The Yield of Fungal Surveillance Cultures in Pediatric Hematopoietic Stem Cell Transplant Patients: a Retrospective Analysis and Survey of Current Practice.

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ABSTRACT

Background: Fungal surveillance cultures (FSC) have been proposed as predictors for development of systemic fungal infections (SFI) and identifiers of the causative organism, although data supporting these are limited and pre-date universal initiation of anti-fungal prophylaxis.

Aims: To define the epidemiology of fungal colonization and investigate the utility of FSC for predicting SFI in pediatric hematopoietic stem cell transplant (HSCT) recipients.

Methods: FSC performed from 2005-2011 on HSCT patients, laboratory, and clinical data were reviewed, and incidence of SFI determined. Descriptive analyses of culture results were performed to determine the yield of FSC and their utility. A web-based survey of national pediatric HSCT providers was undertaken to evaluate current practice and the relevance of our results.

Results: 5,618 FSC from nares, throat and stool in 360 patients were processed. 14.8% were positive: 30.3% stool cultures, 13.2% throat and 0.9% nares. 64.4% of patients had one or more positive FSC. 31 (8.6%) patients had SFI. SFI occurred in 7.9% and 10.9% of patients with positive and negative FSC respectively (p=0.245). Antifungal coverage was changed in 69 patients (29.9%) following positive FSC. 8.6% developed SFI (2/6 pathogen concordance with FSC) compared to 6.7% (p=0.59) that had no treatment change (3/11 concordance). The response rate to the survey was 70.8%; 40% of institutions reported performing routine FSC. 25% of providers would not change management based on FSC results; overall rating of usefulness of FSC was low.

Conclusions: While FSC are commonly performed for pediatric HSCT patients, they have limited utility for predicting SFI.

BACKGROUND

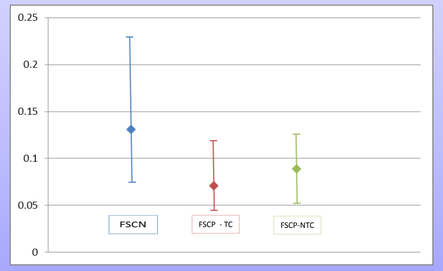
- Systemic fungal infections (SFI) remain a significant cause of morbidity and mortality in children receiving hematopoietic stem cell transplantation (HSCT
- SFI cause 53% of infection-related mortality in a recently published large cohort of pediatric HSCT recipients
- Fungal surveillance cultures (FSC) have been proposed to predict development of SFI and to identify the causative organism.
- A limited number of studies have shown conflicting results with regard to the clinical value of FSC.
- Guidelines issued by several professional societies, including the IDSA, state that performing fungal surveillance cultures is not indicated for asymptomatic HSCT recipients.
- Nonetheless, post transplant FSC are routinely performed in many centers.

OBJECTIVES

- To define the epidemiology of fungal colonization.
- To investigate the utility of FSC for predicting SFI in HSCT recipients.
- To ascertain the relevance of our findings by surveying HSCT providers across the country about their FSC practice

Figure 1. Rates (with 95% C.I.) of invasive fungal disease per 1000 days of at-risk follow up among 360 hematopoietic stem-cell transplant patients.

FSCN=fungal surveillance cultures negative; FSCP-TC=fungal surveillance cultures positive, treatment changed within 48 hours of first positive result; TSCP-NTC = fungal surveillance cultures positive, no treatment change.



METHODS

Settings and Practice

- The joint Pediatric Stem Cell Transplantation Program at Dana-Farber Cancer Institute and Boston Children's Hospital Cancer.
- All patients are routinely cultured for fungi at three sites (nares, throat and stool) weekly until discharge.

Data collection

- The laboratory electronic records were queried for all results of FSC from January 1, 2007 to December 31, 2011 of patients that underwent HSCT.
- We reviewed medical and laboratory records for date of HSCT, type of transplant, change in antifungal management following SFC and SFI.

Survey

- To assess prevalence of use of FSC in different institutions and the relevance of our findings to other HSCT centers in the country, we conducted a web-based survey of FSC practice among pediatric transplant providers.

RESULTS

Surveillance Cultures

- A total of 5,618 FSC from 360 discrete HSCT patients were processed in our lab between 2007-2011 (table 1).
- The median number of cultures obtained per patient was 16 with a range of 1-72. 232 patients (64.4%) had at least one positive FSC

Table 2. Organisms recovered from fungal surveillance cultures performed on hematopoietic stem-cell transplant patients (January 2007-December 2012).

	Stool Cultures	Throat Cultures	Nares Cultures	TOTAL (% POSITIVE CULTURES)
C. albicans	201	87	11	299 (35.8)
C. glabrata	133	65	1	199 (23.8)
C. parapsilosis	46	32	0	78 (9.3)
C. lusitaniae	30	11	0	41 (4.9)
C. krusei	25	11	0	36 (4.3)
C. tropicalis	9	8	2	19 (2.2)
C. guilliermondii	9	1	0	10 (1.2)
C. kefyr	8	1	0	9 (1.0)
C. dubliniensis	2	0	0	2 (0.2)
C. lipolytica	1	0	0	1 (0.1)
C. rugosa	0	1	0	1 (0.1)
Candida not further identified	21	7	1	29 (3.4)
All *Candida spp.*	485	224	15	724 (86.9)
Saccharomyces cerevisiae	49	23	2	74 (8.8)
Mucoraceae	2	0	0	2 (0.2)

Systemic Fungal Infection

- 31 (8.6%) patients had SFI: 8 (25.8%) with *C. albicans*, 8 (25.8%) with *C. lusitaniae*, 2 (6.4%) each with *C. glabrata*, *C. krusei* and *C. tropicalis*. Three (9.6%) patients had invasive disease with *A. fumigatus*, and one patient (3.2%) each with *S. cerevisiae*, Penicillium species, Fusarium species, and Scopulariopsis species.

Survey Results

- We received 51 complete responses (70.8% response rate) from HSCT providers at 40 institutions in the United States and Canada (Table 3).
- 16 (40%) pediatric HSCT programs routinely perform FSC after transplant.

Table 1. Fungal surveillance cultures from HSCT patients, Boston Children's Hospital, January 2007 – December 2011.

	Stool Cultures	Throat Cultures	Nares Cultures	All Sites
Total Cultures Performed	1874	1870	1874	5618
Positive Cultures n(%)	569 (30.3)	247 (13.2)	17 (0.9)	833 (14.8)

Table 3. Results of survey of practice among national pediatric hematopoietic stem-cell transplant providers.

		Results among providers practicing routine FSC	Results among providers not performing FSC	Results among all providers	P
[a]Do you routinely perform FSC after HSCT?	Yes	N/A	N/A	16 (40)	
	No	N/A	N/A	24 (60)	
[a]What body sites are commonly swabbed?	Stools	14 (87.5)	N/A	N/A	
	Throat	12 (75)			
	Nares	4 (25)			
	Groin	4 (25)			
	Axillae	2 (12.5)			
[a]How often do you routinely perform FSC after HSCT?	>2 times a week	0 (0)	N/A	N/A	
	Weekly	16 (100)			
	< once a week	0 (0)			
[a]How long after transplant do you continue FSC?	Until engraftment	2 (12.5)	N/A	N/A	
	Until discharge	6 (37.5)			
	Until discharge and whenever patient is readmitted	6 (37.5)			
	Other	2 (12.5)			
[a]How will a positive FSC influence your management of an asymptomatic patient?	I will change prophylactic treatment to target the organism.	4 (25)	N/A	N/A	
	It will not change management in any way	4 (25)	N/A	N/A	
	In case of future symptoms I will target the cultured organism	8 (50)	N/A	N/A	
[b]Rate the overall clinical usefulness of routine FSC? (scale 0-100)	N/A	24; 0-96	25; 0-55	N/A	0.39

[a]n(%), [b]median; range. FSC=fungal surveillance cultures

CONCLUSIONS

- FSC were of limited clinical value in providing treatment guidance in pediatric HSCT patients.
- Stool cultures showed the highest yield for identifying fungal colonization, but did not predict the causative pathogen in SFI.