Invasive Fungal Infections in Renal Transplant Recipients: Epidemiology and Risk Factors

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INTRODUCTION AND AIMS: Invasive fungal infections following kidney transplantation remain a major cause of morbidity and death. Many studies have investigated the epidemiology of fungal infections in renal transplant recipients. Determining the risk factors for the development of fungal infections in this population can provide early diagnosis and treatment that may reduce mortality. Therefore, this study aimed to identify the epidemiology of invasive fungal infections, the risk factors affecting the development of infections and their prognosis in renal transplant recipients**.**

METHODS: We retrospectively evaluated all kidney transplant recipients at our center from December 1988 to June 2010. Diagnosis of invasive fungal infection was based on clinical, radiological, and specific laboratory (appropriate culture and/or histopathological examination) findings.

RESULTS: In 32 patients (10.3%) of all 313 patients (200 males, 113 females), at least one fungal infection developed after the transplantation. Of these 32 patients, a total of 36 (11.50%) fungal infection episodes developed (2 episodes in each of 4 patients). The most common pathogens causing fungal infections in our patients were Candida spp. and Aspergillus spp. The patients who developed fungal infections had significantly more advanced ages, higher diabetes mellitus (DM) rates and lower transplant duration compared to the patients without infection ($p<0.001$). The ratios of histories of CMV infection (31.3% vs. 8.5%), bacterial infection (78.1% vs. 28.5%) and hospitalization (75% vs. 32.7%) within the last 3 months before the diagnosis in patients with fungal infection were higher ($p<0.001$) than the ones without infection. According to the EORTC/MSG -2008 criteria for fungal infections, of the invasive pulmonary aspergillosis (IPA) attacks, only 1 (7.7%) was proven and 12 (92.3%) were probable. The median time to onset of the infections due to *Candida* species after the transplantation was 105 days, whereas the median time to onset of infections due to *Aspergillus* species (IPA) was 121 days. The independent risk factors associated with invasive fungal infection episodes were bacterial infection within the last 3 months (OR:15.88, 95% CI:3.90–64.73), cytomegalovirus infection (OR:18.54, 95% CI:9.01–38.17) and presence of DM (OR:6.01, 95% CI:2.95–12.25) ($p<0.001$). Bacterial infection (OR: 10.65, 95% CI:2.37-47.90, $p=0.002$) and presence of DM (OR:4.24, 95% CI:1.57-11.42, $p=0.004$) are significant independent risk factors associated with IPA. Eight patients who developed fungal infections (25%) developed graft loss following the fungal infection due to the infection itself or other reasons. This ratios was comparable with those of patients who did not develop infection (33.1%). Mortality was significantly higher among patients with fungal infections than in other patients (53.1% vs. 17.8%, $p<0.001$).

CONCLUSIONS: Consequently, the mortality of invasive fungal infections is still high in all recipients despite new and strong antifungal agents. It is difficult to diagnose and treat fungal infections early, and it can be useful to determine independent risk factors in order to identify and treat high-risk patients.

Table 1. Distribution of 36 fungal infection episodes according to posttransplant period

Fungal infection localization, n(%)	Transplant period		
	1.month	1-6 month	>6.month
Invasive pulmonary aspergillosis	0	8	5
Central nervous system infection*	0	0	2
Candidemia	1	1	1
Symptomatic urinary tract infection	1	1	2
Candida pneumonia	0	1	3
Osteomyelitis**	0	1	1
Rhinocerebral mucormycosis	0	1	1
Intraabdominal infection	2	4	0

**Aspergillus spp.* in 1 case, *Cryptococcus neoformans* in 1 case, ***Aspergillus fumigatus* in 2 case

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