Fungal Infections and Antifungal Use After Blast and Thermal Injury

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Introduction

- Invasive fungal wound infections (IFI) have been reported after combat-related blast injury sustained in recent wars in Iraq and Afghanistan
- Most common fungi/molds include *Mucor*, *Fusarium,* and *Aspergillus*
- Risk factors for IFI include:high-energy wounding mechanisms, traumatic above-the-knee amputations, >20 units of packed red blood cells transfused within 24 hours after injury, decreased nutritional status, environmental pathogens in soil and water
- Systemic antifungal agents are commonly used as an adjunct to urgent surgical debridement
- The Joint Trauma System (JTS) Clinical Practice Guidelines recommend the early use of combination antifungal therapy if fungal infection is suspected, which does not come without risk

Objectives

The primary objective of this study was to describe fungal infections, systemic antifungal use, and possible adverse effects of these agents in blast-injured patients admitted to our burn center between 2004 and 2019.

Methods

- Approved PI project
- Retrospective chart review
- Inclusion criteria:
    - Admitted between January 1, 2004 and February 28, 2019
    - Received a systemic antifungal agent
- Mechanism of injury was screened and subjects who had a blast-related injury were included.
- Data that were normally distributed were reported as means ± SD, and data that were not normally distributed were reported as medians and interquartile ranges (IQR)

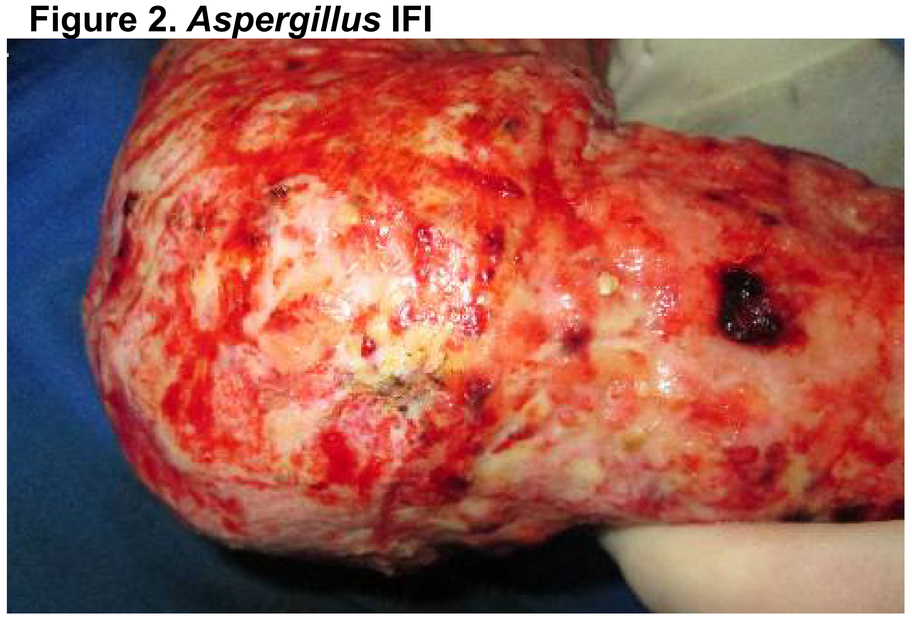
Results

Table 1. Demographic characteristics

Demographic Characteristic	n=81
Age, years, mean ± SD	27.4±7.8
Male gender, n (%)	79 (97.5%)
Active duty at time of injury, n (%)	75 (92.6%)
% TBSA, median (IQR)	51.4±25.3
Inhalation injury, n (%)	35 (43.2%)
Etiology of blast, n (%)	
IED	59 (72.8%)
Unspecified	8 (9.9%)
Other	6 (7.4%)
RPG	4 (4.9%)
Mortar	3 (3.7%)
EFP	1 (1.2%)
Hospital LOS, days, median (IQR)	78 (38, 145)
ICU LOS, days, median (IQR)	49 (27, 78)
Number of operations, median (IQR)	9 (5, 13)
Died during hospital stay, n (%)	27 (33.3%)

Figure 1. *Mucor* IFI

Figure 2. *Aspergillus* IFI



- 48% of subjects had multiorganism infections
- Fungal isolates:
    - *Aspergillus* (n=148)
    - *Candida* (n=106)
    - *Fusarium* (n=16)
    - *Mucor* (n=12)
- Histopathology results:
    - 48 subjects (59.3%) had fungus in non-viable tissue
    - 18 subjects (22.2%) had fungus in viable tissue
    - 12 subjects (14.8%) had fungal angioinvasion
- Combination antifungal therapy was utilized in 22 patients (27.2%)
    - Liposomal amphotericin B + voriconazole
    - Fluconazole + caspofungin
    - Liposomal amphotericin B + fluconazole
    - Voriconazole + caspofungin
- Incidence of AKI was 22.2%. Subjects who received combination antifungal therapy had a significantly higher rate of acute kidney injury, as compared to subjects who received monotherapy (3.6% vs 45.5%; p=0.002)
- Incidence of transaminitis was low at 3.7% and was not significantly different between subjects who received combination therapy vs. monotherapy (4.5% vs 3.4%; p=0.806)

Conclusions

In blast-injured burn patients, systemic antifungal therapy was initiated most often out of concern for invasive fungal wound infection. Combination therapy resulted in a higher incidence of AKI. Despite the use of antifungal agents, these patients had a high mortality rate of 33%. Further research is needed to determine the optimal systemic antifungal regimen.

References

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