

# MRI findings of Monkeypox rash in a patient with suspected midfoot osteomyelitis

L. Ottensoser<sup>1</sup>, S. Fischer<sup>2</sup>, N. Haramat<sup>2</sup>, E. Mardakhaev<sup>2</sup>

<sup>1</sup>Albert Einstein College of Medicine, Bronx, New York, NY, USA

<sup>2</sup>Montefiore Medical Center, Bronx, New York, NY, USA

## ABSTRACT:

- **Background:** Monkeypox (Mpox) is a viral illness that underwent a multinational outbreak in 2022-2023. Symptoms of this disease include fever, myalgia, headache, and lymphadenopathy, followed by the onset of a characteristic rash. Transmission of Mpox is typically through respiratory secretions or contact with skin lesions or bodily fluids. The diagnosis is made by PCR of skin lesions samples, but secondary features, such as lymphadenopathy, may be incidentally noted on radiologic imaging.
- **Case presentation:** A middle-aged male with a past medical history of uncontrolled HIV presented to the emergency department one week following the onset of a foot ulcer and rash. PCR testing confirmed the rash was due to Mpox, and the patient underwent appropriate treatment. Due to concern for osteomyelitis deep in the foot ulcer, an MRI of the foot was performed. While the MRI was negative for osteomyelitis, it incidentally included the skin lesions which corresponded to the patient's rash.
- **Conclusions:** This case demonstrates MRI findings of Mpox rash in a patient with suspected mid-foot osteomyelitis. While laboratory testing remains the appropriate confirmatory testing for Mpox infection, clinicians and radiologists should remain aware of the imaging appearance of these lesions, as well as other secondary findings we may encounter.
- **Keywords:** Monkeypox, Mpox, MRI, Imaging, Radiology, Rash, Infection, Skin lesions.

## INTRODUCTION

In May 2022, the World Health Organization declared a multinational outbreak of the Monkeypox (Mpox) virus. As of early January 2023, almost 30,000 cases have been confirmed in the United States<sup>1</sup>. Mpox is an enveloped, double-stranded DNA virus that is a member of the *Orthopoxvirus* genus of the *Poxviridae* family, the same family that causes smallpox. Symptoms of Mpox are milder than those of smallpox, and it is typically a self-limited disease<sup>2</sup>. Initial symptoms include fever, myalgias, headache, and lymphadenopathy. Within five days from the onset of fever, patients develop a rash, the distribution of which can include the face, extremities,

oral mucous membranes, and genitalia. The number of lesions can vary from few to thousands. Lesions progress through macular, papular, vesicular, and pustular stages before crusting and resolving within two to four weeks<sup>3</sup>.

Mpox is a zoonotic virus, and animal-to-human infection occurs by contact with an infected animal's bodily fluids or through an animal bite. Human-to-human transmission occurs *via* respiratory secretions or direct contact with skin lesions or bodily fluids of an infected individual<sup>4</sup>.

In the United States, Mpox cases have shown increased prevalence in men who have sex with men, along with certain ethnic minority groups. Additionally,



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there is a strong association between Human Immunodeficiency Virus (HIV) and Mpox, with 41% of Mpox cases in the United States having underlying HIV infection<sup>2</sup>. Patients with HIV are shown to have worse outcomes, with greater lesion size, longer duration of illness, and higher rates of genital ulcers and bacterial superinfection<sup>5</sup>. These factors may contribute to Mpox patients with HIV coinfection undergoing increased diagnostic imaging to evaluate for complications of the disease, including bacterial superinfection.

The immunologic response that occurs in patients infected with Mpox has been described primarily as a cytokine storm, as well as a T helper 2 (Th2) cell response. Certain cytokines (IL-2R, IL-10, and GM-CSF) are significantly elevated, and levels increase with disease severity<sup>6</sup>. IL-10 is an anti-inflammatory cytokine that plays an important role in wound healing. The overexpression of IL-10 decreases the inflammatory response to an injury, thereby creating a favorable environment for secondary infection<sup>7,8</sup>. This can explain why a subset of patients with Mpox shows secondary bacterial infections<sup>9</sup>, which could then lead to the utilization of imaging, due to concern for complications such as osteomyelitis.

Mpox is diagnosed through polymerase chain reaction (PCR) test of skin lesion samples<sup>3</sup>. At this time, imaging is not being utilized for diagnosis, as there are no diagnostic features that are specific to imaging. Additionally, imaging of these patients increases the risk of exposure to others who would come into contact with the infected individual. Interestingly, imaging can be used to differentiate Mpox from chickenpox and smallpox by identifying lymphadenopathy, which is a common early finding in patients with Mpox<sup>10</sup>. Inguinal, axillary, and/or cervical lymphadenopathy can occur prior to or at the onset of rash<sup>11</sup>.

## CASE PRESENTATION

This report describes a middle-aged male who presented to the emergency department for evaluation of a foot ulcer and rash that he first noticed a week prior. The patient had a history of uncontrolled HIV due to intermittent compliance with antiretroviral medications. The patient reported a needlestick injury to his foot one week prior to presentation and a small wound that had progressively increased in size and pain throughout the week. Concurrently, he noticed several pustules on his left arm that spread to both legs, followed by his face, right arm, and both palms. The lesions were at first painful, but then became itchy. No genital lesions were noted. He was sexually active with men, and he reported sexual encounters with several male partners during the week prior to the presentation. He was encouraged by a partner to be evaluated for Mpox, but he did not notice any lesions on that partner.

A physical exam revealed an ulcerative lesion on the dorsum of the left foot with surrounding swelling and erythema. The lesion was fluctuant and tender to pal-

pation. There were also pustular lesions of various sizes and stages of healing adjacent to the skin ulcer, as well as on the arms (left greater than right), legs, face, head, and palms (Figure 1A). The patient was afebrile, and vital signs were normal.

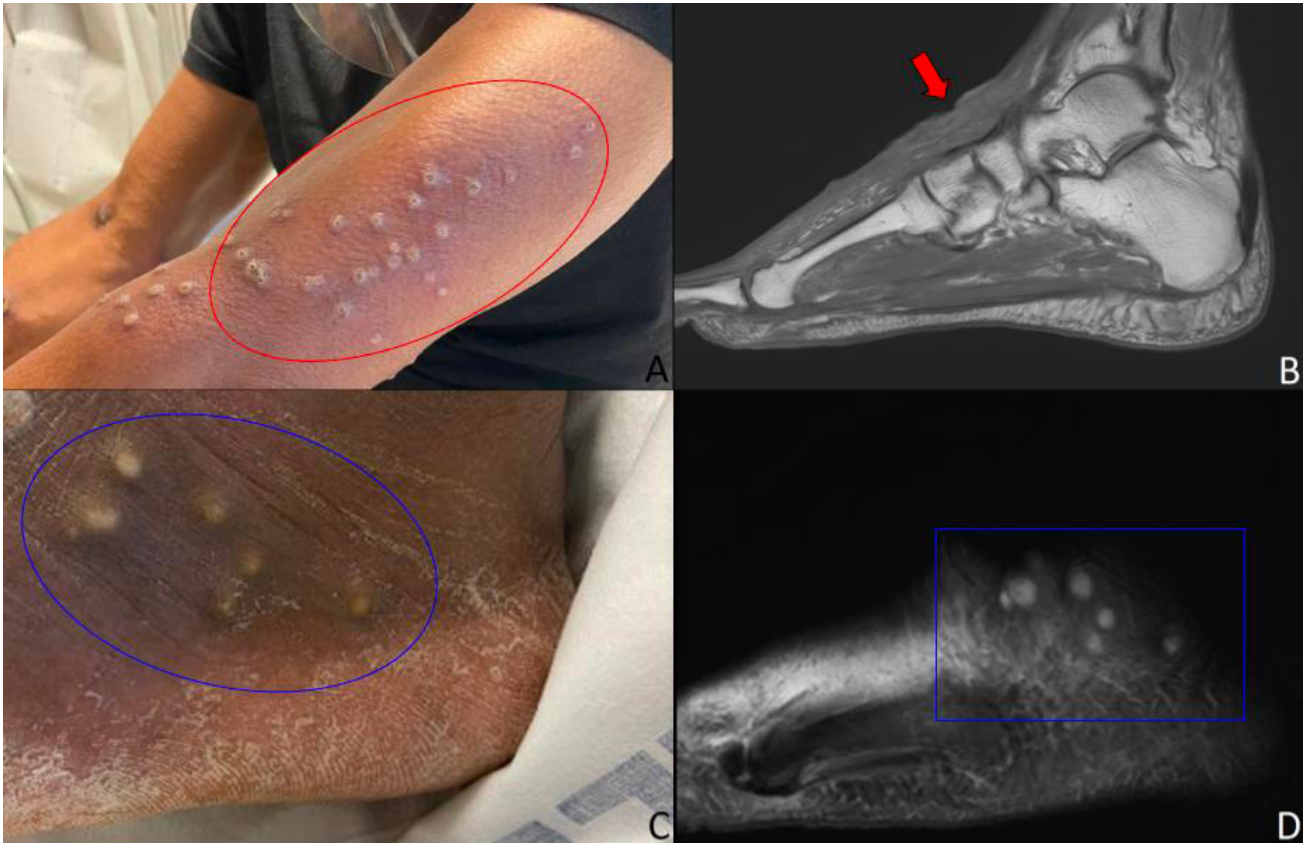
Due to concern that the rash could be a manifestation of Mpox, the patient was started on tecovirimat, recommended by the Centers for Disease Control and Prevention (CDC) to shorten the duration of the illness. An Mpox PCR test was performed, which resulted to be positive a few days later. The patient was also found to have a positive rapid plasma reagin (RPR) titer and was treated for syphilis with intramuscular penicillin. Further infectious disease workup demonstrated the patient was negative for Gonorrhea, Chlamydia, Herpes Simplex Virus 1 and 2, and Varicella Zoster Virus.

The patient was admitted to the hospital and started on vancomycin and piperacillin/tazobactam due to suspicion of Methicillin-resistant *Staphylococcus aureus* (MRSA) infection of his foot ulcer, and was ultimately transitioned to doxycycline prior to discharge. As part of the workup of the foot ulcer, an MRI without contrast of the foot was performed to rule out underlying osteomyelitis. The imaging did not show any evidence of osteomyelitis (Figure 1B). Multiple small round T2 hyperintense lesions in the subcutaneous soft tissues of the foot and ankle were incidentally found on the imaging, clinically correlated to the location of the patient's rash (Figures 1C-D). The patient remained in stable condition and was discharged to isolate at home until 14 days after the onset of symptoms, with appropriate follow-up for his wound care and with his primary care provider.

## CONCLUSIONS

We have recently witnessed an outbreak of Mpox virus, with cases appearing globally. The viral disease is generally self-limited, and the majority of cases are currently presenting in men who have sex with men and immunocompromised patients, such as those with HIV. While the radiologic appearance of several Mpox manifestations such as encephalitis, proctitis, and soft tissue abscesses, has been previously reported in literature, imaging findings of the lesions themselves have not been thoroughly investigated. This case represents a patient who presented with a foot ulcer, whose Mpox lesions of the foot and ankle were incidentally imaged during evaluation for osteomyelitis of the foot.

The current guidelines for diagnosing Mpox include a PCR test of skin lesions; at this time, there is no evidence for the use of radiologic imaging in the diagnosis. However, this patient had an MRI of the foot to evaluate his ulcer, and the Mpox skin lesions were imaged incidentally. It is important for radiologists to be aware of the expected imaging appearance of these lesions, as they could continue to be encountered in examinations. While it may not be a tool to make a clear diagnosis by itself, it can be used to aid clinicians in the diagnosis along with other clinical clues.



**Figure 1.** A, Skin rash with lesions in various stages, including vesicles, pustules, and scabs (red circle). B, T1-weighted sagittal MRI with dorsal midfoot ulcer (red arrow). No evidence of osteomyelitis. C, Skin rash at the lateral aspect of the ankle with a cluster of several pustules (blue circle). D, Proton density fat saturated sagittal MRI sequence at the same level as (C). Small round circumscribed hyperintense lesions in the subcutaneous soft tissues (blue square)<sup>1</sup>.

#### INFORMED CONSENT:

Informed consent has been obtained from the patient.

#### ACKNOWLEDGMENTS:

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#### AUTHORS' CONTRIBUTIONS:

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#### ORCID ID:

Edward Mardakhaev: 0000-0003-3000-2800

#### CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest to declare.

#### DATA AVAILABILITY:

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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