

Retinal Laser Practice Pattern changes with Induction of New Laser Technology in One Tertiary Eye Care Center in India

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ABSTRACT

Purpose: To assess the change in retina laser practice pattern following induction of new laser technology in India, the pattern scan laser (PASCAL) where the single spot slit lamp delivery mode laser already existed.

Materials and methods: The impact of introduction of pattern scan laser (Pascal) on the selection of retina laser device was studied in a prospective study of 273 consecutive patients in a tertiary care eye center in India. Three retina specialists participated in decision-making and one independent observer prospectively recorded the data. The independent observer also used the visual analog scale (VAS) to prospectively record the pain experienced by the patient during pan retinal laser.

Results: Two hundred and seventy-three (138 pattern laser and 135 single spot laser) patients received 415 (234 pattern laser and 181 single-spot laser) laser procedures in a study period of 5 months. The number of pan retinal photocoagulation (PRP) in the pattern laser group (162 of 234; 69.23%) was statistically significant ($p < 0.0001$) than the single-spot laser group (23 of 181; 12.71%). The number of focal laser procedures was statistically significant in the single-spot laser group (98 of 181; 54.14%) than the pattern laser group (34 of 234; 14.53%) ($p < 0.0001$). PRP pain score was less in the pattern laser group (4.58 ± 1.62) than the single-spot laser group (7.1 ± 0.6) ($p = 0.003$). There was one adverse event of inferior choroidal detachment in the pattern laser group following one sitting PRP, but it resolved spontaneously. There was no laser treatment-related complications in the single-spot laser group of patients.

Conclusion: We observed a quick change to use of pattern scan laser system for PRP procedure but not in the focal and barrage laser treatment procedures. This was possibly due to both physician comfort (speed of each session of treatment and typically one session less in PRP procedure) and patient comfort (one time less physician visit and reduced pain).

Keywords: Retina laser, Pattern scan laser, Practice pattern.

INTRODUCTION

Retinal photocoagulation is the standard of care in a variety of retinal disorders. Since the introduction of the xenon arc photocoagulation in 1950, there has been significant change in laser technology (lasing material and laser system) and technique (delivery system).¹⁻⁶ The current technology is use of solid state diode and double frequency Nd:Yag lasers and transpupillary laser delivery by slit lamp and indirect ophthalmoscope, or endo delivery inside the vitreous cavity. The latest in laser delivery technology is incorporation of computer technology either to deliver more than one laser spot in a predetermined pattern (e.g. pattern scan laser, Pascal system) or additionally incorporate other features, such as imaging and treatment planning (e.g. Navilas laser system).^{7,8} These new features are meant to increase safety and efficiency of the laser system and at the same time improves the patient compliance.

The Pascal (OptiMedica Corp, Santa Clara, California) is a semiautomated laser photocoagulator that delivers a pattern of array of multiple burns in a rapid predetermined sequence with a single foot pedal depression. There are several reports on its

improved efficiency, increased safety, uniformity and precision, reduced pain and reduced visual field defects over the currently existing lasers.^{9,10}

The Pascal laser system is recently introduced in India. All new Pascal users were experienced users of the standard single-spot laser system for several decades. With an aim to know the impact on use and acceptance of this new laser system we designed this prospective study in one tertiary care eye institute. We had two objectives- one main and one ancillary. The main objective was to assess the change, if any, in retina laser practice pattern after induction of pattern scan laser, and one ancillary objective was to measure the pain score in patients who received pan retinal photocoagulation.

MATERIALS AND METHODS

This prospective study was done in the LV Prasad Eye Institute, Bhubaneswar, Odisha, India. This vitreoretina service in this center has three retinal specialists with a cumulative experience of 31 years in medical and surgical retina practice. All patients were treated either by the preexisting laser system

(Visulas 532, Carl Zeiss Meditec, Dublin, CA, USA) or by the Pascal (OptiMedica Corp, Santa Clara, California) laser using the slit lamp delivery mode. All the patients were treated after a detailed clinical examination and fluorescein angiography/optical coherence tomography, where applicable, and after obtaining the patient’s consent. The treatment was as per the current standard of care. This included dilation of pupil with topical tropicamide, anesthetizing the treatment eye with topical 0.5% proparacaine, and use of a slit lamp laser lens (Mainster standard/ Mainster wide field/ Volk Quadrasperic) coupled with methyl cellulose solution.

The study was done 6 months after acquisition of Pascal system and the treating physicians had experience of 3 years with the specific Carl Zeiss laser system used in the study. The retina specialists used either of the laser system based on their individual experience, conviction, convenience and preference. In case of Pascal, the surgeon was free to choose the laser pattern. In either laser system all retinal laser spots were placed one burn width apart. After completion of the procedure, topical lubricant was instilled to the treated eye. An independent nontreating ophthalmologist (medical retina fellow) measured the pain score immediately after the laser treatment was completed. The visual analog pain score scale (VAPSS)¹¹ was used to record the pain score. We collected the following information: age, gender, laterality, indication, type of laser, laser parameters, laser pattern for Pascal laser, pain scale (Visual analog scale 0-10) and the surgeon’s name prospectively in a

predesigned data sheet. The independent observer was not allowed inside the laser room at time of laser delivery and the treating surgeon was not allowed to stay in the laser room when the pain scoring was done.

RESULTS

In the study period of 5 months we treated 273 patients using slit lamp laser. This consisted of 138 patients (234 procedures) using the Pascal laser and 135 patients (181 procedures) using the single-spot standard Zeiss 532 nm laser. The demographic and other clinical details are listed in Table 1.

The number of PRP procedures in the Pascal laser system (162/234) was statistically significant than number of PRP procedures in the Zeiss laser system (23/181) (69.2% vs 12.7%; $p < 0.0001$). The number of focal procedures was statistically significant in the Zeiss laser group (98 of 181) than in the Pascal laser group (34 of 234) (54.14% vs 14.53% $p < 0.0001$). The chief indications of PRP were proliferative diabetic retinopathy and the chief indication of focal laser treatment was clinically significant diabetic macular edema. The laser setting (power, duration, spot size and total laser spots) is listed in Tables 2 and 3. The power setting was higher in the Pascal laser system; the laser spot size was fixed at 100 or 200 μm , and total number of laser spots was higher. The power setting in the Zeiss system was lower, the laser spot size varied from 100 to 300 μm , and the total delivered spots were less. The mean

Table 1: Demography

	Conventional laser (Carl Zeiss)	Pattern scan laser (Pascal)	p-value
No. of patients	135	138	
Laterality	OD: 91(50.28%); OS: 90 (49.72%)	OD: 111(47.44%); OS: 123 (52.56%)	
Age	49.3 ± 15.67	57.33 ± 10.65	
Pain score in PRP	7.1 ± 0.6	4.58 ± 1.62	0.003
No of procedures	181	234	
Pan retinal scatter	23 (12.71%)	162 (69.23%)	< 0.0001
Focal/grid	98 (54.14%)	34 (14.53%)	< 0.0001
Barrage	50 (27.62%)	14 (5.98%)	< 0.0001
Sectoral scatter	10 (5.53%)	24 (10.26%)	0.07

Table 2: Laser parameters in standard single-spot laser (Carl Zeiss Meditec)

	Power (mW)	Duration (msec)	Size (μm)	Total laser spots
PRP	258.70 ± 71.37	161.30 ± 33.48	295.65 ± 20.85	582.83 ± 188.96
Focal/grid	113.16 ± 36.57	99.39 ± 17.28	100.82 ± 10.32	37.70 ± 35.40
Barrage	180.20 ± 48.63	158.70 ± 43.29	200.73 ± 74.26	245.375 ± 181.33
Sectoral	305 ± 112.87	195 ± 76.19	260 ± 51.64	630 ± 359.51

Table 3: Laser parameters in Pascal laser

	Power (mW)	Duration (msec)	Size (μm)	Total laser spots
PRP	521.77 ± 125.47	30.25 ± 2.94	200	1369.75 ± 457.37
Focal/grid	305.35 ± 121.16	22.35 ± 4.31	100	236.68 ± 253.56
Barrage	450.14 ± 86.06	67.71 ± 42.73	200	669.64 ± 360.01
Sectoral	423.67 ± 95.35	29.17 ± 2.82	200	1157.88 ± 630.23

pain score for the PRP procedures with the pattern laser was 4.58 (\pm 1.62) and with Zeiss laser was 7.1 (\pm 0.6) ($p = 0.003$) (Table 1). No adverse events were noted after laser photocoagulation save one patient. This patient of proliferative diabetic retinopathy received one sitting PRP using the pattern laser. The laser settings were 650 mW powers, 200 μ m spot size, 30 msec duration and over 2400 spots were applied in one treatment session. He developed a small, but self-resolving, inferior choroidal detachment.

DISCUSSION

The results of this prospective study suggested that the Pascal multispot laser system was preferred for retinal laser procedures that required a longer treatment time such as PRP; the retinal surgeons preferred the standard single-spot laser system for focal or grid laser (mostly for clinically significant macular edema). Greater acceptance of the Pascal multispot laser could be due to ease of performing the procedure, less time required to complete the procedure, more number of laser spots delivered at a single foot pedal depression, less discomfort to the patient, and less number of sittings both for the physician and the patient.

The treating retina physicians involved in the study described three experiences of pattern scan laser treatment. One, they tended to apply more laser spots when using the pattern scan laser system in treatment of proliferative diabetic retinopathy (possibly due both ease of application and tendency to use 200 μ m spot size); two, the laser marks were barely visible while doing a macular focal or grid treatment (because the system allows only up to 20 msec laser duration); and three, retinal barrage photocoagulation in far periphery was difficult not only in focusing the area with any available laser lens, but also creating a laser burn of sufficient strength (only when one used multiple spots). The treating physicians also commented that the patients with proliferative diabetic retinopathy who needed more than one treatment sessions were rather comfortable with two sessions (possible with the multispot lasers) than with more than two sessions (required when one uses single-spot lasers).

There are few weaknesses of the study: One, in this study the treating physicians had options to choose their laser system. The study was done 6 months after the acquisition of the laser and hence it is presumed that reasonable time to evaluate the

Pascal system; two, this is only one center study and hence can not possibly extrapolated the current trends in India. Despite these weaknesses the study shows a trend in use of new and emerging technology in retina laser.

CONCLUSION

Multispot laser delivery system is a new laser delivery method and is subtly changing the retinal laser practice pattern. This was observed in this study center.

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