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Squamous cell carcinoma of the dorsal hands and feet after repeated exposure to ultraviolet nail lamps

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Abstract

Gel nails are a common artificial nail option. Ultraviolet (UV) nail lamps are commonly used to cure gel nails. Ultraviolet A radiation is a known mutagen that penetrates into the nail bed. Although previously reported, the role of UV nail lamps in the carcinogenesis of both keratinocyte carcinoma and melanoma remains controversial. Herein, we report a patient taking the photosensitizing agent hydrochlorothiazide who developed numerous squamous cell carcinomas on the dorsal hands and feet with a 10-year history of UV nail light exposure every 2-3 weeks.

Keywords: nails, squamous cell carcinoma, photosensitization, UVA, UV nail lamps

Introduction

Owing to the increasing popularity of artificial nails, ultraviolet (UV) nail lamps are being used more than ever. UV nail lamps are used to quickly dry acrylic nails and to cure gel nails. These lamps emit UVA radiation, a known mutagen that contributes to cutaneous malignancies [1]. Herein, we report a 70-year-old woman with a long history of UV nail light exposure for artificial nails on both the fingers and toes who developed actinic damage and multiple invasive squamous cell carcinomas (SCC) in irradiated areas of the skin on her hands and feet.

Case Synopsis

A 70-year-old woman presented for evaluation of rough, red macules and papules on her dorsal hands

(**Figure 1**). She had been taking hydrochlorothiazide 25mg daily as management of Ménière disease for over 40 years but was otherwise in good health. She had no history of systemic immunosuppression and during her past professional career she had worked indoors with no history of unusually intense sun exposure.



Figure 1. A) A 4mm pink macule with hyperkeratotic scale on the dorsal aspect of the right second finger. **B)** A 10mm pink patch with areas demonstrating adherent hyperkeratotic scale on the dorsal aspect of the left fifth finger.

The patient stated that she had been getting manicures and pedicures every 2-3 weeks since 2009, which included UVA light exposure. The patient also reported developing a blistering sunburn on her dorsal hands following gel nail application at a salon in 2015.

Over the course of 5 years, the patient developed 8 biopsy-proven SCCs, which have all occurred on the dorsal fingers and feet except for a single lesion on the left anterior thigh. In addition, the patient has had 52 actinic keratoses over the same time period, all except 6 were distributed on the dorsal fingers and feet. The patient was encouraged to discontinue manicures and pedicures that included UV nail light exposure.

Case Discussion

An estimated 23,745 nail salons operate in the United States, where over \$8.5 billion is spent on nail services each year [2, 3]. Artificial nails are an increasingly common option for patrons of nail salons. Subtypes of artificial nails include silk wrap, acrylic, and gel (also known by the popular brand name Shellac®). A majority of consumers receive either acrylic or gel nails [4]. Many salons utilize UV nail lamps to quicken the drying and setting of nail applications, which are designed to cure upon exposure to UVA radiation. These lamps are formulated to emit UVA in a manner similar to tanning beds. Indeed, the amount of UV radiation per meter squared of body surface area is comparable for UV nail lamps and tanning beds [5]. Although the human nail has been shown to completely block UVB penetration into the nail bed, UVA does penetrate [6].

There exists some concern for the potential carcinogenic effect of these lamps. In 2009, two cases of women developing SCC on the dorsal hands were reported. Both women endorsed frequent utilization of UV nail lamps [7]. A more recent case was reported in 2019 of a woman who had an 18-year history of utilizing UV nail lamps every three weeks. She developed over 25 actinic keratoses on her dorsal hands with two SCCs in situ [8].

The nail industry has previously tried to assuage public concern by releasing a study that tested two commonly-used lamps to evaluate UVA exposure. The study concluded that the UVA exposure during nail treatment is equivalent to an additional 1.5-2.7 minutes of sunlight exposure per day between 2-week nail treatments [9]. Curtis et al., in contrast, found more concerning results. They demonstrated that, although the minimal erythema dose per treatment is low, the UV lamps emitted 4.2 times more energy at wavelengths between 355nm and 385nm than the sun. In addition, the total energy exposure in J/m² in individuals using UV lamps was between 15 and 22.5 per nail session; this is a striking fact when considering that the International Commission on Non-Ionizing Radiation Protection set the exposure limit at 30J/m² for 8 hours [10]. A response completed by request from the Nail Manufacturers Council on Safety (NMC) evaluated 6 different UV nail lamps and concluded that only moderate risk exists, with daily permissible exposure limits ranging from 30 to 130 minutes. A more recent study tested UVA and UVB radiation emitted from 17 different commonly used UV lamps from 16 separate nail salons. Results showed that damage could occur after as little as 8 UVA exposures or after as many as 208 exposures, depending on the specific lamp utilized, with an uneven distribution of radiation exposure [11].

The discrepancies between these experiments can likely be explained by the large number of UV lamps available with variations in wattage, bulb count, and UVA radiation. It is evident that further independent investigation into the risks of carcinogenesis following UV nail lamp exposure is necessary. Gels came onto the market in the late 1990's, but did not achieve widespread popularity until after a 2010 marketing campaign by Shellac® [4]. This could also explain the limited number of currently reported cases of UV nail lamp-associated cases of skin cancer, as both repeated exposure and passage of many years would be required for carcinogenesis

The distribution of this patient's lesions is particularly notable in relation to her extensive history of gel nail application. A 2011 prospective study of 9650 skin

lesions found that the most common sites for SCC in women are the face, lower legs/feet, and the forearms (27%, 24%, and 14.1% respectively), [12]. Our patient demonstrated a distinctly different pattern than what would be expected, with 7/8 (88%) of her SCCs and 46/52 (88%) of her actinic keratoses occurring on the hands and feet. We believe this unique distribution can be attributed to the patient's extended history of UVA nail-lamp exposure.

Some may argue that the patient's long-term treatment with oral hydrochlorothiazide could have been a contributing factor to her cutaneous SCC diathesis. In 2008, population-based data from Denmark were presented suggesting that individuals on long-term hydrochlorothiazide therapy had a 1.79-fold increase risk for SCC [13]. It has been speculated that the photosensitizing effects of the thiazide diuretics in skin might have an initiating and/or promoting effect on skin cancer development [14, 15]. We recommend that individuals who have a prolonged history of UV light nail treatments be followed carefully for the development of SCC in otherwise atypical locations such as the dorsal hands and feet. This is especially

true for individuals on long-term therapy with photosensitizing drugs such as hydrochlorothiazide.

Conclusion

Although rare, three previous cases of SCC developing after frequent UV nail lamp usage have been reported, most recently in 2019 [7, 8]. Our patient is an important addition to the literature. Because gel nails didn't achieve widespread popularity until 2010, the frequency of such cases may increase in the coming years considering the necessary exposure and passage of time required to develop SCC. In addition, patients with light skin types or other risk factors such as drugs with photosensitizing effects should be counseled by their dermatologists about the potential risks of UVA exposure following photocuring that utilizes UV lamps. Individuals utilizing UV light for photocuring should consider methods of protection including gloves and socks or sunscreen for covering the entire skin surface save the nails.

Potential conflicts of interest

The authors declare no conflicts of interests.

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