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## Monkeypox-associated kidney impairment in renal transplant patients

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### ABSTRACT

Monkeypox can adversely affect allograft function in kidney transplant recipients through increased infection risk, potential for acute kidney injury (AKI), and interactions with immunosuppressive therapies. The clinical management of these patients requires careful monitoring and a tailored approach to treatment to mitigate risks and ensure optimal outcomes.

**Keywords:** Monkeypox, Kidney transplantation, Acute kidney injury, Allografts, Immunosuppressive agents, Infection risk

#### *Implication for health policy/practice/research/medical education:*

Monkeypox can cause severe acute illness in kidney transplant patients, the long-term consequences are not yet clear.

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### Introduction

Monkeypox, an emerging zoonotic disease, poses significant health risks, particularly in immunocompromised populations such as kidney transplant recipients (1). The unique immunosuppressed state of kidney transplant patients may increase the risk of severe monkeypox disease and complicate treatment (2). Current evidence suggests that monkeypox may present differently in these patients, with a higher likelihood of severe illness and adverse outcomes due to their compromised immune systems (1,2).

In general population, monkeypox has been linked to acute kidney injury (AKI), often exacerbated by dehydration or other systemic effects of the infection; however, in kidney transplant patients exhibited severe clinical manifestations such as disseminated vesicular rashes, mucosal involvement, and gastrointestinal symptoms like proctitis and bowel obstruction. These symptoms can complicate the management of kidney function due to fluid and electrolyte imbalances (1-3).

In documented cases, kidney transplant recipients with monkeypox have presented with severe symptoms, including fever, skin rashes, and gastrointestinal issues (4). For instance, Attieh et al in a case presented a patient with disseminated vesicular skin rashes and proctitis, which

indicates a significant systemic impact of the virus on an already compromised immune system (3).

### Search strategy

For this review, we searched PubMed, Web of Science, EBSCO, Scopus, Google Scholar, Directory of Open Access Journals (DOAJ), and Embase, using different keywords like; Monkeypox, kidney transplant, and acute kidney injury

### Monkeypox in kidney transplant recipients

Monkeypox can lead to several severe complications in immunosuppressed patients, particularly kidney transplant recipients (1). For example, kidney transplant patients may develop an extensive disseminated vesicular rash (4). The rash can be painful and lead to secondary infections. In addition, this disease can cause significant mucosal involvement, leading to painful lesions in the mouth, throat, and genital areas. This lesion can cause discomfort and complications (5). Moreover, severe proctitis, rectal bleeding, and bowel obstruction have been reported in kidney transplant patients with monkeypox (3,6). The inflammation and lesions in the GI tract can lead to significant symptoms (3,6). Some patients may experience urinary retention, likely due to the overall

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systemic effects of the infection (7).

### Impact of Mpox on allograft function

Kidney transplant recipients are inherently more susceptible to infections due to the immunosuppressive medications they take to prevent organ rejection. This increased vulnerability can lead to more severe manifestations of monkeypox, which may complicate the management of the transplant (8,9). Since the reported cases of AKI, attributed to monkeypox in transplant patients are limited, the overall stress of a severe viral infection can contribute to kidney function deterioration (10,11). Factors such as dehydration, systemic inflammation, and the effects of the virus itself can all play a role in renal impairment (10,11). Meanwhile, reports indicate that kidney transplant patients with monkeypox can experience severe symptoms, including disseminated skin lesions and mucosal involvement, which may further complicate their clinical management (3).

### Long-term outcome of Mpox

Most reported cases have focused on the acute presentation and short-term outcomes. The long-term effects of monkeypox on graft function, patient survival, and quality of life in kidney transplant recipients remain largely unknown. Continued surveillance and reporting of cases is needed to better characterize the long-term implications (1,3).

### Renal histopathological findings

Generally, the data on monkeypox-related renal pathology is scarce. The majority of findings stem from isolated cases or small cohorts, indicating a need for more extensive studies to fully understand the renal implications of monkeypox infection. Studies on animal models, particularly African rope squirrels, indicated that renal tubular degeneration is a common finding associated with monkeypox (12). These lesions were accompanied by perivascular lymphoid and plasmacytic inflammation in the kidney cortex and pelvis (12). In autopsies of patients who succumbed to monkeypox, destructive glomerular lesions were noted, alongside acute tubular necrosis. These findings highlight the severe impact of the virus on kidney structure and function (3,13-15). Previous findings noted the presence of acute tubular necrosis observed through electron microscopy. This finding is significant as it suggests direct tubular injury, which can be a consequence of viral infections or related complications such as dehydration (16-18).

### Treatment considerations

Monitoring serum creatinine and other markers of kidney function can help identify any deterioration early.

Additionally, emerging research suggests that specific urinary biomarkers may aid in the early detection of AKI, allowing for timely intervention to prevent further kidney damage (19). The management of monkeypox in kidney transplant patients requires careful consideration of their immunosuppressive therapies (1). Tecovirimat has been used to treat monkeypox and may have implications for kidney function. While it is generally well-tolerated, there could be concerns about interactions with immunosuppressive medications like tacrolimus, which is commonly used in transplant patients (20). Monitoring of drug levels and renal function is essential during treatment. Adequate hydration is crucial, especially in patients presenting with gastrointestinal symptoms that may lead to dehydration. This can help mitigate the risk of AKI (2,3).

### Conclusion

Monkeypox poses unique challenges for kidney transplant recipients, necessitating vigilant monitoring and tailored treatment approaches. The potential for severe disease and complications like AKI highlights the importance of understanding the implications of monkeypox in this vulnerable population.

### Conflicts of interest

The authors declare that she has no competing interests.

### Ethical issues

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

### Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors utilized Perplexity to refine grammar points and language style in writing. Subsequently, the authors thoroughly reviewed and edited the content as necessary, assuming full responsibility for the publication's content.

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