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# The influence of social media on patients' perception of aesthetic treatment outcome. Satisfaction with tattoo removal: A model

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## Abstract

The level of patient satisfaction following tattoo removal often varies and frequently diverge from clinical objectivity. This study assesses how much social media can influence patient satisfaction after picosecond laser (PSL) tattoo removal, in light of the growing influence they have on consumers. Twenty-seven patients were treated with PSL for removal of professional black tattoo. Two groups of patients were identified: those who were already being treated at our institute or had been referred by other physicians (group 1) and those who found us through social media (group 2). Clinical improvement was evaluated 8 weeks after the final laser session and patients' satisfaction was assessed. In both groups, clinical results were homogeneous; however, Group 2 patients' subjective Global Aesthetic Improvement Scale scores were lower than those reported by clinicians ( $p=0.035$ ), while Group 1 was globally more satisfied ( $p<0.001$ ). We can affirm that the influence of social media on the perceptions and expectations of patients can affect their level of satisfaction. Particularly for people who are influenced by social media, it is essential to provide explanations prior to laser treatments, in order to clarify what may actually be expected from laser sources.

## Introduction

The demand for tattoo removal is increasing as is the practice of decorative tattoos and the picosecond laser (PSL) represents one of the main options for their treatment.<sup>1</sup> Picosecond technology has been

introduced to improve clinical outcome and reduce the number of sessions required for tattoo removal, compared to previously used technologies.<sup>2</sup> Pedrelli *et al.*<sup>3</sup> recently highlighted the effectiveness of PSL, with fewer sessions and side effects than conventional Q-switched technology.

However, the degree of satisfaction with tattoo removal of individual patients is highly variable and does not always correspond to the clinical objectivity of the improvement obtained.<sup>4</sup> Numerous factors influence patients' satisfaction, including pretreatment expectations and information, laser treatment procedures, outcome, and subjective experiences such as pain. Patients today can search for medical information on internet and especially in social media. However, these sources of information often do not report reliable scientific evidence and are often business-oriented, generating false expectations and untrue beliefs about possible treatments. Numerous papers are emerging in the scientific literature regarding the influence of social networks in the relationship between doctor and patients, including in the dermatological field.<sup>5-7</sup> Few studies report patient satisfaction with tattoo removal and prior picosecond laser technology.<sup>4,8</sup>

As we have noticed an increasing role of social network in influencing patients, this study aims to scientifically evaluate how much social media platforms can affect satisfaction with picosecond laser tattoo removal.

## Materials and methods

### Patients

Patients who received picosecond (PSL) treatment for tattoo removal since May 2017 to January 2021 at the referral center were eligible for this study. Inclusion criteria were as follows: professional black tattoos; dense color density; dimensions between 25 and 35 cm<sup>2</sup>; length of time with tattoo before removal more than one year and less than 4 years.

Exclusion criteria included all those factors known to influence the clinical response to treatment;<sup>9</sup> amateur or traumatic tattoos; tattoos of colors other than black; age <18 and >50 years old; pregnancy or lactation; other previous laser treatments; smoking history; chemical dependency or alcoholism; any other dermatological disease in the treated area; autoimmune diseases; AIDS; diabetes mellitus; immunosuppressive therapies. The study was conducted in accordance with the Declaration of Helsinki.

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## Procedures and clinical assessment

At the baseline visit, patients were divided in two groups, according to the reason for coming to our medical institute (Group 1: patients already being treated in our institute or referred by other physicians; Group 2: those who came after research on social media); then they were instructed about PSL treatment and his possible adverse effects, and written consent was obtained. An investigator (MF) collected data from each patient, including sex, age, skin phototype according to Fitzpatrick.<sup>10</sup>

All patients received the treatment from the same investigator (PLB) with picosecond 1064 nm Nd-YAG laser (Discovery PICO, Quanta System, Italy), using the fol-

lowing parameters: initial fluence 1.8 J/cm<sup>2</sup>, increasing by 20% per session up to a maximum of 5 J/cm<sup>2</sup>; spot size 5 mm square-shaped.

Laser sessions were scheduled at minimum intervals of 8 weeks. The end of the treatment sessions was decided based on the complete (100%) removal of the tattoo, or the lack of further improvement as judged by the treating physician after 3 consecutive laser treatment sessions. In all patients, treatment after the laser sessions consisted of topical antibiotics (Gentamicin 0,1% cream - Gentalyne<sup>®</sup> cream, ESSEX, Italy) and photoprotection with total block sunscreen (FotoUltra Spot Prevent<sup>®</sup> fluid SPF100+, ISDIN, Spain). The total number of laser sessions, the median of the days required for complete healing after each laser treatment and any adverse event were recorded.

Standardized photographs were taken using a digital camera (EOS 350D; Canon) at the initial visit, before each laser session, and 8 weeks after the final laser treatment session. The initial and final photographs were evaluated by a blinded investigator (MF) who were unaware of the patients' Group and number of sessions completed to assess clinical response. Clinical response was classified in percentages, ranging from 0% (no improvement) to 100% (complete removal)<sup>9</sup> and the Global Aesthetic Improvement Scale (GAIS)<sup>11</sup> was used to evaluate efficacy to have a standardized qualitative evaluation by the physician (PGAIS; 1= worst, 2= no change, 3= improved, 4= much improved, 5= very much improved).

### Patients' questionnaire

At the final follow-up visit, patients were asked to complete a questionnaire evaluating pretreatment expectations, pain according to a five-point scale (0= not painful, 1= little painful, 2= moderately painful, 3= very painful, 4= extremely painful), complications, aesthetic improvement according to subject GAIS (SGAIS), satisfaction according to a 3-point scale (1= not satisfied, 2= satisfied, 3= very satisfied) and explanation of the reasons. Finally, the patients answered socio-cultural questions that assessed: level of education (primary school, secondary school, university), number of books read per year (<3, 4-11, >12), source of medical information (physicians, newspapers, television, internet, or social media), most visited social media and websites (Google, YouTube, Facebook, Instagram), time spent on social media (less than 2 hours; 2-4 hours; more than 4 hours).

### Statistical analysis

Collected data were analyzed using the IBM SPSS<sup>™</sup> Statistics 25.0 software (SPSS Inc., Chicago, IL). Continuous variables were summarized as median with range, and categorical variables were analyzed as numbers with percentages. The association between independent variables was assessed with Mann-Whitney U test. All statistical tests were considered significant if they yielded p-values ≤0.05.

## Results

### Patients, procedures, and clinical assessment

A total of 27 patients were treated with PSL: 14 of Group 1 (51.8%) and 13 of Group 2 (48.2%). General information on participants is shown in Table 1.

Patients received a median of 7 laser sessions (range 6-12), with an average of 13 days of complete healing after each laser treatment (range 11-19 days). Regarding

side effects, ghost tattoo was observed in three patients (2 in group 1 and 1 in group 2). No significant differences were observed in the two groups for these parameters. The clinical results were homogeneous in the two groups in terms of both clearing rate and PGAIS (Table 2).

### Patients' questionnaire

All the patients signed informed consent and were informed of possible side-effects, complications, and potential incomplete result of ink removal prior the treatments. However, nearly all Group 2 patients (10/13, 76.9%) and 6 of Group 1 (43%) expected complete removal of tattoos without any blemish. 4 of Group 1 (28.5%) and 2 of Group 2 (15.3%) expected near optimal removal; the remaining patients (4 of Group 1, 28.5%; 1 of Group 2, 7.8%) expected partial clearing even with possible scars. The pain reported after each procedure did not differ between the two groups (Table 3).

Globally, patients reported worse SGAIS compared to PGAIS (p=0.018) and GAIS score was significantly lower for

**Table 1. General information of patients treated with PSL in Group 1 and Group 2.**

	Group 1	Group 2	p
Sex	M 7 (50%) F 7 (50%)	M 5 (38.5%) F 8 (61.5%)	ns
Age	33 (range 24-41)	27 (range 21-38)	ns
Skin type	I 0 (0%) II 6 (42.8%) III 8 (57.2%) IV 0 (0%)	I 0 (0%) II 4 (30.7%) III 8 (61.5%) IV 1 (7.8%)	ns
Length of time with tattoo before removal (months)	32 (range 12-39)	30 (range 13-36)	ns
Size (cm <sup>2</sup> )	32 (range 25-35)	31 (range 25-35)	ns

ns, not significant.

**Table 2. Physician Global Aesthetic Improvement Scale (PGAIS) and Subject Global Aesthetic Improvement Scale (SGAIS).**

	Group 1 N (%)	Group 2 N (%)
PGAIS		
Very much improved	7 (50)	7 (53.8)
Much improved	3 (21.4)	3 (23.1)
Improved	4 (28.6)	3 (23.1)
No change	0	0
Worst	0	0
SGAIS		
Very much improved	6 (42.8)	2 (15.3)
Much improved	4 (28.6)	3 (23.1)
Improved	4 (28.6)	6 (46.3)
No change	0	0
Worst	0	2 (15.3)
Clearing rate, %		
75	3 (21.4)	3 (23.1)
90	4 (28.6)	3 (23.1)
100	7 (50)	7 (53.8)

**Table 3. Pain during laser treatment.**

Pain	Not painful	Little painful	Moderately painful	Very painful	Extremely painful
Group 1	0	2 (14.2%)	7 (50%)	5 (35.8%)	0
Group 2	0	2 (15.3%)	6 (46.3%)	5 (38.4%)	0

**Table 4. Socio-cultural questionnaire.**

	Group 1 N (%)	Group 2 N (%)	P
Education level			0.078
Primary school	2 (14.2)	2 (15.3)	
Secondary school	7 (50)	7 (53.8)	
University	5 (35.8)	4 (30.9)	
Books read per year			0.032
<3	4 (28.5)	6 (46.1)	
4-11	8 (57.3)	5 (38.6)	
>12	2 (14.2)	2 (15.3)	
Source of medical information			0.021
Newspapers	6 (42.8)	2 (15.3)	
Physicians	6 (42.8)	3 (23.3)	
Television	1 (7.4)	1 (7.6)	
Social media	3 (21.4)	7 (53.8)	
Most visited social media and websites			<0.001
Google	9 (64.2)	4 (30.9)	
YouTube	2 (14.2)	4 (30.9)	
Instagram	1 (7.4)	4 (30.9)	
Facebook	2 (14.2)	2 (15.3)	
Time spent on social media per day (hrs)			<0.001
<2	9 (64.2)	5 (38.4)	
2-4	4 (28.5)	3 (23.2)	
>4	1 (7.3)	5 (38.4)	

patients of Group 2 ( $p=0.035$ ), as shown in Table 3.

Patients of Group 1 were more satisfied than those of Group 2 ( $p<0.001$ ) and, particularly, 3 of Group 1 (21.4%) patients and 6 of Group 2 (46.1%) were not satisfied, 5 of Group 1 (35.7%) and 4 of Group 2 (30.7%) were satisfied, 6 of Group 1 (42.9%) and 3 of Group 2 (23.2%) were very satisfied.

Motivations of unsatisfied patients included a greater number of sessions than expected, a different or lower result than expected more pain than expected, or the presence of side effects.

Regarding socio-cultural aspects, the two groups of patients differed in terms of educational level, number of books read per year, source of medical information, most visited social media and websites and time spent on social media, as shown in Table 4.

## Discussion

The picosecond laser is an effective and safe method for tattoo removal, due to the short pulse duration and high peak energy, resulting in fine fragmentation of pigment

cleaned by the lymphatic system.<sup>12</sup> Recent studies highlighted that PSL result in reduced treatment time, whilst achieving an identical or more effective clinical outcome compared to conventional Q-switched technologies.<sup>13,14</sup>

Although the results highlighted in our study are like those reported in the literature,<sup>15</sup> with clinical improvement and clearing in all treated cases, patients reported less improvement and partial satisfaction.

From the physician's point of view, good results were all those cases in which lightening occurred, even when the removal of the tattoo was not complete; moreover, the number of adverse events was limited and like those reported in the literature.<sup>16</sup> However, despite the clinical results obtained, the patients reported a lower degree of satisfaction and a perceived clinical result worse than judged by clinicians. Our study shows that the perception of the physician and the patient are hugely different.

In trying to understand the reason for this difference, the increasing role of social media in influencing the perception and expectations of patients in the medical field has emerged.<sup>17,18</sup> We highlighted two groups

of patients: the first group consists of people who spend little time on social networks, who get their information from newspapers or physicians mostly, and who came to our institute because they were already patients or on the advice of other physicians. This group was overall more satisfied with the treatment and the clinical judgment corresponded more to that given by the dermatologist. These patients often ask information about the treatment directly to physicians (general practitioner, other specialists who refer them or the dermatologist himself) and therefore, obtain more truthful information about options and expectations. The second group, on the other hand, is represented by patients who spend more time on social media, from which they also often get medical information. These patients were significantly more dissatisfied and showed a quite different perception than the dermatologist's judgment. These people likely build their expectations of treatment based on videos/information found on social media and websites. However, these are often business-oriented or provided by non-medical personnel, or by advertising material that only highlights successful cases, without clarifying the real expectations that may be had. Many representative videos show treatments with picosecond lasers that are painless and lead to the complete disappearance of the tattoo in very few sessions. This creates false expectations in the patient before the interview with the dermatologist, who are likely to remain so despite the explanations of the real expectations of the treatment, leading to patients' dissatisfaction despite the success of the treatment. Therefore, there is a risk that patients looking for advanced technologies for the removal of tattoos are unable to fully understand and distinguish the real information from the false expectations created by misleading sites, negatively influencing the physician-patient relationship.

## Conclusions

A clear explanation before the treatment is fundamental to make the patient understand what can really be expected from laser sources, especially for those influ-

enced by social media. Moreover, since there are conversely a growing number of dermatologists and other physicians becoming more present on these platforms, they should be advised to carry out serious scientific divulgation.

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