

## 577 nm 레이저 섬유주성형술의 단기 임상효과

### Short-Term Clinical Outcomes of Laser Trabeculoplasty Using a 577-nm Wavelength Laser

김종민 · 조경진 · 경성은 · 장무환

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**Purpose:** To evaluate the pressure-lowering effects of single-spot laser trabeculoplasty and patterned laser trabeculoplasty using a 577-nm wavelength laser.

**Methods:** A total 35 eyes of 35 patients with primary open-angle glaucoma were enrolled in this study. Eighteen eyes of 18 patients were treated with 360° single-spot laser trabeculoplasty and 17 eyes of 17 patients were treated with 360° patterned laser trabeculoplasty. All patients were evaluated after laser trabeculoplasty at 1 week, 1 month, 3 months, and 6 months using slit lamp examination and Goldmann applanation tonometry.

**Results:** At 6 months postoperatively, the single-spot laser trabeculoplasty group had a mean IOP of  $15.89 \pm 3.89$  mm Hg with a mean IOP reduction of 37.1%, while the patterned laser trabeculoplasty group had a mean IOP of  $17.57 \pm 2.64$  mm Hg with a mean IOP reduction of 27.1%.

**Conclusions:** Laser trabeculoplasty with a 577-nm optically pumped semiconductor laser was safe and demonstrated an IOP lowering effect. There were no significant differences in the IOP lowering effects between the single-spot laser trabeculoplasty and the patterned laser trabeculoplasty.

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**Key Words:** Laser trabeculoplasty, PASCAL, Pattern laser trabeculoplasty

20-30%

. 1979 Wise and Witter<sup>1</sup>

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. 1995 Latina and Park<sup>2</sup>

532 nm Q-switched frequency-doubled

Nd:YAG laser

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(PASCAL)

3

. Turati et al<sup>4</sup>

25

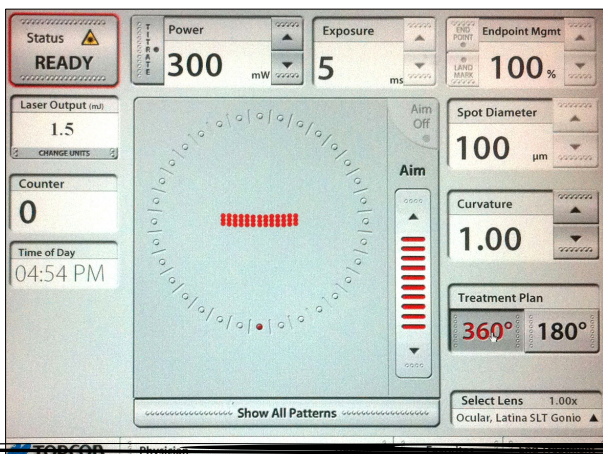
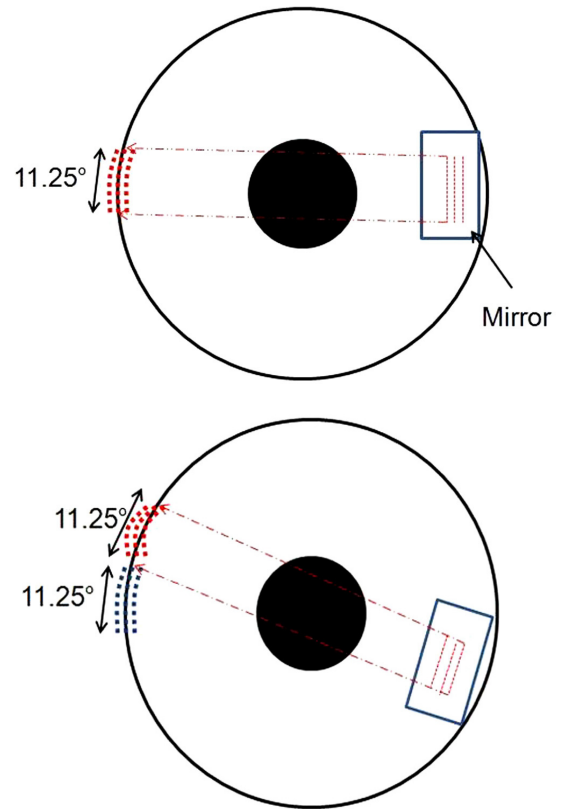


Figure 1. Graphic user interface for patterned laser trabeculo-

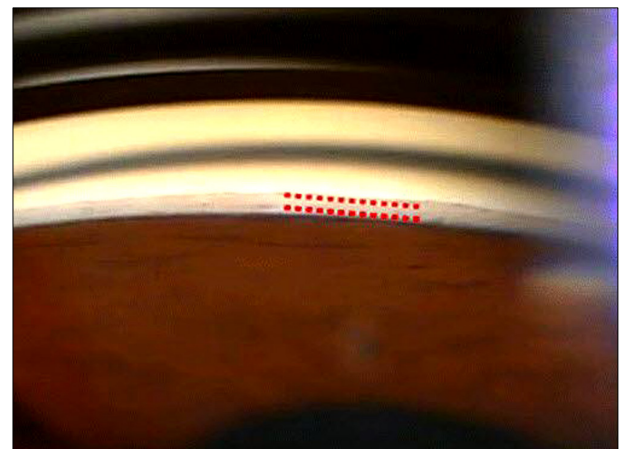


Figure 2. Procedure of patterned laser trabeculoplasty. (A) Schematic view of patterned laser trabeculoplasty. Pattern of Aiming beam (635 nm) is projected on trabecular meshwork. Once a physician presses the foot pedal, PASCAL photo-coagulator delivers a patterned laser on trabecular meshwork. (B) After shooting the laser, the pattern is automatically rotated clockwise by 11.25°. (C) Gonioscopic view of patterned laser trabeculoplasty.

**Table 1.** Patient demographics

	Single spot laser group	Patterned laser group	<i>p</i> -value
Age (years)	53 ± 16.59 (19-72)	46 ± 9.5 (35-65)	0.30*
Sex :			0.87 <sup>†</sup>
Male	10	8	
Female	8	9	
Mean number of glaucoma medication (n, range)	0.81 ± 1.17 (0-3)	1.30 ± 1.25 (0-3)	0.44*
Baseline IOP (mm Hg, range)	25.27 ± 7.51 (18-32)	24.11 ± 4.17 (19-45)	0.91*
Mean duration of increased IOP (month)	2.44 ± 1.69 (1-5)	2.35 ± 1.59 (1-6)	0.64*
Degrees of glaucomatous visual field loss (month, range)			0.49 <sup>†</sup>
Early defect	7	8	
Moderate defect	5	5	
Severe defect	4	6	

Values are presented as mean ± SD.

IOP = intraocular pressure.

\*Mann-Whitney *U*-test; <sup>†</sup>Chi-square test.

**Table 2.** Changes of mean intraocular pressure during 6 months of follow-up

Time	Single spot laser group			Patterned laser group		
	Number of eyes	IOP (mm Hg)	<i>p</i> -value*	Number of eyes	IOP (mm Hg)	<i>p</i> -value*
Baseline	18	25.27 ± 7.51 (18-32)		17	24.11 ± 4.17 (19-45)	
1 week	18	18.09 ± 4.44 (12-25)	0.01	17	17.78 ± 2.49 (14-21)	0.01
1 month	16	19.44 ± 5.15 (10-26)	0.02	15	19.44 ± 5.15 (12-20)	0.03
3 months	16	17.67 ± 5.13 (11-23)	0.02	15	18.43 ± 1.40 (17-20)	0.02
6 months	18	15.89 ± 3.89 (11-21)	0.01	17	17.57 ± 2.64 (15-22)	0.03

Values are presented as mean ± SD.

\*Wilcoxon signed ranks test.

**Table 3.** Success rate of laser trabeculoplasty

	Success	Failure	
		IOP decreased	IOP increased
Single spot laser trabeculoplasty	50% (9)	44.44% (8)	5.56% (1)
Patterned laser trabeculoplasty	52.94% (9)	47.06% (8)	0% (0)
<i>p</i> -value*	0.87		

IOP = intraocular pressure.

\*Chi-square test.

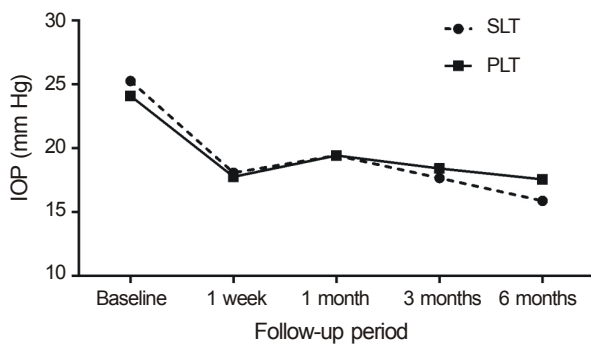
**Table 4.** Mean IOP reduction of subgroups between single spot laser trabeculoplasty and patterned laser trabeculoplasty groups using success definitions

		Baseline IOP (mm Hg)	IOP after 6 months (mm Hg)	<i>p</i> -value*
SLT	Success subgroup (n = 9)	27.40 ± 10.08 (19-45)	14.50 ± 2.88 (11-18)	0.01
	Failure subgroup (n = 9)	23.50 ± 3.45 (19-29)	17.00 ± 4.16 (11-21)	0.42
	<i>p</i> -value†	0.03	0.16	
PLT	Success subgroup (n = 9)	26.80 ± 3.27 (24-32)	17.50 ± 2.08 (15-20)	0.01
	Failure subgroup (n = 8)	20.75 ± 2.22 (18-23)	17.67 ± 3.79 (15-22)	0.06
	<i>p</i> -value†	0.01	0.30	

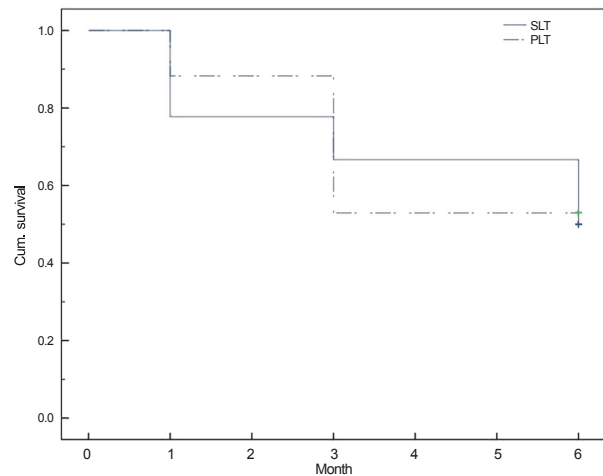
Values are presented as mean ± SD.

IOP = intraocular pressure; SLT = single spot laser trabeculoplasty; PLT = patterned laser trabeculoplasty.

\*Wilcoxon signed ranks test; †Mann-Whitney *U*-test.



**Figure 3.** Changes in mean intraocular pressure after laser trabeculoplasty. No statistical differences between the groups during follow-up ( $p > 0.05$ , Mann-Whitney test). SLT = single spot laser trabeculoplasty; PLT = patterned laser trabeculoplasty.



**Figure 4.** Kaplan-Meier survival curve using success definition in single spot laser trabeculoplasty and patterned laser trabeculoplasty groups. No statistical differences between the groups during follow-up ( $p = 0.93$ ). Cum = cumulative; SLT = single spot laser trabeculoplasty; PLT = patterned laser trabeculoplasty.

24.11 ± 4.17  
mmHg, 1 17.78 ± 2.49 mmHg (26.3%)  
, 1 19.44 ± 5.15 mmHg (19.4%), 3  
18.43 ± 1.40 mmHg (23.6%), 6  
17.57 ± 2.64 mmHg (27.1%)  
(Table 2, Fig. 3).

1, 1, 3, 6  
(Wilcoxon signed ranks test,  
 $p < 0.05$ ).

6 50%,  
6 52.94%  
( $p = 0.87$ ) (Table 3).

(Table 4). 1, 3, 6

( $p=0.93$ ) (Fig. 4).

1

. 1

Micropulse

13,14

810 nm

. Micropulse

, 6

## 고 찰

pulse

micropulse

. Wise<sup>6</sup>

Titanium-Sapphire

790 nm

Titanium-

. Van Buskirk et al<sup>7</sup>

Sapphire

10

532 nm

Q-switched fre-

quency-doubled Nd:YAG laser

IL-1 $\beta$ , TNF- $\alpha$

cytokine

matrix metalloproteinase

6-8

8-10

15

180°

“champagne

Micropulse  
Nd:YAG

, Titanium-Sapphire

bubbles”

50-70

Jang et al<sup>17</sup>

180 360

16

488

514 nm

1973

Worthen

180

10-20 ms

and Wickham<sup>11</sup>

. 1979

Wise and Witter<sup>1</sup>

18

56

. Park et al<sup>12</sup>

PASCAL Photocoagulator  
(OptiMedica Inc., Santa Clara, CA) 2006

computer-guided program

35

1

35.27%

. 3

22

(

66 )

, 100  $\mu$ m,

5 ms

22.5°

16

360°

. 360°

3.5 J

1056

63%

8.3 mm<sup>2</sup>

810 nm

100 ms

200  $\mu$ m

5 ms

10

50  $\mu$ m

.<sup>4</sup> Nd:YAG  
3 ns  
18  
PASCAL Streamline 577<sup>TM</sup> 577nm  
PASCAL Photocoagulator 532 nm  
Sramek et al<sup>19</sup> 577 nm  
532 nm 26%  
PASCAL Photocoagulator  
66  
22.5° PASCAL Streamline 577<sup>TM</sup>  
39 12.25° 360°  
1248  
39  
200 ms  
(curvature)  
577 nm  
577 nm  
6

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= 국문초록 =

## 577 nm 레이저 섬유주성형술의 단기 임상효과

**목적:** 577 nm 레이저를 이용한 단일 광응고반 레이저섬유주성형술과 패턴 레이저섬유주성형술의 안압 하강효과를 알아보고자 하였다.

**대상과 방법:** 원발개방각녹내장 환자 35명을 대상으로 18안은 360° 단일 광응고반 레이저섬유주성형술을 시행하였고, 17안은 360° 패턴 레이저섬유주성형술을 시행하여 시술 후 1주, 1개월, 3개월, 6개월의 안압검사 및 세극등 현미경검사를 시행하였다.

**결과:** 단일 광응고반 레이저섬유주성형술을 시행한 군에서 술전 안압은 평균  $25.27 \pm 7.51$  mmHg였고, 술후 6개월째 안압은 평균  $15.89 \pm 3.89$  mmHg로 술전에 비해 평균 37.1% 안압하강 효과가 있었다. 패턴 레이저 섬유주성형술을 시행한 군에서 술전 안압은 평균  $24.11 \pm 4.17$  mmHg였고, 술후 6개월째 안압은 평균  $17.57 \pm 2.64$  mmHg로 술전에 비해 평균 27.1% 안압하강 효과가 있었다.

**결론:** Optically pumped semiconductor laser (577 nm)를 이용한 단일 광응고반 레이저섬유주성형술과 패턴 레이저섬유주성형술은 안압하강 효과가 있으며, 시술방법에 따른 안압하강의 효과는 두 군간에 통계학적으로 유의한 차이는 없었다( $p=0.40$ ).

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