Trends in the incidence and diversity of fungi recovered from urine

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Abstract

The diversity and incidence of fungal organisms recovered from the urine of patients at a tertiary level medical center was examined and compared over time. Mycologic culture records were examined for the 12 months prior to, and following the introduction of fluconazole to the hospital formulary in December 1991. 290 patients with 588 urine cultures from which fungi were recovered provided the database for this study. Candida albicans was the most common organism recovered in these cultures, followed by C. tropicalis, Torulopsis glabrata and C. parapsilosis. C. albicans was recovered alone in the urine of 54.4% of patients with funguria in the initial period and in 49.3% during the second. Funguria with T. glabrata nearly doubled (8.7% versus 17.1%) between these intervals (p < 0.05). Fungal urine cultures in the second period were also noted more frequently to grow multiple organisms (mixed cultures), and to show a greater diversity of species. Review of the prescribing of antifungal agents to these patient groups revealed no clear pattern of prior drug exposure influencing this change. Although introduction of fluconazole at this institution was associated with a trend toward the recovery of a higher frequency of fungi in the urine which are not C. albicans, no direct evidence to implicate the introduction of this important new antifungal as the cause of this phenomenon was found.

Key words: Funguria, Candiduria

Introduction

The significance of the recovery of fungi from the urine of patients is not clearly understood. Fungal growth may represent contamination, bladder colonization, fungal bezoar, primary renal infection, or disseminated mycosis. The frequency at which fungi are recovered in urine samples ranges from less than one to eight percent [1–4]. Among the organisms identified, Candida species are the most common. Other fungi found in urine include Aspergillus spp., Blastomyces dermatitidis, Cryptococcus neoformans, Coccidioides immitis, Geotrichum spp., Histoplasma capsulatum, Malassezia furfur, Paecilomyces spp., Penicillium spp., Rhodotorula rubra, Torulopsis glabrata, T. pintolopesii, Trichosporon spp., and zygomycetes. In order of decreasing incidence, Candida albicans, Torulopsis glabrata and other candidal species are most commonly isolated [2, 5]. In pooling data from seven separate studies, Odds [6] found C. albicans (55.4%), T. glabrata (20.2%), C. tropicalis (8.9%), and C. parapsilosis (4.1%) to be the four most common isolates. C. tropicalis was the most frequently recovered organism in one surveillance study of 89 immunocompromised patients [7]. C. albicans and T. glabrata can be found as colonizers of the skin, gut and vagina in healthy subjects.
The effect of selective pressure by antibiotics on the normal bacterial flora leading to the development of antimicrobial resistance is well known. Much less is known about the effect that antifungal therapy exerts on fungal resistance. Although the development of resistance to 5-fluorocytosine by yeasts is well documented, the consequences of selective pressure secondary toazole exposure is less well studied. Recent data from AIDS patients has shown the selection of less susceptible strains of \textit{C. albicans} in response to long-term fluconazole therapy of thrush and esophagitis [8, 9]. Study of prophylaxis with this drug in bone marrow transplant recipients has been associated with increase in both colonization and infection with \textit{C. krusei} and \textit{T. glabrata} [10, 11]. The effect of exposure of the newer antifungals on organisms recovered from other body sites is not known. In our study, we examined the diversity and incidence of fungi recovered in urine cultures over two separate one-year periods. The introduction of the new triazole, fluconazole, to the hospital formulary was used as the time point to divide these two groups for comparison.

Methods

Urine cultures growing fungal organisms were identified by searching the hospital computerized laboratory database for 1990–1992. Patient and culture information was recorded for each identified specimen. Patient information included name, unique identifier, age, and sex. Organism(s) recovered, unique culture identifier, and date of processing were recorded for each specimen. These data were examined for the year prior to the introduction of fluconazole (Diflucan\textsuperscript{®}), December 1990 – November 1991, and for the year which followed (1992). Exposure of these patients to antifungal agents was determined by searching the pharmacy database for outpatient prescriptions or inpatient therapies which included amphotericin B or fluconazole. Yeasts recovered were speciated by employing carbohydrate assimilation profiles (API-20C, bioMerieux Vitek, Inc., Hazelwood, MO). Mycelial fungi were identified by microscopic and colonial morphology. Identification of asexual fruiting structures was performed by direct mounts into lactophenol cotton blue and by various other preparations, including slide culture. Incidence data for each 12-month period was compared employing chi-square analysis (Statistix\textsuperscript{®} 4.0, Analytical Software, St. Paul, MN).

Results

Of the 46,434 urine samples cultured in 1991 and 1992, fungi were recovered in 1.3% (1.16% of 24,278 in 1991, 1.37% of 22,156 in 1992). In the two time periods studied a total of 290 patients with 588 urine cultures which grew fungi were identified. Five of these 290 patients had funguria in both time periods and thus appear in both groups. Characteristics of these patients are noted in Table 1. In the first period 15 species of fungi in 19 combinations (solitary or mixed cultures) were recovered in urine (Table 2). In the second period 20 species in 27 combinations were recovered in urine (Table 3). The increase in recovery of \textit{T. glabrata} between these time periods was statistically significant ($\chi^2 = 4.63$, $P = 0.0313$). No statistically significant change was noted the incidence of \textit{C. albicans}, \textit{C. tropicalis}, or \textit{C. krusei} at our institution. Study of the use of amphotericin B and/or fluconazole in these patients revealed a significant increase ($\chi^2 = 33.23$, $P = 0.0000$) in use of antifungals in the second group (33.6% vs. 6.7%).

Previous antifungal therapy in patients with positive urine cultures was not noted in the first time period, and was only seen in 10 patients (6.9%) in the second ($\chi^2 = 10.56$, $P = 0.0012$). Of these therapies only three occurred greater than one week prior to funguria noted at our institution. Neither \textit{T. glabrata} nor \textit{C. krusei} was isolated from any of these ten cultures.

Discussion

A broad diversity of fungal organisms was seen over the short duration of our study. Increase in both the number of species recovered and also the number and variety of mixed cultures was seen over these 25 months. The overall incidence of funguria did not change significantly during the study.

Although many risk factors for funguria have been suggested, factors which influence the specific fun-