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Tattoo complications in treated and non-treated psoriatic patients

Running head: *Tattoos and psoriasis*

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Abstract

Background. Tattooing is a widespread phenomenon, with an estimated prevalence of 10–30% in Western populations. For psoriasis patients, current recommendations are to avoid having a tattoo if the disease is active and they are receiving immunosuppressive treatments. Although scientific data supporting these recommendations is lacking, dermatologists are often reluctant to advocate tattooing in psoriasis patients.

Objective. We aimed to evaluate the frequency of tattoo complications in patients with psoriasis and determine if the occurrence of complications was associated with psoriasis status and treatments received at the time of tattooing.

Methods. We performed a multicentre cross-sectional study. Adults with psoriasis were consecutively included and classified as tattooed or non-tattooed. Prevalence of complications associated with tattoos was then evaluated according to psoriasis onset and treatments. The study was divided into three parts, in which data were collected through a series of questionnaires filled in by the dermatologist. Complications included pruritus, oedema, allergic reaction/eczema, infection/superinfection, granuloma, lichenification, photosensitivity, Koebner phenomenon and psoriasis flare after tattooing. Diagnosis of complications was made retrospectively.

Results. We included 2053 psoriatic patients, 20.2% had 894 tattoos. Amongst non-tattooed patients, 15.4% had wished to be tattooed, with psoriasis being stated as a reason for not having a tattoo by 44.0% and 5.7% indicating that they planned to have a tattoo in the future. Local complications, such as oedema, pruritus, allergy and Koebner phenomenon were reported in tattoos in 6.6%, most frequently in patients with psoriasis requiring treatment at the time of tattooing ($p<0.0001$). No severe complications were reported.

Conclusions. The rate of tattoo complications in psoriasis patients was low. Although the risk of complications was highest amongst patients with psoriasis requiring treatment at the time of tattooing, all the complications observed were benign. These results can be helpful for practitioners to give objective information to patients.

Introduction

Tattooing is defined as the introduction of exogenous pigments or dyes into the dermis to permanently mark the body in an artistic way. It has become a widespread phenomenon, especially amongst young people, with the current prevalence estimated at 10–30% in Western countries[1,2]. In France, 17% of the adult population are reported to have at least one tattoo[3]. However, the tattooing procedure is known to be associated with potential complications, such as pruritus, swelling, photosensitivity, infections and allergies[4-6].

Patients with chronic dermatoses, such as psoriasis, may also be interested in having a tattoo. According to a recent French study, 5.4% of tattooed people had psoriasis[3]. Psoriasis is not a strict contraindication for tattooing, but there are controversies about the advisability of receiving a tattoo if the disease is active and if patients are receiving immunosuppressive treatments[7]. There is a lack of clarity in the scientific literature about the risk of complications related to tattooing in this population. Koebner phenomenon has been reported on tattoo sites in several case reports and in one case series of patients with psoriasis[8]. However, no severe complications after tattooing, such as infections in patients undergoing immunosuppressive therapies, have been reported.

To evaluate the risks of tattooing in psoriatic patients, the French national network and multicentre study group for research on psoriasis (GEM Resopso: http://www.resopso.fr/la-recherche/) developed a two-part clinical research project named “Tatou”. During the first phase of this project, we conducted an international study in France, Italy and Finland to evaluate how dermatologists address the issue of tattoos in patients with psoriasis in clinical practice[9]. Our study revealed that 52.6% of dermatologists were reluctant to advocate tattooing in patients with psoriasis and 88.5% considered that tattoos could cause problems in these patients. Furthermore, 81.0% of dermatologists were opposed to tattooing in patients with active psoriasis, and 49.2% were opposed in patients with psoriasis in complete remission. However, less than a quarter of these dermatologists had personal experience of complications arising with a tattoo in a patient with psoriasis. For those who had encountered patients with complications, the complications were mild and easily treatable. The dermatologists included in our study were most likely to be reluctant to advocate tattooing in patients undergoing immunosuppressive treatments or in those receiving phototherapy.

Thus, the first part of our study revealed a widespread reluctance amongst dermatologists to advocate tattooing in patients with psoriasis, despite a lack of scientific data on this subject. Here, we report the results of the second phase of the “Tatou” project in which we evaluated the frequency of complications after tattooing in patients with psoriasis. We also investigated whether the occurrence of these complications varied depending on the psoriasis status and type of psoriasis treatment the patients were receiving at the time the tattooing was performed.

Materials and methods

Study design, setting and participants

This multicentre, cross-sectional observational study was conducted in France by dermatologists practising in 23 centres located within university (n=7), general (n=11) or military (n=1) hospitals, or within private clinics (n=4). All dermatologists participating in the study were members of the GEM Resopso and were asked to include consecutive adult patients (> 18 years) with psoriasis attending their centres between April to August 2018.

The study was conducted in accordance with the good clinical practice guidelines. The research protocol was approved by the local ethics committee (*Comité de Protection des Personnes Sud-Est I* – Saint-Etienne – ref: 2018-22).

Assessment outcomes

The main study outcomes were determination of prevalence and type of complications associated with tattoos. We then evaluated whether occurrence of these complications was associated with psoriasis status and type of psoriasis treatments.

Other study outcomes were determination of frequency and number of tattoos, identification of demographic and clinical characteristics associated with the likelihood of having a tattoo, and reasons for patients abstaining from having a tattoo.

Assessment methods

All study assessments were carried out during the recruitment consultation and data were collected through a series of questionnaires filled in by the dermatologist.

Patients were first asked whether or not they had a tattoo (1st part of the whole study). Patients with tattoos and permanent makeup were both considered as being tattooed. Patients without tattoo were then asked if they had ever wanted a tattoo, if they were planning to have one and why they had never had one.

The dermatologist then filled in two further questionnaires for tattooed patients. The first questionnaire (2nd part of the whole study) included items about patient demographics, medical history, number of tattoos and psoriasis characteristics (age of onset, type, family history, association with psoriatic arthritis, disease severity and specific treatments received). The second questionnaire (3rd part of the whole study) concerned patients' tattoos, with each tattoo being

analysed separately. The data were evaluated with the patient and included the date when the tattooing was carried out; its localisation, size and colour(s); occurrence of any complications (e.g. Koebner phenomenon, infection or allergy); and psoriasis treatments at time of the tattooing.

Data obtained from these questionnaires were used to classify patients into groups, as tattooed or not tattooed. The tattooed patients were then classified into three groups: tattooing carried out before psoriasis onset; tattooing carried out after psoriasis onset in the absence of psoriasis treatment (psoriasis without treatment group), and tattooing carried out after psoriasis onset whilst the patient was undergoing psoriasis treatment (the psoriasis with treatment group). If a patient had two or more tattoos, then this patient could have tattoos classified in multiple groups.

Definition of complications

Diagnosis of complications was made retrospectively. We tried to define precisely each complication in order to *match it to* to each diagnosis. We asked the patients if diagnosis was confirmed by a dermatologist and if there was a skin biopsy. Complications of the tattoo were classified as following:

- pruritus was defined as itch without skin change,
- oedema was defined as transient swelling with or without itch, without erythema on the tattoo,
- allergic reaction – eczema were defined as itchy and inflamed patches of skin within one colour of the tattoo. We insist on the short delay after tattooing (1-7 days) and the effect of corticosteroids if used. Late onset allergic reactions were not taken into account,
- infection/superinfection were defined as: 1) early superinfection as an impetigo or cellulitis. We enquired for the necessity of topical or general antibiotics to control the disease; 2) or later superinfection such as mycobacterial infection; this infection needed bacterial confirmation to be included in the study,
- granuloma (included sarcoidosis) and lichenification needed histological diagnosis. Granuloma was defined as a collection of inflammatory cells which includes histiocytes (macrophages, epithelioid and/or giant multinucleated cells), and lymphocytes,
- photosensitivity was defined as occurrence of symptoms such as local itch in the tattoo directly after a variable time of unprotected sun exposure,

- Koebner phenomenon was defined as appearance of psoriasis strictly located at the tattoo lines either just after tattooing, or later. In the definition we also included well-delineated psoriasis plaques in tattoo fields,
- psoriasis flare after tattoo was defined as psoriasis flare during the 2 weeks after tattooing, in the area of the tattoo, and also general flare, including psoriasis arthritis

Statistical analysis

The size of the study population was determined using data from previous studies indicating that 15–20% of adults in France have a tattoo[1,3]. To obtain statistically relevant results, we aimed to include at least 2000 psoriatic patients, 400 of whom we would have expected to be tattooed.

Quantitative data are expressed as the mean ± standard deviation (SD) and qualitative data as the number and percentage of patients or tattoos. Means were compared using the Student t-test and frequencies were compared using the Chi square test or Fisher exact test, as appropriate. A p-value of less than 0.05 was considered statistically significant. Multiple logistic regression analysis was carried out to evaluate the relationship between being tattooed and gender, age, and age at onset of psoriasis (p-value < 0.10 in univariate analysis). Statistical analyses were performed using R software version 3.0.2 (http://www.r-project.org).

Results

Patient demographics

During the 5-month period, 2053 psoriatic patients were included in our study, 414 (20.2%) were tattooed (Table 1) and 1639 were non-tattooed (79.8%). Univariate analysis revealed that tattooed patients were more likely to be female ($p=0.03$), younger ($p<0.0001$), and have an earlier age psoriasis onset ($p<0.0001$) than non-tattooed patients (Table 1). After multivariate analysis, only age was found to be linked to the likelihood of having a tattoo: $p<0.0001$, with an odds ratio (OR) = 0.97 and 95% confidence interval (CI) of 0.96–0.98 (Table 1).

Non-tattooed patients

A summary of the responses given by non-tattooed patients about their reasons for not having a tattoo is provided in Table 2. Among patients without tattoos, 252 (15.4%) had wished to have a tattoo but never received one. Amongst these patients, 111 (44.0%) did not have a tattoo because of their psoriasis, because of the treatment for their psoriasis, or due to negative advice from their doctor. Finally, 93 of the non-tattooed patients (5.7%) planned to have a tattoo in the future.

Demographic and clinical characteristics of tattooed patients

In patients under the age of 50, women were more often tattooed than men (Figure 1). Tattooing was most common in patients in the 25–34 year-old age group and was least common in patients aged 65 and over (Figure 1).

The characteristics of the psoriasis in the 414 tattooed patients are detailed in Table 3: plaque psoriasis was the most common form of psoriasis (n=300; 72.5%), and 79 patients (19.1%) had associated psoriatic arthritis. Before inclusion, the most common treatments were methotrexate (n=194; 46.9%), phototherapy (n=158; 38.2%), adalimumab (n=95; 22.9%), ustekinumab (n=90; 21.7%), and acitretin (n=85; 20.5%).

Tattoo characteristics and treatments at the time of tattooing

Tattoo characteristics, and details of the psoriasis status of the patients and treatments they were receiving at the time they were tattooed are shown in Table 4. There were 894 tattoos, with a mean of 2.2 tattoos per patient and a range of one to 13 tattoos per patient. The majority of tattoos were black (n=688; 77.0%), most commonly located on the upper limb (n=530; 59.3%), and covered

less than 5% of the body surface area (n=851; 95.2%). Tattooing was carried out in 336 patients (38.3%) before psoriasis onset, and in 542 (61.7%) after psoriasis developed. Among these, 344 (38.3) were tattooed in an episode without treatment for psoriasis at the time of tattooing, and 198 (22.6%) had a tattoo whilst receiving treatment for psoriasis: 72 patients (8.1%) were receiving local steroids, 56 (6.3%) systemic treatments, and 67 (7.5%) biotherapy at the time of tattooing.

Local complications associated with tattoos according to psoriasis and treatment status

Local complications were reported for 58 of the 894 tattoos (6.6%; Table 5). There was oedema in 2.1%, isolated pruritus in 2.7%, allergy in 0.2%, local infection in 0.7% and Koebner phenomenon in 3.0%. Complications occurred most frequently in the psoriasis with treatment group ($p<0.0001$; Table 5), with oedema ($p=0.049$), pruritus ($p<0.0001$), allergy ($p=0.03$), and Koebner phenomenon (Fig. 2) ($p<0.0001$) all being more common in the psoriasis with treatment group. There were no differences in the frequency of complications between the group before psoriasis onset and the group with psoriasis without treatment (Table 5).

Tattooing caused psoriasis flare in 29 cases (3.2%) independently of the occurrence of Koebner phenomenon. Tattooing as a cause for psoriasis flare was most frequent in the psoriasis with treatment group ($p=0.0002$). Tattooing caused psoriatic arthritis flare in three cases (0.3%; Table 5).

During a psoriasis flare-up, psoriasis plaques occurred within the tattooed area (Fig. 3) in 177 tattoos (19.8%), most commonly in the psoriasis with treatment group ($p<0.0001$) and regardless of the treatment received. Tattoos were spared by psoriasis in 417 cases (46.7%; Table 5).

Amongst patients in the psoriasis with treatment group, the occurrence of local complications appeared to be more common in patients undergoing systemic treatment or biotherapy ($p=0.03$) at the time of tattooing than in those receiving local treatments; however, no statistical differences in the frequency of complications were observed between the treatment subgroups (Table 6).

Discussion

Our multicentre, cross-sectional observational study provided needed information about the frequency of complications occurring after tattooing in psoriasis patients, and on the difference in frequency according to psoriatic treatments.

We found that tattoos were more frequent in younger patients, notably within the 25–34 year-old age group. These demographic trends, identified in our population of psoriasis patients, were in accordance with those observed by Kluger et al. [3] in the general population in France.

Amongst our non-tattooed patients, 15.4% indicated that they had wanted a tattoo. For 44.0% of these patients, their disease and the negative advice from their physician had prevented them from undergoing the tattooing procedure. These findings are similar to those of a Finnish study of tattooing and psoriasis in 90 patients, in which 28% of non-tattooed patients indicated that fear of a worsening of their psoriasis had prevented them from receiving a tattoo[10]. The characteristics of the tattoos in our study population were broadly similar to those reported in previous studies[11-13], with our study revealing a predominance of monochrome (black) tattoos, located on the upper limb and trunk and a mean of 2.2 tattoos per patient. However, the total tattooed area per person was larger in our study than that reported previously: the tattoos in our study most frequently covered between 1 and 5% of the body surface area, whereas in the study by Høgsberg et al. they most commonly covered between 0.1 and 1%[11].

We found that the rate of local complications occurring in our study population was low, at only 6.6%. We also found that tattooing induced psoriasis flares in 3.5% of cases, including psoriasis arthritis. The complication rates after tattooing reported in the literature are extremely variable, ranging from 2.1 to 67.5% and depending of the methodology: prospective studies, self-reported declaration, delay of analysis, … [4,5,12-16]. Kluger et al. found that minor symptoms – such as onset of pruritus and oedema more than three months after tattooing – were frequent (20%), but that persistent and chronic reactions after tattooing were rare, occurring in less than one out of 10 individuals[14]. The rates of 2.1% for oedema, 2.7% for pruritus, 0.2% for allergies and 0.7% for infections observed in our study are similar to those reported in the general population in a recent French study [3]. However, the complication rates in our psoriasis population were much lower than those reported in the general population by other studies.[4,13,15,16]. The majority of tattoos in our study were monochrome. Thus, the very low rate of allergies occurring in our study could be explained by the fact that allergies are generally more common with coloured tattoos, especially

red ones[4,13,14]. Also, we did not take into account late onset allergies, which could explain this low percentage. Moreover, as the definition of complications was retrospective, often made on patient descriptions, we cannot exclude misclassifications of some diagnoses.

No photosensitivity reactions, granulomas, lichenoid reactions or cancers were reported in our study, despite explicit questions about these complications being included in the questionnaire. Photosensitivity reactions on tattoos seem to be frequent according to previous studies. In a beach study in Denmark involving 144 tattooed participants[17], the rate of complications was 42%, with 52% of the complications being due to sun exposure. Similarly, in the study by Høgsberg et al., photosensitivity was reported in 9% of tattoos with 58% of complaints about tattoos being caused by sun exposure[11].

In our study, the rate of Koebner phenomenon was only 3.0%, and that of tattoos causing psoriasis flare only 3.2%. These rates are much lower than those reported by Kluger et al. in their study of tattooing in 90 psoriatic patients[10], where the rate of Koebner phenomenon was 28%, that of psoriasis flare-ups after tattooing was 30%, and that of flare-ups on another part of the body was 7%. In the first part of our "Tatou" study concerning dermatologists' opinions about tattooing in psoriatic patients, 15% of dermatologists reported that the Koebner phenomenon had occurred after tattooing in psoriatic patients[9]. Our findings from the current study show that the Koebner phenomenon was more common in the psoriasis with treatment group, with a rate of 9.1%. The higher frequency amongst patients in this group might be explained by the fact that patients under systemic treatment or biotherapy have more severe psoriasis and therefore have a higher risk of developing the Koebner phenomenon.

We also found that local complications were most frequent in the psoriasis with treatment group, in particular amongst patients treated with biotherapies. Indeed, this increase in complications may be associated either with the severity of the psoriasis or with the treatments received. Patients in our study had mean Psoriasis Area and Severity Index (PASI) and Dermatology Life Quality Index (DLQI) scores indicative of severe psoriasis. Interestingly, a few case reports have been published concerning tattoo complications in patients undergoing systemic treatments. For example, delayed healing, fatigue and local infection were reported in a 27-year-old woman with ankylosing spondylitis treated with adalimumab and methotrexate, and delayed healing and the Koebner phenomenon were reported in a 29-year-old woman treated with infliximab for psoriasis [18]. Delayed healing was also reported in a 19-year-old woman treated with

isotretinoin for acne [19]. Finally, a granulomatous reaction was reported in a 39-year-old man undergoing etanercept treatment for ankylosing spondylitis [20].

The main limitation of our study was memory bias, which could partly explain why the prevalence of complications in our study was lower than that found in previous reports. Other limitations were the fact that the diagnosis was made retrospectively and that the severity and duration of the complications were not included. The strengths of our study were the large number of participants and the multicentre approach.

In conclusion, we found that the overall complication rate in psoriasis patients after tattooing was low, but that complications were most likely in patients who underwent tattooing after psoriasis onset and whilst undergoing treatment. However, even in patients with psoriasis requiring treatment, the complications we observed were benign. The Koebner phenomenon, which is often easily treatable and transient, was the most frequent complication amongst these patients. Dermatologists and healthcare professionals should be mindful of the fact that tattooing is a way for psoriasis patients to express themselves, and can have positive effects through improving wellbeing and self-esteem. Our study provides valuable objective information about the risks associated with tattooing in this population. This information should be used by dermatologists and general practitioners to help patients decide if they want to be tattooed or not.

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Table 1. Demographic data for the whole study population and according to the presence or absence of tattoos.

	All patients N=2053	Tattoo		Univariate analysis	Multivariate analysis	
		Yes (n=414)	No (n=1639)	p-value	p-value	OR [95% CI]
Gender						
Female	915 (44.6)	204 (22.3)	711 (77.7)	0.03	0.07	0.82 [0.66–1.02]
Male	1138 (55.4)	210 (18.5)	928 (81.5)			
Age (years)	50.3 ± 15.3	44.5 ± 12.4	51.9 ± 15.5	< 0.0001	< 0.0001	0.97 [0.96–0.98]
Age at onset of psoriasis (years)	29.9 ± 16.5	26.3 ± 13.4	30.9 ± 17.1	< 0.0001	0.99	1.00 [0.99–1.01]

Quantitative data are expressed as means ± standard deviation and qualitative data as the number of patients, n (%). OR, odds ratio; CI, confidence interval

Table 2. Non-tattooed patients, n=1639

Have you ever wanted a tattoo? Yes	252 (15.4)
Why didn't you do it? n=252 [a]	
For personal or familial reasons	71 (28.2)
Because of my psoriasis [b]	108 (42.9)
Because of my treatments [b]	8 (3.2)
My practitioner gave negative advice [b]	2 (0.8)
Other reasons	69 (27.4)
Do you wish to be tattooed in the future? Yes	93 (5.7)

Qualitative data are expressed as the number of patients, n (%).[a] Patients could provide multiple explanations. [b] These three responses were included in the group "because of psoriasis and/or negative advice from practitioner"

Table 3. Psoriasis characteristics of tattooed patients.

	n=414
Family history of psoriasis	178 (43.0)
Plaque psoriasis	300 (72.5)
Psoriatic arthritis	79 (19.1)
Peak severity of psoriasis	
PASI [a]	13.1 ± 10.6
BSA (%) [a]	24.1 ± 23.0
DLQI	11.3 ± 7.8
Treatments before or at inclusion	
Phototherapy	158 (38.2)
Systemic treatments	
Acitretin	85 (20.5)
Alitretinoin	1 (0.2)
Methotrexate	194 (46.9)
Cyclosporin	97 (23.4)
Apremilast	49 (11.8)
Biotherapies	
Efalizumab	7 (1.7)
Etanercept	40 (9.7)
Adalimumab	95 (22.9)
Infliximab	15 (3.6)
Guselkumab	3 (0.7)
Golimumab	1 (0.2)
Ustekinumab	90 (21.7)
Secukinumab	35 (8.5)
Ixekizumab	19 (4.6)
Brodalumab	2 (0.5)

Quantitative data are expressed as the mean ± standard deviation and qualitative data as the number of patients, n (%). PASI: Psoriasis Area Severity Index; BSA: Body Surface Area; DLQI: Dermatology Life Quality Index. [a] Assessments for plaque psoriasis only.

Table 4. Tattoo characteristics

	N=894 [a]
Number of tattoos per patient	2.2 ± 1.8
Location	**n=886** [a]
Upper limb	530 (59.3)
Lower limb	118 (13.2)
Trunk	170 (19.0)
Face	28 (3.1)
Neck	40 (4.5)
Body surface area [b]	**n=882** [a]
< 1%	251 (28.1)
1–5%	600 (67.1)
5–10%	27 (3.0)
> 10%	4 (0.4)
Monochrome (black)	688 (77.0)
Timing of the tattoo procedure	**n=878** [a]
before psoriasis developed	336 (38.3)
after psoriasis developed, without treatment	344 (39.2)
after psoriasis developed, with treatment	198 (22.6)
Treatments at the time of tattooing	**n=891** [a]
Local steroids or vitamin D analogues	72 (8.1)
Systemic treatments	***56 (6.3)***
Phototherapy	12 (1.3)
Acitretin	3 (0.3)
Cyclosporin	10 (1.1)
Azathioprine	1 (0.1)
Steroids	1 (0.1)
Methotrexate	27 (3.0)
Apremilast	1 (0.1)
Apremilast + methotrexate	1 (0.1)
Biotherapies	***67 (7.5)***

Anti-TNF alpha	***28 (3.1)***
Etanercept	4 (0.4)
Adalimumab	22 (2.5)
Infliximab	2 (0.2)
IL-12/23 inhibitor	***35 (3.9)***
Ustekinumab	35 (3.9)
IL-17 inhibitors	***4 (0.4)***
Secukinumab	1 (0.1)
Ixekizumab	3 (0.3)

Quantitative data are expressed as the means ± standard deviation and qualitative data as number of tattoos, n (%). TNF, tumour necrosis factor; IL, interleukin. [a] Number of tattoos evaluated. [b] BSA of the tattoo was defined as follow: 1% of BSA corresponded to one palm of the patient. We considered the outer perimeter of the tattoo, even if the inner part was not tattooed.

Table 5. The frequency of local complications associated with tattoos according to psoriasis and treatment status

	All tattoos **N=894** [a]	Tattoo before psoriasis onset **n=336**	Tattoo after psoriasis onset: without treatment **n=344**	Tattoo after psoriasis onset: with treatment **n=198**	p-value
Local complications	58 (6.6)	10 (3.0)	20 (5.8)	28 (14.1)	<0.0001
Oedema	19 (2.1)	5 (1.5)	5 (1.5)	9 (4.5)	0.049
Isolated pruritus	24 (2.7)	3 (0.9)	7 (2.0)	14 (7.1)	<0.0001
Allergy	2 (0.2)	0 (0)	0 (0)	2 (1.0)	0.03
Local infection	6 (0.7)	2 (0.6)	2 (0.6)	2 (1.0)	0.76
Koebner phenomenon (Fig. 2)	26 (3.0)	1 (0.3)	7 (2.0)	18 (9.1)	<0.0001
Psoriasis flare after tattoo					
Cutaneous psoriasis	29 (3.2)	3 (0.9)	11 (3.2)	15 (7.6)	0.0002
Psoriatic arthritis	3 (0.3)	1 (0.3)	2 (0.6)	0 (0)	0.53
Presence of psoriasis plaques within the tattoo during a flare of the disease [b]					
Psoriatic plaques within the tattoo (Fig. 3)	177 (19.8)	40 (11.9)	76 (22.1)	60 (30.3)	< 0.0001
Tattoos spared by psoriasis	417 (46.7)	169 (50.6)	158 (46.5)	80 (40.4)	0.07

Qualitative data are expressed as the number of tattoos, n (%). [a] No data on the timing of the tattoo procedure with respect to psoriasis onset or on the treatment received were available for 16 patients. [b] during follow-up

Table 6. The frequency of local complications associated with tattoos according to treatment type

	Treatments received in the psoriasis with treatment group N=198			
	Local treatments n=72	Systemic treatments [a] n=56	Biotherapies n=67	P-value
Local complications [b]	5 (6.9)	8 (14.3)	15 (22.4)	0.03
Oedema	1 (1.4)	2 (3.6)	6 (9.0)	0.11
Isolated pruritus	4 (5.6)	2 (3.6)	8 (11.9)	0.19
Allergy	0 (0)	1 (1.8)	1 (1.5)	-
Local infection	0 (0)	1 (1.8)	1 (1.5)	-
Koebner phenomenon (Fig. 2)	3 (4.2)	6 (10.7)	9 (13.4)	0.15
Psoriasis flare after tattoo				
Cutaneous psoriasis	7 (9.7)	4 (7.1)	4 (6.0)	0.75
Psoriatic arthritis	0	0	0	
Presence of psoriasis plaques within the tattoo during a flare of the disease [c]				
Psoriatic plaques within the tattoo (Fig. 3)	18 (25.0)	17 (30.4)	23 (34.3)	0.48
Tattoos spared by psoriasis	36 (50.0)	20 (35.7)	24 (35.8)	0.15

Qualitative data are expressed as the number of tattoos n (%). [a] systemic treatments including phototherapy. [b] n (%) of tattoos associated with at least one complication. One tattoo may have been associated with multiple complications. [c] during follow-up

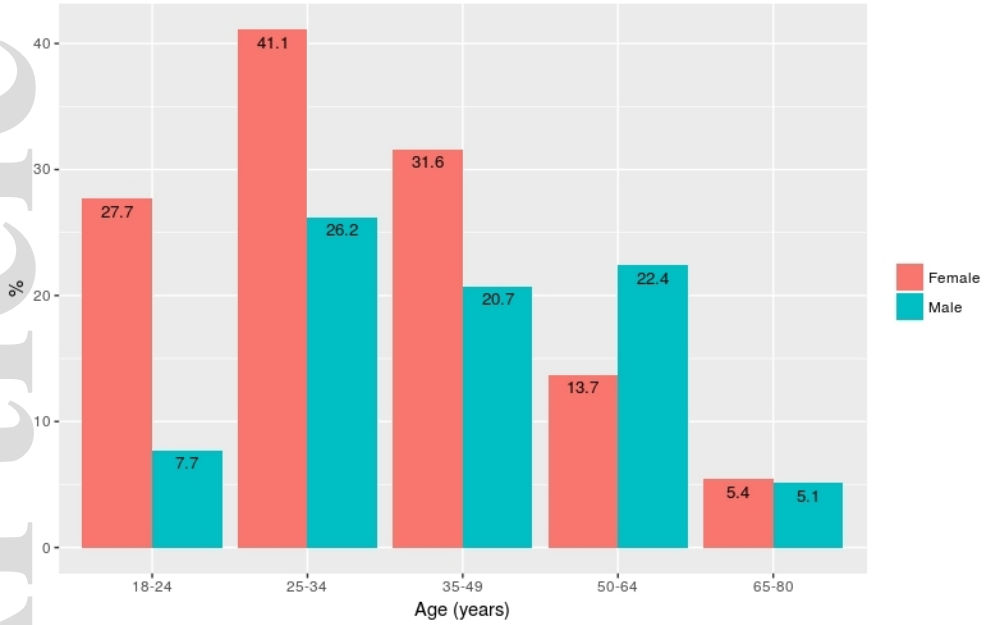


Figure 1. Percentage of tattooed psoriatic patients according to age and gender

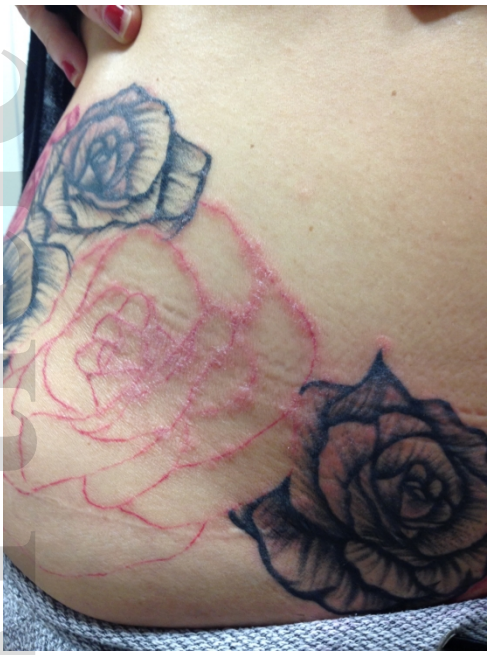
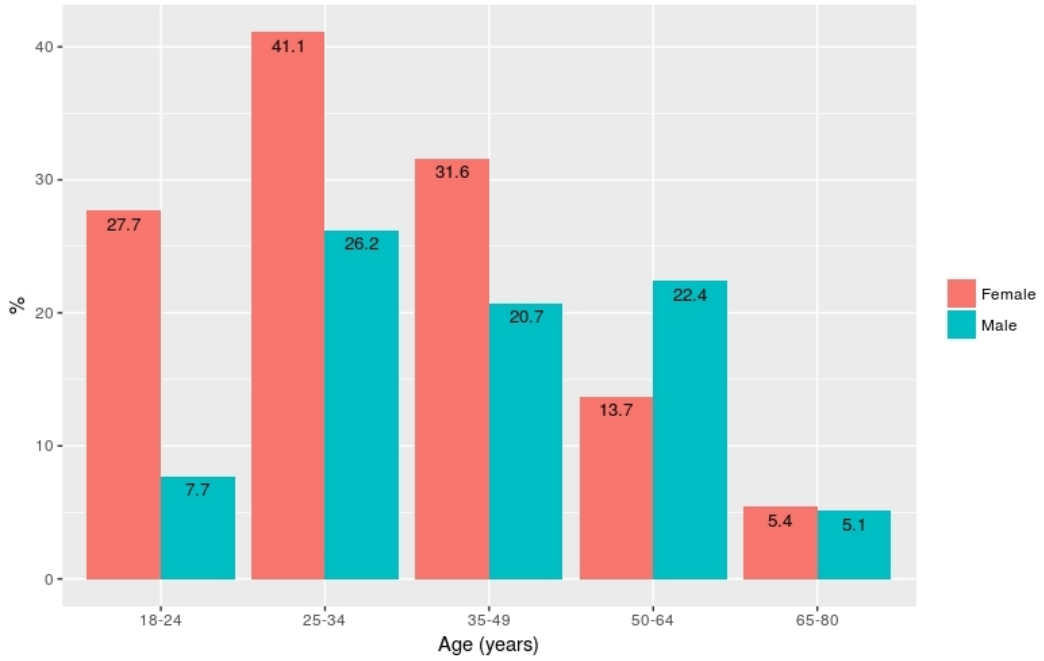


Figure 2. Koebner phenomenon with psoriasis predominantly within a red tattoo. This aspect was later after tattooing, during a flare of the disease.

Figure 3. Plaque psoriasis on a tattoo (without Koebner phenomenon)



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