Journal of Hospital Infection 86 (2014) 267–271

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Cluster of *Fusarium verticillioides* bloodstream infections among immunocompetent patients in an internal medicine department after reconstruction works in Larissa, Central Greece

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ARTICLE INFO

Article history:
Received 11 September 2013
Accepted 28 January 2014
Available online 27 February 2014

Keywords:
Fusarium verticillioides
Reconstruction
Nosocomial outbreak

SUMMARY

Background: *Fusarium* spp. can cause disseminated infections, particularly in immunocompromised patients. *Fusarium verticillioides* is a human pathogen, and sporadic cases of fusariosis have been reported.
Aim: To report a nosocomial cluster of *F. verticillioides* bloodstream infections among seven immunocompetent inpatients following reconstruction works.
Methods: Identification was performed using macroscopic and microscopic morphology, and molecular assays (sequencing the nuclear ribosomal internal transcribed spacer region and translation elongation factor-1α gene). Susceptibility testing was performed in accordance with the guidelines of the Clinical and Laboratory Standards Institute. Environmental surveillance specimens were taken and cultured on Sabouraud dextrose agar plates.
Findings: In total, 16 blood cultures obtained from the seven patients were positive for *F. verticillioides*. All surveillance cultures were negative.
Conclusions: In order to prevent fungaemia, it is important to implement effective infection control measures, before, during and after demolition and construction activities in healthcare settings.

Introduction

Fusarium spp. are filamentous fungi, widely distributed in soil and plants, that can infect humans and animals, causing superficial locally invasive or disseminated disease.[1,2] Infection is mainly through inhalation of air-borne conidia or via breaks in the skin due to trauma and/or burns. Contamination of hospital

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0195-6701/$ – see front matter
http://dx.doi.org/10.1016/j.jhin.2014.01.011

water systems has been reported to result in dispersal of airborne conidia.[3] Patients undergoing haematopoietic stem cell transplantation or solid organ transplantation, those with haematological malignancies and those undergoing immunosuppressive therapy are at high risk of fusariosis.[4] Although *Fusarium verticillioides* (formerly *Fusarium moniliforme*) is considered to be one of the most common *Fusarium* spp., information regarding its clinical significance is limited, and is mainly found in case reports of infections in immunodeficient patients.[5,6] This article describes a cluster of *F. verticillioides* bloodstream infections among immunocompetent patients in an internal medicine department in Central Greece following reconstruction works, and the control measures implemented.

Methods

Setting

The study institution is a 650-bedded tertiary care hospital that serves a population of approximately one million people. The internal medicine department has 44 beds distributed in five four-bedded units, nine two-bedded units and six single rooms. All 20 rooms are on the same floor, and none of the rooms have high-efficiency particulate air filters or negative pressure.[7] The internal medicine department admits patients 24 h/day, four days/week, making simultaneous evacuation of the entire unit impossible.

Reconstruction works

The floors of all rooms in the internal medicine department were reconstructed over a seven-day period (1st–7th November 2012). Each day, three different rooms were evacuated for reflooring. The air-conditioning unit of each room was dismantled and disinfected. Additional measures, such as sealing rooms with plastic coverings, were not implemented. After renovation, each room was cleaned thoroughly and aerated for 24 h before the return of the patients; no environmental cultures were taken at this time. After the outbreak, all rooms in the internal medicine department were disinfected with quaternary ammonium fungicidal compounds, and surveillance cultures were taken.

Patients

Between 8th and 26th November 2012, seven cases of fever with fungaemia occurred among inpatients in the internal medicine department. These patients were distributed in four closely located rooms. All patients were elderly males (median age 77 years, range 63–86 years). According to their clinical data, none of the seven patients were malnourished. Six of the seven patients did not have any risk factors for fusarium infection, such as neutropenia, or hepatic or renal insufficiency.[8,9] One patient with idiopathic thrombocytopenic purpura was on methylprednisolone therapy. Epidemiological data of the patients and final outcomes are shown in Table I.

Surveillance specimens during the outbreak

After the third case of fungaemia, environmental swab samples were taken in all rooms of the internal medicine department, before and after disinfection, in order to identify the source of the outbreak. Swabs were taken from consumables, benches, incubators, porous materials (e.g. blankets and

Table I
Clinical characteristics and outcome of patients with fusariosis, Larissa, Greece, 8th–26th November 2012 ($N = 7$)

Age in years/sex	Date of admission	Cause of admission	Date of positive blood cultures	Source of positive blood cultures	Treatment	Outcome	Comments
74/M	02/11/2012	UTI/BSI[a]	08/11/2012 26/11/2012	Peripheral	Yes	Death	Date of death 01/12/2012
85/M	02/11/2012	UTI/BSI[b]	12/11/2012 29/11/2012	Central venous catheter	Yes	Survival	Discharged 12/12/2012
86/M	08/11/2012	Endocarditis–spondylodiscitis[c]	13/11/2012	Peripheral	No	Death	Date of death in ICU 20/11/2012
70/M	15/09/2012	ITP	17/11/2012 04/12/2012 09/12/2012	Peripheral	Yes	Death	Date of death 11/12/2012
63/M	13/10/2012	Pneumonia[d]	18/11/2012 02/12/2012 05/12/2012	Peripheral	Yes	Death	Date of death in ICU 12/12/2012
82/M	10/11/2012	Pneumonia[e]	20/11/2012 09/12/2012	Peripheral	Yes	Survival	Discharged 30/12/2012
80/M	18/11/2012	BSI[f]	26/11/2012 06/12/2012 08/12/2012	Central venous catheter	Yes	Survival	Discharged 07/01/2013

M, male; UTI, urinary tract infection; BSI, bloodstream infection; ICU, intensive care unit; ITP, idiopathic thrombocytopenic purpura.
[a] Due to *Klebsiella pneumoniae*.
[b] Due to *Proteus* spp.
[c] Due to *Staphylococcus aureus* (meticillin sensitive).
[d] Due to *K. pneumoniae* and *Serratia marcescens*.
[e] Due to *S. marcescens*.
[f] Due to *Proteus* spp., *Escherichia coli* and *Providencia stuartii*.