CASE REPORT

Sexually transmitted monkeypox with pseudo-koebnerization within a tattoo

Nadav Friedel, MD, Elisa S. Gallo, MD, Tamir Horovitz, MD, Ronen Ben Ami, MD, and Eli Sprecher, MD, PhD, MBA

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INTRODUCTION

Monkeypox virus (MPV), an approximately 250 nm double-stranded DNA virus, was first identified in 1958 in laboratory monkeys, in Denmark. It appeared in humans in Africa, specifically in the Democratic Republic of Congo in 1970. Until recently, it has been endemic in Africa, and rarely reported elsewhere. Herein we report the first case of MPV infection identified in Israel, in the largest outbreak outside Africa in 2022, with similar clinical features as in other cases, but also with pseudo-koebnerization due to viremia within a new tattoo.

CASE REPORT

A 39-year-old, afebrile, healthy male, regularly treated with preexposure prophylaxis for HIV, presented to the emergency department with a 4-day history of painless papules in the genital region, without systemic symptoms, but with pain, erythema, and edema in his left groin. These findings appeared while traveling in Europe, 10 days after unprotected sexual activity with multiple male partners. Upon return to Israel, the patient placed a tattoo on his left arm.

On initial examination, 4 discrete umbilicated papules with adherent brown crust were noted at the base of the penile shaft and suprapubic region (Fig 1, A). Dermoscopy revealed white radiating lines at the lesion’s periphery and a central reddish-brown structureless area (Fig 1, B). In his left groin, an erythematous mass was tender and warm.

Complete blood count and a basic metabolic panel were both within normal limits. C-reactive protein level was 46 mg/dl. Chest radiography was unremarkable. Blood and throat cultures were unrevealing and serology for TPHA (Treponema pallidum hemagglutination), VDRL (venereal disease research laboratory), hepatitis A, B, and C viruses, and HIV was negative. Polymerase chain reaction (PCR) using DNA extracted from the lesions was negative for varicella zoster virus and herpes simplex virus, but diagnostic for MPV (West African clade). Given the sensitivity and specificity of PCR testing in confirming the diagnosis, biopsy of a lesion was deemed unnecessary. PCR for MPV using DNA extracted from throat swabs and blood leukocytes was negative; however, PCR of semen was positive for MPV.

The patient was diagnosed with MPV infection and secondary lymphangitis of the left groin. He was isolated under negative pressure conditions and treated with Cefazolin 2 gm IV every 8 hours for 5 days with rapid resolution of the lymphangitis. On the third day of hospitalization, his temperature rose to 39 °C, and 9 new umbilicated papules appeared, koebnerizing within the new tattoo (Fig 2). Meanwhile, 5 new lesions appeared over

From the Division of Dermatology and Tel Aviv Sourasky Medical Center, Tel Aviv, Israel; Department of Infectious Diseases, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel; and Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel.

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Abbreviation used:
HIV: human immunodeficiency virus
MPV: monkeypox virus

Correspondence to: Nadav Friedel, MD, Division of Dermatology, Tel Aviv Sourasky Medical Center, 6, Weizmann St, Tel Aviv, 6423906, Israel. E-mail: Nadavfriedel@gmail.com.
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his lower limbs, trunk, and within the oral cavity. Eventually afebrile, he was discharged and remained in home isolation until the papules resolved 3 weeks later.

**DISCUSSION**

Herein we describe the first case of MPV infection reported in Israel in the context of the 2022 worldwide outbreak. The patient displayed a typical MPV infection course, secondary lymphangiitis, and pseudo-koebnerization due to viremia within a new tattoo, the latter not previously reported with MPV.

Considered a zoonotic infection, MPV is mainly transmitted to humans through direct contact with an infected animal, such as a rodent or non-human primate, or their body fluids. Human-to-human transmission, by respiratory droplets or direct contact with body fluids or cutaneous lesions, has also been reported.

Clinical manifestations of MPV are similar to smallpox, though usually milder. The incubation period ranges from 5 to 21 days, and results in a febrile prodrome of several days accompanied by headache, myalgia, and fatigue. A primary red macule then appears at the inoculation site, followed within days by umbilicated papules, vesicles, and pustules that develop a hemorrhagic crust, healing with scars. The rash spreads centrifugally to other body areas, including the palms, soles, and mucous membranes. Lymphadenopathy is characteristic, and helps differentiate monkeypox from smallpox. Cutaneous complications include secondary infection and pitted scars, while extracutaneous complications include bronchopneumonia, encephalitis, gastrointestinal symptoms, keratitis, and blindness.

The differential diagnosis of an acute eruption of monomorphic umbilicated papules includes infectious etiologies such as viral diseases caused by herpesviridae (varicella and herpes simplex infections) and poxviridae (smallpox, monkeypox, disseminated vaccinia and molluscum contagiosum), as well as opportunistic fungal infections such as histoplasmosis, cryptococcosis, penicilliosis, and coccidiomycosis. PCR establishes the diagnosis of MPV.

Pseudo-koebnerization is a variant of the Koebner phenomenon, wherein the former is the result of seeding of an infectious entity, such as a virus, within a site subjected to trauma. A review of tattoo associated viral infections is a well-known occurrence. However, pseudo-koebnerization has not been previously reported specifically with MPV until now, wherein this case a disproportionate number of lesions was localized to the new tattoo in comparison to an equal number being scattered randomly over the rest of the body surface.

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**Fig 1.** Clinical presentation. A, Umbilicated papules with crust at the base of the penile shaft. B, Dermoscopic high magnification of an early lesion.

**Fig 2.** Pseudo-koebnerization. A, Umbilicated papules located within a new tattoo. B, Dermoscopic high magnification of one lesion within the new tattoo.
The majority of MPV cases in 2022 have been reported in young men, many self-identifying as men who have sex with men, denying recent travel history to endemic regions. Most cases present with papules in the genital region, suggestive of sexual transmission. All cases have been due to the less virulent West African clade.³

Phylogenetic analysis of the viral draft genome from 10 Portuguese and 1 American patient revealed that all shared the same origin.⁷ However, the virus responsible for the current outbreak diverges a mean of 50 single nucleotide changes from the MPV strain isolated from an outbreak in the United Kingdom, Israel, and Singapore in 2018 and 2019. These changes, more numerous than anticipated considering the estimated substitution rate for orthopoxviruses including MPV, possibly resulted from an evolutionary jump, a phenomenon occurring when organisms spread into a new geographic area, leading to a hypermutated virus.⁷

The largest monkeypox outbreak reported outside Africa started in the United Kingdom on May 7, 2022, originating from Nigeria. Thousands of cases have since been diagnosed globally. Microevolution of the virus may be seen through tracking genetic changes as virus dissemination persists. Whether these genetic changes will relate to alternate viral behavior remains to be determined.

Nonetheless, we report a case revealing the mode of transmission, course of disease, and pseudo-koebnerization within a new tattoo likely due to viral particles seeding within the tattoo during the viremic phase of the disease.

**Conflicts of interest**
None disclosed.

**REFERENCES**
1. Mauldin MR, McCollum AM, Nakazawa YJ, et al. Exportation of monkeypox virus from the African continent. J Infect Dis. 2022; 225(8):1367-1376.
2. Berger S. Monkeypox: global status. GIDEON Informatics; 2022.
3. World Health Organization. Multi-country monkeypox outbreak in non-endemic countries. Accessed May 23, 2022. https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON385
4. Cohen PR. Tattoo-associated viral infections: a review. Clin Cosmet Investig Dermatol. 2021;14:19-1540.
5. McCollum AM, Damon IK. Human monkeypox. Clin Infect Dis. 2014;58(2):260-267.
6. Sanchez DP, Sonthalia S. Koebner Phenomenon. In: StatPearls [internet]. StatPearls Publishing; 2022. https://www.ncbi.nlm.nih.gov/books/NBK553108/
7. Isidro J, Borges V, Pinto M, et al. Multi-country outbreak of monkeypox virus: genetic divergence and first signs of micro-evolution. Genome reports. Accessed May 23, 2022. https://virological.org/t/multi-country-outbreak-of-monkeypox-virus-genetic-divergence-and-first-signs-of-microevolution/806