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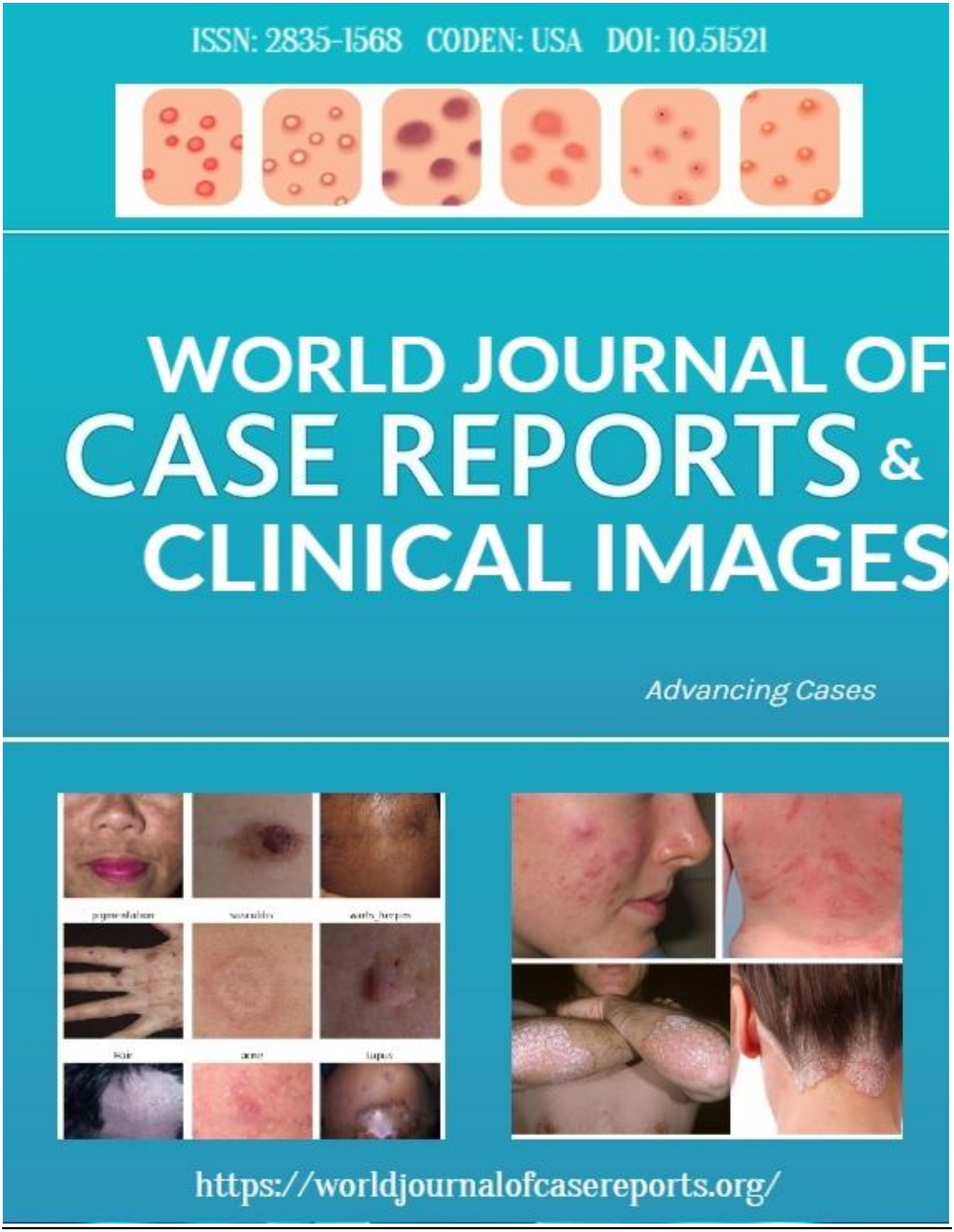

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A CASE REPORT

Disseminated *Trichosporon asahii* Infection in an Immunocompetent Polytrauma Patient; A Case Report

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Abstract

Trichosporon asahii is a yeast-like opportunistic pathogen known to cause many infections. It is known to cause infections in immunocompromised patients with hematologic malignancies and those who develop neutropenia secondary to cytotoxic drugs. We report a case of a 35-year-old man with no previously known comorbid who presented at our ED with polytrauma and full-thickness burns covering 20% of the total body surface area (TBSA). Despite being previously healthy, we explored several factors that made our patient susceptible to T asahii infection, including full-thickness burns, polytrauma, indwelling catheters, and massive blood transfusions. The definitive route of infection remains unclear, however case reports like ours can shed light on modifiable risk factors in patients.

Keywords: Polytrauma, Fungemia, Burn, Trichosporon asahii, Indwelling catheters

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Introduction:

The yeast-like fungus *trichosporon asahii* is ubiquitous throughout nature and has been identified as part of the natural microbiota of human skin, as well as the respiratory tract, gastrointestinal (GI) tract, and vagina [1,2]. It is an opportunistic pathogen known to cause various infections that span from superficial in immunocompetent hosts to invasive trichosporonosis in immunocompromised hosts [1]. The most fatal infections typically affect those with invasive devices or hematologic cancers [1]. However, rare cases of life-threatening *T. asahii* fungemia have been reported in immunocompetent patients with polytrauma or high total body surface area burns [3,4].

This report describes the case of a 35-year-old with no past medical history who presented to the emergency department (ED) after a motor vehicle collision (MVC) that resulted in the ignition of his vehicle. He had full-thickness 3rd degree burns that covered 20% TBSA and several abdominal and thoracic injuries, including diaphragmatic and GI tract perforations. The patient required multiple units of blood products and underwent six surgeries before blood culture was positive for *T. asahii* infection on day 20 of admission. Considering this fungus as a potentially fatal cause of infection in previously immunocompetent polytrauma patients is essential. The mechanism through which these patients develop invasive *T. asahii* infection has yet to be elucidated, but case reports such as this one could shed light on clinical similarities and identify modifiable risk factors.

Case Presentation:

A 35-year-old Caucasian male, not known to have any comorbid conditions, presented to our ED with an MVC (truck vs tree). It was reported that the patient was driving an SUV at a high speed and struck a tree with subsequent ignition of the vehicle. He was extricated by a bystander and rolled on the ground to extinguish the fire. He arrived at the ED with Glasgow coma scale (GCS) of 3/15. Urine was positive for amphetamines at admission. He was bradycardic (HR: 46 beats/min), hypotensive (BP: 63/30 mmHg), absent breath sounds bilaterally, and in acute distress due to multiple injuries, including full thickness burn involving 20% of total body surface area (TBSA) on the right side (Figures A, B & C), open pelvic deformity, open fractures of femur, tibia and fibula (Figure D), multiple rib fractures (Figure E) and transverse processes L1-L4 fractures. Initial CT scan revealed a small left pneumothorax, left diaphragmatic injury (Figure F), perisplenic hemorrhage with splenic laceration, hematoma next to left kidney and concern for traumatic bladder injury. In the ED, he was immediately intubated and sedated, which improved his oxygen saturation.

Fluid resuscitation using the parkland formula was started within one hour of injury. Massive blood transfusion protocol was also initiated and he received 29 units of packed red blood cells (PRBC), 25 units of fresh frozen plasma (FFP), 30 units of platelets, and 45 units of cryoprecipitate in the first 48 hours of the ED admission. He was taken to the OR for exploratory laparotomy, splenectomy, diaphragm repair (diaphragm injury shown in (Figure F), chest tube placement, and abdominal packing. He was shifted to intensive care and subsequently underwent six laparotomies in the next few days and surgeries, including excision and debridement (E&D) of the right tibia and fibula, rib plating, ORIF medial malleolus, external fixation right pelvic injury, cholecystectomy secondary to gangrenous gallbladder. He developed a fever on day 7, and blood cultures were growing Kliebsiella and enterobacter; he was started on vancomycin, cefepime, and flagyl and was later switched to linezolid and meropenem. E&D of the right upper extremity and right lower extremity and application of cadaver skin on the burn injury were also performed, and he was found to have purulent discharge on cadaveric skin, which was sent for cultures. He was found to have *trichosporon asahii* and fusacurium growth on bone, blood, sputum, and tissue cultures on day 20 of admission. He was started on amphotericin and isavuconazonium. During his ICU course, apart from undergoing multiple surgeries, he developed acute kidney injury (AKI) and started on continuous renal replacement therapy (CRRT) secondary to rhabdomyolysis, gastrojejunostomy tube placement, and tracheostomy tube placement. He developed multiple complications, including GI bleed, bowel perforation, and deep venous thrombosis (DVT) of the left lower extremity. He underwent right below knee amputation (BKA) and removal of infected hardware due to disseminated fungal infection. He also developed necrotizing pneumonia and loculated pericardial effusion. Amphotericin and

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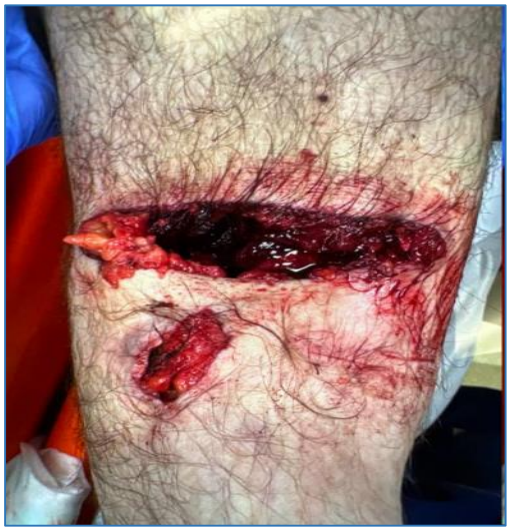
isavuconazonium were discontinued after 18 days, and he was started on voriconazole. Voriconazole levels were monitored, and it was switched to posaconazole after he developed transaminitis. Posaconazole was planned to be continued to complete a six-month course. However, given the patient's deteriorating condition over the next few days, the patient's do not resuscitate order was implemented, and he was put on comfort measures; the patient subsequently expired on the day 150 of admission.

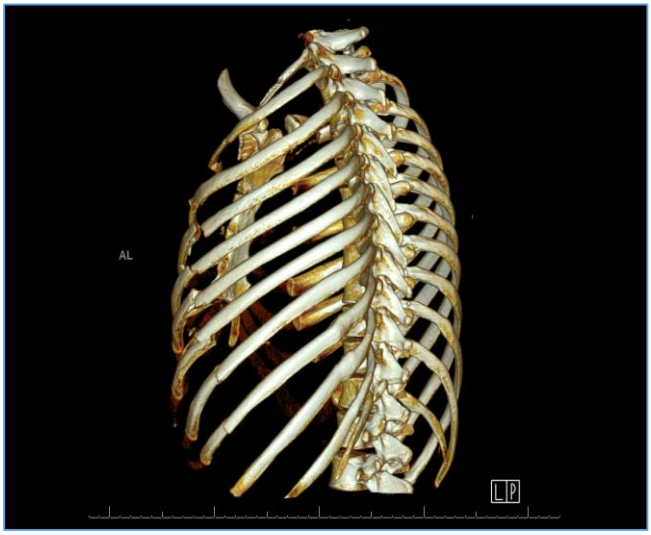
A: Right Flank Burns

B: Right Leg Burns

C: Right Flank and Upper Limb Burns



D: Right Open Tibia Fibula Fractures



E: Left Sided Rib Fractures of 2nd 3rd, 4th, 5th, 6th, 7th, 8th and 9th ribs

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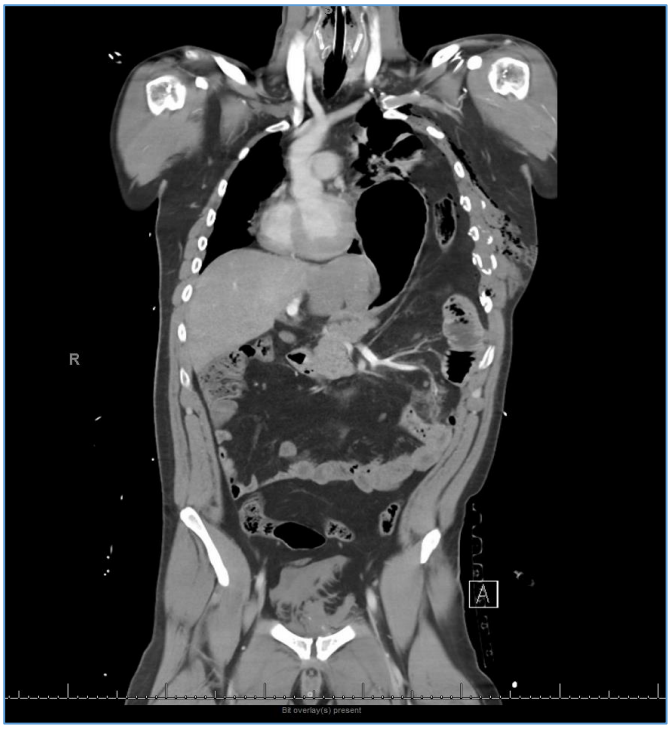
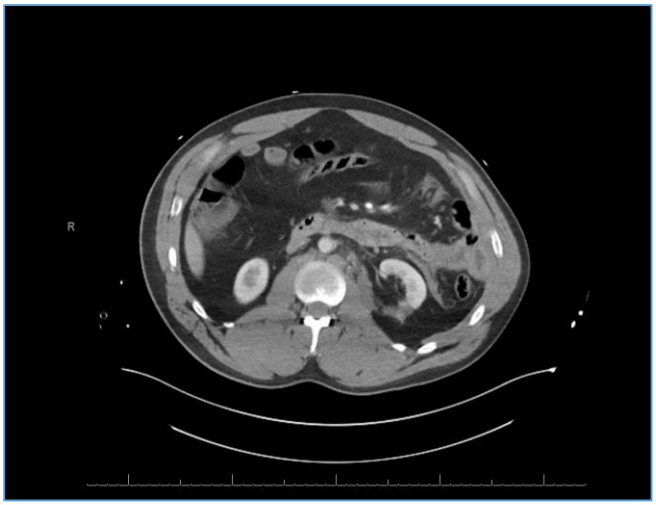


F: Left diaphragmatic injury with elevation of left hemidiaphragm



G: Left Renal Injury

Discussion:

The first Trichosporon asahii infection was reported in 1970, and the cases have gradually increased [2]. Fungi not from the candida or Cryptococcus genus are classified as "rare yeasts" [3]. Despite its rare nature, *Trichosporon asahii* is widespread in the environment, and mortality is higher than that of candida species. However, it is more common in patients with hematological malignancies or those who develop neutropenia with a cytotoxic drug [3]. Invasive trichosporon infection has a mortality of up to 80% among immunocompromised patients. Patients who are immunocompetent but have a history of ICU admission, trauma, mechanical ventilation, broad-spectrum antibiotics, or the use of indwelling catheters have a higher risk of developing trichosporon infection [1,3,5]. Our patient not only had these risk factors but was also on multiple broad-spectrum antibiotics, including vancomycin, cefepime, meropenem, and linezolid. Rubic, et al., reported a case of an immunocompetent patient with polytrauma who was comatose and developed a catheter-related *T. asahii* infection after receiving multiple antibiotics [6].

This patient was healthy before experiencing polytrauma except for the positive drug screen for amphetamines at admission. Several key events made him more susceptible to infection with *Trichosporon asahii*. The cytokine response from polytrauma has been shown to create an immunosuppressed state within the first two hours, which is further exacerbated by blood transfusions [7]. This patient received a total of 29 units of PRBCs and 25 FFPs in the first 48 hours in the ED as he developed acute blood loss anemia. Polytrauma, compounded by hemorrhagic shock, can also break down organ barriers and lead to multi-system organ dysfunction [8].

Trichosporon asahii is part of the normal skin, vaginal, and gut microbiota [1,2] and it is an opportunistic infection [9]. The association of *T. asahii* with burns and burn center outbreaks is purportedly due to the hair shaft colonization of *Trichosporon* species, [10], [11] wherein damage to the hair follicle from severe burns creates an entry point for infection [12]. While this patient had a burn covering 20% of the total body surface area, he also had extensive abdominal injuries, including diaphragmatic rupture and gastrointestinal perforations. Each provided ample opportunity for the fungus to leave the gut and seed other tissues.

Invasive devices, including urinary and central venous catheters, are also associated with *T. asahii* fungemia because of its ability to form biofilms [4,13,14]. At the time of positive blood culture, this patient had multiple invasive devices, including a tracheostomy tube, dialysis catheter, and GJ tube for

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feeding. He had been mechanically intubated and undergoing complete renal replacement therapy, both of which are risk factors for *Trichosporon* fungemia [4]. Additionally, *T. asahii* can form synergistic relationships with bacteria. Previously, co-infection of *T. asahii* with *Enterobacter cloacae* has been reported, specifically in a traumatic lower leg injury [15]. *E. cloacae* has clinical characteristics similar to *those of K. aerogenes*, though *K. aerogenes* results in worse outcomes.

Disseminated infection caused by *T. asahii* has also been reported to present with eosinophilia in an immunocompetent patient in a case report by Yang et al. A complete blood count of our patient did reveal elevated eosinophils. However, it was not the presenting symptom in our patient [16]. Table 1 summarizes the clinical and pathological findings in a few previously reported cases of *T. asahii* infection in immunocompetent patients.

Our case underscores the importance of rare fungal infections in otherwise immunocompetent patients with polytrauma, burns, indwelling catheters, use of broad spectrum antibiotics and undergoing multiple procedures, including blood transfusions, which might affect their immune status and contribute to a fungal infection.

Table 1: Clinical and pathology findings in reported cases of *trichosporon* infection in immunocompetent patients

Author/year	Presentation	Site of Infection	Pathogen Isolated	Immune Status at Presentation	Outcome
Yang, *et al.*, 2021	Fever and progressively enlarging cervical lymph nodes over two months	Lymph nodes, liver and spleen	*Trichosporon asahii*	Immunocompetent – no past medical history	Recovered
Ding, *et al.*, 2020	Polytrauma	Bloodstream	*Trichosporon asahii*	Immunocompetent – no past medical history	Survived
Rubic, *et al.*, 2015	Polytrauma	Catheter tip	*Trichosporon asahii*	Immunocompetent – no past medical history	Survived
Hajjeh, *et al.*, 1995	Electrical burns	Bloodstream	*Trichosporon beigelii*	No past medical history mentioned	Recovered

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Conflicts of Interest

None

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