

Cutaneous Complications Related to Tattoos: 31 Cases from Finland

Nicolas Kluger

Department of Dermatology, University of Helsinki and Helsinki University Central Hospital, Helsinki, Finland

Keywords

Tattooing · Tattoo · Lichen planus · Sarcoidosis · Melanoma · Atypical mycobacteria · Inflammation · Tattoo pigment · Cutaneous granuloma

Abstract

Background: Cutaneous complications related to permanent tattoos affect 2–30% of those patients who have tattooed their skin. Little is known about the cases of tattoo complications in Finland. **Objective:** The aim of this study was to conduct a retrospective review of a series of Finnish patients with cutaneous tattoo reactions. **Methods:** We collected cases of tattoo reactions from the Department of Dermatology at Helsinki University Central Hospital, from members of the Finnish dermatological society and from various other sources (author's private practice, tattooists, professional internet forum). We analysed the demographics, clinical presentation, diagnosis, and microscopic findings on the skin biopsies, and evaluated the therapeutic outcome. **Results:** Thirty-one patients (16 men and 15 women, mean age 37.8) were included from 9 cities, mainly from Helsinki. Fifty-two percent (16/31) presented with an allergic tattoo reaction mainly against the red colour (75%, 12/16). Reactions were clinically polymorph ranging from scattered papules or

nodules to complete infiltration of a colour. Lesions were itchy and sometimes painful. The reactions were lichenoid, granulomatous, pseudolymphomatous or less specific with a dermal lympho-histiocytic or plasmacytic infiltrate. Other diagnoses included tattoo blow-out (13%), melanoma within a tattoo, naevi within a tattoo (10% each), lichen planus (6%), granulomatous reaction with uveitis, sarcoidosis and dermatofibroma (3% each). Allergic tattoo reactions were mainly treated with local corticosteroid (CS) ointments, CS infiltration or surgical removal. **Conclusion:** This review is the largest series of tattoo complications in the Baltic area. It illustrates the wide spectrum of complications. Prospective, controlled therapeutic studies are necessary to assess the best treatment protocols for tattoo allergies and tattoo reaction management in general.

© 2017 S. Karger AG, Basel

Introduction

Today, about 10–20% of the general population in Western countries has at least one tattoo [1]. In Finland, the 2009 Youth Barometer survey indicated that 13% of the 20- to 30-year-old population was tattooed [2]. In 2013, the Finnish Tattoo Artists Association (*Suomen*

Tatuointiyhdistys) estimated that there were approximately 300–400 “professional” tattooists in the country (5.49 million inhabitants), or 1 tattooist for every 13,500 inhabitants [1]. But the total number of tattooists, including the unlicensed ones (also called “backyard tattooists” or “scratchers”), is unknown in Finland. The extent of home tattooing could be more than expected, as suggested by our findings in a small study of tattooed individuals attending a tattoo convention in Hämeenlinna in 2015: 21.7% of the respondents acknowledged having at least one amateur tattoo [3].

The exact prevalence of cutaneous complications related to tattooing remains difficult to assess. The variations among the available clinical studies have been explained by the study settings (often self-reports to online questionnaires or by phone or direct interview) and the specific questions about symptoms, with physical examination being rather rare. It is broadly acknowledged that minor symptoms beyond 3 months post-tattooing, like waxing and waning itching or swelling, are frequent [4, 5]. These complaints do not concern all the tattoos of a given individual, but usually 1 out of 5 tattoos [4]. On the other hand, persistent and chronic reactions on tattoos affect fewer than 1 out of 10 individuals (6–8%) [5–7].

In our practice, we classify the cutaneous complications on the basis of the patient’s history, the clinical presentation of the tattoo reaction, the findings of a full physical examination and the histopathology of the reaction. The main complications include (i) hypersensitivity tattoo reactions (also called “tattoo allergies”), (ii) cutaneous infections, (iii) benign and malignant tumours, and (iv) localization of chronic skin disorders on the tattoo [8, 9]. The definition of “hypersensitivity tattoo reaction/tattoo allergy” is empirical. We have arbitrarily defined it [10] as a chronic and constant reaction, affecting one or several tattoos, restricted to a single colour, and developing with-in variable delays, from immediately to years after tattoo completion. Clinically, the rash presents as permanent tumefaction(s) that can be localized or diffuse and complete infiltration of the tattooed area. Itch is frequent, while pain is rare. A biopsy is mandatory. Various histopathological patterns have been described, which allow more precise classification of the reaction. These patterns are also important as they may shed light on possible sarcoidosis or lichen planus (LP) [8, 9]. The choice of the treatment can be guided by the histopathology [10].

Very little is known about tattoo reactions in Finland. We found no case reports in *Duodecim*, the Finnish Medical Society journal. Therefore, in order to assess the clinical spectrum of cutaneous tattoo complications in Finn-

ish patients, we analysed the demographics, clinical presentation and microscopic findings from the skin biopsies, and evaluated the therapeutic outcome whenever possible.

Material and Methods

For further details, see the online supplementary materials (see www.karger.com/doi/10.1159/000468536 for all online suppl. material) [11–13] (Fig. 1).

Results

In all, 60 cases were collected from the different sources (Fig. 1).

Excluded Cases

We excluded 27 cases from this study. From the cases collected from our department’s pathology records, 15 were identified as traumatic tattoos or radiotherapy markings without complications. In addition, we excluded a 28-year-old man with discoid lupus who presented with an atrophic macular eruption that partially affected some of his tattoos, but for which no clear diagnosis could be made from the clinical and pathological data. From the author’s private practice, 6 cases were excluded: 4 patients had clinical tattoo reactions that were not sufficiently or properly documented or had not been followed for evolution and treatment. Two tattooists had asked for advice about cosmetic side effects: one case was an unexpected shift in colour from grey to purple after tattooing and one customer had seen the text of her tattoo become thicker and blurrier with weight gain. Among the last group, 5 other cases were excluded: a patient with 2 naevi surgically removed from a tattoo (but without further information), 3 cases of tattoo reactions with no further documentation or exploration, and a 24-year-old tattooed patient with pigmented enlarged lymph nodes whose case did not fit the aims of the current article.

Demographic Data and Diagnosis

Overall, 31 patients (16 men and 15 women, mean age 37.8 ± 12.4) were included in the present study. Women were older than men in our series (mean age at presentation, 43.6 vs. 33.8). All were white patients of Finnish descent. None had a complication related to permanent make-up. The tattoos were all of the “decorative” type. Eighteen patients were managed in the Dermatology De-

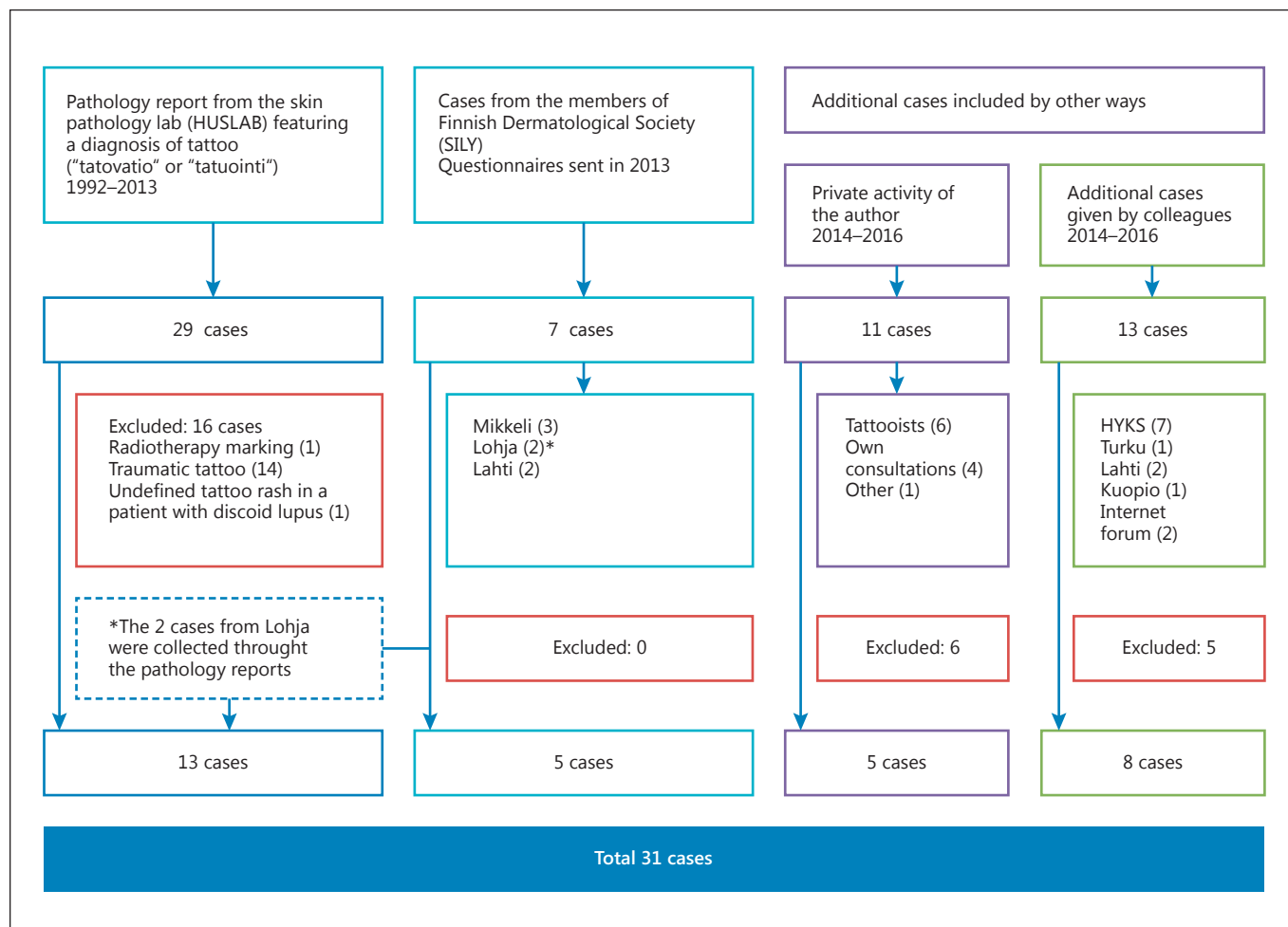


Fig. 1. Flowchart of the study.

partments of the Hospital Districts of Helsinki and Uusimaa (16 in Helsinki, 2 in Lohja). Thirteen of them were retrieved from the pathology database from 1992 to 2013. However, the first case of complication on a decorative tattoo dated from 2008. Before this year, only cases of traumatic tattoos were recorded. Six additional cases were collected through colleagues from our department of Dermatology. Four cases were not found in the pathology database because the diagnostic keyword “tattoo” had not been used: 2 melanomas on tattoos, a case of dysplastic naevi on tattoos, and a chronic tattoo reaction. In one case, the biopsy was not performed on a tattooed area, and the last patient did not have any biopsy at all. An additional 8 cases originated from other cities in Finland (see online suppl. data).

The demographic data and diagnoses are summarized in Table 1. Twenty-eight patients (90%) were biopsied at

least once. Figure 2 shows the various clinical presentations of the tattoo complications.

Hypersensitivity Tattoo Reaction or Tattoo Allergy

Sixteen patients (52% of the total cohort, 12 women, mean age 41.1) had a diagnosis of hypersensitivity reaction to tattoo ink (or “tattoo allergy”). The clinical symptoms and the histopathology diagnosis are summarized in Table 2. More detailed results can be found in the online supplementary Figure. The reactions were restricted to one coloured area in 94% of the cases (15/16), mainly red (75% of the cases, 12/16). The mean delay of onset after tattooing was 6.8 months, ranging from immediate onset to 3 years later. The affected areas within the tattoos were always extremely small and the tattoos themselves were rather small, covering a maximum of 1% of the body surface. One patient acknowledged a home-tattoo by her

Table 1. Demographics and diagnosis of the present Finnish series

Patients	31
Mean age $\pm$ SD (range)	37.8 $\pm$ 12.4 (19–66)
Men, <i>n</i> (%)	16 (52)
Mean age $\pm$ SD (range)	33.8 $\pm$ 10.8 (19–61)
Women, <i>n</i> (%)	15 (48)
Mean age $\pm$ SD (range)	43.6 $\pm$ 13.1 (25–66)
Diagnosis ^a , <i>n</i> (%) (<i>n</i> = 31)	
Hypersensitivity reaction/tattoo allergy	16 (52)
Infection	2 (6)
<i>Aspergillus fumigatus</i>	1 (3)
Possible atypical mycobacteria	1 (3)
Systemic and chronic cutaneous disorders	4 (13)
Generalized lichenoid reaction/lichen planus	2 (6)
Sarcoidosis	1 (3)
Granulomatous tattoo reaction and uveitis	1 (3)
Tumours and malignancies	7 (23)
Naevi on tattoos	3 (10)
Melanoma	3 (10)
Dermatofibroma	1 (3)
Tattoo blow-out	4 (13)
Colour involved ^b , <i>n</i> (%) (<i>n</i> = 30)	
Red	13 (43)
Black	12 (39)
Violet/lilac/pink	3 (10)
Gray	1 (3)
Green	1 (3)

^a Two patients with tattoo allergy also had a tattoo blow-out phenomenon. ^b The tattoo colour was available for 30 patients. One patient had a reaction on both light red and light violet.

Table 2. Characteristics of the 16 cases of hypersensitivity/allergic tattoo reactions

Gender, M:F, <i>n</i> (%)	12:4 (75:25)
Age at onset, years, mean $\pm$ SD	41.4 $\pm$ 13.7
Mean delay after tattooing, months	6.8 $\pm$ 10.2
Patients with previous tattoos (<i>n</i> = 12)	9 (75)
Patients with previous tattoo reaction (<i>n</i> = 12)	0 (0)
Tattoo localization (<i>n</i> = 15) ^a	
Upper limbs	10 (67)
Lower limbs	5 (33)
Neck	1 (7)
Tattoo colour reaction ^b	
Red	12 (75)
Violet, lilac, pink	3 (19)
Black	2 (12.5)
Clinical manifestations (<i>n</i> = 15) ^c	
Scattered papules	5 (33)
Scattered nodules	2 (13)
Complete colour infiltration	10 (66)
Scales	9 (60)
Crusts	2 (13)
Excoriations	3 (20)
Itch (<i>n</i> = 14)	13 (93)
Pain (<i>n</i> = 14)	2 (14)
Histopathology (<i>n</i> = 16) ^d	
Lichenoid reaction	5 (31)
Granuloma (foreign body or sarcoidal)	4 (25)
Cutaneous lymphoid hyperplasia (pseudolymphoma)	2 (12)
Miscellaneous (lymphocytic, lymphoplasmacytic, lymphohistiocytic, eczematiform reaction)	4 (25)
Pseudo-epitheliomatous hyperplasia	3 (19)

^a One patient had a tattoo reaction on tattoos located on the upper limbs and neck. ^b One patient developed a reaction against both light red and light violet colours. ^{c, d} A patient may have several symptoms or several histopathological patterns.

partner in Finland. Two had their tattoos performed abroad in a professional parlour: one in Thailand and one in Bulgaria. None had a prior history of tattoo reaction and no one reported any flare-ups on older tattoos. Two patients had several tattoos involved, but in both cases, the tattoos had been done at the same time. Clinically, the reactions presented as papules, nodules or swelling/complete infiltration or induration of the coloured area, with or without scales or crusts and nail excoriations due to intense itch. Tattoo reactions were rarely painful (14%). We did not assess whether sun exposure could be a precipitating factor.

Histologically, an allergic tattoo reaction almost always presented with a reaction on the epidermis (acanthosis, hyperkeratosis or parakeratosis) and a constant

inflammatory infiltrate in the dermis made of lymphocytes. Other cell infiltrates like macrophages or histiocytes were often found, plasma cells occasionally, and more rarely eosinophils or neutrophils. Granulomas were sometimes observed, in association with an epidermal reaction or not. The following diagnoses were made based on the main reaction observed at the time of biopsy: lichenoid, cutaneous lymphoid hyperplastic (pseudolymphoma), granulomatous or a less specific lymphohistiocytic, and lymphoplasmacytic or eczematous reaction. In some cases, the intensity of the epithelial hyperplasia led to a diagnosis of pseudo-epitheliomatous (or pseudo-carcinomatous) hyperplasia (PEH). Patch-testing was done for 3 patients with red tattoo reactions. Explorations were negative in 2 cases, and one presented positive reactions



Fig. 2. **a–i** Clinical presentation of various tattoo complications (and diagnosis). **a** Scaly papules and nodules in the red part of a diamond (pseudo-epitheliomatous hyperplasia and lymphoplasmocytic infiltration). **b** Scaly infiltration and crusts on a red gecko (lymphocytic reaction). **c** Complete scaly infiltration of the red part of a tattoo (pseudo-epitheliomatous hyperplasia) and tattoo blowout with the black color. **d** Papules restricted to the gray shadings (non-caseating granulomatous reaction, possible mycobacterial infection). **e** Scaly papules on the red parts (lichenoid reaction) and tattoo blow-out on the black parts. **f** Infiltration and excoriation of the red leafed flowers (pseudo-epitheliomatous hyperplasia). **g** Infiltration of all the red areas (tattoo allergy, lichenoid reaction). **h** Scattered papules on a black dolphin (sarcoidal granuloma without systemic sarcoidosis, considered a tattoo allergy thus far). **i** Scattered papules and nodules (cutaneous and mediastinal sarcoidosis).

to various acrylates and a thiuram mix. No tests were performed with red inks.

Management of the allergic tattoo reactions was most often an initial application of local corticosteroid (CS) ointment, mainly one of the superpotent ones (propionate clobetasol) with or without occlusion. More than half of the patients (55%) reported a complete or partial response to this treatment. Conversely, potent CSs were always inefficient. Intralesional injections of CS were efficient in half of the cases, even in cases of very thick reactions. Three patients requested immediate surgical removal of the tattoo, while in a fourth case, the tattooed areas were removed after the failure of both topical and intralesional CS. In this last case, only the itchy inflamed red areas were removed by punch biopsies (Fig. 3).

Infection

Only 2 patients (6%) in our cohort had developed an infection on their tattoos. A young immunocompetent patient developed an acute and severe primary cutaneous aspergillosis infection of the entire back immediately after home tattooing. The case was reported in detail elsewhere [13].

A 33-year-old man presented with itchy papules restricted to grey shadings of a tattoo on the arm performed 2 months earlier (Fig. 2d). The rash started one month after tattooing. The histopathology disclosed an inflammatory infiltrate with lymphocytes, macrophages and giant cell granulomas in the superficial and mid dermis. Mycobacterial staining, cultures and identification by polymerase chain reaction were negative. However, the patient reported that 5 or 6 other customers had had similar symptoms from the same tattooist. He received vari-

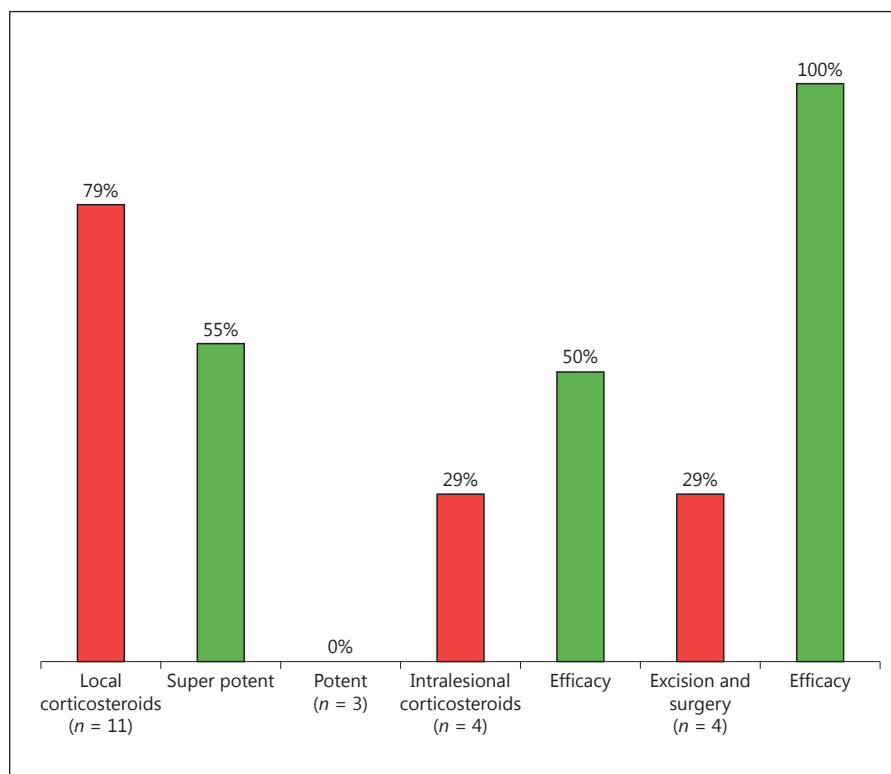


Fig. 3. Tattoo allergy treatment and efficacy rate.

ous antibiotics including cyclines and the eruption resolved. Despite negative germ identification, the history, clinical picture and presence of granulomas favoured a possible environmental (rapidly growing) mycobacterial infection.

Skin Tumours and Pigmented Lesions with a Tattoo

Seven patients (23%) had lesions within their tattoos that required skin consultation. Three male patients were diagnosed with a melanoma on their tattoos [11, 12]. Three patients displayed naevi within their tattoos. One had 2 atypical naevi excised from a tattoo. Moreover, patients seen in private practice had moles within their tattoos. Clinical evaluation and dermatoscopy were more difficult than on plain skin. It was not possible to determine whether the naevi were present before tattooing or had appeared after. Last, one patient had a dermatofibroma excised from a tattoo.

Chronic Cutaneous Conditions and Generalized or Systemic Reaction

In our series, no patient had any chronic skin condition located on their tattoos, such as psoriasis, lupus or vitiligo.

Only one patient was diagnosed with cutaneous and mediastinal sarcoidosis without parenchymal lung involvement. The cutaneous lesions, made of scattered nodules along the tattoo lines, led to the diagnosis of sarcoidosis on biopsy (Fig. 2i). Angiotensin conversion enzyme levels were elevated. The patient did not have any other manifestation of the disease. Interestingly, 2 months after the diagnosis, the cutaneous lesions started to improve spontaneously. One year later, he was free of any skin lesions of his tattoo without treatment.

A heavily tattooed (arms, back, and neck) 32-year-old man presented a foreign-body granulomatous tattoo reaction on several 2- to 10-year-old black tattoos and the rapid development of a bilateral uveitis within a month. He developed neuroretinitis 15 months later. His ocular condition required the initiation of oral and topical steroid treatment. Sarcoidosis and other granulomatous systemic diseases were ruled out, but leptospirosis serology was found positive 1 year after the occurrence of the symptoms. He was unfortunately then lost to follow-up.

Two patients developed a generalized lichenoid reaction after tattooing. Four days after getting his first black tattoo on a wrist, a healthy 19-year-old man developed an itchy rash that spread to the rest of the body within 2

months. Dermoscopy revealed typical Wickham's striae. Lichenoid lesions were observed in the mouth. Histology of a non-tattooed skin area confirmed the diagnosis of LP. Therapeutic compliance was poor regarding topical CSs. Oral retinoids (acitretin 25 mg/day) and oral prednisolone 30 mg daily were also inefficient. At the last follow-up, the rash was still present without any itch. A 32-year-old woman with previous asymptomatic black tattoos got a new multi-coloured one on the right leg that never healed completely. It became infiltrated, scaly and itchy on the red parts. The histology was in favour for a lichenoid tattoo reaction associated with a pseudo-epitheliomatous hyperplasia. However, 7 months after the tattoo, she developed an extensive itchy rash made of lichenoid papules. Asymptomatic white striae in a reticular pattern in the mouth favoured the diagnosis of LP. UVA phototherapy was efficient on the body rash, but the tattoo reaction responded poorly to local CSs. She did not want to take oral CSs and instead received intralesional CS.

Tattoo Blow-Out

Three young women and a man presented with a blurry halo of deep pigmentation around their recent tattoos (also called tattoo blow-out; Fig. 2c, e). In 2 cases, this was the motive for consultation, while for the 2 other patients, the diagnosis was fortuitous during physical examination for an allergic reaction to the red parts of the very same tattoos. Two were located on the inner side of the forearms, one on the arm, and the last was on the thigh. In 3 cases, the halo was black and in the third case it was green. One was disturbed by the cosmetic consequences of the tattoo blow-out, and she thus agreed to have the tattooist correct it by hiding the halo with extra designs. The results were satisfactory for both.

Discussion

We report here the largest series of tattoo complications in Finland and Northern Europe across the Baltic Sea. Our series illustrates the wide spectrum of cutaneous complications related to tattooing: allergic tattoo reactions, tattoo blow-out, infections and benign and malignant tumours. Some of the complications in our series have been discussed in detail elsewhere: issues related to tattoo blow-out [14], the difficulties of mole surveillance within tattoos [15, 16], the fortuitous association of melanomas in tattoos [17, 18], the occurrence of benign tumours such as dermatofibroma [19] or outbreaks of mycobacterial infections in tattoo parlors [20, 21], and sar-

coidosis on tattoos [22]. We will therefore focus here on some of the specific aspects emerging from our studies.

Tattoo Allergy Is the Most Common Complication and Occurs on Small Tattooed Areas

Unsurprisingly, half of our patients presented with an allergic tattoo reaction, mainly against red and red shades (pink and violet). The delay of onset, clinical presentation and histopathology were similar to what has been reported in the literature for more than 30 years [23, 24]. Itch was almost constant and had an impact on the patient's quality of life [25]. Some of our patients also reported pain, always in association with itch. Unbearable itch or pain was a reason for requesting tattoo removal. Red ink was the main culprit, but the actual allergens have not yet been identified [24, 26]. It is widely acknowledged that patch-testing is not suitable for exploring tattoo allergies [24, 27] and therefore we rarely use this test for tattoo reactions in our practice. The results in our 3 patients confirm the current policy.

Our study confirms an empirical observation that we have repeatedly made over the years and that has been amply reported in the literature: allergic tattoo reactions seem to occur mainly in small tattooed areas or, in the case of large tattoos, within small motifs and designs that are part of the tattoo (flowers, diamond, etc.). We have never seen an allergy to a tattoo colour covering a large area of body surface, such as a dragon in the back. We estimated that the tattooed surfaces affected by a reaction in our series were smaller than a half palm (0.5%) – at maximum, 1%. We therefore suspect that a reaction to a colour is possible only if the quantity or size of the allergen does not exceed a critical threshold. This recalls the hypotheses regarding pencil core granulomas and granulomas on tattoos [22]. Beyond the critical quantity or size, either the reaction does not occur and the immune system may be in a state of anergy or, if it does, the reaction remains at too low a level to produce any visible or disabling symptoms or complaints.

Granulomatous Reaction on Tattoos: Allergy, Mycobacteria and Sarcoidosis

Six patients presented with non-caseating granulomas on biopsy. Three had an isolated foreign body granulomatous tattoo reaction against black or violet, one had systemic sarcoidosis, and one most likely had a rapidly growing mycobacterial infection on the grey shadings of a tattoo. The patients usually clinically presented with scattered papules and nodules, but sometimes also with papules distributed on the grey shading or scaly inflam-

mation. Itching was sometimes absent. We still suggest that any granulomatous tattoo reaction should prompt screening at least once to rule out sarcoidosis. Of note, the spontaneous resolution of granulomatous reaction, even after biopsy, is possible [22].

Granuloma Reaction and Uveitis: A Distinct Entity?

One patient developed the rare association of granulomatous tattoo reaction and uveitis. To date, approximately 20 cases of granulomatous tattoos reactions with isolated (pan)uveitis have been reported [28–30]. They share strikingly the following similar features: male predominance, granulomatous infiltration of tattoos that are often black, and the complete lack of systemic sarcoidosis at the time of presentation. The prognosis for vision should prompt the initiation of immunosuppressive treatment. The skin and eye manifestations may be simultaneous or the skin lesions may precede the ocular ones. The pathophysiology remains unclear, suggesting either a genuine sarcoidosis without all the criteria for a systemic disease or an “immune-allergic” uveitis [22]. Our case is quite similar to the reports in the literature. The discovery of a positive leptospirosis serology a year after symptom onset and the loss at follow-up unfortunately add some confusion and uncertainty about this case.

Generalized Lichenoid Tattoo Reactions and LP

Two of our patients quickly developed a tattoo reaction – within a week of tattooing – followed by a generalized lichenoid reaction. Both had oral mucosal lesions evocative of LP. The occurrence of a generalized lichenoid reaction after tattooing has been recorded in the literature [31–37]. The delay of onset varies from days to years and not all patients present oral lichenoid lesions. None have been found with hepatitis C infection. The main question remains whether the tattoo is the cause of the lichenoid reaction or the tattoo reaction is the result of a Koebner phenomenon in a patient with undiagnosed LP. Histology cannot distinguish between the 2 conditions [33]. Both of our patients had mucosal lesions, but it is impossible to draw any conclusion about the status before tattooing, as they were examined after the tattoo rash. The rash on the body of one patient responded quickly to UVA balneophototherapy, while the lichenoid eruption remained active on the tattoo. Of note, another patient in our series with a past history of LP conversely developed a lymphocytic reaction against the red of her tattoo without any lichenoid features and without LP flare-up. Because the lichenoid reaction was restricted to the red ink, it is more likely that it was an allergic reaction

rather than a genuine LP. However, we again stress [8, 10] that any patient with a lichenoid eruption on a tattoo should be examined thoroughly to rule out a rare but possible LP.

Management of Tattoo Reaction: From Local Treatment to Systemic Therapies

The first line of treatment was almost always local. Half of the patients who tried superpotent CS (clobetasol propionate) reported its complete or partial efficacy in treating the reaction. Weaker classes of potent CS were not efficient. Failure of local treatment should prompt patient questioning to rule out improper therapeutic observance. Intralesional injections of CS were also efficient and should be considered an alternative to creams and ointments. Topical tacrolimus was suggested as an alternative [38, 39] to some of our patients when CS treatment failed, but it was never used. Some patients opted for surgical excision either immediately or after other treatments had failed. This was performed by a dermatologist or plastic surgeon, depending on the size and location of the tattoo. For small areas, skin punch biopsies were also efficient. Dermotome shaving is not performed at Helsinki University Hospital [40]. Systemic treatments (CSs, UVA phototherapy, retinoids) are restricted to patients with systemic conditions like uveitis or generalized lichenoid reaction/LP. PEH may be difficult to treat. Although ointments often fail, intralesional CSs have been found to be efficient. Excision is often necessary in cases of failure.

Overall, the choice of treatment should be guided by the diagnosis, the extent of the lesions, and the wishes and expectations of the patient [10]. We recently suggested a therapeutic pyramid to help physicians with treatment escalation for tattoo reactions, based on our experience and the treatment strategies reported in the literature [10]. However, one should not forget that the spontaneous resolution of tattoo reactions is possible, so a controlled trial should be initiated to determine the best protocol for patients with tattoo reactions.

Limitations

This study has limitations that should be acknowledged, notably those of any retrospective study, including the retrospective analysis of patients from different sources. We may have missed cases from our pathology records as the pathologist may not have used “tattoo” as a diagnosis code and not every tattoo reaction was biopsied. We also had to exclude 8 cases of tattoo reactions because of the lack of proper documentation or follow-up.

Conclusions

In this study, we reviewed 31 cases. Our results are consistent with the data in the literature and illustrate the wide spectrum of tattoo complications. Our findings also indicate that tattoo ink allergies mainly occur in small coloured areas, although for as yet unknown reasons. The first line of treatment should be local, with ultrapotent CS or intralesional CS, but prospective controlled studies are needed to assess the best therapeutic protocols for patients with tattoo reactions, especially those with tattoo allergies. It is also important that physicians and pathologists develop the habit of using “tattoo” in the diagnostic coding (ICD 10 L81.8) [41] so that larger studies can be performed more easily.

Key Message

Tattoo reactions in Finland are mainly related to allergy to the red dye.

Acknowledgements

The author is indebted to all the physicians who took part directly or indirectly in collecting the data: Leila Jeskanen, Katariina Hannula-Jouppi, Hannele Heikkilä, Johanna Höök-Nikanne, Toni Karppinen, Anne Keinonen, Sari Koskenmies, Emilia Lybeck, Leeni Mäkelä, Pauliina Nuutinen, Kaisa Pitkonen, Anita Remitz, Kari Saarinen, Alexander Salava, Olli Saksela, Raimo Suho-nen, Ioannis Teras, Lauri Tolkki and Anna-Reetta Vauhkala.

Statement of Ethics

The Institutional Review Board approval was waived off for this retrospective chart study.

Disclosure Statement

The author declares no conflicts of interest with regard to this manuscript.

References

- 1 Kluger N: Epidemiology of tattoos in industrialized countries. *Curr Probl Dermatol* 2015;48:6–20.
- 2 Myllyniemi S: Nuorisobarometri [Youthbarometer] 2009, p 205, Yliopistopaino Oy, Helsinki, 2009 http://www.minedu.fi/export/sites/default/OPM/Nuoriso/nuorisoasiain_neuvottelukunta/julkaisut/barometrit/liitteet/Nuorisobarometri_2009.pdf (accessed April 23, 2013).
- 3 Kluger N: Tattooing in Finland: a survey in a tattoo convention. *Forum Nord Dermatol Venereol* 2016;21:7–11.
- 4 Høgsberg T, Hutton Carlsen K, Serup J: High prevalence of minor symptoms in tattoos among a young population tattooed with carbon black and organic pigments. *J Eur Acad Dermatol Venereol* 2013;27:846–852.
- 5 Kluger N: Self-reported tattoo reactions in a cohort of 448 French tattooists. *Int J Dermatol* 2016;55:764–768.
- 6 Klügl I, Hiller KA, Landthaler M, Bäumler W: Incidence of health problems associated with tattooed skin: a nation-wide survey in German-speaking countries. *Dermatology* 2010;221:43–50.
- 7 Brady BG, Gold H, Leger EA, Leger MC: Self-reported adverse tattoo reactions: a New York City Central Park study. *Contact Dermatitis* 2015;73:91–99.
- 8 Kluger N: Cutaneous complications related to permanent decorative tattooing. *Expert Rev Clin Immunol* 2010;6:363–371.
- 9 Kluger N: Cutaneous and systemic complications associated with tattooing. *Presse Med* 2016;45:567–576.
- 10 Kluger N: [Tattoo skin reactions: management and treatment algorithm]. *Ann Dermatol Venereol* 2016;143:436–445.
- 11 Kluger N, Koskenmies S, Jeskanen L, Övermark M, Saksela O: Melanoma on tattoos: two Finnish cases. *Acta Derm Venereol* 2014;94:325–326.
- 12 Kluger N, Saarinen K: Melanoma on a tattoo. *Presse Med* 2015;44:473–475.
- 13 Kluger N, Saarinen K: Aspergillus fumigatus infection on a home-made tattoo. *Br J Dermatol* 2014;170:1373–1375.
- 14 Kluger N: Blurry halos around tattoos: a new case of “tattoo blow-out”. *Int J Dermatol* 2014;53:e44–e46.
- 15 Gall N, Bröcker EB, Becker JC: Particularities in managing melanoma patients with tattoos: case report and review of the literature. *J Dtsch Dermatol Ges* 2007;5:1120–1121.
- 16 Kluger N, Thomas L: The dragon with atypical mole syndrome. *Arch Dermatol* 2008;144:948–949.
- 17 Kluger N, Phan A, Debarbieux S, Balme B, Thomas L: Skin cancers arising in tattoos: coincidental or not? *Dermatology* 2008;217:219–221.
- 18 Kluger N, Koljonen V: Tattoos, inks, and cancer. *Lancet Oncol* 2012;13:e161–e168.
- 19 Kluger N, Cotten H, Magana C, Pinquier L: Dermatofibroma occurring within a tattoo: report of two cases. *J Cutan Pathol* 2008;35:696–698.
- 20 Kluger N, Muller C, Gral N: Atypical mycobacteria infection following tattooing: review of an outbreak in 8 patients in a French tattoo parlor. *Arch Dermatol* 2008;144:941–942.
- 21 Mudedla S, Avendano EE, Raman G: Nontuberculous mycobacterium skin infections after tattooing in healthy individuals: a systematic review of case reports. *Dermatol Online J* 2015;21:pii:13030/qt8mr3r4f0.
- 22 Kluger N: Sarcoidosis on tattoos: a review of the literature from 1939 to 2011. *Sarcoidosis Vasc Diffuse Lung Dis* 2013;30:86–102.
- 23 Goldstein N: IV. Complications from tattoos. *J Dermatol Surg Oncol* 1979;5:869–878.
- 24 Sowden JM, Byrne JP, Smith AG, Hiley C, Suarez V, Wagner B, Slater DN: Red tattoo reactions: X-ray microanalysis and patch-test studies. *Br J Dermatol* 1991;124:576–580.
- 25 Hutton Carlsen K, Serup J: Patients with tattoo reactions have reduced quality of life and suffer from itch: dermatology Life Quality Index and Itch Severity Score measurements. *Skin Res Technol* 2015;21:101–107.
- 26 Serup J, Sepehri M, Hutton Carlsen K: Classification of tattoo complications in a hospital material of 493 adverse events. *Dermatology* 2016, Epub ahead of print.
- 27 Serup J, Hutton Carlsen K: Patch test study of 90 patients with tattoo reactions: negative outcome of allergy patch test to baseline batteries and culprit inks suggests allergen(s) are generated in the skin through haptenization. *Contact Dermatitis* 2014;71:255–263.

- 28 Ostheimer TA, Burkholder BM, Leung TG, Butler NJ, Dunn JP, Thorne JE: Tattoo-associated uveitis. *Am J Ophthalmol* 2014;158:637–643.e1.
- 29 Adam MK, Rahimy E, Dunn JP: Tattoo-associated uveitis. *JAMA Ophthalmol* 2015;133:e144543.
- 30 Reddy AK, Shildkrot Y, Newman SA, Thorne JE: T-lymphocyte predominance and cellular atypia in tattoo-associated uveitis. *JAMA Ophthalmol* 2015;133:1356–1357.
- 31 Taaffe A, Wyatt EH: The red tattoo and lichen planus. *Int J Dermatol* 1980;19:394–396.
- 32 Goldberg HM: Tattoo allergy. *Plast Reconstr Surg* 1996;98:1315–1316.
- 33 Dang M, Hsu S, Bernstein E: Lichen planus or lichenoid tattoo reaction? *Int J Dermatol* 1998;37:860–861.
- 34 Litak J, Ke MS, Gutierrez MA, Soriano T, Lask GP: Generalized lichenoid reaction from tattoo. *Dermatol Surg* 2007;33:736–740.
- 35 Künzelberger B, Altmeyer P, Rotterdam S: Professional Tattoo as Koebner Phenomenon in Lichen Planus. Poster 620, 16th EADV Congress, Vienna, 2007.
- 36 Jacks SK, Zirwas MJ, Mosser JL: A case of a generalized lichenoid tattoo reaction. *J Clin Aesthet Dermatol* 2014;7:48–50.
- 37 Rambhia KD, Chikhalkar SB, Khopkar US: Generalized lichen planus following tattooing with involvement of old hypertrophic scars: is it “Koebner recall”? *Indian J Dermatol Venereol Leprol* 2015;81:306–308.
- 38 Campbell FA, Gupta G: Lichenoid tattoo reaction responding to topical tacrolimus ointment. *Clin Exp Dermatol* 2006;31:293–294.
- 39 Wylie G, Gupta G: Lip-enhancing tattoo reaction resolving with topical tacrolimus. *Clin Exp Dermatol* 2008;33:505–506.
- 40 Sepehri M, Jørgensen B, Serup J: Introduction of dermatome shaving as first line treatment of chronic tattoo reactions. *J Dermatolog Treat* 2015;26:451–455.
- 41 <http://www.who.int/classifications/icd/icd-onlineversions/en/>.