

TATTOOS - HISTORY AND ACTUALITY

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Abstract: *Tattoos have been practiced for thousands of years and remains a common practice in various cultures and countries. Tattooing has gained popularity in Western society where about 10% of the population has at least one decorative tattoo. Lately the same phenomenon can be also observed in Romania.*

Metal salts or organic compounds are the pigments used in tattooing to achieve a different color. The introduction of various substances into the skin can cause side effects such as: acute inflammatory reactions, contact dermatitis, photoinduced reactions, lichenoid reactions, granulomatous reactions, pseudolymphomatous reactions, discoid lupus erythematosus, and bacterial infections (pyoderma, leprosy, tuberculosis) or viral (warts, molluscum contagiosum, hepatitis virus, HIV).

In parallel with the emergence of new ways of tattooing, new ways of removing them have also developed. Currently, Q-switched laser is most commonly used to remove tattoos, however, without guarantee their complete removal.

Key words: *tattoo, Henna, pigment, metal salts, organic compounds.*

Tattooing has been practiced since prehistoric era being practiced by all civilizations for different purposes or reasons [11, 18]. Tattooing is defined as deliberate or accidental depositing of pigment in the skin. The word tattoo originates in Tahitian word *tatau* brought to Europe in the late XXVIII by Captain Cook after the trip made in Tahiti and Polynesia [17]. Tattooing is part of the Polynesian life with profound cultural and social significance.

Since the 1970s tattooing was used in industrialized countries in certain professions or members of cultural movements. Currently the prevalence of

tattooed individuals in the general population is estimated at 10% in Europe and Australia [21, 25, 36], the United States the prevalence being 24% according to a survey of people aged between 18 and 50 years [23]. A recent German study conducted on 3400 tattooed persons made the typical portrait of "tattooed individual": man or woman aged 30 years, with a tattooed area of 300 cm² (or more in 61% of those surveyed), and more than one tattoo at 65% of these [21].

A classification divides tattoos into three categories: traumatic, cosmetic and decorative [12]. The traumatic tattoos are those in which a specific material

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accidentally penetrates in the skin (eg. skin abrasions after a bicycle or motorcycle accident). Cosmetic tattoos or micropigmented tattoos are used with the aim to perform a permanent makeup of the eye, lips and eyebrows contour or for breast reconstruction for delimiting the mammary areola. Cosmetic tattoos are also used for therapeutic purposes to correct disfiguring skin diseases such as vitiligo, alopecia areata or some vascular malformations [1, 38].

In the current context of the increasing in popularity of tattoos and their social acceptance patients are addressed to camouflage the postoperative scars, sometimes tattoos paradoxically completing an intervention performed for aesthetic purposes. Decorative tattoos mark the persons inducing a specific cultural, religious or social orientation (eg. the purpose of punishing the person: infidelity, bondage, prisoners).

The reasons that may lead a person to tattooing are multiple and intricate varying depending on vintage, individual, culture and fashion. The tattoo represents not only a psychological investment (personal value and motivation of tattooing) but also a time (reason elaboration, looking for the person who will perform the tattoo, waiting time of meeting with this as well as the sessions time and healing time), financial and physical investment (pain during the sessions).

Tattoos can play various roles focused on bearer: magical role, used as talisman, protection against disease, disaster or evil spirits, a possible role for the passage to the other world after death in different faiths, and finally the religious role to express a religious affiliation, devotion and faith.

Regarding the link between tattoo and religious sphere from the point of view of Renaut [33] it must respond to one of the

following four criteria:

- Updating of a ritual, tattoo being done during a religious ritual or a part of magical practice;

- Symbolic capacity, tattoo representing a sign, a symbol, a word or an image with a religious symbol

- The tattoo gives a mark of religious affiliation, a priesthood, a penitence action;

- The tattoo reflects a greeting for the Saviour, act against malefic forces or confer benefactions.

However, religious tattoo remains paradoxical meaning that it precludes what is written in the Bible (Levites 19:28) and in the Quran (Sourat El Nissa the verse 119) which proscribe tattooing.

Another interesting phenomenon is the full body tattooing, practice that lasted from the second half of the nineteenth century until the mid-twentieth century being widely popularized in circuses. Therefore in the VIII-th volume of the *Atlas der Hautkrakheiten* of Ferdinand von Hebra there is a drawing representing a completely tattooed. This character, named Georje Constantine, was initially presented in 1872 by Moritz Kaposi in a communication entitled *L'homme tatoue de Birmanie* in Wiener Medizinische Wochenschrift. Constantine was a 43-year old Albanian who spoke fluent in Greek (native language), Arabic, Persian, and medium in French, Italian, English and German. Constantine stated that he had been tattooed in Birmania, the tattooing lasting for three months. Constantin was tattooed from head to toes; he had also his penis tattooed, and leaving untattooed only the plants and scrotum, giving the impression that he would wear an ornamental coat. Kaposi counted 338 tattoos representing mainly animals: panthers, monkeys, leopards, lions, tigers, cats, crocodiles, snails, fish, roosters, storks, swans, but also men, women, fruits,

flowers, leaves, arrows, bows, stars. The drawings had an incredible precision. Constantine joined the Barnum circus to become Prince Constantine and Prince Constantenus. In the respective period other persons with extensive skin surfaces tattooed were also presented: the defector Jean-Baptiste Cabri discovered in 1804 by the explorer Langsdorff, John Rutherford an English man captured by Moors and whose adventures were published in the press (1828), or James O'Connell tattooed in Caroline Islands and presented in 1850 in Barnum Museum.

Performing tattooing consists of introducing a pigment into the dermis by using a pin. Decorative tattoos can be made by amateur or professional artists. Amateur artists use India ink, charcoal or ash powder using a common needle or a nail instead of special needle used for tattooing. These tattoos have a poor artistic quality there is also the risk of infection. In contrast professional artists use pigments containing various metal salts such as: mercury (red), chromium (green), manganese (blue-purple), cobalt (blue), cadmium (yellow), hydrate ferric (ocher), or organic compounds such as sandalwood (red) or *Caesalpinia echinata* (red).

In contrast to conventional tattoos temporary tattoos are also performed in which the pigment is applied superficially only in the stratum corneum, disappearing by the natural process of renewal of the epidermis. Such temporary tattoo is made with Henna, a natural pigment obtained from the plant *Lawsonia inermis* that stains the skin in reddish-brown and disappears after two or three weeks. Henna tattoos are used for centuries by Muslims and Hindus for cosmetic purposes. A range of products such as lemon, vinegar or tea leaves are used to prevent the deterioration of tattoos and additives such as phenylenediamine or derivatives of phenylenediamine are used

for blackening the Henna pigment (black Henna).

The introduction of various substances into the skin can cause irritative or immunological responses being described a series of side effects to pigments of tattoos [15]. These manifestations include acute inflammatory reactions, contact dermatitis [32], photoinduced reactions, lichenoid reactions [15], granulomatous reactions, pseudolymphomatous reactions [13] and discoid lupus erythematosus [14].

Acute inflammatory reactions appear immediately after tattooing due to physical injury of the tissues and injection of the pigment into the skin disappearing after 2-3 weeks. Treatment consists of topical corticosteroid application.

Delayed reactions occur weeks or even years after tattooing. Allergic contact dermatitis is clinically characterized by the presence of eczematous lesions limited to the tattoo area. Histopathological are characterized by acanthosis, spongiosis and perivascular lymphocytic infiltrate [30].

The role of the metal salts (at least for some of them) in the allergic reactions of the tattoos is effectively suspected for many years. Chrome, nickel and cobalt are present in the allergological accepted limits ($>1\mu\text{g/g}$) in 62.5%, 16.1% and 1.8% of cases respectively [21]. However, the role of these salts is difficult to prove in practice mainly for two reasons: patch tests reproduce imperfectly the pathophysiology of the tattoo, the negativity or positivity of the ink or metal salts tests being difficult to interpret, and the second reason is the fact that in the ink composition are present additives in addition to metal salts which themselves may be the cause of allergic reactions [25]. Red tattoos, especially mercury ones, are the most common causes of contact dermatitis.

Photoinduced reactions occur after

ultraviolet exposure most often manifested by pruritic erythematous nodules. Tattoos containing cadmium sulfate are most commonly related to such reactions.

Lichenoid reactions occurring in the tattoo have a similar clinical appearance of lichen planus presenting as violaceous papules and plaques and histologically by the presence of a band-like lymphocytic infiltrate located at the dermo-epidermal junction, hydropic degeneration of the basal layer and a "saw-tooth" appearance of the rete ridges. Mercury is most commonly involved in the onset of lichenoid reactions.

Granulomatous reactions occur as a foreign body reaction to the pigment inserted into the skin, histopathological appearing numerous giant cells containing pigment or as an immunological hypersensitivity reaction with few giant cells. These reactions occur when using pigment as mercury, cobalt or manganese. Although rare, sarcoid granulomas can also occur on the tattoos that may represent early manifestation of sarcoidosis.

Pseudolymphomatous reactions clinically manifested by the appearance of indurated nodules or erythematous and purplish plaque on the tattoo. Histopathological a polymorphic cellular infiltrate and well represented vascularity is present in the upper dermis. In pseudolymphomatous reactions there is a polyclonal lymphocytic infiltration in contrast to that of malignant lymphoma in which there is a monoclonal infiltrate. This type of skin reactions are caused mainly by the red pigment of the tattoos but also the green and blue ones.

Pseudoepitheliomatous hyperplasia is a rare reaction in the tattoos that cause reactive histological changes: irregular acanthosis of epidermis and follicular infundibulum, absence of cellular atypia and rare mitoses. These changes are difficult to distinguish from cutaneous

tumors as squamous cell carcinoma or keratoacanthoma requiring skin biopsy.

The appearance of various infections on the tattoos was also published [24]. Pyogenic infections are secondary to epidermal barrier breakage during the tattooing. Among the cutaneous viral infections arising on the tattoos rare cases of warts and moluscum contagiosum were published. Therefore cases of moluscum contagiosum occurred between 3 weeks and 5 months after tattooing have been reported, lesions being solely localized on the tattoos [7, 28, 34]. Warts arising on the tattoos are varied in number and size appearing between one month and 10 years following the tattooing; in some cases the lesions are located strictly on the one color. Viral inoculation may be achieved through tools and strict localization of lesions on a certain color would be due to changing of local immunity induced by the pigment or ink contamination [27, 31, 37]. An infraclincic viral expanding by Koebner phenomenon, by inoculation as a result of breakage of the skin barrier or by a contamination through the saliva of person performing the tattoo may be also suspected. An additional factor of local immunosuppression is ultraviolet that could favor viral reactivation. Cases of transmission during tattooing of leprosy [8], syphilis, tuberculosis [9, 10], hepatitis B and C, HIV [24], dermatophytes, sporotrichosis have been published in the literature.

Causing a skin trauma tattooing may induce by isomorphic phenomenon Köbner some dermatoses such as psoriasis, sarcoidosis [3, 5], pyoderma gangrenosum [16], chronic lupus erythematosus, vitiligo [20]. Lichen planus is difficult to distinguish by lichenoid reactions described above.

The toxicology of metal salts by inhalation, ingestion or skin application is

quite well studied in contrast to those by tattooing where the substance is introduced by puncturing the skin and it is less known or even unknown. Tattooing consists in injection only once of a certain quantity of the product into the dermis and which will remain throughout life into the tattooed skin. This particular toxicokinetics could expose to carcinogenic or toxic risks different from the risks related to chronic daily exposure such as inhalation (smoking) or ingestion (chronic saturnism). Mercury involved in allergic reactions, but also having a toxic role, has almost completely disappeared from the red inks. Toxicological involvement of polycyclic aromatic hydrocarbons present in black inks was also discussed. Most of these products are cancerous when they are located in the dermis and are exposed to ultraviolet radiation leading to an increase of free radicals.

The association of tattoos with skin cancers occurring on them seems to be adventitious despite the alarmist *in vitro* toxicological data. Only few cases of skin cancers arising on tattoos have been described since 1930. These were mainly basal cell carcinomas, squamous cell carcinomas and keratoacanthoma to which were also added melanoma and B type lymphoma.

Tattoos removal methods have occurred since antiquity [19]. The reasons for the request for removal of tattoos are usually of professional or social nature. The techniques called "mechanical" include salabrasion, dermabrasion and surgical excision. The first two methods are currently abandoned. Surgery represents an alternative of tattoos removal while the laser therapy remains the treatment of choice.

In practice the surgery remains the first-line choice for small tattoos localized on areas of appropriate laxity. Postoperative

scar is all the more discreet and aesthetically as it is located on an area of significant laxity. In these cases, surgery has the advantage of complete excision of the tattoo in one surgical time resulting in an acceptable cosmetic scar. For larger tattoos, especially those located in areas of high tension, a complete excision requires two operative times with a higher risk of vicious scars. Reported complications include difficulties in suturing of the skin, with risk of delayed healing, development of hypertrophic scars, keloids or anatomical distortions resulting in scars less aesthetically acceptable.

Currently the use of lasers is the most popular therapeutic modality with the best aesthetic results. The choice of the laser depends on the wavelength needed to destroy the tattoo pigment [22]. The most commonly used are Nd:YAG, Er:YAG, ruby and alexandrite lasers [2, 4, 6, 35] used in Q-switched mode to increase the selectivity for pigmented lesions. The lasers act by fragmentation of the particles of pigment from the dermis which will then be removed by macrophages of the skin [22]. In most cases, tattoo removal requires 5 to 12 sessions spaced at 6-8 weeks. Monochrome tattoos require fewer sessions than the multicolored ones requiring furthermore the use of different lasers [26]. However, a complete removal is not possible in all cases despite the multiple treatments. The results depend on the depth of the pigment was injected into the dermis, the amount and chemical nature of the pigment [2], [29], [39]. Q-switched laser therapy may be followed by complications such as structural changes of the skin, scars or transient or permanent changes in skin pigmentation. Seldom, dispersing granules of tattoo in allergic patients can be followed by localized or generalized allergic reactions.

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