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Research Article

Efficacy and Safety of Selective Trabeculoplasty in the Treatment of Exfoliative Glaucoma

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Abstract

Exfoliative glaucoma is the leading cause of identifiable glaucoma in the world. Due to its favorable safety profile and its repeatability potential, SLT offers a therapeutic option for the eyes with XFG, POAG or with ocular hypertension. The main goal of this work was to demonstrate the efficacy of TLS to reduce intraocular pressure, confirm its immediate and long-term safety and to prove its usefulness as a 1st and 2nd line treatment for exfoliative glaucoma.

Keywords: Exfoliative glaucoma; Selective Laser Trabeculoplasty SLT

Introduction

Exfoliative glaucoma is the leading cause of identifiable glaucoma in the world [1]. Laser treatment is mainly indicated when medical treatment proves to be insufficient or sometimes as a first line, especially when there is a doubt about therapeutic compliance. Selective laser trabeculoplasty has been shown to decrease pressure in exfoliative glaucoma [2,3]. The aim of our study is to report the efficacy and safety of selective laser trabeculoplasty in the treatment of exfoliative glaucoma.

Methods

This is a prospective, non-comparative, non-randomized study conducted in the ophthalmology department B at hospital des spécialités de Rabat, based on the study of the efficacy and tolerance of selective trabeculoplasty in 10 patients. 16 eyes were examined, of which 8 are newly diagnosed (group A) and 8 were followed for poorly balanced exfoliative glaucoma under well-managed hypotonic treatment (group B). The exclusion criteria were a history of SLT, ALT or filtering surgery before laser treatment, the existence of any other ocular pathology, in particular inflammatory, and a history of ocular trauma. All patients underwent an ophthalmological examination with measurement of the best corrected visual acuity, slit lamp examination (LAF), measurement of eye tone, and fundus examination. All patient had a visual field and papillary OCT. Treatment with SLT was carried out 15 minutes after instillation of a drop of 0.5% apraclonidine in the eye. The procedure was performed under topical anesthesia using the Latina SLT lens (Ocular Instruments, Bellevue, WA, USA) to visualize the angle. The laser used was an Nd: Yag Coherent Selecta 7000 (Coherent Inc, Palo Alto, CA). The laser beam was focused on the pigmented trabeculum. The initial energy setting was 0.7mJ, which was increased or decreased by 0.1mJ to the maximum power giving no thermal effect "in champagne bubbles". The lower 180° were treated with 50 non-confluent impacts, all patients received topical treatment with non-steroidal anti-inflammatory drugs 3 times a day for a week. The patients were examined at 1 hour, 1 day, 1 week, 1 month, 3, 6, 9 and 12 months after the laser treatment. At each visit, an ophthalmological examination was performed, which included measurement of visual acuity, slit lamp biomicroscopy, Goldmann aplanation tonometry and the fundus. All IOP measurements were taken between 8:00a.m. and 11:00a.m. Success of SLT was defined by a drop in IOP greater than 20% compared to the base IOP and / or reduction in the number of drugs used by at least 1. Patients had to have a follow-up of 12 months in relation to achieving SLT to be included in the study.

Results

The average age of the patients at the start of treatment was 62.2 years (between 48 and 75 years of age) for a total of 10 patients, we had 4 men and 6 women. 6 patients had bilateral glaucoma. 16 treated eyes of which 8 were on hypotonizing treatment and 8 are newly diagnosed. A central corneal thickness analysis was performed using the IOL master. The average pachymetry is 535.5 microns with extremes ranging from 507 to 584 µm. The cup / disc ratio was evaluated by the papillary OCT with an average of 0.65 (Figure 1). For group B, 1 eye was on quaditherapy (3 molecules topically and diamox per os), 2 eyes were on triple therapy and 5 on dual therapy. The average drug used was 2.5. The energy used per impact varied from 0.4 to 0.9 mj with an average of 0.65mj. The mean initial intraocular pressure of the 16 eyes was 25.66mmhg (Figure 2). It decreased to 17.93mmhg, a percentage of 30.12%. The initial IOP was 27.20mmhg in group A, and 24.12mmhg in group B. All patients received topical non steroid anti inflammatory therapy at the rate of 3 drops per day for one week after SLT. One patient complained of minimal eye pain in the 2nd day after SLT, however we did not observe any inflammatory reaction or hypertensive peak or significant pain in the hours and days following the laser. At 12 months, the success rate reached 75% in group A and 87.5% in group B. In group A, at the end of the study, the number of hypotonizing agents used was reduced in 4 eyes and the average medication went from 2.5 before SLT to 1.87 (Figure 3-5).

Discussion

Over the past decade, Selective Laser Trabeculoplasty (TLS) has become a widely used treatment option worldwide for decreasing intraocular pressure (IOP) in patients with ocular hypertonia or open-angle glaucoma [4–5]. SLT has many theoretical advantages over ALT. First, the realization of the SLT laser is simpler due to a larger diameter of the impacts (400µm, and 3 nanoseconds). In addition, the SLT laser causes a selective thermal effect on the trabecular meshwork cells, thereby probably creating less damage to

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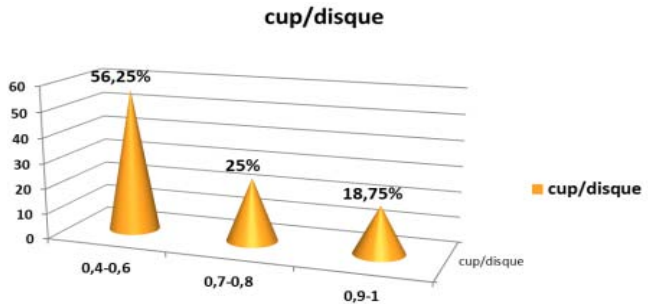

Figure 1: Cup / disc ratio (OCT).

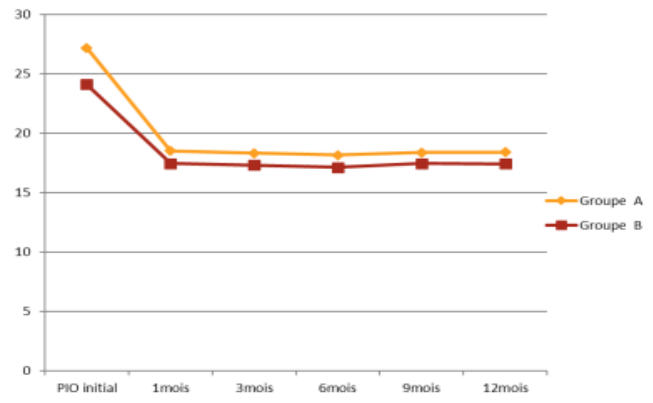

Figure 2: Evolution of mean IOP after SLT in group A and B.

Figure 3: Exfoliation deposits on the anterior lens capsule (ophthalmology B, Rabat Specialty Hospital).

Figure 4: Pseudo-exfoliation material in irirdo-corneal angle (Ophthalmology B, specialities hospital of Rabat).

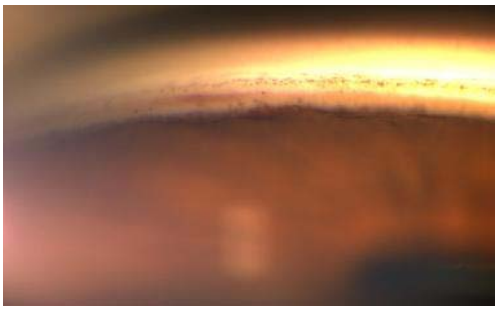

Figure 5: Line of Sampaolesi (ophthalmology B, Specialties hospital of Rabat).

the iridocorneal angle and offering the advantage of repeatability. In the end, it is less operator dependent [6]. Exfoliating glaucoma (XFG) is an open angle secondary glaucoma characterized by high and fluctuating pressure numbers resulting in rapid and considerable deterioration of the optical fibers [7,8]. Under treatment, the stability of lesions in XFG requires an average target IOP (17mmHg or less). It is generally difficult to achieve the desired target IOP in XFG with topical monotherapy [7]. Thus, the clinician need additional therapeutic options to manage exfoliative glaucoma [7-9]. To achieve more long-term success, it is essential to reduce the burden of chronic combined medical treatments (fewer drops) and to diversify the therapeutic means using alternative treatments (SLT, minimally invasive glaucoma surgery). This also implies that laser treatment, specifically SLT, should not be considered as a last resort option after failure of medical treatment, but as a second or third step in our management algorithm and must be repeated if necessary [10]. Indeed, SLT can help delay or even avoid the use of filtering surgery, which could be important for some patients [11,12]. As a general rule and as in our study, SLT is performed with approximately 50 impacts over 180 °. As the size of the spot (400lm) and the duration (3ns) are fixed, the surgeon only has to adjust the laser energy to a level where the microbubbles become visible or to a level immediately below the threshold which produces microbubbles [11]. As the energy of SLT is preferentially absorbed by the melanin pigment, trabecular hyperpigmentation improves the effectiveness of SLT [13]. So in case of pigmented angles, it is strongly advised to use a lower energy. In our study, the energy used varied between 0.4 to 0.9mj with an average of 0.65mj. The study by Shibata et al. [14] and the Prasad et al [15] study established that a 360° SLT makes it possible to reach lower IOP figures than a 180°, and also makes it possible to reduce variations in IOP in patients with primitive open angle glaucoma or ocular hypertension. Unfortunately, no study to date has addressed this issue in patients with XFG. Chen et al [13] conducted a prospective study comparing the efficacy of 90° and 180° SLT in patients with glaucoma (approximately 50% of XFG). They reported that SLT was just as effective with 25 spots (90°) as 50 spots (180°). This evidence, although limited, may imply that in XFG, the increased pigmentation of the trabecular meshwork could justify the fewer number of spots, the reduction of the energy levels and the surface of the laser. Treatment can be just as effective with fewer side effects (i.e., post-laser pressure spikes). Although a patient's individual response to SLT is difficult to predict, the decrease in IOP is proportional to the value of the initial IOP before the laser. In addition, the response of one eye to SLT makes it possible to predict the response of his contralateral in the same patient [16]. SLT offers the advantage of its

possible repeatability in the eyes previously treated with ALT [17] or SLT [18]. A prospective randomized study focused on the effect of repeated laser treatment on eyes with XFG or POAG, the first SLT of which did not achieve a reduction of more than 20% in IOP [18]. It showed that IOP decreased significantly in both the group initially treated with ALT and the group treated with SLT. In XFG specifically, reprocessing with SLT could be particularly useful since there is a continuous accumulation of pigment on and in the trabecular mesh. More evidence is needed in the future to elucidate when and how SLT reprocessing should be chosen in XFG patients. After treatment with TLS, anti-glaucomatous drugs are generally continued in most patients. SLT is proposed to further reduce IOP. Over time, however, when SLT is successful, the daily burden of combination treatments can be lessened with fewer drugs used and therefore fewer drops. In our study, patients in group B also continued their hypotonic treatment. During follow-up, it was possible to decrease the number of molecules used in 4 eyes and the average medication went from 2.5 before SLT to 1.87. There is still limited published evidence on the overall success of SLT in simplifying or reducing combination regimens. The success of SLT also concerns the enhancement of the overall quality of life of patients. Future studies should pay attention to clinical criteria other than only IOP reduction. To date, there is no consensus on the need for anti-inflammatory drugs in the immediate post-laser period. Surgeons prescribe a topical steroid for a few days to decrease inflammation and improve comfort. Others do not, based on the idea that the mild inflammatory reaction induced by SLT may be desirable, as it facilitates the biomechanical effects that increase the flow of the aqueous medium through the trabecular meshwork. All of the patients in our study received treatment with local NSAI and none of them experienced hypertonia or an inflammatory reaction after the laser. A short series recently described five cases of XFG that eventually required a trabeculectomy due to the recurrent elevation of IOP after SLT [19]. Unfortunately, to date, there has been no specific study on the efficacy of first-line SLT in the XFG. In a prospective trial, Melamed et al. [20] studied the efficacy of SLT as a primary treatment in 45 eyes of 31 patients with newly diagnosed open-angle glaucoma or ocular hypertension. This study included 29 cases with POAG and 5 cases of XFG. All patients received 180 ° SLT laser treatment of their trabecular meshwork. The mean pre-laser IOP was 25.5 ± 2.5 mmHg, after an average follow-up time of 11 months, the IOP was significantly reduced to 17.9 ± 2.8 mmHg, 30% reduction. It should be noted that in the smallest cohort of XFG the average reduction in IOP was significantly greater (from 28.6 ± 3.2 to 16.8 ± 0.8 mmHg; 41% reduction; P = 0.001) and than that seen in the POAG group (from 25.5 ± 2.0 to 18.5 ± 2.8 mmHg; 27% reduction; P \ 0.001). Subsequently, the efficacy of primary SLT was studied in a prospective trial including 18 cases of XFG and 19 cases with POAG [21]. These authors also treated the 180° of the trabeculum in all their patients. Failure has been defined as the need for medical, surgical, laser treatment or the return of IOP to a value within 3mmHg of the baseline pressure. The mean initial IOPs in patients with XFG and POAG were 25.5 ± 3.4 and 23.2 ± 3.0 mmHg, respectively. After 30 to 42 months of follow-up, patients with XFG who were not considered to have failed had an average IOP of 18.3 ± 4.7 mmHg (mean IOP reduction: 5.3mmHg), this IOP was at 17.6 ± 2.8 mmHg (mean IOP reduction : 5.7mmHg) in patients with POAG. Thus, the success rate of SLT was similar for the XFG and CAPE groups at 74% and 77% respectively at the end of the study. These two small cohorts studied the relative efficacy of SLT as a primary option in POAG compared to XFG. The inconsistency in these two surveys may be due to the difference in design and the methodological weakness. The study by Melamed et al. [15] included only five cases of XFG. In the study by Shazly et al. [21], the authors reported the results of the IOP at the end of the follow-up period only for the eyes which were not considered to be "failures", but not for the whole of the treated group. It is also remarkable that in this study, the base IOP of the XFG group was rather low (25.5 ± 3.4 mmHg), which is not typical of the other XFG groups of published reports [20]. For more evidence, powered studies are needed to fully describe the effectiveness of primary SLT in XFG. To date, several aspects of primary treatment for SLT remain poorly defined. For example, the optimal level of energy, the number of spots and the surface of the trabecular meshwork to be laserized. In addition, the efficacy of SLT on variations in IOP over the 24 hours in patients with XFG compared to other therapeutic means remains to be elucidated [8,12]. Finally, since in XFG there is a continuous accumulation of pigment in the trabecular meshwork, it may be essential to determine the optimal time and the probable effectiveness of reprocessing by SLT. In our study which included 16 XFG eyes, IOP in the eye group without prior treatment (group A) increased from 27.20mmhg to 18.41mmhg in 12 months after SLT, a percentage of lowering 32.31% PIO. The success rate of SLT in this group reached 87.5%.

Conclusion

Due to its favorable safety profile and its repeatability potential, SLT offers a therapeutic option for the eyes with XFG, POAG or with ocular hypertension. The main goal of this work was to demonstrate the efficacy of TLS to reduce intraocular pressure, confirm its immediate and long-term safety and to prove its usefulness as a 1st and 2nd line treatment for exfoliative glaucoma. Our results corroborated those of the literature concerning the efficacy of SLT in pressure reduction. This efficacy seems to be greater during the first 6 months, then there is a slight increase in IOP which remains mostly tolerable. However, a study over a longer language period is necessary to determine the best reprocessing time offered by the selective nature of SLT. In comparison between the two groups, the success rate reached 75% in group A and 87.5% in group B. Therefore, SLT seems to have more effect on the eyes which have never had prior medication only on eyes that have already been treated. This can be explained by the saturation of the excretory capacities of the trabecular meshwork in the previously treated eyes. Nevertheless, it allows a substantial reduction in IOP that cannot be overlooked. In addition, it also allows a long-term reduction in the number of eye drops / eye with an obvious gain in compliance. There is no question about the safety of SLT. Although some complications have been described, they remain rare and mild. We have not encountered any major laser incidents.

References

1. Ritch R. Exfoliation syndrome-the most common identi-fiable cause of open-angle glaucoma. J Glaucoma. 1994; 3: 176-177.

2. Latina MA. Selective laser trabeculoplasty-180-degree treat-ment. J Glaucoma. 2007; 16: 274-275.

3. Damji KF, et al. Selective laser trabeculoplasty versus argonlaser

trabeculoplasty: results from a 1-year randomised clini-cal trial. Br J Ophthalmol. 2006; 90: 1490-1494.

4. Weinand FS, Althen F. Long-term clinical results of selective laser trabeculoplasty in the treatment of primary open angle glaucoma. Eur J Ophthalmol. 2006; 16: 100-104.

5. Wong MOM, Lee JWY, Choy BNK, Chan JCH, Lai JSM. Systematic review and meta-analysis on the efficacy of selective laser trabeculoplasty in openangle glaucoma. Surv Ophthalmol. 2015; 60: 36–50.

6. Hollo´ G, Katsanos A. Exfoliation syndrome and exfoliative glaucoma: from genetics to surgery. In: Berhardt L, editor. Advances in Medicine and biology. New York: Nova Science Publishers Inc; 2016. p. 199–225.

7. Hollo´ G, Katsanos A, Konstas AG. Management of exfoliative glaucoma: challenges and solutions. Clin Ophthalmol. 2015; 9: 907–919.

8. Heijl A, Bengtsson B, Hyman L, Leske MC, Early Manifest Glaucoma Trial Group. Natural history of open-angle glaucoma. Ophthalmology. 2009; 116: 2271–2276.

9. Konstas A, Quaranta L, Katsanos A, Voudouragkaki I, Dutton G. Fixed combination therapies in glaucoma. In: Shaarawy T, Sherwood M, Hitchings R, Crowston J, editors. Glaucoma. 2nd ed. London: Elsevier; 2015. p. 583–592.

10. Hong BK, Winer JC, Martone JF, Wand M, Altman B, Shields B. Repeat selective laser trabeculoplasty. J Glaucoma. 2009; 18: 180–183.

11. Kennedy JB, SooHoo JR, Kahook MY, Seibold LK. Selective laser trabeculoplasty: an update. Asia Pac J Ophthalmol. 2016; 5: 63–69.

12. Konstas AGP, Quaranta L, Bozkurt B, et al. 24-h efficacy of glaucoma treatment options. Adv Ther. 2016; 33: 481–517.

13. Chen E, Golchin S, Blomdahl S. A comparison between 90 degrees and 180 degrees selective laser trabeculoplasty. J Glaucoma. 2004; 13: 62–65.

14. Shibata M, Sugiyama T, Ishida O, et al. Clinical results of selective laser trabeculoplasty in openangle glaucoma in Japanese eyes: comparison of 180 degree with 360 degree SLT. J Glaucoma. 2012; 21: 17–21.

15. Prasad N, Murthy S, Dagianis JJ, Latina MA. A comparison of the intervisit intraocular pressure fluctuation after 180 and 360 degrees of selective laser trabeculoplasty (SLT) as a primary therapy in primary open angle glaucoma and ocular hypertension. J Glaucoma. 2009; 18: 157–160.

16. Lee JWY, Wong MOM, Wong RLM, Lai JSM. Correlation of intraocular pressure between both eyes after bilateral selective laser trabeculoplasty in open-angle glaucoma. J Glaucoma. 2016; 25: e248–252.

17. Latina MA, Sibayan SA, Shin DH, Noecker RJ, Marcellino G. Q-switched 532-nm Nd:YAG laser trabeculoplasty (selective laser trabeculoplasty): a multicenter, pilot, clinical study. Ophthalmology. 1998; 105: 2082–2088 (discussion 2089–2090).

18. Ayala M. Intraocular pressure reduction after initial failure of selective laser trabeculoplasty (SLT). Graefes Arch Clin Exp Ophthalmol. 2014; 252: 315–320.

19. Bettis DI, Whitehead JJ, Farhi P, Zabriskie NA. Intraocular pressure spike and corneal decompensation following selective laser trabeculoplasty in patients with exfoliation glaucoma. J Glaucoma. 2016; 25: e433–437.

20. Melamed S, Ben Simon GJ, Levkovitch-Verbin H. Selective laser trabeculoplasty as primary treatment for open-angle glaucoma: a prospective, nonrandomized pilot study. Arch Ophthalmol. 2003; 121: 957–960.

21. Shazly TA, Smith J, Latina MA. Long-term safety and efficacy of selective laser trabeculoplasty as primary therapy for the treatment of pseudoexfoliation glaucoma compared with primary open-angle glaucoma. Clin Ophthalmol. 2010; 5: 5–10.