



ORIGINAL RESEARCH PAPER

Dermatology

COMPARATIVE ASSESSMENT OF TATTOO REMOVAL WITH SINGLE SESSION OF R20 TECHNIQUE AND CONVENTIONAL TECHNIQUE

KEY WORDS: Q-switched Nd:YAG laser, R20 method, tattoo removal

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ABSTRACT

Background: Most suitable devices for tattoo removal at present are Q-switched ruby, Nd:YAG and Alexandrite lasers. These are the current gold standard for laser tattoo removal¹. But there are few limitations, such as long duration of treatment, large interval between sessions; side effects such as blistering, scarring and dyschromia. The current methods attempted to reduce the total number of sessions and total duration to achieve clearing of tattoos. R20 method of tattoo removal is based on principle of repeated exposure of laser light in a single session.

Aim: 1) to compare lightning of tattoos with a single pass Q-switched laser treatment with 4 treatment passes separated by 20 minutes

2) To compare the Adverse effects between two methods

Methods and Material: It included 50 patients and were divided in half and randomized. Half of them received single pass treatment with Q-switched Nd:YAG laser 1064 nm used at energy of 360 mJ. Other half received multipass treatment (each pass at 20 minutes interval with maximum of 4 pass). Tattoo lightening and adverse effects compared 1 month later i.e. after single session.

Results: 1 month later, treatment with the R20 method was much more effective than conventional single-pass laser treatment. With R20 method, 100% patients experienced immediate erythema and edema, 16% patient experienced blistering, crusting. No obvious Scarring/permanent pigmentary changes in any patient. >75% fading experienced by 18 patients after single session, 50-75% fading in 4 patients, 40% experienced transient hypopigmentation. With single pass technique, all patients experienced <50% fading.

Conclusion: With R20 method the number of sessions required for tattoo removal is greatly reduced thus decreasing the number of visits. It is more effective but also safe in most of the patients. The disadvantages are one single session can take 3½ to 4 hours.

INTRODUCTION:

Most suitable devices for tattoo removal at present are Q-switched ruby, Nd:YAG and Alexandrite lasers. These lasers are based on the principle of selective photothermolysis i.e., different chromophores absorb light with different wavelength¹. Q-switched lasers emitting short (in nanosecond), high-intensity pulses, cause thermo-mechanical destruction leading to fragmentation of tattoo ink. These fragments are gradually cleared by Macrophages by phagocytosis. The rapid heating of melanosomes converts cytoplasmic water into steam, resulting in bubble formation which reflected clinically as immediate whitening or frosting which limits further penetration of laser into the skin^{1,3}. One limitation is long total treatment duration with the large interval between sessions. R20 method of tattoo removal is based on principle of repeated exposure of laser light at 20-minute interval in a single session as whitening takes 20 minutes to subside³. During subsequent passes pulse penetrates the deeper layers of the dermis³.

MATERIALS AND METHODS:

Patients with infections, coagulopathy, photosensitivity, or immunocompromised were excluded. Informed consent was obtained from all participants. It included 50 patients (all having Amateur Tattoos) and were divided in half and randomized. Q-switched Nd:YAG laser 1064 nm used at energy of 360 mJ. Half of them received single pass treatment and other half received multipass treatment (each pass at 20 minutes interval with maximum of 4 pass). The laser energy is delivered using same parameter and a gap of 20 min is given in between each pass. After laser treatment, Fusidic acid 2% ointment (with Beclomethasone Dipropionate 0.025% in case of severe erythema) was applied. Tattoo lightening was compared 1 month later i.e., after single session by evaluation of photograph with 5-point scale: 1 = 0-25% (none or slight

lightening), 2 = 26%-50% (moderate), 3 = 51%-75% (significant), 4 = 76%-95% (very good), 5 = 96%-100% (excellent).

RESULTS:

Study population included 50 patients. Of them, 44 (88%) were males and 6 (12%) females. Majority of the patients 36 (72%) lied in the age group of 18-24years while remaining 14(28%) were from age group 25-29 years[Table 1]. Mean of the age was 22 years. Average tattoo lightening with the R20 method was 75% with median of 85%. With conventional method, this average was 27.8% with median of 30% [table2]. With R20 method highest number of patients i.e., 18 of 25 showed lightening score of 4 (75-95%) and only 1 showed score of 1 (<25%). Lightning score with conventional method was 1 and 2, which was much less than R20 method, observed in 10 and 15 of 25 patients respectively [fig1]. Adverse effects such as erythema and oedema were seen in all 50 patients, post-inflammatory hyperpigmentation was more with conventional method, while blistering and post-inflammatory hypopigmentation was significantly higher in R20 group [Fig 2].

Table 1: Age and sex wise distribution of patients

AGE (years)	MALE	FEMALE	TOTAL
18-24	30	6	36(72%)
25-29	14	0	14(28%)
	44 (88%)	6 (88%)	50

Table 2. Average tattoo lightening with the R20 method versus the conventional treatment method

Method	R20 method Lightening (%)	Conventional method Lightening (%)
Mean±SD	75±19.74	27.8±14.79
Median	85	30

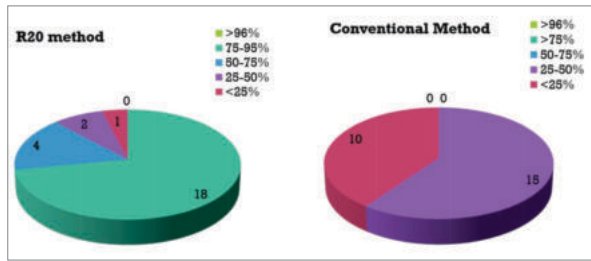


Fig 1. Comparison of lightening response between the two methods

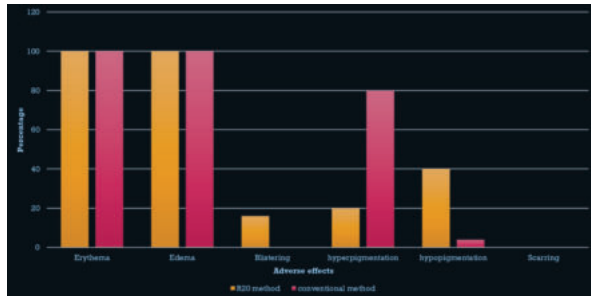


Fig 2. Comparison of Adverse effects between two methods



Fig 3. Tattoo of a patient with skin type III. A. Before treatment, B. 1 month after treatment (R20 method) showing >75% clearance



Fig 4. Tattoo of a patient with skin type III. A. Before treatment, B. 1 month after treatment (R20 method) showing post inflammatory depigmentation



Fig 5. Tattoo of a patient with skin type III. A. before treatment B. 1 month after treatment (Conventional method) showing post inflammatory hyperpigmentation



Fig 6. Tattoo of a patient with skin type III. A. before treatment B. 1 month after treatment (Conventional method) showing lightning <25%.

DISCUSSION:

It was hypothesized that if we deliver laser after clearance of frosting, it penetrates deeper in the dermis thus targeting more dermal ink. Also fragmentation of ink particles into smaller pieces leads to faster clearance by macrophages¹. A study by *Kossida et al*, with Q-switched alexandrite laser (755-nm wavelength; fluence 5.5 J/cm²); comparing lightening score between R20 method and conventional method, showed significantly higher average lightening score with R20 method in both professional and amateur tattoos i.e., 88% and 96% respectively. In the present study, we used Q-switched Nd:YAG laser (1064nm wavelength; and energy 360 mJ). All of our patients had Amateur tattoos of color green and black. Motivation for most of the patients was army recruitment and needed speedy clearance of tattoos, led us to use R20 method. We observed that, average lightening score in R20 method was much higher than conventional method. However, these parameters are absolutely not ideal. In general, higher laser fluence is more effective. Adverse effects such as erythema and edema were common to all the patients, while pigmentary changes were variable. Blistering observed only with R20 method in that too only in 16%, this was followed by crusting and eventually healing without scarring. This low count of blistering may be attributed to lower used fluence. Post inflammatory hypopigmentation which is more in R20 method may indicate more destruction of ink. This hypopigmentation was eventually followed by repigmentation. No patient showed 100% clearance of tattoo in single session, this again may be attributed to low energy used.

CONCLUSION:

The number of sessions required for tattoo removal is greatly reduced thus decreasing the number of visits to the clinic and increasing patient compliance. R20 method appears to be more effective and safer with only few reversible adverse effects. The only disadvantage is, it is time consuming method. Maintaining a balance between effectiveness and safety requires standardization of procedure.

Conflicts of interest: None

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