

## The Application of Laser Beam in Various Skin Diseases

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### Abstrak

*Enam puluh dua pasien dengan kelainan kulit vaskular dan non-vaskular telah diobati dengan laser argon MDS 10, tuneable dye laser. Sembilan belas kasus merupakan kelainan kulit vaskular yang terdiri dari pws (port-wine stain), teleangiectasia, granuloma piogenikum dan angiofibroma. Kelainan kulit nonvaskular terdiri dari melasma, keratosis seboroik, lentigo, nevus Ota, nevus Becker, nevus spilus, nevus verukosus dan tato yang berjumlah 43 kasus. Hasil pengobatan sangat baik dan baik diperoleh pada kelainan vaskular dan hasil baik dan sedang pada kelainan nonvaskular. Hasil kurang baik ditemukan pada kelainan tato.*

### Abstract

*Sixty two patients with vascular and nonvascular skin lesions have been treated with argon MDS 10, tuneable dye laser. The vascular lesions (19 cases) consisted of port-wine stain (pws), telangiectasia, pyogenic granuloma and angiofibroma. The nonvascular lesions (43 cases) consisted of melasma, seborrheic keratosis, lentigo, nevus of Ota, Becker's nevus, nevus spilus, nevus verrucosus and tattoo. The results were very good and good in vascular skin lesions and good or moderate in nonvascular lesions. A poor result was found in tattoo lesion.*

*Key words : Laser surgery, argon tuneable dye laser, vascular skin lesion, nonvascular skin lesion.*

### INTRODUCTION

The science of laser medicine and laser surgery developed rapidly these last two decades and the progress of laser therapy as a medical device constituted a process of continuous improvements. It began in 1960, when T.H. Maiman, a scientist from the Hughes Research Laboratories USA successfully created the first laser known as ruby laser. In 1961, the laser was used for the first time by Dr. Goldman, a dermatologist and one of the pioneers in laser therapy, on port-wine stain hemangioma (pws) or nevus flammeus.<sup>1</sup>

In its development, several laser devices were used in skin diseases such as ruby laser, argon laser, CO<sub>2</sub> laser, tuneable dye laser, Nd Yag laser, Q-switched Nd Yag laser, Q-switched ruby laser, and Q-switched alexandrite laser.

With the existence of laser instrument, skin diseases which were formerly difficult or could not be cured conventionally, have a possibility to be cured.

The laser therapy in skin diseases is different from the therapy in internal organs. The aim of laser skin

therapy is not only the removal of the pathological lesion, but also to provide good cosmetic result. Each laser beam impacting the skin surface, causes a change at the affected area. The change could be a superficial damage which could heal easily or something deeper which causes scar formation.<sup>2,3</sup> Therefore, the careful choose of the right laser to be used is crucial so that the recovery of the skin could be justified cosmetically.

Among many types of laser devices available, argon dye laser represents one type which is commonly used in the treatment of skin diseases.<sup>4</sup>

The argon laser emits a very strong beam with blue green color and 488-514 nm wavelength. The beam was selectively absorbed when it passes through colored skin lesion. For example red color due to vascular abnormality or black color due to pigment disturbance. This is called selective photothermolysis.<sup>5</sup>

In selective photothermolysis, selective thermal damage could be induced where the pulse duration or exposure time are shorter than the cooling time or thermal relaxation time of the tissue target.

In contrast to CO<sub>2</sub> laser which has a localized effect on tissue, the argon laser penetrates more deeply (1 to 2 mm). Because of its color absorption property, the argon laser is an ideal device for the destruction of blood vessels that are a little bit deep and wide, such as hemangioma and other vascular abnormalities, as well as for the treatment of melanin containing lesion such as melanotic skin lesion. It is important to undertake a test area and to evaluate the result after 6 weeks as unacceptable scarring may sometimes occurs.

The argon laser is indicated for vascular abnormalities, such as port-wine stain (pws), telangiectasia, pyogenic granuloma, angiofibroma, Kaposi's sarkoma and venous lake. It can also be used for pigmented lesions such as chloasma/melasma, ephelid, lentigo, nevus Ota, cafe-au-lait spots, tattoo decorative or traumatic.

The purpose of this study was to evaluate the efficacy of laser therapy in various vascular and non-vascular skin diseases using the argon tuneable dye laser.

## METHODS

The subjects of this study were taken from the out-patient visiting policlinic of Dermatology and Venereology, Cipto Mangunkusumo National Central General Hospital, Jakarta, for consultation of non-vascular and vascular abnormalities, including benign skin tumors. The study was conducted from August 1992 to February 1994 involving 62 persons (40 male and 22 female) with the age ranged between 7 and 50 years. An informed consent was obtained from each patient after a thorough and detailed information concerning the laser treatment, the cost, the complications and the expected results. The skin abnormalities consisted of nonvascular lesions (melasma, seborrheic keratosis, lentigo, nevus of Ota, Becker's nevus, nevus verrucosus, nevus spilus and tattoo). The vascular lesions including facial port-wine stain with red or light red color, facial telangiectasia, pyogenic granuloma, and angiofibroma. The diagnosis were established clinically and some with histopathologic confirmation.

The laser instrument used for in study was Argon MDS 10, tuneable dye laser, (Aesculap Germany). The power used varied from 2 to 4 watts, with 1-2 mm spot size, and the pulse duration or exposure time was between 0.1-0.2 sec. A 4 weeks interval was allowed between treatments.

Criteria of the result were as follows :

**VERY GOOD** : Total lightening or total disappearance of the lesion without scar formation.

**GOOD** : marked lightening or marked disappearance of the lesion without scar formation

**MODERATE** : moderate lightening or moderate disappearance of the lesion without scar formation.

**POOR** : slight lightening or slight disappearance of the lesion with scar formation.

The results were expressed as data frequency and analyzed with nonparametrical statistical analysis using Kolmogorov-Smirnov test.

## RESULT

Table 1. Skin lesions and number of patient with vascular and nonvascular lesions.

Vascular lesions	N	Nonvascular lesions	N
Facial port-wine stain	10	Melasma	14
Facial Telangiectasia	3	Seborrheic keratosis	5
Pyogenic granuloma	3	Lentigo	4
Angiofibroma	3	N. Ota	5
		Becker's nevus	5
		N. spilus	3
		N. verrucosus	5
		Tattoo	2
<b>Total</b>	<b>19</b>		<b>43</b>

Table 1 shows the distribution of patients according to the skin abnormalities and Table 2 shows the response of nonvascular and vascular lesions to laser treatment.

Table 2. Response of skin disorders to argon laser therapy

Response	Nonvascular lesions	N	Vascular lesions	N
Very Good	--	0	facial pws	2
Good	seborrheic keratosis	5	facial pws	5
	lentigo	4	facial telangi-	3
	n. spilus	3	ectasia	3
			angiofibroma	3
			pyogenic granulo-	3
			ma	
Moderate	melasma	14	facial pws	3
	n. Ota	5	--	
	Becker's nevus	5		
	n. verrucosus	5		
Poor	tattoo	2	--	
<b>Total</b>		<b>43</b>		<b>19</b>

Table 3. Distribution of patients according to the type of dermatologic abnormalities and the results of argon laser therapy.

Type of skin abnormalities	Nonvascular	Vascular	Total
<b>Results</b>			
Very Good	0	2	2
Good	12	14	26
Moderate	29	3	32
Poor	2	0	2
<b>Total</b>	<b>43</b>	<b>19</b>	<b>62</b>

The result shows a significant relation between the type of dermatologic abnormalities (vascular vs nonvascular) and the result of argon laser therapy ( $p < 0.01$ ). A better result with argon laser therapy is found in vascular skin lesions when compared to nonvascular lesions.

## DISCUSSION

Nevus flammeus or port-wine stain is a congenital skin defect consisting of a sharply demarcated and flat border, with pink, red or port-wine color. Sometimes, the color varied from purple to almost black. The most common location is the face with unilateral distribution. Port-wine stains (pws) in this study were located on the face (facial pws) with red or light red color. Pws is one of the indications for laser treatment since there is no other effective treatment available. In the present study, very good and good results were observed in 7 of 10 patients (70%) suffering from facial pws and moderate result were found in 3 cases (30%). Disturbance in pigmentation occurred in 6 patients. A similar result was obtained by Landthaler and Hohenleutner.<sup>6</sup> Fitzpatrick et al have reported a much better response with flashlamp pulsed dye laser (585 nm) with good and excellent result observed in 84%.<sup>7</sup>

Facial telangiectasia is referred to as a superficial dilatation of cutaneous vessels usually located on the nose, cheek or alae nasi. The argon laser has been used for the treatment of this lesion with a good and excellent result reported in 65% to 96% of patients treated.<sup>8</sup> In this study the good result was observed in 3 patients without scarring.

Pyogenic granuloma occurs as a single lesion consisting of red, soft or moderately firm, raised and slightly pedunculated nodule. Wheeland,<sup>9</sup> using the pulsed dye laser, obtained excellent therapeutic and cosmetic result, whereas in this study using argon laser the good result was found in 3 cases (Figure 1a and 1b).

Angiofibroma consists of numerous small, reddish, smooth papules with symmetrical distribution in the nasolabial folds, the cheek and the chin. Cosmetically good result of disfiguring angiofibroma have been reported in 6 patients after the treatment of argon laser therapy.<sup>10</sup> In fact, angiofibroma can be treated by both argon and CO<sub>2</sub> laser. The better result was found with CO<sub>2</sub> laser than that with the argon laser.<sup>11</sup>

Melasma or chloasma is a macular pigmentation, usually situated on the forehead, malar eminences and cheek. Melasma causes a considerable cosmetic problem with limited options of treatment. In this study, a moderate response to argon laser therapy was observed with repigmentation after about 6 months. Post treatment hydroxyquinon was used to prevent repigmentation (Figure 2a and 2b). In the literature a number of different kinds of lasers can be used for the treatment of melasma such as Q-switched ruby laser (694 nm) and Q-switched alexandrite laser (755 nm). The initial result were normally encouraging, but later repigmentation occurred.<sup>12</sup>

Seborrheic keratosis is a common benign skin tumor in elderly people often situated in seborrheic area. It tends to increase in number with aging. A good result was obtained in 5 patients by this method. Goldman et al<sup>12</sup> treated seborrheic keratosis with ruby laser. A complete clearance after 3 consecutive treatments were reported.

Nevus Ota is a blue to grey brown pigmented patch located on the face, usually within the distribution of the ophthalmic and maxillary branch of the trigeminal nerve. In this study a moderate result was obtained with argon tuneable dye laser. The color however did not disappear completely (Figure 3a and 3b). Goldman et al<sup>12</sup> reported a good cosmetic result of the lesion using the Q-switched alexandrite laser.

Nevus spilus is a congenital light brown/pigmentation patch speckled with dark brown macules, located on the trunk or proximal extremities. The ruby laser has been used to treat this skin lesion by Goldman et al<sup>12</sup> with successful result. In our study a good resolution is obtained in 3 patients.

Lentigenes are small, round or oval dark macules located on any cutaneous surface. The result of the treatment in this study was good in 4 patients. Some authors have reported successful result with ruby laser in treating lentigenes. The Q-switch ruby laser was reported to be more efficacious.<sup>12</sup>

Nevus Becker, also called Becker's pigmented hairy nevus, is usually a unilateral patch characterized by hyperpigmentation and hypertrichoses on the shoulder or chest. The result of argon laser therapy in this study was moderate with only partial response. The color did not disappear completely. Goldman et



Figure 1a. Pyogenic granuloma in a body, 10 years old, located on the scalp

Figure 1b. Result after treatment; the lesion becomes flat after 3 consecutive treatments



Figure 2a. Melasma in a woman before treatment

Figure 2b. After treatment there is still a slight pigmentation after 5 consecutive therapy.



Figure 3a. Nevus of Ota on the left side of the face

Figure 3b. Result after treatment. There is still a slight bluish discoloration after 5 consecutive treatments



Figure 4a. Verrucous nevus on the forehead of a 13 years old boy, prior to treatment

Figure 4b. Post-treatment after 3 times Argon laser therapy. The result is moderate

al<sup>12</sup> treated 2 patients with Becker's nevus with Q-switched alexandrite laser with unsatisfactory result.

Nevus verrucosus or linear epidermal nevus consists of linear lesion, closely set, papillomatous, hyperkeratotic papules, located anywhere on the body, the head, trunk or extremities. The result of this study was moderate without scar formation (Figure 4a and 4b). It has been reported that laser therapy was successful and gave good cosmetic result, although sometimes recurrences could not be avoided.<sup>13</sup>

Tattoo is body painting and dermally implanted pigment. There is no ideal treatment available for tattoos. Therefore, it was important to carefully evaluate each tattoo patient. The result with argon laser in this study was minimal or poor with scar formation. More recent method for treating tattoo are the Q-switched ruby laser and Q-switched alexandrite laser. This methods are effective in removing tattoo's pigment without scarring.<sup>14</sup>

## CONCLUSION

The result of this study demonstrated that argon laser therapy was very good and good in treating vascular skin lesions such as facial pws, facial telangiectasia, angiofibroma and pyogenic granuloma. A good and moderate results were observed in nonvascular lesions such as pigmented lesions. Some pws cases had a moderate result, whereas a poor result was found for tattoo lesions. Newer laser devices such as Q-switched lasers is hoped to give better results.

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