Case Report

Scedosporiosis Transmission from Near-Drowning Donor to Kidney Recipient: A Case Report and Literature Review

Bei Yang, MD, PhD;[1] Romesh Kohli, MD;[2] John E Tomaszewski, MD;[1] Lin Liu, MD, PhD[1]*

[1] *Department of Pathology and Anatomical Sciences, Jacobs School of Medicine and Biomedical Sciences, University at Buffalo, State University of New York, Buffalo, NY*
[2] *Department of Medicine, Jacobs School of Medicine, University at Buffalo, State University of New York, Buffalo, NY*

Infection is a common complication following a near-drowning event. Near-drowning victims as organ donors carry an increased risk for donor-derived infection. We report a rare case of donor to recipient transmission of scedosporiosis in a kidney transplant from a near-drowning organ donor. The patient is a 62-year-old male who received his second deceased-donor kidney transplant from a young man who died of freshwater drowning. The patient's clinical course was complicated when the heart recipient from the same donor died of invasive scedosporiosis, and the other kidney recipient from the same donor lost the graft due to kidney fungal infection. Our patient had no symptoms with negative urine and blood cultures. Kidney biopsies on three different occasions were performed and revealed no evidence of fungal infection. However, given the high mortality rate of scedosporiosis, the grafted kidney was eventually explanted on the 37th day post-transplantation. Two small cystic lesions were found in the explanted kidney, and microscopic examination with Grocott methenamine silver (GMS) stains revealed fungal colonization within these two cystic lesions. Scedosporium spp. were further identified by PCR. In conclusion, near-drowning donors pose an increased risk for donor-derived scesdoporiosis. Routine screen tests are not sensitive enough to detect scesdoporium infection pre- or post-transplantation. Scedosporiosis is intractable, with a high mortality rate and graft loss in organ recipients. *[N A J Med Sci. 2022;15(1):013-016. DOI: 10.7156/najms.2022.1501013]*

Key Words: *near-drowning donor; donor-derived infection; scedosporiosis*

INTRODUCTION

Infection is a common complication following a near-drowning event. There have been concerns that organ donors after near-drowning events have increased risks for donor-derived infection. Scedosporium spp. are the most common pathogens for invasive fungal infection following near drowning. Here we report a rare case of scedosporiosis in a transplanted kidney transmitted from a near-drowning donor.

CASE PRESENTATION

Donor: The donor is a young man in Florida who died of freshwater drowning. The results of his chest X-ray, cultures from sputum, blood, and urine before death are unknown. Biopsies at the time of donor organ harvesting showed no evidence of fungal infection or other significant abnormalities.

Kidney Recipient: The patient is a 62-year-old African American male who received a second deceased donor kidney transplant (DDKT) for end-stage renal disease (EDRS) secondary to membranous glomerulonephritis and hypertension. Additional histories also include chronic obstructive pulmonary disease, hypothyroidism and rheumatoid arthritis. His first DDKT failed seven years ago before the second transplant, and he had been anuric and on hemodialysis before receiving the second allograft. He had delayed graft function and remained dialysis-dependent after the transplant. On the 21st day post-transplantation (PT21), an allograft kidney biopsy was performed due to continuous low urine output, which showed features of acute tubular necrosis, mild capillaritis, and diffuse C4d staining in the interstitial capillaries, suggesting acute alloantibody mediated rejection (AAMR). There was no evidence of fungal infection or acute cellular rejection, and the tubulointerstitial inflammation was minimal. The patient subsequently underwent anti-AAMR management. He also had a delayed wound healing complicated with prolonged wound infection with associated bacteremia from E.coli and Serratia, and had been treated with Zosyn and Ceftriaxone.

His clinical course was further complicated when the heart recipient from the same donor died of invasive scedosporiosis. Meanwhile, the other kidney recipient from the same donor developed kidney granuloma with fungal infection resulting in allograft kidney explantation. This raised the concern for a risk of donor-derived fungal infection in our patient.

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***Corresponding Author:** 115 Flint Road, Williamsville, New York 14221. (Email: linliu@buffalo.edu)

Voriconazole was immediately started on day PT29. Although serum Fungitell on PT29 was increased, and a repeat test on PT36 remained at a high level, the patient had no symptoms with repeated negative results on urine and blood cultures. Abdominal CT on PT29 suggested large fluid collections around the transplant kidney. On day PT37, open kidney biopsies were taken at random sites to further investigate the possibility of fungal infection, and again, no definitive evidence of fungal infection was identified. Considering the high mortality rate of invasive scedosporiosis, the grafted kidney was eventually explanted on PT37. During the surgery, a hematoma was identified above the psoas muscle and the superior pole of the kidney, which corresponded to the fluid collections around the graft previously identified by the abdominal CT. No molds were noted in the abdominal cavity or on the grafted kidney. The evacuated hematoma and representative kidney biopsy tissue were sent for bacterial and fungal cultures, which later all turned out to be negative.

The explanted kidney was bivalved and serially sectioned to reveal two yellow-green softened cystic lesions containing necrotic materials located in the superior pole (1.2 x 1.0 x 0.6 cm) and inferior pole (1.4 x 1.2 x 1.0 cm), respectively. The remaining kidney was unremarkable. Microscopic examination with GMS stains revealed fungal colonization within these two cystic lesions (**Figure 1**). Further PCR identification with 28S primer confirmed Scedosporium spp., and no other fungal organisms were detected.

Of note, after fungi were identified in kidney resection specimen, GMS stains were performed on previous tissue sections biopsied on PT21 and PT37. The cases were re-reviewed, and again no fungal organisms were identified. The patient was discharged on PT53 and continued Voriconazole 200 mg q12 hours for one year without signs for scedosporiosis in other organs. He has been maintained on dialysis and is currently doing well with no clinical features to suggest residual infection.

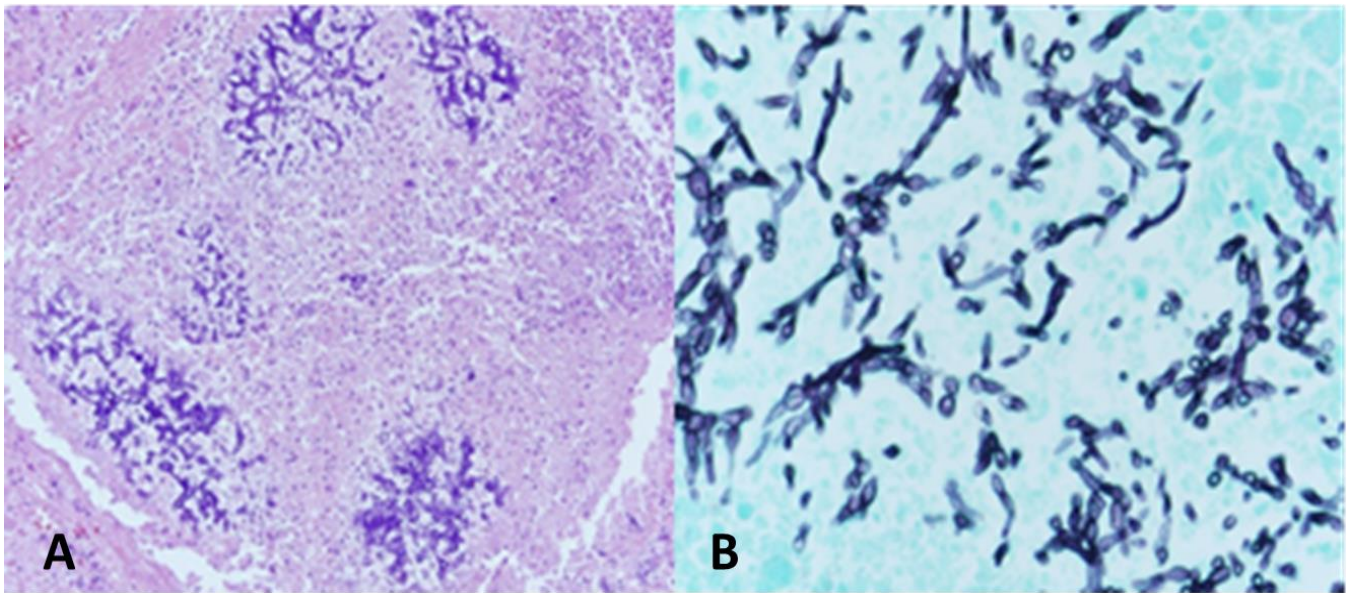

Figure 1. HE sections from the renal cystic lesion show fungal organisms and renal parenchymal necrosis (A). GMS stain highlights the fungal hyphae (B).

DISCUSSION

One of the potentially life-threatening complications of near drowning is infection. In the setting of near drowning, some opportunistic fungi can cause severe primary infection even in an immunocompetent host. Lung tissue damage and the large inoculum of organisms associated with submersion may predispose an immunocompetent host to fungal infection.[1] Scedosporium spp. are ubiquitously present in a wide range of environmental conditions.[2] While they are well known for causing opportunistic infections in the immunocompromised hosts, more and more reports have shown that Scedosporium spp. are also the most common cause for fungal pneumonia, central nervous system infection, and disseminated fungal infection in immunocompetent hosts after near-drowning.[1,3-5] Polluted water has been described as the reservoir specific for these fungi and sources of scedosporiosis after near-drowning.[6] Among the species, Scedosporium boydii, Scedosporium apiospermum, Scedosporium aurantiacum, and Lomentospora prolificans are the major pathogens that cause diseases in humans and account for most of the scedosporiosis.[7]

In our case, there are some combined facts: scedosporiosis was found in the transplanted kidney and heart from the same donor; the other kidney recipient from the same donor also developed fungal infection in the grafted kidney; the donor was a victim of near-drowning event; and scedosporiosis is the most common disseminated fungal infection in victims following near-drowning event.[1,3-5] These facts collectively direct to the conclusion that scedosporiosis in the transplanted kidney in our case is donor-derived infection.

Although credited as the most common fungal infection in near-drownings, the transmission of Scedosporiosis in organ transplants from near-drowning donors to recipients is rarely reported. Only three similar case reports have been published to date in English literature.[8-10] Some common features are shared in these cases **(Table 1)**. Firstly, all the donors show signs of bilateral pneumonia.[8-10] Although the modes of Scedosporium spp. invasion and subsequent dissemination are not well understood, hematogenous spread from the lung has been the most reported mode.[3,4,11] In these cases, all the near-drowning donors showed signs of pneumonia on chest X-ray, and the sputum culture from one donor was positive for Scedosporium apiospermum.[8] These findings support hematogenous spread from the lung may be the primary mode of disseminated scedosporiosis, and therefore clinicians should be alarmed about the increased risk of donor-derived scedosporiosis when the near-drowning donors have signs of pneumonia.

Table1. Summary of reported cases.

PMID	Donor		Recipient			
	Pneumonia	***Scedosporim* spp. culture**	**Allografted Organ**	**Clinical course**	**Outcome**	***Scedosporium* spp. culture**
7000231 Ref.8	Yes (Symptoms and chest X ray)	sputum *S. apiospermum* (+) on the day of death	1 Kidney	Kidney abscess with extensive fungal growth in kidney and along arterial anastomosis Arterial anastomosis rupture	Expired on PT16	Graft culture (-)
			2 Kidney	Kidney abscess with fungal growth	Loss of graft	Graft *S.apiospermum* (+)
25639881 Ref.9	Yes (Symptoms and chest X ray)	(-) in blood, sputum, urine culture	1 Heart	Biventricular vegetation Multifocal brain embolic infarction	Expired on PT16	blood, urine and wound culture (+) *S.aurantiacum*
			2 Kidney	Mental status change, wound dehiscence	Expired on PT36	blood, urine and wound culture (+) *S.aurantiacum*
			3 Kidney	Disseminated scedosporiosis including kidney, CNS, incision site	Expired on PT58	wound culture (+) *S.aurantiacum*
			4 Liver	Followed until PT340 without any signs of fungal infection		Unknown
			5 Liver	Followed until PT350 without any signs of fungal infection		(-)
28070441 Ref.10	Yes Chest X ray	Unknown	1 Combined kidney and liver transplant	Peritonitis with fungal infection, disseminated scedosporiosis, septic shock	Expired on PT55	Multiple specimens culture (+) *S.apiospermum*
			2 Kidney	No signs of organ scedosporiosis		
			3 Heart	No signs of organ scedosporiosis		
			4 Pancreas	No signs of organ scedosporiosis		
Our case	Unknown	Unknown	1 Heart	Invasive scedosporiosis	Expired	*Scedosporium.* Spp. (+)
			2 Kidney	Kidney fungal abscess	Loss of graft	Unknown
			3 Kidney	Kinney fungal abscess	Loss of graft	*Scedosporium.* Spp. (+)

Secondly, visceral lesions of disseminated scedosporiosis often present as multiple small abscesses and nodules. Thyroid gland, brain, kidney, heart, and lungs are reportedly the mostly involved organs.[11] Combining the previously reported donor to recipient transmission cases and our case, seven out of eight (7/8) kidney recipients and two out of three (2/3) heart recipients developed donor-derived sdedosporiosis,[8-10] indicating a higher risk of transmission in kidney and heart transplants. Although the number of overall cases is small, two isolated liver transplants and a pancreas transplant appeared doing well.[8-10]

Thirdly, routine blood, urine, and sputum cultures in near-drowning donors before transplantation can often be negative. Gross and biopsy examinations of the donor organs before transplantation usually could not detect fungal infection either. Katragkou et al. reviewed 23 cases of scedosporiosis after near drowning and revealed a slowly progressive clinical course with a mean survival time of 87 days.[3] The diagnosis was often delayed, and the median time of diagnosis was 28 days using routine fungal culture or histology examination as the diagnostic methods.[3] With a slowly progressive clinical course, there may not have enough fungi yet in the blood, sputum, urine, or other clinical specimens to be detected by routine culture before transplantation, especially when the donor dies shortly after a near-drowning event. Early detection of scedosporiosis in the recipient is also difficult. In our case, repeated blood and urine cultures remained negative even when kidney fungal abscesses were identified. The diagnosis was established only when sampling was taken directly from the abscesses. Although kidney biopsies were performed respectively at transplantation, on PT21, and on PT37, none of them successfully sampled the infected areas. Interestingly, the patient's CT scan on PT29 only showed periallograft fluid collection, but no abscesses were noted, implying a jet lag phase of the fungal organisms. The difficulties in detecting

Scedosporium spp. may attributed to factors such as the slow growth of the fungal organisms, scedosporium spp. level in the clinical specimen below the threshold of detection method, fungal proliferation as isolated foci within the organs not sampled by untargeted biopsy, or insensitivity of routine fungal culture. Whereas image study may not be useful until at the relatively late phase of the fungal infection. In the reported cases,[8-10] scedosporiosis was either diagnosed after the recipients passed away or not diagnosed until life-threatening complications occurred. Previous studies also deliberated about the lack of clinical presentations of the scedosporium spp. involved organs in the majority of the cases.[11]

Furthermore, scedosporiosis transmission in recipients resulted in high mortality. So far, no optimal treatments have been defined. Scedosporium spp. are resistant to many antifungal agents, including amphotericin B, 5-flucytosine, fluconazole, and itraconazole. Voriconazole has a relatively low minimum inhibitory concentration (MIC) for Scedosporium apiopermum and Scedosporium boydii and has been used as the first-line treatment for scedosporiosis currently. According to the three previously reported cases and our case, there are four donors to a total of fourteen organ recipients, and of these recipients, nine developed donor-derived scedosporiosis.[8-10] Among these nine recipients, six of them died despite some being treated with voriconazole, and the three survivors lost their grafts. Of note, a previous study suggested scedosporiosis was associated with 59% mortality in patients with solid organ transplantation.[10]

CONCLUSION

As shown in this and previous reports, near-drowning donors carry an increased risk for scedosporiosis transmission, especially in donors with signs of pneumonia. This is in agreement with Gomez et al.' review that donors after near-drowning present an increased risk for donor-derived filamentous fungal infections in organ transplant recipients.[12] Kidney and heart recipients are more susceptible to this donor-derived infection. Although this transmission is rare, given its high mortality rate and the challenges in timely screen and diagnosis, clinicians should be alert to the possibility of scedosporiosis transmission from near-drowning donors which will be helpful in post transplantation prevention, early recognition, and prompt management of this highly fatal infection.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare. There was no funding for this research. The work is original and has not been submitted elsewhere.

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