

Flat Warts (*Verrucae Planae*) Confined to the Pigment of a Tattoo: A Rare Tattoo-associated Complication

Tattoos are a form of decorative body art in which pigment dyes of different colors are inoculated into the skin. It is estimated that 15-25% of general population has one or more tattoos (1), and the reasons for the popularity of this procedure may include greater social acceptance, aesthetic appeal, or perhaps the option of using laser removal techniques to eliminate unwanted tattoos. Even though modern professional tattoos are usually performed in sterile conditions, complications still occur, and with increasing numbers of people getting tattoos, the incidence of tattoo-associated side-effects presenting to dermatologists, which may be as high as 2%, is likely to increase (2).

Herein we present a case of a 43-year-old male patient with multiple HPV-associated flat warts (*verrucae planae*) confined to the black pigment of a tattoo done 15 years ago.

A 43-year-old patient presented to our clinic due to eczema on the trunk. However, during skin examination, we observed asymptomatic verrucous papules confined to the black ink of a tattoo done 15 years ago on the lateral side of his right lower leg (Figure 1a). Clinical examination showed multiple, discrete, skin-colored, verrucous papules disseminated exclusively within the lines of the black-colored tattoo. Full skin examination did not reveal any similar lesions anywhere else on the body. Dermoscopically, papules showed a discretely papillomatous surface and sharp borders (Figure 1b).

The patient had another black tattoo on his trunk, in which no similar lesions were found. All his tattoos had been done more than 15 years ago in a professional tattoo salon and with no previous history of cutaneous lesions within tattoos. The patient had no other medical conditions and was not taking any medications. Additionally, no history of warts or other HPV-related lesions of the skin or mucosal membranes could be established.

A biopsy of an individual papule was taken and sent for a histopathological analysis, which subse-

quently showed hyperkeratotic, orthokeratotic, and parakeratotic acanthotic epidermis with hypergranulosis and rare cells with perinuclear halo indicative of koilocytes (Figure 3b). Immunohistochemical analysis showed negative reaction for p16 and p53, while Ki67 was positive only in rare basal and suprabasal cells. These findings were indicative of low-risk HPV, and the diagnosis of HPV-induced *verruca plana* was ultimately established. The patient was then successfully treated with cautious curettage of the lesions, leaving no scars.

Due to the growing popularity of tattoos, especially among younger populations, it is necessary to emphasize the possibility of various tattoo-related side-effects that can still occur due to improper preparation of the tattoo location, contamination of ink products, improperly sterilized instruments, or due to insufficient personal hygiene following tattooing (3).

In the past, tattoo-associated infections were significantly more frequent, with the highest prevalence of *Staphylococcus* and *Streptococcus* infections causing impetigo, folliculitis, cellulitis, erysipelas, or sepsis (2), but recent improvement and efforts in using sterile techniques in tattooing has led to a significant drop in the number of tattoo-related infections.

In this short report, we present a case of a different and a relatively rare type of tattoo-associated infection – flat warts i.e., *verrucae planae*. Flat warts are usually caused by HPV-3, -6B, -10, -28, and -49. Typical predilection sites are the face, dorsal sides of the hands or feet, arms, and legs, and they usually appear as skin-colored, pink, or brown, flat-topped discrete papules. It is believed that HPV can be inoculated through contaminated ink, instruments, the artist's saliva, or that it may be a pre-existing unnoticed wart in the tattooed area (4-6). The latency period between tattooing and HPV infection can range from several months to 10 years, with a mean period of 5 years (3). This may suggest that the immune system can control the infection for some time, and that some form of immune suppression may result in the

development of a clinical disease. In our case, the latency period could not be established due to the patient's unawareness of the lesions, and no potential trigger could be identified.

The occurrence of lesions on only one of the patient's tattoos as well as their confinement to the black pigmented ink may indicate a correlation to this specific pigment. Ramey *et al.* (6) conducted a study in which they assessed the localization of warts in differently colored tattoos. The results showed that black ink tattoos had a seven times higher risk of developing warts when compared with colored ink. At first it was thought that this was due to HPV inoculation via contaminated instruments, ink, or autoinoculation of the patient's own warts, but some evidence indicates that it is unlikely for HPV to survive in ink and that if the warts were inoculated they would occur equally in all ink colors. A different theory by Ruocco *et al.* (7) explains this phenomenon through an "immunocom-

promised district" mechanism, in which polycyclic aromatic hydrocarbons found in black ink produce reactive oxygen species (ROS) that can damage cellular structures and consequently increase the risk of a variety of infections, including HPV. Moreover, black ink contains almost pure nanoparticles, which are associated with greater ROS production than the larger particles found in colored ink (7,8).

There are several treatment options for verrucae planae, such as liquid nitrogen cryotherapy, topical 5% fluorouracil, topical 5% imiquimod, 0.025-0.050% tretinoin, 10% salicylic acid, or 10-30% glycolic acid. These treatments have differing success rates. Destructive modalities, such as surgical excision, curetting, or laser ablation may significantly damage the tattoo and cause scarring, and are thus not regularly performed.

It's necessary to emphasize that despite today's sterile methods of tattooing, complications may still

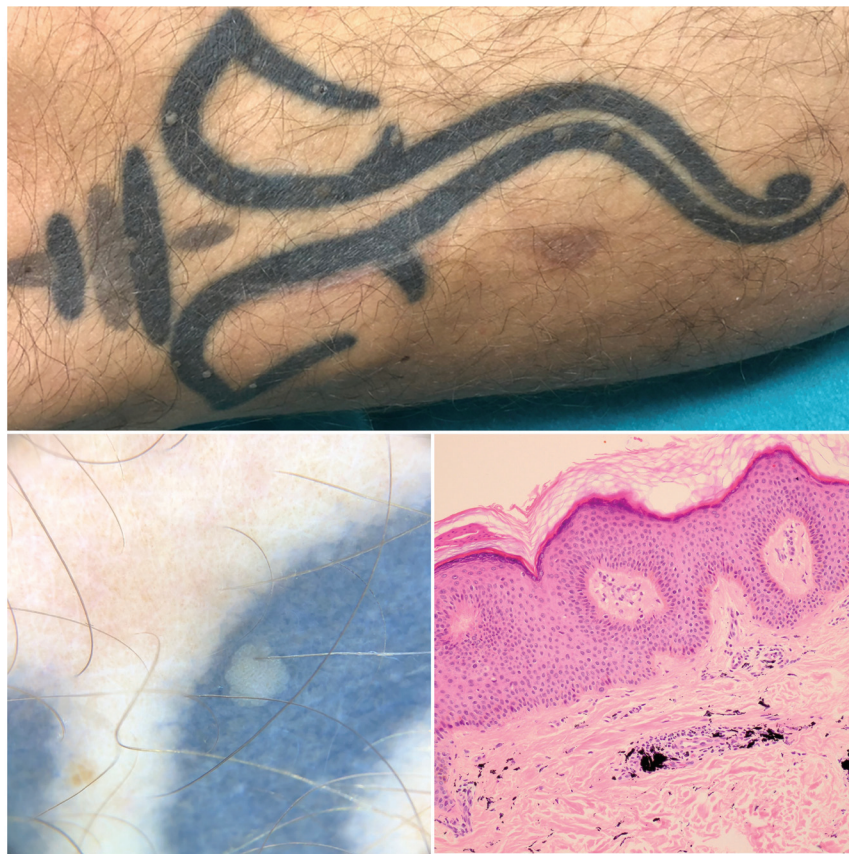


Figure 1a. Upper figure: multiple, discrete, skin-colored, verrucous papules disseminated exclusively within the lines of a black-colored tattoo.

Figure 1b. Lower left: Papules were flat-topped, smooth, and up to 2 mm in diameter; a discrete papillomatous surface and sharp borders were observed dermoscopically.

Figure 1c. Lower right: Histologically, the papule was made of hyperkeratotic, orthokeratotic, and parakeratotic acanthotic epidermis with hypergranulosis and individual cells with a perinuclear halo indicative of koilocytes. Dark exogenous pigment was observed in the dermis (hematoxylin and eosin, $\times 200$).

occur and medical professionals, namely dermatologists, should be aware of them. A person who wishes to get a tattoo should be advised to visit a licensed tattoo artist at a licensed tattoo parlour only. Patients with pre-existing dermatoses characterized by an isomorphic phenomenon, such as psoriasis or lichen planus, are particularly prone to developing a tattoo-associated adverse reaction, and those with severe dermatoses should be advised to avoid tattooing. Additionally, people with a previous history of warts should be aware of the possibility of warts occurrence, even years or decades after tattooing. Even though most of tattoo-related side effects are merely inconveniences, there is a potential for serious complications and patients should be advised as such.

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