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Outcomes of Pediatric Patients with Invasive Fungal Rhinosinusitis

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Introduction

Acute invasive fungal rhinosinusitis (IFRS) manifests almost exclusively in severely neutropenic individuals, most commonly from therapy-induced immunosuppression, and is challenging to manage. This study seeks to describe the mortality of pediatric patients who have undergone biopsy for suspected IFRS, compared with a control population of otherwise similar patients, and to describe the impact of the biopsy result and other clinical factors on mortality.

Methodology

This is a single-site three arm retrospective review of mortality among patients undergoing sinonasal biopsy for suspected IFRS, with a control group of similar patients for whom IFRS was not suspected. Data collected and descriptively summarized for this study included date and result of sinonasal biopsies, date and cause of death in patients who received biopsies, and mortality among controls. Other clinical data examined for possible impact on mortality included underlying diagnosis, time from most recent major oncologic event, number of doses of corticosteroids within 30 days prior to biopsy, species of fungus, and number of days the absolute neutrophil count fell below 100 cells/uL. Comparisons for mortality were made across all variables using chi-square or Fisher's Exact tests.

Characteristics of patients who underwent biopsy (N = 37)

Clinical Characteristics of patients who underwent biopsy	
Male, N (%)	21 (56.8)
Race or ethnicity, N (%)	
Caucasian	29 (78.4)
African American	1 (2.7)
Multiracial	0 (0.0)
Hispanic	5 (13.5)
Other	1 (2.7)
Asian	0 (0.0)
Biopsy results	
Patients with positive biopsy, N (%)	17 (45.9)
Patients with negative biopsy, N (%)	20 (54.1)
Mortality rate, N (%)	
Patients with positive biopsy	5 (29.4)
Patients with negative biopsy	8 (40.0)

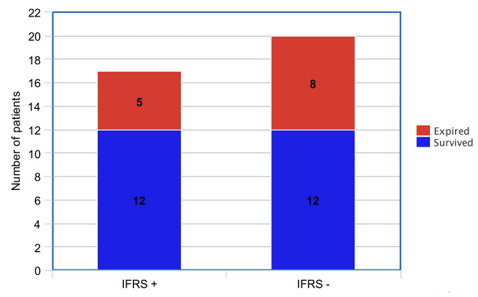
IQR, interquartile range

Results

1. Mortality was higher among patients undergoing biopsy to rule-out IFRS (35.1%) compared to a control cohort (9.72%) ($p<0.05$)

2. A positive biopsy did not increase the mortality rate relative to those with a negative biopsy, and most biopsy positive patients did not die of IFRS ($p=0.501$)

Mortality of patients undergoing biopsy for IFRS



3. Among biopsy patients, survival was highest for patients with initial-diagnosis ALL compared to the overall cohort, while all patients with relapsed ALL expired

Descriptive demographics for biopsied patients by mortality

	Mortality	
Diagnosis	**Yes (n=13), N (%)**	**No (n=24), N (%)**
ALL-Initial	2 (15.4%)	15 (62.5%)
ALL-Relapse	5 (38.5%)	0 (0.0%)
AML-Initial	1 (7.7%)	1 (4.2%)
Aplastic anemia	1 (7.7%)	1 (4.2%)
Bone Marrow Transplant: Graft vs Host Disease	2 (15.4%)	3 (12.5%)
Bone Marrow Transplant: No graft vs host disease	2 (15.4%)	2 (8.3%)
NHL-initial	0 (0.0%)	2 (8.3%)

4. Other clinical factors examined (fungal species, doses of corticosteroids, duration of neutropenia, time from most recent major oncologic event) were not shown to impact survival

Conclusions

Patients requiring biopsy to rule out IFRS are at high risk of all-cause mortality, demonstrating significantly higher mortality than a control cohort of similar patients with no history of biopsy. Biopsy result did not appear to impact mortality in our cohort. Rather than diminishing the relative risk of a diagnosis of IFRS, these data suggest that among IFRS negative patients, other disease processes that contributed to a need for biopsy to rule out IFRS may also increase mortality in a manner similar to IFRS. The high mortality among biopsy negative patients implies a high degree of urgency to identify and treat the underlying source of fevers, suggesting expeditious biopsy is important even if ultimately negative. Additionally, the insight that initial-diagnosis ALL patients demonstrated a better prognosis than our overall biopsy cohort, while relapsed-ALL patients requiring biopsy demonstrated a dismal prognosis, may be useful for clinicians while counseling family members or caretakers.

Future Directions

Future plans for this study include assessing the differences in the time from MOE to death as well as time from biopsy to death through use of the Kaplan-Meier estimator with log-rank tests or through Cox Proportional Hazards Regression Analysis.

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