Low Fluence Q-Switched Neodymium-Doped Yttrium Aluminium Garnet (LFQSNd:YAG 1064nm) versus Combination of LFQSND: YAG 1064nm and Microneedle Fractionated Radiofrequency (MFRF) for Treatment of Indonesian Melasma Patients. Which is Better?

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Abstract: Melasma treatment is still very challenging and cannot definitely be cured, since recurrence are high. Many modalities used to treat melasma, such as broadspectrum sunscreen, lightening agents, intense pulsed light, lasers, and a newly microneedle fractionated radiofrequency specially design to treat melasma. In this study, we enrolled 5 Indonesian melasma patients, Fitzpatricks skin type III-IV, 36-65 years old and given low fluence Q switched Nd:YAG 1064 nm and other half face added the microneedle fractionated radiofrequency treatment. Patients were given 4 treatments 2-4 weeks apart. Parameters for the laser treatment using spot size 6 or 8 mm, 1,6- 1,8 J/cm2, 10 Hz, endpoint slight erythema, and for the microneedle fractionated radiofrequency, power 3, depth 1-1,5 mm, 100-150 shots The improvement of pigmentation lesion, skin tone and side effects were evaluated using the Janus imaging system. Conclusion: Melasma treatment using combination low fluence Q Switched Nd:YAG 1064 nm and microneedle fractionated radiofrequency was better than low fluence Q Switched Nd:YAG1064 nm alone and no serious side effects found during both treatment.

1 INTRODUCTION

Melasma is considered one of the most challenging hyperpigmentation disorder to treat, especially in Indonesian skin type. Many factors contribute in developing melasma, such as genetic factors, sun exposures, pregnancy, oral contraceptives, phototoxic and photo allergic drugs and cosmetics. Melasma appears as symmetric facial hypermelanosis, with irregular light brown to dark brown macules and patches on face, predominantly on malar areas, forehead, and chin but until now the etiology and pathogenesis are not fully understood.

Many treatments modalities are used to cure melasma in Indonesia, including broad spectrum sunscreen, topical lightening agents, retinoids, corticosteroid, chemical peelings, lasers and other light based energy devices. Unfortunately, there is no definite cure for melasma. Lasers may worsen the melasma and cause post inflammatory hyper pigmentation, but recently laser experts have found that using the low fluence parameters (laser toning) give better results (Kim *et al.*, 2012; Fabi *et al.*, 2014; Trivedi, Yang, and Cho, 2017; Kauvar). New treatment for melasma is always awaited.

In 2016, a new device with microneedle fractionated radiofrequency technology was specially design to treat melasma, particulary refracter melasma with the vascular involvement.[5-7] However there is no report on the safety and effectiveness in Indonesian melasma patients. Aim of this study is to evaluate the changes in skin tone and spot pigmentation on the face of melasma patients, comparing the low fluence Q switched Nd:YAG 1064 nm versus the combination of low fluence Q switched Nd:YAG 1064 nm and microneedle fractionated radiofrequency using the Janus imaging system.

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2 METHODS

We enrolled 5 Indonesian woman patients with melasma, age 36-65 years old, Fitzpatricks Skin type III-IV in this study. Before treatment, patients signed informed consent and given topical anesthesia using topical eutectic mixture of 2,5% lidocain and 2,5 % prilocaine. All patients were treated with low fluence Q switched Nd:YAG 1064 nm spotsize 6 or 8 mm with fluence 1,6-1,8 J/cm, 10 Hz, with end point slight erythema, and half face of each patients received an addition of microneedle fractionated radiofrequency treatment. The parameters of microneedle fractionated radiofrequency were: power 3, depth 1-1,5 mm, 100-150 shots. Interval treatment was 2-4 weeks and all other treatments were continued such as broadspectrum sunscreens, and topical lightening agents. Photographs were taken using normal light, polarization light and UV light with the skin analyzer Janus 2 done by the same technician. Evaluation of data and photographs was done by another dermatologist.

3 RESULTS

Table 1: Mean value of skin tone and spot pigmentation using Janus imaging system

	Area	Treatment	LFQS1064nm	LFQS1064nm & MFRF
	Upper cheek	Before	32.2 ± 2.6 (29-36)	33.6 ± 2.7 (31-38)
Skin Tone		After	32.6 ± 1.5 (30-34)	32.6 ± 2.6 (29-35)
	Lower cheek	Before	32.4 ± 0.5(32-33)	32.9 ± 0.2 (33-32.9)
		After	32.3 ±0.7 (31.5-33)	32.9 ± 0.2 (33-32.9)
Spot	Upper cheek	Before	32.6 ±12.8 (19-46)	38.8 ±10,4 (29-53)
Pigmentation		After	27.8 ±14.9 (10-43)	28.6 ±10.9 (15-40)
	Middle cheek	Before	33.2 ±7.4 (21-40)	36 ±13.8 (22-52)
		After	31.4 ± 13.1 (10-45)	24.4 ± 11.3 (13-40)
	Lower Cheek	Before	34.6 ± 9.5 (23-45)	33.8 ±10 (24-47)
		After	39 ± 9.9 (28-51)	19.4 ± 8.4(12-30)

LFQS1064nm : Low fluence Q-Switched Neodymium-Doped Yttrium Aluminium Garnet 1064nm
MFRF: Microneedle Fractionated Radiofrequency

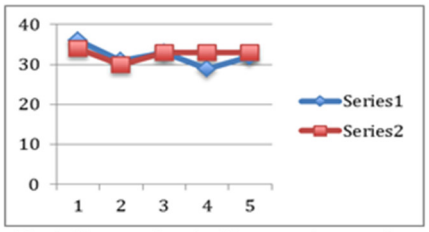


Fig 1. Upper cheek skin tone (control)

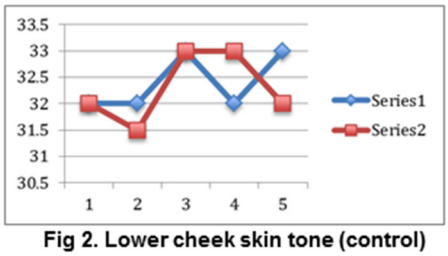


Fig 2. Lower cheek skin tone (control)

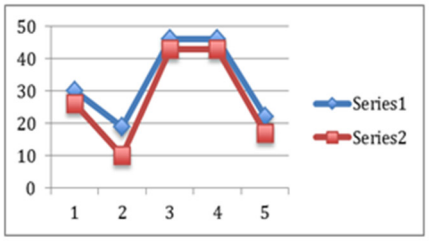


Fig 3. Upper cheek skin spot/ pigmentation (control)

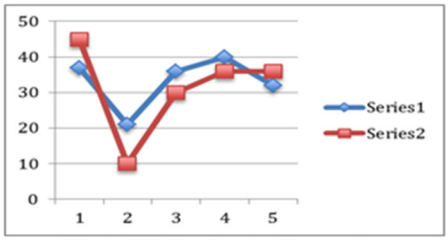


Fig 4. Middle cheek skin spot/ pigmentation (control)

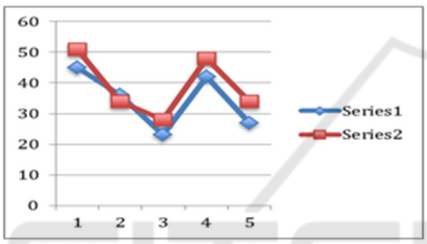


Fig 5. Lower cheek skin spot/ pigmentation (control)

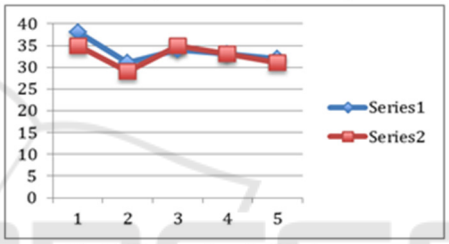


Fig 6. Upper cheek skin tone (interventional)

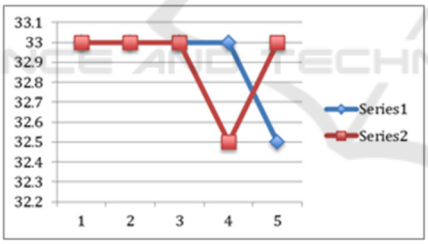


Fig 7. Lower cheek skin tone (interventional)

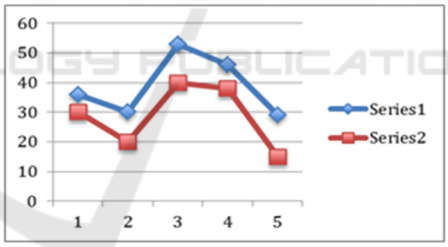


Fig 8. Upper cheek skin spot/ pigmentation (interventional)

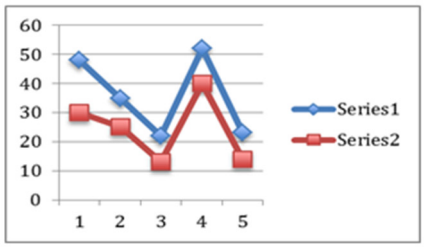


Fig 9. Middle cheek skin spot/ pigmentation (interventional)

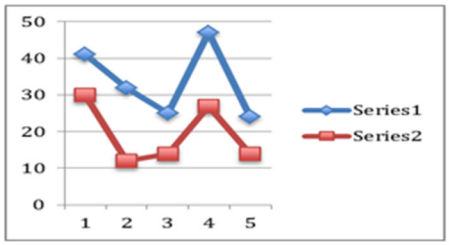
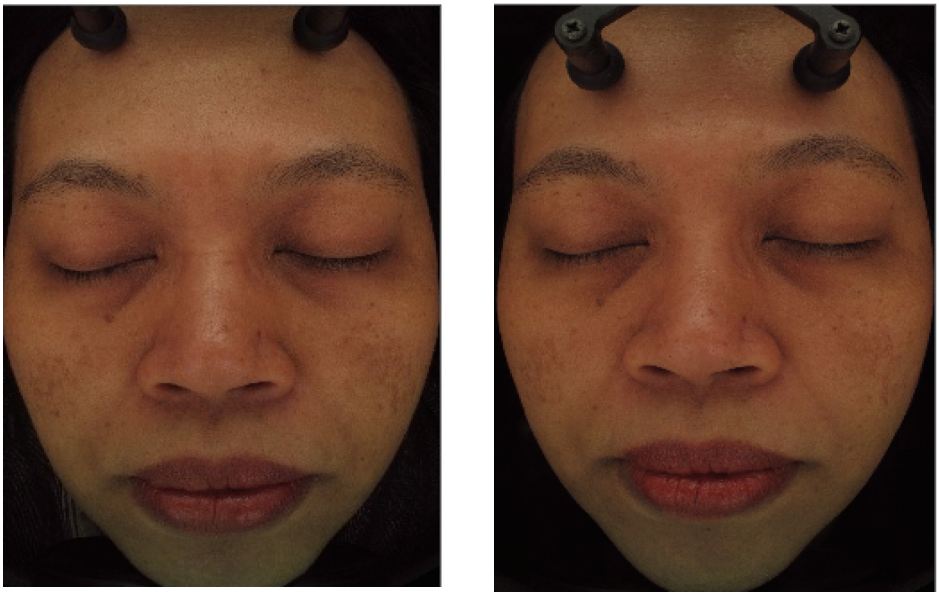


Fig 10. Lower cheek skin spot/ pigmentation (interventional)

Blue = before
Red = after

Figure 1: The line graph of skin tone and spot pigmentation (before-after) in split face control and interventional area.



Splitface:
Before treatment

After 4 treatments

Figure 2: Photograph using Janus Imaging System: left side of patient: combination LFQSNd:YAG1064nm and Microneedle Fractionated Radiofrequency. right side: LFQSNd:YAG1064nm.

4 DISCUSSION

Janus imaging system take images in 3 different lights, normal light for evaluating wrinkles and pores, polarized light for evaluating spot and pigmentation while UV light to evaluate sebum and porphyrin (p.acnes). In the polarized imaging of the Janus system we found that the skin tone for our patients in this study did not improve consistently in both treatments, the LFQS1064nm and the combination LFQS1064nm and microneedle fractionated radiofrequency (figure 1,2,6,7). Skin tone is level of darkness of the overall skin. The skin tone can be uneven due to excessive workload, stress, pigmentation, sunburn, keratin and skin problems. Janus imaging system record that melasma patients have poor skin tone before and after treatment. We conclude in this study that skin tone in Janus imaging system is not a realible parameter to evaluate the efficacy of melasma treatment. These findings were similar to research done by Prakoeswa CRS, Pratiwi FD, *et al.* Skin tone was found not significant to evaluate the improvement in photoaging before and treatment using amniotic membrane stem cell conditioned medium (AMSC-CM) (Prakoeswa, nd).

Evaluation of the skin pigmentation and spots of melasma decrease on both sides of the face, except two patients (the middle cheek), and three patients (the lower cheek) that were only given LFQS1064 nm. These areas showed an increase value of pigmentation (figure 2,4). These findings may be due to that the lesion had more intense pigmentation, darkening effect post laser treatment or the lesions were refracter to LFQS 1064nm treatment. Spots and pigmentation in the upper, middle, and lower cheeks with combination treatment, we found that the pigmentation consistently decreased after treatment (figure 8,9,10). This may due to the proposed mechanism of the microneedle fractionated radiofrequency, where the microneedle fractionated radiofrequency may work through modes of action, including enhancing permeability of topical lightening agents and increasing degradation of dermal vasculature (Choi and Choi; Choi, *et al.*, 2015). The therapeutic topical lightening agents are known to be limited by their poor transepidermal penetration, so maybe the microneedle radiofrequency creates micro channels to enhance transdermal drug delivery. This micro environment altered by the microneedle fractionated radiofrequency may caused the reversal of solar elastosis, causing decrease melanogenesis and lightening of the melasma. Not like the fractionated lasers which cause more crusting, the microneedle fractionated radiofrequency did not show any obvious microcrusting or increased epidermal

shedding. The effectiveness combination treatment of microneedle fractionated radiofrequency and topical lightening agents reported by Choi *et al,* showed good improvement in melasma lesion (Choi and Choi; Choi, *et al.*, 2015).

Laser toning using low fluence Q Switched Nd:YAG 1064 nm for melasma treatment has gain popularity since a few years ago. It is an addition treatment to previous treatment such as topical lightening agents, broadspectrum sunscreens, and chemical peelings. The exact mechanism of laser toning on the improvement of melasma is still unclear. It has been proposed that melanin granules are fragmented and dispersed into the cytoplasm without destruction by repetitive laser energy with a subphotothermolytic fluence over large spot size known as subcellulear selective photothermolysis. Effectiveness of this treatment various and melasma lesions can recur or get darkened and rebound hyperpigmentation can occur. Common side effects were physical urticaria, acneiform eruption, minute petechiae, whitening of fine facial hair, herpes simplex reactivation, leukoderma and mottled hyperpigmentation (Sim *et al.*, 2014). In this study patients tolerated the laser toning and the microneedle fractionated radiofrequency and found no serious side effect, only slight erythema which subside after few hours.

Future studies to evaluate effectiveness treatment of melasma may easily done using Janus imaging system by evaluating spot pigmentation, and for generalization of the treatment effectiveness still need larger subjects, more treatment sessions, and long term follow up to monitor recurrences.

5 CONCLUSION

Patients recieving low fluence Q switched Nd:YAG1064nm laser and microneedle fractionated radiofrequency showed better improvement in spots pigmentation of melasma compared to only using low fluences QSNd:YAG 1064nm laser. Treatments were well tolerated and no serious side effects notice during both treatments.

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DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone responsible for the content and writing of the paper.

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