Kong. Inclusion criteria were co-operative patients with inflammation in the eye to be treated or in whom the treatment area was close to the fovea centre. Institutional ethics approval and consent from patients were obtained. Exclusion criteria include hypersensitivity to local anaesthetic agent of the amide type, a primary ocular surface problem and secondary problems such as lid malpositions with entropion, ectropion or lagophthalmos.

Study procedure

After receiving an application of 1 cm length of 2% lignocaine gel (2% Xylocaine Jelly, Astra, Sweden) in the lower conjunctival fornix of the treatment eye 1 min before laser therapy, the patient was allowed to rest with the eyes closed. The same gel was used as a coupling medium for the transpupillary laser contact lens. The demographic details, diagnosis, procedure performed and laser settings used were recorded. At the conclusion of each treatment, the patient was asked to grade a pain score of the procedure: 0 = no discomfort, 1 = mild discomfort, 2 = mild pain, 3 = moderate pain, 4 = severe pain.

Table 1. *Patient demographics and laser procedure details of the glaucoma group*

Patient no.	Age (years)	Sex	Eye	Diagnosis	Procedure	Laser settings	Remarks	Pain score
1	66	F	Left	AACG	Sequential PI	Argon: #97 × 0.1 s × 0.2–1 W × 50 μm YAG: #15 × 2–4 mJ		1
2	62	M	Right	AACG	Sequential PI	Argon: #90 × 0.1 s × 0.2–1 W × 50 μm YAG: #3 × 2 mJ		0
3	63	F	Left	AACG	Sequential PI	Argon: #86 × 0.1 s × 0.2–1 W × 50 μm YAG: #10 × 2–3.4 mJ		1
4	65	F	Left	AACG	Sequential PI	Argon: #78 × 0.1 s × 0.2–0.8 W × 50 μm YAG: #5 × 2–3 mJ		0
5	69	F	Right	AACG	PI	Argon: #146 × 0.1 s × 0.2–0.8 W × 50 μm		0
6	79	F	Right	Phacomorphic glaucoma	Sequential PI	Argon: #57 × 0.15 s × 0.2–1 W × 50 μm YAG: #3 × 2.3 mJ		0
7	68	F	Right	Traumatic glaucoma	Transcorneal cyclophoto-coagulation	Argon: #154 × 0.5 s × 0.4–0.59 W × 500 μm	Second 180°; previous time with topical oxybuprocaine, moderate pain	1
8	78	M	Right	Rubeotic glaucoma	TSCPC	Diode: #5 × 1.5 s × 1.5 W		2

AACG, acute angle closure glaucoma; PI, peripheral iridotomy; TSCPC, trans-scleral cyclophotocoagulation; YAG, yttrium–aluminium–garnet.

Results

Twenty eyes of 19 consecutive patients were recruited prospectively. Ten female and 9 male patients were included, with ages ranging from 10 to 79 years (mean 59.4 years). Nine right eyes and 11 left eyes were treated. Both eyes were treated in one patient. 2% lignocaine gel was suitable as a coupling medium, providing clear view for the laser procedures to be performed. No discomfort was experienced in 75% (15 eyes) of total treated eyes; mild discomfort in 20% (4 eyes, score of 1) and mild pain in 5% (1 eye, score of 2). No adverse reactions were encountered in any of the patients. All the procedures were completed without additional anaesthetics. The patients were divided into a glaucoma group, post-operative group and miscellaneous retinal group, respectively.

In the glaucoma group (Table 1), 6 patients received sequential or simple peripheral iridotomy for acute angle closure glaucoma or phacomorphic glaucoma, after receiving medical anti-glaucomatous treatment. The intraocular pressures immediately before laser treatment ranged from 35 to 50 mmHg (mean 42 mmHg). One eye received transcorneal cyclophotocoagulation for traumatic glaucoma after ruptured globe repair involving pars plana vitrectomy, as the iris tissue was totally avulsed during the trauma. Another patient received trans-scleral diode cyclophotocoagulation for rubeotic glaucoma. No discomfort was experienced in 50% (4) of the 8 patients; mild discomfort in 38% (3 patients) and only mild pain in the patient receiving trans-scleral diode cyclophotocoagulation.

Table 2. *Patient demographics and laser procedure details of the post-operative group*

Patient no.	Age (years)	Sex	Eye	Diagnosis	Procedure	Laser settings	Remarks	Pain score
1	66	F	Left	RD	Supplementary barrier	Argon: #211 × 0.1–0.4 s × 200 μm × 0.2–0.28 W		0
2	46	M	Left	RD	Supplementary barrier	Argon: #364 × 0.2 s × 0.44 W × 500 μm	Silicone oil in eye	1
3	74	F	Right	PDR + VH	Supplementary PRP	Argon: #219 × 0.1 s × 0.43 W × 200 μm		0
4	37	F	Right	PDR + VH	Supplementary PRP	Argon: #179 × 0.2 s × 02–0.3 W × 500 μm		0
5	56	M	Left	PDR + VH + CSMO	Grid	Argon: #185 × 0.1 s × 0.18–0.3 W × 100 μm		0
6	54	M	Left	PDR, VH + CSMO	Grid	Argon: #142 × 0.1 s × 0.35 W × 100 μm		0
7	65	M	Left	PDR + VH + CSMO	Supplementary PRP	Argon: #508 × 0.15 s × 0.3 W × 200 μm		0
					Grid	Argon: #80 × 0.1 s × 0.18–0.23 W × 100 μm		
8	42	F	Left	PCO	YAG cap.	YAG: #30 × 2 mJ	Uveitic cataract, poor right eye vision	0

RD, retinal detachment; PDR, proliferative diabetic retinopathy; VH, vitreous haemorrhage; PRP, panretinal photocoagulation; CSMO, dinically significant macular oedema; PCO, posterior capsule opacification; YAG cap., yttrium–aluminium–garnet capsulotomy.

Table 3. *Patient demographics and laser procedure details of the miscellaneous retinal group*

Patient no.	Age (years)	Sex	Eye	Diagnosis	Procedure	Laser settings	Pain score
1	10	M	Left	Coats' disease	Focal	Argon: #13 × 0.35 s × 0.2 W × 500 μm	0
2	68	M	Right	Retinal break in panuveitis	Barrier	Argon: #84 × 0.1 s × 0.29 W × 500 μm	0
3A	60	M	Left	IPCV	Juxtafoveal focal	Argon: #29 × 0.1 s × 0.2 W × 200 μm	0
3B	60	M	Left	IPCV	Juxtafoveal focal	Argon: #38 × 0.1 s × 0.18 W × 200 μm	0

IPCV, idiopathic polypoidal choroidal vasculopathy.

In the post-operative group (Table 2), 8 patients received laser therapy 1–5 days after surgery. Two patients underwent supplementary barrier laser after retinal detachment surgery. Five other patients received pars plana vitrectomy for proliferative diabetic retinopathy. Two of them received supplementary panretinal photocoagulation (PRP). Another 2 underwent grid laser for clinically significant macular oedema. One patient received both PRP and grid laser. The last patient in this group received a YAG capsulotomy for posterior capsule opacification. No discomfort was experienced in all but one patient (88%), who only had mild discomfort.

In the miscellaneous retinal group (Table 3), 1 patient aged 10 years underwent focal laser for Coats' disease. Another patient with panuveitis received barrier laser for a retinal break, while the last patient underwent juxtafoveal focal laser for bilateral idiopathic polypoidal choroidal vasculopathy. No discomfort was experienced in any of the patients.

Discussion

In the majority of transpupillary laser procedures, a coupling agent such as methylcellulose is normally applied, after instillation of a topical anaesthetic solution shortly beforehand. Usually the procedures can be finished without much discomfort to the patients. However, in the more painful procedures or the more pain-sensitive patients, the treatment may have to be inconveniently interrupted for the instillation of additional topical anaesthetic agent. Sometimes, additional modes of regional anaesthesia may be required, such as retrobulbar or peribulbar injections. These injections are associated with rare but serious systemic and local complications, such as brain stem anaesthesia and globe perforation, respectively.[1–13] To avoid the use of sharp needles and associated complications in these injections, sub-Tenon's anaesthesia in panretinal photocoagulation has been advocated.[16] However, this procedure requires surgical opening of the conjunctiva and sub-Tenon's space under aseptic condition. Additionally, complications such as orbital haemorrhage and muscle paresis have been reported.[17,18]

Weinberger *et al.*[19] suggested the use of topical sodium diclofenac 0.1% drops during retinal laser photocoagulation, which was performed 30–135 min after the administration of the analgesic agent in their study. The inconveniently long waiting time is probably due to the slow penetration of the drug through the cornea into the aqueous. The highest average concentration of the drug to be found in the aqueous is at 2.4 h after instillation.[20] On the other hand, topical lignocaine gel was reported to be effective even when applied only 5 min before cataract surgery.[14,15] Moreover, side-effects associated with topical sodium diclofenac, such as corneal problems[21,22] and exacerbation of asthma,[23] have been increasingly reported. The efficacy and safety of this agent in retinal laser photocoagulation has been challenged.[24]

In the present study, we have shown the safety and efficacy of using 2% lignocaine gel as a topical anaesthetic as well as a coupling agent for the contact lens during laser procedures in inflamed eyes. All laser treatments were completed without any corneal or other complications. No pain was experienced in 95% of the total eyes treated in our series. Only mild pain was reported in 1 patient receiving trans-scleral cyclophotocoagulation, which normally requires periocular anaesthetic injection. Another patient receiving transcorneal cyclophotocoagulation of the remaining 180° reported only mild discomfort, as compared with moderate pain even with additional topical oxybuprocaine in the first 180° treatment. In addition to the glaucoma patients, post-operative cases also benefited from the early pain-free laser treatment. Supplementary barrier laser in retinal detachment surgery, as well as PRP and grid laser in diabetic eyes, could have favourably affected the post-operative course. Early post-operative YAG capsulotomy after uveitic cataract operation for an only-eye patient meant a great difference in the quality of life. After we became confident in this method, we decided to apply it in other scenarios, namely retinal laser in children and juxtafoveal laser treatment, which normally requires periocular anaesthetic injection. The superb patient comfort makes the procedure feasible and safe.

During the laser treatment, many subthreshold afferent pain stimuli summate, leading to an efferent withdrawal response such as eyelid squeezing. The noxious afferent sources originate from either the anterior or posterior parts of the eye, which include the eyelid, conjunctiva, cornea, anterior uvea and choroid. The pain fibres of the anterior segment of the eye are blocked directly by contact with lignocaine gel or indirectly through diffusion of lignocaine gel into the anterior chamber. The long ciliary nerves, which

innervate the choroid, may also be anaesthetised by the gel. The efferent pathway manifests as ciliary spasm and eyelid squeezing, which may also be influenced by lignocaine gel as it diffuses into the anterior chamber as well as infiltrating the orbicularis muscle through the conjunctiva. As a result, the pain-relieving mechanism of lignocaine gel involves blockage of both afferent and efferent routes. Although not all afferent stimuli are completely blocked, removal of some of them may shift the pivot from threshold to subthreshold summation, thus suppressing an effective noxious stimulus. Lignocaine gel as the coupling medium also acts as a depot for slow and continuous release of the anaesthetic.

In summary, 2% lignocaine gel as a topical anaethetic as well as a coupling medium for the contact lens during laser procedure is safe and effective in inflamed eyes. It offers considerable comfort to the patient and is likely to reduce the duration of the laser procedure. This method is also simple, convenient, cheap, and has a rapid onset of action. A randomised control trial is warranted to further ascertain its usefulness compared with other modes of anaethesia. Modifications of the present study design may include pain assessment using the visual analogue score, analysis of single eyes of single patients and laser to be performed on homogeneous groups.

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