

# **Efficacy of Laser Photocoagulation for Type 1 Idiopathic Macular Telangiectasia: A Retrospective Study**

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## **Authors' contributions**

*The work was carried out in collaboration among all authors. Authors HK, KY and TK drafted the manuscript. Authors HK, KY, DK and KK collected the data. Authors HK and KY reviewed the literature. Authors HK and KY interpreted the data and critically reviewed the manuscript. Author TK critically reviewed the final version of the manuscript. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Aims:** The aim of this study was to evaluate the efficacy of laser photocoagulation for type 1 idiopathic macular telangiectasia (MacTel).

**Study Design:** Retrospective case series

**Place and Duration of Study:** Department of Ophthalmology, Oita University Hospital during the period from 2004 to 2013.

**Patients and Methods:** Six eyes of 6 patients with type 1 MacTel diagnosed consecutively in the Oita University Hospital during the period from 2004 to 2013 were studied. They showed macular edema and their visual acuity were deteriorated due to leakage from the aneurysms. Four patients were male and two were female with an average age of 64 years (range: 41 to 74 years). Informed consent was obtained from each patient and the laser photocoagulation was applied to leaky

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aneurysms in all eyes. The central macular thickness (CMT) was measured by optical coherence tomography (OCT). Mean follow up period was 44 months (range: 24 - 63 months).

**Results:** Mean visual acuity significantly increased from logMAR 0.25±0.27 at baseline to logMAR 0.11±0.14 (P<0.05) at the last visit. Visual acuity improved more than 0.2 logMAR in five eyes and was stable (gain or loss of < 0.3 logMAR) in one eye. Mean central macular thickness significantly decreased from 454±181 µm at baseline to 231±67 µm (P<0.05) at the last visit. Macular edema was not detected by OCT in any patients at the last visit.

**Conclusion:** In type I MacTel, laser photocoagulation may achieve a visual improvement and normalize the central macular thickness.

**Keywords:** Photocoagulation; idiopathic macular telangiectasia; aneurysmal telangiectasia; macular edema.

## 1. INTRODUCTION

Idiopathic macular telangiectasia, recently called MacTel, shows retinal capillary telangiectasia in the macula and perifoveolar areas, resulting in macular edema and atrophy without a known etiology. In 1993, Gass classified MacTel into three categories [1]. In 2006, Yannuzzi et al. [2] proposed a simplified classification: clinical detection of the aneurysmal telangiectasia (type 1) and bilateral retinal atrophy also called perifoveal telangiectasia (type 2). Fluorescein angiography shows telangiectasia with slight leakage without aneurysmal vessels in type 2 MacTel, which is refractory to the treatment including laser photocoagulation [1,3].

As the MacTel is a rare disease, the strategy of its treatment has not been established yet. Most instances of telangiectasia in Western countries are type 2, while the most frequent among the Japanese has been reported to be type 1 MacTel [4,5]. Laser photocoagulation, photodynamic therapy, and anti-VEGF agents have been applied for the treatment of type 1 MacTel. However, there are only several reports describing the effectiveness of the treatment [6-12]. Therefore, we examined the effectiveness of laser photocoagulation for type 1 MacTel of Japanese patients in the present study.

## 2. PATIENTS AND METHODS

This study was designed as a retrospective case series. Institutional review board approval was obtained from the Oita University Hospital, Oita, Japan (No. 2034). We reviewed medical records of 22 eyes of 20 patients (age: 66.4±9.7, range:41-79 yrs) who were diagnosed as type 1 MacTel in the Oita University Hospital during the period of 2004 to 2013. The patients consisted of 9 eyes of 9 males (age: 59.9±10.3, range:41-74

yrs) and 13 eyes of 11 females (age: 71.7±5.0, range: 62-79 yrs). Six eyes of 6 patients showed macular edema and their visual acuities were deteriorated due to leakage from aneurysms. The patients underwent a complete ophthalmic examination including best-corrected visual acuity, indirect ophthalmoscopy, fluorescein angiography (FA), indocyanine green angiography (IA), fundus photography and spectral-domain optical coherence tomography (OCT). After obtaining informed consent from each patient, the retinal photocoagulation was applied to leaky aneurysms detected with FA. The multicolor laser was used and the parameters in this study were color of yellow, spot size of 50-100 µm, duration of 200 milliseconds, and power between 80-160 milliwatt. Six-9 laser shots were applied to the lesion. The decimal visual acuity was converted to a logarithm of the minimal angle of resolution. The central macular thickness (CMT) was measured by OCT. The visual acuity, and CMT were measured at baseline, 1, and 3 months postoperatively. The patients underwent laser photocoagulations at the baseline, and were followed at least 24 months with 3 monthly schedules.

## 3. RESULTS

Patients consisted of 4 males and 2 females. Ages was 41 to 74 years (mean ± SD: 64.3 ± 12.2). The follow up period was 24 to 63 months (mean ± SD: 44.2 ± 13.7). General complications included hypertension (3 patients), diabetes (3 patients), arrhythmia (1 patient) and cerebral infarction (1 patient). No patients had ocular complications such as glaucoma, retinal disease except MacTel, cataract deteriorating visual acuity, and anterior segment abnormalities. Two eyes (a male and a female) were right, and 4 eyes (3 males and a female) were left.

The logMAR visual acuity was  $0.25 \pm 0.27$  (mean  $\pm$  SD) at the first visit, became  $0.21 \pm 0.25$  at 24 months after the treatment ( $p < 0.01$ ), and significantly improved to  $0.11 \pm 0.14$  at the last. ( $p < 0.01$ ) The patients improved greater than 0.2 logMAR were 5/6 (83%) at the last visit (Table 1).

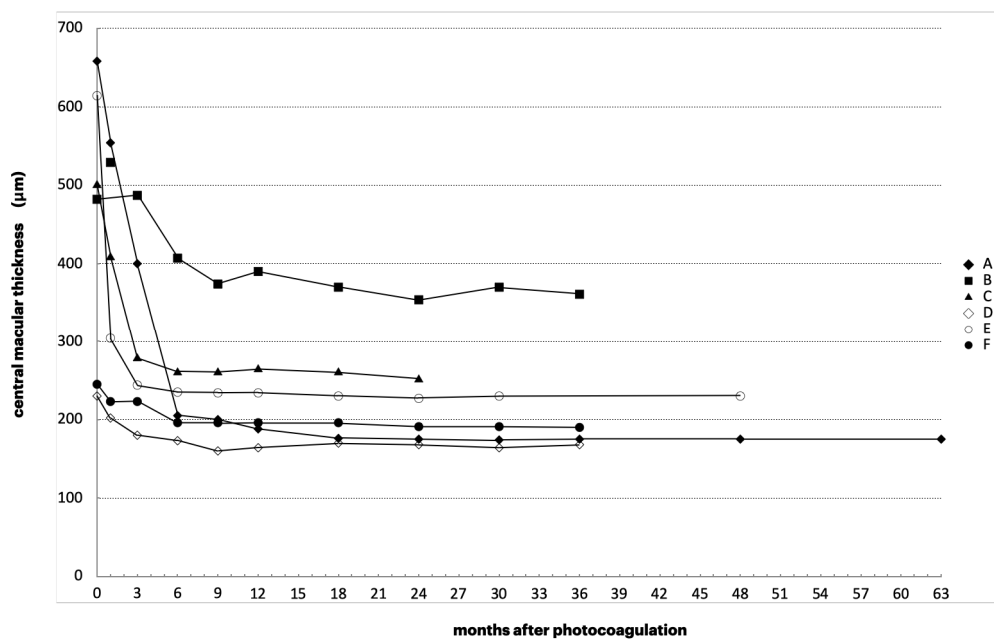
The CMT significantly decreased from  $454.8 \pm 181.1 \mu\text{m}$  (mean  $\pm$  SD) at the first visit to  $227.7 \pm 69.5 \mu\text{m}$  24 months after the treatment ( $0.01 < P < 0.05$ ), and  $231.0 \pm 66.9 \mu\text{m}$  at the last ( $0.01 < P < 0.05$ ). The CMT of the fellow eye of these patients was  $211.8 \pm 19.3 \mu\text{m}$ . There was no significant difference in the treated and fellow eye in CMT ( $P > 0.05$ ) at the last visit (Table 1, Fig. 1). There were no adverse events in the treated eyes.

A representative case is shown with its figures. The female case aged 62. At the first visit, ringed hard exudate and cystoid macular edema was seen in foveolar area, and visual acuity was 0.2 (Fig. 2). There were many leaky aneurysms in parafoveal area in fluorescein angiography (Fig. 3). The retinal photocoagulation was performed to these aneurysms (Fig. 4). The laser parameters were a spot size of  $50 \mu\text{m}$  (Area Centralis), color of yellow, power of 80 milliwatts (mW), duration of 200 milliseconds, and the number of shots was 49. Eight months after the

photocoagulation, the edema was resolved and at 36 months, visual acuity improved to 1.0 (Fig. 5,6).

#### 4. DISCUSSION

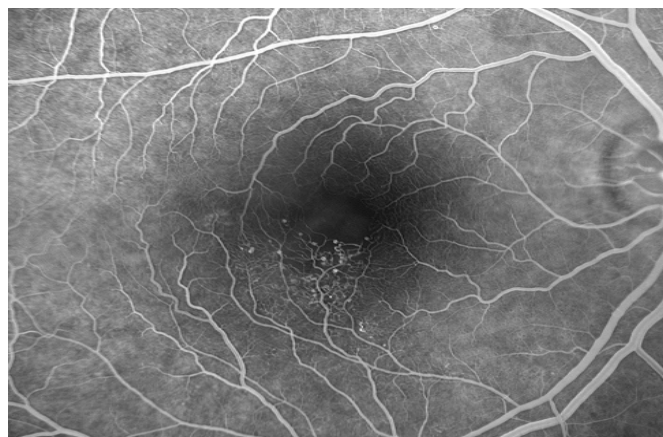
Type 1 MacTel is a developmental retinal vascular disease characterized by ectasia of the perifoveal capillaries with microaneurysmal dilatation and capillary non-perfusion of the perifoveal capillaries. The vascular change occurs in the deep retinal capillary network, leading to intraretinal neovascularization that seems to be retinal origin. Loss of visual acuity in the patients is caused by extension of the exudation from the abnormal capillaries into the foveolar area where it may produce the cystoid macular edema. The changes of visual acuity after laser photocoagulation for type 1 MacTel have been reported before [1,3,6,7]. Our results support the previous ones that laser photocoagulation for type 1 MacTel is effective in improving or maintaining visual acuity. The changes in CMT are due to a reduction of macular edema. In terms of the change in CMT in this study, macular edema is considered to be absorbed in about 6 months by the treatment (Fig. 1). The macular edema has disappeared in each patient by the last visit.



**Fig. 1.** The central macular thickness decreased rapidly after the treatment, and became stable in about 6 months. The 6 cases represent A – F



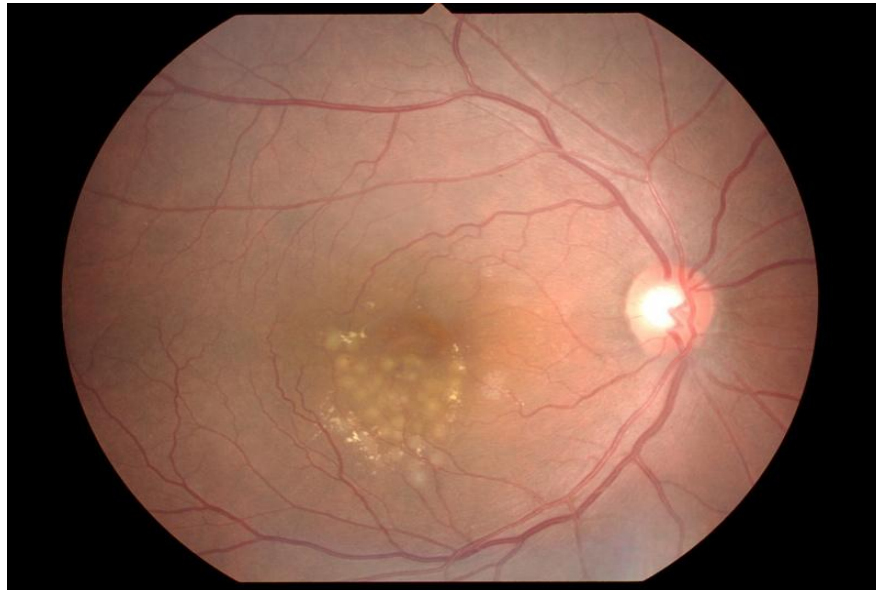
**Fig. 2.** The female case aged 62. At the first visit, ringed hard exudate and cystoid macular edema were seen in foveolar area



**Fig. 3.** Numerous aneurysms and destruction of the structure of capillary are observed in parafoveolar area in fluorescein angiography at the first visit. There is a fluorescence leakage from the lesion

**Table 1. Clinical course of the 6 patients after the laser therapy. The logMAR VA was  $0.25 \pm 0.27$  at the baseline and became  $0.21 \pm 0.25$  at 24 months after the treatment ( $p < 0.01$ ). The CMT significantly decreased from  $454.8 \pm 181.1 \mu\text{m}$  at the baseline to  $227.7 \pm 69.5 \mu\text{m}$  24 months after the treatment ( $0.01 < P < 0.05$ ). VA: visual acuity, CMT: central macular thickness.**

Case	Age	Sex	VA logMAR				CMT $\mu\text{m}$				
			Baseline	12 months	24 months	Last visit	Baseline	12 months	24 months	Last visit	Last visit (months)
A	62	M	0.70	0.70	0.52	0.05	626	188	175	175	63
B	74	M	0.15	0.00	-0.08	0.05	460	390	354	361	41
C	41	M	0.22	-0.08	-0.08	-0.08	468	264	251	251	24
D	73	F	0.70	0.30	0.30	0.30	191	164	168	168	55
E	67	F	0.22	-0.08	0.00	-0.10	599	234	227	230	45
F	69	M	0.70	0.52	0.30	0.20	222	196	191	190	37



**Fig. 4. Photocoagulation was carried out aimed at the aneurysms while checking the results of FAG**



**Fig. 5. Fundus of five years after treatment. Atrophic creeping is not seen because of the appropriate photocoagulation**

Laser photocoagulation leads to destruction of retinal tissue, including irreversible thermal denaturation of the outer and inner segments. The area of the retinal atrophy induced by laser photocoagulation may expand, which may lead to vision loss because of laser inducing retinal atrophy including foveolar area. It is absolutely necessary to carry out under appropriate conditions of laser photocoagulation

on the perifoveal telangiectasia. In the present study, there was no significantly difference in the CMT between the treated and the fellow eyes. In addition, there was no obvious retinal atrophy clinically detected in the macular area of all cases. Future observation is necessary to conclude that the present parameters of laser photocoagulation are appropriate. No other adverse events occurred

in the study periods of this study. Hirano et al. [10] reported the efficacy of IA-guided laser photocoagulation for treating MacTel. They proposed that high-speed IA enabled more precise targeting of treatment and less invasive. The short pulse focal laser photocoagulation has been applied for leaking microaneurysms of diabetic macular edema [13]. The comparative study may be necessary to evaluate the efficacy of these new laser therapies.

The intravitreal injection of anti-VEGF agent for type 1 MacTel has been reported. The central retinal thickness reduced significantly on average of 6.7 months when administered to seven eyes without visual acuity improvement [14]. Another study showed that there was no difference in the mean visual acuity in 4 eyes although the aneurysms disappeared [12]. The previous studies showed that the effect of injection of anti-VEGF therapy was limited [15]. The multiple injections of anti-VEGF agent may be necessary to control the macular edema. Laser photocoagulation may have benefits over intravitreal injection of anti-VEGF.

The present study has a limitation, that is, the small sample size, because of the low prevalence of type 1 MacTel. The only way to increase the statistical power and significance would be to get more samples from type 1 MacTel patients in the further study. The patients of the present study included 9 male and 11 female patients. Type 1 MacTel, a rare disease involving aneurysms in the retina, typically affects a single eye in male patients of European countries [1,2]. However, the disorder is frequently found in females of Japan [4]. There may be a sex difference among the races.

## 5. CONCLUSION

In type 1 MacTel, laser photocoagulation may achieve a visual improvement and normalize the central macular thickness and might be most effective therapy among the current available treatments.

## CONSENT

Informed consent was obtained from each patient

## ETHICAL APPROVAL

All authors hereby declare that this retrospective observational study has been

examined and approved by the Institutional Review Board of Oita University Hospital (No. 2034), and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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