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REVIEW ARTICLE

Cutaneous Adverse Reactions to Tattoos and Piercings

J. Mataix and J.F. Silvestre
Servicio de Dermatología, Hospital General Universitario de Alicante, Alicante, Spain .

Abstract. Piercings and tattoos have become very popular in western society in recent decades, particularly among younger generations. Reports of medical complications associated with these decorative techniques have increased in parallel with the rise in their popularity. Due to their high frequency, adverse cutaneous reactions are particularly important among these potential complications. Tattoo-related complications include a number of cutaneous and systemic infections secondary to breach of the epidermal barrier, acute and delayed inflammatory reactions with different histopathological patterns, the appearance of benign and malignant tumors on tattooed areas of skin, and certain dermatoses triggered by isomorphic phenomena. Piercing-related complications are similar, though some, such as pyogenic skin infections, are much more common due to the delayed wound healing after piercing in certain sites. We must differentiate between complications that are independent of the site of piercing, and specific complications, which are closely related to the body area pierced. The rate of complications after performing piercings or tattoos depends on the experience of the artist, the hygiene techniques applied, and the postprocedural care by the customer. However, some of these complications are unpredictable and depend on factors intrinsic to the patient. In this article, we review the most common decorative techniques of body art, with particular focus on the potential cutaneous complications and their management.

Key words: scarification, implanting, tattoo, piercing, pocketing, cutaneous adverse reactions.

REACCIONES CUTÁNEAS ADVERSAS POR *TATUAJES* Y *PIERCINGS*

Resumen. En las últimas décadas, la realización de piercings y tatuajes se ha convertido en una práctica muy popular en los países occidentales, especialmente entre los más jóvenes. Paralelamente al auge de estas técnicas decorativas corporales, las comunicaciones acerca de complicaciones médicas asociadas han aumentado. De todas estas complicaciones potenciales destacan por su frecuencia las que afectan a la piel y mucosas. Las complicaciones asociadas a los tatuajes incluyen múltiples procesos infecciosos, cutáneos o sistémicos, debido a la ruptura de la barrera epidérmica, reacciones inflamatorias agudas y crónicas con diferentes patrones histológicos, la aparición de tumores benignos y malignos sobre áreas tatuadas o el brote de ciertas dermatosis por el fenómeno isomórfico. Las complicaciones asociadas a los *piercings* son similares, aunque algunas de ellas, como las piodermitis, son mucho más comunes debido al lento proceso de cicatrización de la perforación en determinadas localizaciones. Hemos de diferenciar entre las complicaciones que son independientes de la localización del piercing y de las complicaciones específicas, las cuales están estrechamente relacionadas con el área perforada. La tasa de complicaciones tras la realización de tatuajes y perforaciones depende de la experiencia del artista, de las condiciones higiénicas en las que tiene lugar y de los cuidados posteriores tras la realización de la técnica por parte del propio cliente. Sin embargo, algunas de estas complicaciones son impredecibles y dependen de facto-res intrínsecos del propio paciente. En este artículo revisamos las técnicas decorativas más frecuentes que abarca el *body art*, con especial interés en sus posibles complicaciones cutáneas y en el manejo de éstas.

Palabras clave: escarificación, *implanting*, tatuaje, *piercing*, *pocketing*, reacciones cutáneas adversas.

Introduction

In modern society, external appearance is increasingly gaining in importance, and body decoration using tattoos and piercings is part of a current fashion trend, particularly

Correspondence:
Javier Mataix, Servicio de Dermatología, Hospital General Universitario,
Avda. Pintor Baeza, s/n., 03010 Alicante, Spain
mataixdiaz@hotmail.com

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among teenagers. These decorative techniques should perhaps be interpreted as a means of communication, an expression of identity, or a way of proclaiming the cult of the body, known today as body art. This conceptual art form involves using the body as a base material, which can be painted, molded, and contorted, as if it were a work of art. Many are the reasons that lie behind this kind of practice, including fashion, rebelliousness, differentiation, sexual motives, memories of events, and the enjoyment of ethnic and tribal awareness and influences.[1]

However, these techniques are not devoid of potential adverse effects, mostly affecting the skin. For this reason, as skin care specialists, dermatologists must be familiar with both the various types of tattoos and piercings that exist and the possible skin complications that these decorative techniques can give rise to. As dermatologists it is up to us to arrive at an early diagnosis of such complications, to identify the most appropriate treatment, and if possible, to prevent these complications by informing potential users.

Tattoos

Tattooing is the act of making indelible patterns by inserting pigments into punctures in the skin. Although the origin of the tattoo is not completely clear, it is known to have been practiced throughout history by many civilizations in remote geographical areas for different purposes or reasons. The term *tattoo* first appeared in Europe in the late 18th century thanks to Captain Cook's voyages of exploration to Tahiti and Polynesia.[2] In this area of the South Pacific, tattoos consisted of highly elaborate geometric designs that were usually worked throughout the life of the individual, eventually covering the entire body. Tattoos were a natural and spiritual part of Polynesian life and had deep cultural and social significance. Respect towards an individual was usually measured by the number of tattoos on their body.

In the 1970s, tattooing in the more industrialized countries was restricted to certain professions such as the armed forces or members of certain alternative cultural movements such as punk culture. However, in the last 2 decades we have witnessed a notable increase in the demand for tattoos, particularly among the young. In the United States of America, where this practice is widespread, approximately 8% to 24% of the population have tattoos.[4-7] Though classification can be complex, tattoos can be divided into 3 main groups: traumatic, cosmetic, and decorative.[8]

Traumatic tattoos are those in which the skin is penetrated by a specific material in an accidental manner. This often occurs through skin abrasions after a bicycle or motorbike accident, or after a prick from a pencil, which leaves a graphite tattoo. Cosmetic or micropigmentation tattoos are used as permanent makeup to outline eyes, lips, and eyebrows and in breast reconstruction for the nipple-areola. They have also been used therapeutically to correct various disfiguring dermatoses, including vitiligo, alopecia areata, and certain vascular malformations.[9] Finally, decorative tattoos aim to mark the individual with a distinctive feature indicative of certain cultural, religious, or social beliefs. Decorative tattoos can be done by professional or amateur tattoo artists. Nonprofessional tattoos are done by unqualified artists, generally under very poor hygienic conditions. These artists generally use India ink, charcoal powder, or ash and a pin instead of a tattoo needle. Such tattoos generally have poor artistic quality and are associated with an increased risk of undesirable effects, generally infections. Professional tattoos, in contrast, are done with a tattoo gun, have great artistic quality with an abundance of detail, and, at least in theory, must be carried out under strict conditions of health and hygiene in authorized establishments and always under the control of regional government and local authorities. Pigments used by professional tattoo artists are composed of highly varied inorganic metal salts and organic plants (Table 1).

Unlike conventional tattoos, temporary tattoos do not require intradermal pigment injection and pigments are applied superficially to the corneal layer. These temporary tattoos are usually done with henna, a natural pigment obtained from the plant *Lawsonia inermis*, which dyes the skin reddish-brown and disappears after 2 or 3 weeks through the natural process of skin renewal. Henna or 2-hydroxy-1,4-naphthoquinone is responsible for the dyeing power of this plant and rarely causes sensitization. Natural henna has been used for centuries in Muslim and Hindu countries for cosmetic purposes. In the western world, however, henna is adulterated with various additives. On the one hand, several products such as lemon oil, vinegar, and tea leaves are added to prevent deterioration, and on the other, different additives, such as phenylenediamine (PPD) or PPD derivatives, are used to darken the pigment, making the final product blacker (black henna). Temporary tattoos done with black henna are currently in fashion and a customary practice during summer holidays, particularly among children.

Adverse Skin Reactions Caused by Permanent Tattoos

Inflammatory Reactions

Acute inflammatory reactions are those that appear immediately after the application of a tattoo. Because of the trauma caused to the skin by multiple intradermal injections of pigment into the skin, such reactions typically

last for 1 to 2 weeks.[10] They are, as such, an expected and practically inevitable side effect. Patients are generally advised of the risk beforehand by the tattoo artist and tend not to require medical care, apart from, at most, the application of a topical corticosteroid.

Delayed reactions—which appear weeks and even years after a tattoo has been applied—can also occur. Although attempts have been made to classify these reactions into clinical and pathologic patterns,[2,7] this is difficult in practice because clinical manifestations are not specific[11] and the histologic patterns overlap. The appearance of delayed reactions to tattoos has been described as a clinical manifestation of the immune restoration syndrome in patients with human immunodeficiency virus (HIV) who have initiated antiretroviral therapy.[12]

Allergic contact dermatitis is characterized by the appearance of eczematous lesions confined to the tattooed area (Figure 1), with occasional secondary spread.[13] Histologically, they are characterized by the presence of acanthosis, spongiosis, and a perivascular lymphocytic inflammatory infiltrate. Red tattoos, and particularly those containing mercury, are the most common causes of delayed tattoo-related allergic reactions.[10] Photo-induced reactions manifest as erythematous-edematous lesions that occur following exposure to ultraviolet radiation. These reactions are most often caused by yellow and red cadmium-containing pigments.[14,15] Some authors have found lichenoid reactions to be the most common type of tattoo reaction,[16] with lesions that are clinically and histologically similar to lichen planus lesions occurring in a specific area of the tattoo (Figure 2).[17] These type of reactions are most often seen tattoo with pigments containing mercury.[10]

Granulomatous reactions (Figure 3) have also been reported. Histologically, these can present as either foreign body reactions, with numerous giant cells containing pigment particles, or hypersensitivity reactions with few giant cells. Such reactions have been reported in association with the use of chromium, mercury, cobalt, and magnesium.[18-20] Although less common, sarcoid granulomas have also been described within tattoos. These granulomas may be nonspecific but they may also be an early clinical manifestation of systemic sarcoidosis, meaning that it is important to search for other signs of this disease.[21,22]

Pseudolymphomatous reactions manifest as indurated erythematous, violaceous nodules confined to the tattooed area (Figure 4). Histologically, they are identical to cutaneous T-cell or B-cell lymphomas but biologically, they are benign. The lymphocytes within these pseudolymphomatous infiltrates are typically polyclonal, unlike those seen in true cutaneous lymphomas. This type of skin reaction has mainly been described for red-pigment tattoos, but there have also been reports for green and blue pigments.[23,24]

Table 1. Composition of Tattoo Dyes and Laser of Choice for Their Removal

Color	*Composition*	*Most Effective Laser*
Red	Cinnabar (mercury sulfide)	Q-switched double-frequency Nd:YAG laser (532 nm)
	Sienna (iron oxide)	
	Cadmium	
	Sandalwood	
	Brazil wood	
Green	Potassium dichromate	Q-switched alexandrite laser (755 nm)
	Malachite green	Q-switched ruby laser (694 nm)
Yellow	Cadmium sulfide	Q-switched double-frequency Nd:YAG laser (532 nm)
	Amarillo curcumino	
Blue	Cobalt aluminate	Q-switched alexandrite laser (755 nm)
		Q-switched ruby laser (694 nm)
White	Titanium oxide	Poor response in general
	Zinc oxide	
Purple	Manganese	Q-switched ruby laser (694 nm)
		Q-switched double-frequency Nd:YAG laser (532 nm)
Black	Black iron oxide	Q-switched ruby laser (694 nm)
	Carbon (India ink)	Q-switched alexandrite laser (755 nm)
	Logwood	Q-switched Nd:YAG laser (1064 nm)

Abbreviation: Nd:YAG, neodymium:yttrium-aluminum-garnet.

Finally, pseudoepitheliomatous hyperplasia is a rare tattoo reaction that involves reactive histologic changes. These changes, however, are difficult to distinguish from those seen in true cutaneous tumors such as squamous cell carcinoma or keratoacanthoma.[25] In such cases, it is always recommendable to perform an excisional biopsy as diagnosis can be particularly complicated in patients with incomplete biopsies (shave or punch biopsies). Pseudoepitheliomatous hyperplasia is histologically characterized by irregular acanthosis of the epidermis and the follicular infundibulum, absence of cytologic atypia, and very low mitotic activity. Because this reactive

Figure 1. Eczematous inflammatory reaction caused by black pigment.

Figure 2. Lichenoid inflammatory reaction caused by red pigment.

Figure 3. Granulomatous inflammatory reaction following micropigmentation of lip outline.

Figure 4. Delayed inflammatory reaction caused by red pigment. The histologic study showed a pseudolymphomatous histologic pattern.

condition has also been described in various infections, staining studies are advisable to rule out fungal, bacterial, and mycobacterial infection.[26]

Koebner Phenomenon

Because tattoos cause trauma to the skin, they can trigger the onset of different forms of dermatosis through the isomorphic Koebner phenomenon. The appearance of psoriasis-like lesions in tattooed areas was first described by Heinrich Koebner in 1872, with several other reports since.[27] The Koebner phenomenon has also been described in patients with tattoos in association with sarcoidosis,[21,22] pyoderma gangrenosum,[28] and cutaneous lupus erythematosus.[29] Furthermore, the appearance of sarcoid lesions on tattoos has been described as a clinical manifestation of the immune restoration syndrome in patients with HIV who have started antiretroviral therapy.[30]

Although lichen planus lesions can theoretically develop in tattooed areas (lichen planus is well known for its tendency to become isomorphic), in practice, they are difficult to differentiate from the lichenoid reactions described above.

Infectious Diseases

Infectious disease can be transmitted during tattooing as the pigment penetrates the dermis and comes in contact with both capillaries and lymph vessels (Table 2). The risk of acquiring a tattoo-related infection largely depends on the hygiene conditions under which the tattoo is applied and the experience of the tattoo artist. Having a tattoo done by a nonprofessional, therefore, considerably increases the risk of infection. It should also be borne in mind that even when adequate hygiene and sanitation measures are taken, the pigments themselves may be contaminated (Figure 5).[57,58] Pyogenic infections caused by staphylococci and streptococci are relatively common and can be acquired during the tattooing process or afterwards if basic care measures are not taken. It is, however, difficult to determine the true incidence of tattoo-related infections as few patients consult their physicians regarding such cases, opting instead to return to the tattoo parlor. We are also witnessing a considerable increase in systemic infections due to bacteria that gain access to the body via tattoos.[40,42,43,59] In view of the increased risk of endocarditis associated with tattoos, patients with congenital heart disease should be advised against getting a tattoo or a piercing, or at least be urged to wait until they have talked to their cardiologist.[60]

Tattoos are also a known risk factor for certain viral infections such as hepatitis B.[49-51] Although scientific evidence and reports of anecdotal cases suggest that HIV[51] and the hepatitis C virus[51-53] can be transmitted through tattoos, epidemiologically, this risk factor is not considered to be statistically relevant.[3] Nonetheless, a person who has had a tattoo is not allowed to give blood for 6 to 12 months. There have also been isolated reports of skin infection caused by the human papilloma virus[46-48] (Figure 3) and molluscum contagiosum[44,45] following tattoo application.

In an attempt to minimize these and other problems associated with tattoos, permanent cosmetics (micropigmentations), and piercings, Spain's autonomous governments have introduced legislation regulating the practice of such techniques and legal requirements for the authorization and operation of the corresponding establishments. The aim of such measures is to ensure that body decoration is performed by qualified professionals, in suitable establishments and under suitable conditions, under the control of regional government and local councils.

Table 2. Reported Cases of Tattoo-Related Infections[a]

Bacterial Infections
Atypical mycobacteria[31,32]
Methicillin-resistant *Staphylococcus aureus*[33]
Tuberculosis[34-36]
Lepra[37-39]
Staphylococcus lugdunensis[40] *(endocarditis)*
S aureus[41] *(endocarditis)*
Pseudomonas aeruginosa[42,43] *(septicemia)*
Staphylococcus pyogenes[42] *(septicemia)*
Treponema pallidum[2]
Viral Infections
Molluscum contagiosum[44,45]
Verruca vulgaris[46-48]
Type B viral hepatitis (VHB)
VHC[52,53]
Human immunodeficiency virus[51]
Fungal Infections
Zygomycosis[54]
Candida albicans[55] (endophthalmitis)
Trichophyton rubrum[56]
Epidermophyton floccosum[56]

[a]Local infections caused by staphylococci, streptococci, and Pseudomona species are not included.

Figure 5. Abscess due to *Pseudomonas aeruginosa.* The microbiology study showed that the pigment container was contaminated with this microorganism.

Figure 6. Development of viral warts after micropigmentation of lip outline.

Tumors

There have been several reports of malignant cutaneous tumors developing within tattoos. To date, the following tumor types have been reported: malignant melanoma (12 cases),[61-71] basal cell carcinoma (7 cases),[72-76] squamous cell carcinoma (3 cases),[77,78] keratoacanthoma (5 cases),[78-82] and dermatofibrosarcoma protuberans (1 case).[83] What causes these tumors to appear in tattooed areas is still unknown. Numerous factors might be involved, including the inflammatory reaction triggered by the placement of the tattoo, the intradermal injection of potentially toxic or carcinogenic compounds, exposure to ultraviolet radiation, and above all genetic factors. Nonetheless, in view of the large number of people that have tattoos and the few cases that have been reported, the association is probably purely coincidental. Indeed, we believe it should continue to be considered as such until more conclusive data become available. For this reason and in view of the debate surrounding this issue, physicians should report all skin tumors observed in tattooed areas, and if possible, prospective cohort studies should be conducted to determine the true association between tattoos and skin carcinogenesis.[84]

The appearance of a malignant melanoma in a tattooed area can complicate clinical and histologic diagnosis. Tattoos can obviously mask the onset of new melanocytic lesions and in some cases, they may even modify the morphology of an existing nevus and make it look like an atypical mole.[85] Histologically, the trauma caused to the skin during the tattooing process can cause a series of microscopic changes—including lymphocytic inflammatory infiltrates, dermal fibrosis, and melanophages—that could be confused with melanoma regression in this area. Guitart et al[86] demonstrated that malignant melanomas with a Breslow thickness of less than 1 mm and considerable histologic regression (> 50%) had greater metastatic potential than melanomas of the same thickness showing no signs of regression. Histologic signs of tumor regression in patients with a tattoo should thus be interpreted with great caution as the changes may have been caused by the tattoo. Finally, when malignant melanoma develops within or around a tattoo, the interpretation of sentinel lymph node biopsy results may be complicated because pigmentation observed in the macroscopic examination of the lymph nodes draining a tattooed area may simply be tattoo dye and not evidence of lymph node disease. Histologically, however, the 2 types of pigmentation can be easily distinguished using modern immunohistochemical techniques.[71,87,88]

Adverse Skin Reactions Caused by Temporary Tattoos

Natural henna tattoos are very safe and rarely cause adverse skin reactions. Indeed, there have only been rare reports of acute and delayed hypersensitivity reactions to this natural pigment.[89,90] Allergic contact eczema due to black henna (which contains PPD derivatives), however, is very common (Figure 7) and there have even been reports of microepidemics. The reactions usually manifest clinically as acute eczema and a single exposure is usually sufficient to trigger a reaction as henna tattoos tend to contain high concentrations of PPD.[90] The eczema takes about 2 to 3 weeks to clear and the reaction can leave temporary postinflammatory hypopigmentation with the original form of the tattoo. PPD sensitization, however, can have other consequences. Affected patients will subsequently

not be able to use hair dyes containing PPD and they may also develop allergic eczemas following the use of black rubber items, textile azo dyes, and sunscreens containing para-aminobenzoic acid. All these compounds have a similar chemical structure to PPD and can therefore give rise to cross-reactions. For the same reason, patients may also develop toxicoderma due to sulfamides, sulfonamides, and ester local anesthetics such as benzocaine. Furthermore, sensitization to these products can have occupational consequences as they are used in certain professions such as hairdressing, photographic development, and shoe dyeing.[91] There have also been several reports of allergy to black henna in which the sensitizing substance was the perfume additive rather than PPD.[92]

Not all black temporary tattoos are applied using PPD-containing henna. Other options include kohl and harquus. There were 3 recently described cases of contact dermatitis due to harquus in patients who had been tattooed during a holiday in Tunisia.[93] Harquus is a black body paint made by artisans from a blend of different desert plants.

Evaluation and Treatment

A skin biopsy and/or a microbiological culture should be performed upon detection of a skin lesion on a tattoo. Patch tests tend to have poor diagnostic yield in such cases, and while positive results may be obtained for eczema-type lesions, results are generally negative for other types of delayed inflammatory reactions. Accordingly, several authors argue that intradermal tests should be used in such cases.[16]

Ideally, the ingredients used in the tattoo pigments should be identified before any patch tests are performed. This can be very difficult and even impossible in some cases, however, as pigments tend to contain many components, including organic compounds, metals, and even solvents. Furthermore, pigments are generally mixed prior to manufacture and tattoo artists sometimes mix different pigments together before use. When information on the ingredients of a pigment is unavailable, it may be helpful to perform an x-ray microanalysis of the biopsy specimen, or if possible, of the pigment used.

In Spain, patch tests should be performed using the standard series of the Spanish Contact Dermatitis Research Group (abbreviated in Spanish to GEIDAC). This series includes, among other compounds, potassium dichromate, cobalt chloride, nickel sulfate, metallic mercury, PPD, benzocaine, black rubber, and fragrance mix, and a metal series including iron salts, gold sodium thiosulfate, palladium chloride, titanium oxide, and cadmium salts. Sandalwood oil, which is present in certain red pigments, can be found in the fragrance series. Pigments can be applied directly in patch testing but they are generally insoluble and do not penetrate the skin. A photopatch test should be performed when a photoallergic reaction to a yellow pigment containing cadmium is suspected. When a lesion is detected on a tattoo on a patient's back, patch tests should not be performed in this area as decreased cellular immunity and the tattoo pigment itself could mask weak reactions. Nonetheless, there are reports of positive patch tests in tattooed areas.[3,94]

While tattoo reactions can resolve spontaneously, they often last for months, or even years, despite treatment with topical, intralesional, or systemic corticosteroids. Some lesions may even require removal via dermabrasion, surgery, or laser treatment.

The medical profession is also witnessing a growing number of tattoo removal consultations and unfortunately tattoos are easier to apply than to remove. Traditionally,

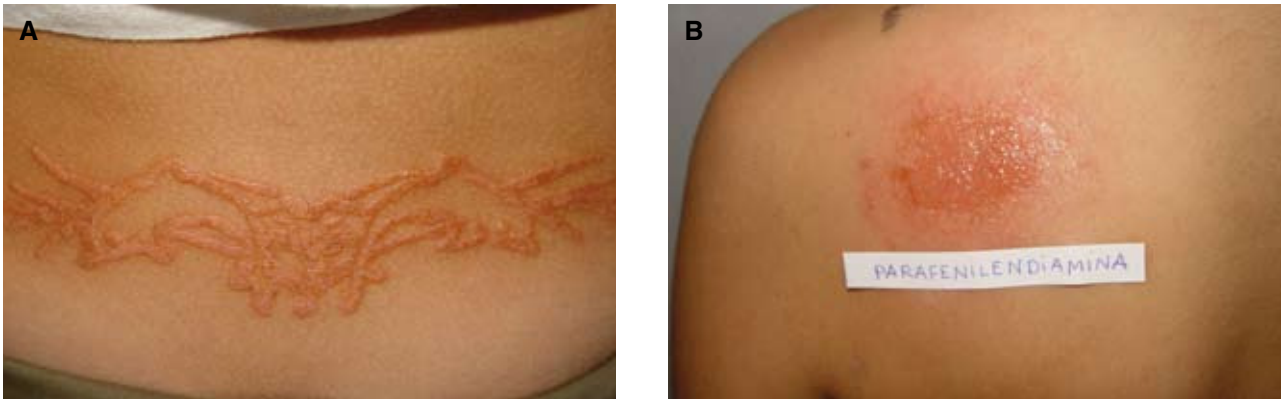

Figure 7. A, acute allergic contact dermatitis due to paraphenylenediamine. B, Patch test readings at 96 hours.

tattoos were removed using mechanical destruction methods such as dermabrasion or chemabrasion, or indeed conventional surgical excision. Nowadays, however, use of lasers is the most popular method and also the one that offers the best cosmetic results. Both intense pulsed light therapy and laser treatment are used, with varying results. The choice of laser depends on the wavelength required to destroy the pigments used (selective photothermolysis) (Table 1). The most widely used lasers are the neodymium: yttrium-aluminum-garnet (Nd:YAG) laser and the alexandrite laser, which is used in Q-switched mode to increase its selectivity for pigmented lesions. Monochromatic tattoos require fewer sessions than multicolored ones, which in addition require the use of various types of lasers.[3] Laser treatment can cause texture changes and temporary or permanent pigment alterations. Tattoos containing titanium dioxide or iron oxide respond least favorably to laser treatment and can actually become darker.[95,96] Patients planning to undergo laser treatment for the removal of a tattoo should also be warned about the risk of skin allergies. There have been reports of local urticaria with secondary spread in a patient in whom a carbon dioxide laser was used to remove a tattoo[97] and of local and widespread allergic reactions in a patient treated with a Nd:YAG laser and in another treated with a ruby laser.[98]

Scarification

Scarification basically involves making superficial incisions on the skin for artistic and/or cultural reasons. The practice dates back to ancient times and used to denote social status or symbolize beauty in the members of a tribe. Scarification is common in certain cultures in parts of Africa and Australia, partly because skin color renders the tattoos less striking. The practice is, however, also becoming increasingly popular in other parts of the world as an alternative to tattoos. In 1 study conducted in the USA, for example, 4% of a group of 210 teenagers examined in a hospital were found to have some type of scarification.[99]

The technique consists of making incisions as far as the dermis, with or without the removal of tissue, so that the subsequent healing by secondary intention will cause permanent scars. In most cases, the aim is to create a hypertrophic scar in order to produce a raised scar form. The scar healing process, however, cannot be controlled, and patients can develop keloids, which are, by definition, overgrown scar tissue around the scarified area. Such keloids may not only be esthetically unpleasant but also cause functional problems such as limited mobility. Finally, scarification is a more painful procedure than other body decoration methods and is also associated with a greater risk of local and systemic infections.

Body Piercing

Body piercing is the practice of attaching adornments (jewelry) to the body through the skin, mucosa, or tissue. Ear piercing performed using automatic, sterile, single-use gun systems is not considered a form of body piercing.

This form of body modification has been used by practically all civilizations throughout history. In the Roman Empire, for example, the centurions wore nipple rings as a symbol of virility and courage and as a clothes accessory to hold the short capes they wore. The popularity of body piercing is growing fast and although data vary from one place to another, between 8% and 50% of the population are estimated to have one or more body piercings.[4-6]

Body piercings are difficult to classify due to their highly varied nature. For the purpose of this article, we have divided them into 5 groups: standard piercing, dermal anchoring, surface bar piercing, pocketing, and implant piercing. Standard piercing (Table 3) involves making a hole through which small bars or rings decorated with a small metal or plastic bead or tusk are inserted. Dermal anchoring (or punching) consists of making a single hole in the skin and inserting an anchor under the skin onto which an adornment is then screwed. Surface bar piercing consists of making an entry and exit hole on the same plane and inserting a metal bar (generally small) through the holes and attaching beads to either end. The pocketing technique is similar but the bead is placed in the center of the bar rather than at the ends. Finally, implanting consists of the placement of materials such as Teflon or steel under the skin to create decorative shapes.

Adverse Skin Reactions Caused by Piercings

As occurs with tattoos, the risk of acute complications following a body piercing depends on the experience of the piercer, on the hygiene-sanitation conditions used, and on general piercing aftercare. This risk, however, also varies greatly in accordance with the part of the body pierced. It is useful to distinguish between complications that can occur with any type of piercing and specific complications that occur in certain parts of the body (Table 4).[7,100] According to data available, the likelihood of developing an adverse skin reaction is greater with piercings than with tattoos.[6,101]

The most common complications are infections. Local infections are particularly common, occurring in 10% to 20% of cases. The most common bacteria involved

Table 3. Types of Conventional Body Piercings: Name, Definition, and Approximate Healing Times

Site	*Type of Piercing*	*Description*	*Healing Time*
Genitals	Prince Albert	A hole made through the urethra at the base of the glans of the penis (the ring is then inserted in this hole)	4-6 wk
	Apadravya	Vertical piercing of the glans	4-6 mo
	Ampallang	Horizontal piercing of the glans, may or may not pass through the urethra	4-6 mo
	Guigue	Horizontal piercing located in the perineum	2-3 mo
	Dydoes	Piercing crossing through the crown of the glans	2-3 mo
	Hafada	Piercing of the skin of the scrotum	2-3 mo
	Foreskin	Piercing of foreskin	6-8 wk
	Frenum	Piercing of frenum	4-6 wk
	Inner/outer labia	Piercing of inner/outer labia	Inner labia: 4-6 wk; outer labia: 2-3 mo
	Clitoris	Piercing crossing all the clitoris (clit) or part of it (hood)	Clit: 6-8 wk; Hood: 4-6 weeks
Face	Nostril/septum	Piercing of nostril or septum	Nostril: 2-3 mo; septum: 4-6 wk
	Eyebrow/bridge	Piercing of eyebrow. When placed between 2 eyebrows, it is called a bridge	6-8 wk
	Monroe	Piercing of upper lip at either side	6-8 wk
	Labret	Piercing of middle part of lower lip	6-8 wk
Ear	Earlobe Piercing of earlobe	4-6 weeks	4-6 wk
	Tragus, Antitragus, Conch, Daith, Rook, Industrial, and Helix	Various piercings made through specific parts of the ear's cartilage	2-3 mo
Nipple			6-9 mo
Navel			6-9 mo

are *Staphylococcus aureus*, group A streptococci, and *Pseudomona* species.[102] In most cases, these infections are self-limiting and improve quickly with topical antibiotics, but occasionally, they may result in very serious conditions such as chondritis[103] or cellulitis[104-106] that are treated by removing the piercing and administering systemic antibiotics. Less common infective agents associated with piercings are coagulase negative staphylococci,[106] *Lactobacillus*,[103] *Mycobacterium tuberculosis*,[107] and atypical mycobacteria.[108]

In terms of systemic infections, body piercings are a risk factor for endocarditis, which is increased in patients with congenital or acquired heart disease.[109,110] The recommendations mentioned in the section on tattoos are also perfectly applicable in the case of piercings.[60] There have also been reports of hepatitis B,[111] C,[112] and D and HIV[113] infections after a body piercing, although not all studies have succeeded in demonstrating a causal link.[3]

Piercings can also be an important cause of allergic contact dermatitis to metals.[114] Ehrlich et at,[115] for example, reported metal sensitization in 4% of men who had never had a piercing, contrasting with a rate of 11.1% in those who had 1 piercing and of 14.6% in those who had more than 1 piercing. Jewelry, in fact, is the most common cause of sensitization to nickel sulfate. Accordingly, the European Nickel Directive, which came

Table 4. Site-Specific Piercing Complications

Location of Piercing	*Potential Complications*
Mouth	Chipping or fracturing of teeth
	Gum recession
	Increased salivation
	Halitosis
	Problems chewing or speaking
	Aspiration/digestion
	Galvanic currents
	Bleeding
Pinnae	Hypertrophic/keloid scarring
	Chondritis/perichondritis
	Incrustation
Nipple-areola complex	Long healing times
	Mastitis
	Infection of mammary prothesis
	Breastfeeding difficulties
Navel	Long healing times
	High rates of local infections
Genitals	Long healing times
	Transmission of sexually transmitted diseases
	Tearing of condom
	Male infertility
	Prostate infections in urethral piercings
	Testicular infections in scrotal piercings
	Female infertility
	Pelvic inflammatory disease
	Problems during vaginal birth
	Traumatic lesions during sexual intercourse
	Urethral rupture
	Paraphimosis
	Priapism
	Aspiration/digestion
	Fournier gangrene
Eyelids	Orbital cellulitis

into force in July 2001, limited not only the amount of nickel that could be used in a piece of jewelry but also the amount that could be released during its use. Several authors, on investigating compliance with the new directive after it came into force, found that while the nickel content in jewelry had decreased considerably, 17% of the piercing posts they studied contained higher-than-permitted levels.[116] The greatest risk of sensitization to piercing metals occurs during the healing period,[7] which can last for up to 9 months in certain parts of the body (Table 3). The majority of body piercings were traditionally made of surgical steel, which is an alloy containing carbon, chromium, nickel, molybdenum, and iron. Once inserted in the body, however, the integrity of this alloy (called 316L [low carbon content] or 316LVM [low carbon content, vacuum-melted]) depends on the quality of its finish. This means that if the piercing is damaged or its finish is faulty, it might end up releasing chromium, molybdenum, or nickel. Surgical steel should not, therefore, be used during the healing period.[7] If gold is used, it must be at least 14-karat gold (58.3% gold) or, in the case of recent piercings, at least 18-karat gold (75% gold). The use of inert materials such as titanium and niobium is a good alternative, although it should be noted that these metals may contain traces of nickel.[117] It is also worth noting that metal is not the only source of sensitization in piercing. As occurs in any type of surgery, other items used such as antiseptics, anesthetics, or gloves can also cause immediate or delayed hypersensitivity reactions.

Piercings of all types can also cause healing problems. Certain parts of the body, such as the nipples, the navel, or the genital area heal slowly (up to 6 months) and are associated with a considerably increased risk of secondary infection (Table 3). Piercings can also cause hypertrophic or keloid scars, which are particularly common in areas such as the pinnae (Figure 8) and the upper chest, which is the one of the most common sites for surface piercing or pocketing. Piercing guns, typically used to pierce ears, cause most cases of excessive scarring due to the inflammatory response they trigger.[3] Anybody with a history of hypertrophic or keloid scars should therefore be advised against body piercing. Patients who are taking or have recently taken isotretinoin should also be advised to wait before getting a body piercing given the risk of abnormal scarring associated with this drug.

Another common complication associated with piercings of all types is bleeding, which can be considerable in certain sites, such as the tongue[118] or in certain circumstances such as the use of anticoagulants or antiplatelets or the presence of blood disorders such as hemophilia and low platelet levels. Hardee et al,[119] for example, reported the case of a patient who

Figure 8. Keloid after a piercing.

experienced hypovolemic shock following a tongue piercing.[119]

Conflicts of Interest
The authors declare no conflicts of interest.

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