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Predisposing factors for candidemia in patients with major burns

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ABSTRACT

Background: Despite advances in surgery and critical care, candidemia remains a significant cause of morbidity and mortality in patients with extensive burns.

Methods: A retrospective single-center cohort study was performed on 174 patients admitted to the Burn Intensive Care Unit of the General Hospital of Vienna (2007–2013). An AIC based model selection procedure for logistic regression models was utilized to identify factors associated with the presence of candidemia.

Results: Twenty (11%) patients developed candidemia on median day 16 after ICU admission associated with an increased overall mortality (30% versus 10%). Statistical analysis identified the following factors associated with proven candidemia: younger age (years) odds ratio (OR):0.96, 95% confidence interval (95% CI):0.92–1.0, female gender (reference male) OR:5.03, 95% CI:1.25–24.9, gastrointestinal (GI) complications requiring surgery (reference no GI complication) OR:20.37, 95% CI:4.25–125.8, non-gastrointestinal thromboembolic complications (reference no thromboembolic complication) OR:17.3, 95% CI:2.57–170.4 and inhalation trauma (reference no inhalation trauma) OR:7.96, 95% CI:1.4–48.4.

Conclusions: Above-mentioned patient groups are at considerably high risk for candidemia and might benefit from a prophylactic antifungal therapy. Younger age as associated risk factor is likely to be the result of the fact that older patients with a great extent of burn body surface have a lower chance of survival compared to younger patients with a comparable TBSA.

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1. Background

Major burns are still associated with a considerably high morbidity and mortality [1]; however due to the advances in surgery and intensive care the survival among burn patients was significantly improved in recent years [1–4]. As a result of the extended survival, patients with extensive burns are increasingly exposed to a high risk of infectious complications [1]. It is commonly accepted that due to the large wound areas, burn patients are vulnerable to local and systemic infections. Previously, Williams and colleagues concluded that sepsis is the leading cause of late death after burn [3].

Thermal injury alone induces alterations in multiple inflammatory parameters, leading to physiological changes such as tachycardia, tachypnea and a raise in body temperature [5,6]. Because of the severe metabolic and physiologic response, it is a challenge to diagnose bacterial or fungal sepsis early in burn patients [6]. The gold standard for diagnosis of candidemia is still blood culture that implies at least 48 h for the growth of the organism [2,7]. Consequently it was previously suggested that there is a need for better diagnostic tools such as PCR technique that make an early diagnosis and timely therapy start possible [2,8].

In the last decades a decrease of bacterial- and an increase of opportunistic fungal infections among burn patients were observed. A reason for this observation might be an increased early use of broad-spectrum antibacterial agents [1,2,9]. Septic complications due to fungal infections in burn patients represent a therapeutic and diagnostic challenge and are associated with high mortality rates [2,10]. As main fungal pathogen, *Candida albicans* is the fourth most common pathogen isolated from blood cultures in an intensive care setting [2,9,11,12].

Although several epidemiological studies were performed to assess clinical risk factors for invasive *Candida* infections in long-term intensive care patients, burn patients were only rarely studied. In the past, it was suggested that the risk for candidemia increases with a greater total burn surface area (TBSA), burn-associated hyperglycemia, the usage of central venous catheters, the occurrence of bacteremia and prior antibacterial therapy, advanced patient age and a longer hospital stay [2,9,13–16].

To identify factors associated with proven candidemia in this special patient population, we conducted a 6-year retrospective cohort study in the General Hospital of Vienna, Austria.

2. Methods

2.1. Study population

After approval by the local ethics committee (EC No. 1295/2013), a retrospective single-center cohort study was performed on burn patients who were admitted to the 5 bed Burn Intensive Care Unit of the General Hospital of Vienna, Austria between May 2007 and August 2013.

2.2. Study design and data collection

Patients who suffered from larger burns, had an abbreviated burn severity index (ABSI) [17] ≥6, and stayed at the ICU for at least 24 h met the general inclusion criteria for this study. To identify the influence of candidemia on survival only patients with a survival of more than 7 days were included into the study.

Candidemia was defined as the presence of at least one positive blood culture for any *Candida* sp. Patients were categorized into two groups based on their final outcome. Group I consisted of subjects in whom candidemia occurred; Group II consisted of subjects in whom candidemia did not occur (Fig. 1).

Clinical data were recorded and analyzed according to age, gender, underlying illnesses, systemic antifungal therapy, inhalation trauma, number of surgical procedures, type of combustion, TBSA, ABSI, cause of death, gastrointestinal and non-gastrointestinal thromboembolic complications, kidney failure, days spend in the ICU, days until candidemia, systemic antifungal agents, days until antifungal therapy, days until parenteral antibiotic prophylaxis, number of antibiotic agents previous candidemia, type of *Candida* sp., bacteremia and days until first detection of *Candida* sp. in wound swab, bronchial secretion, stool or urine.

2.3. Statistical analysis

Continuous data were described with median, minimum and maximum. Categorical data were described with absolute and relative frequencies. A stepwise AIC based variable selection was conducted to identify factors associated with the presence of candidemia. Therefore we formulated a logistic regression model of determinants of candidemia explained by age (years), total body surface area (TBSA), number of surgical procedures, number of gastrointestinal (GI) complication, number of non-GI thromboembolic complications, inhalation trauma,

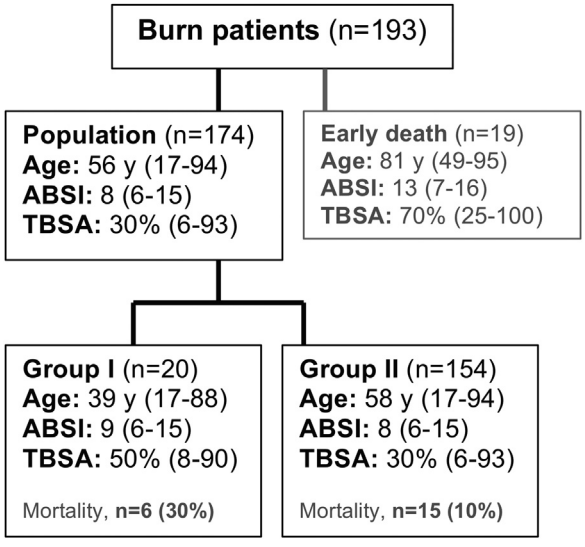

Fig. 1 – Flow chart of the study population. Data are given as median (minimum–maximum). Group I = patients with candidemia; Group II = patients without candidemia;.