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Case report

A case of cutaneous *Paecilomyces formosus* infection in an extremely premature infant

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ABSTRACT

Background: Many types of weak pathogenic microorganisms often cause opportunistic infections in extremely preterm infants. *Paecilomyces formosus* is one such opportunistic fungus that can lead to a serious infection. Here, we report the clinical course of *P. formosus* infection in an extremely preterm infant.

Case presentation: An extremely preterm male infant was born at 23 weeks of gestation. Six days after birth, he developed yellowish-brown nodules on the skin of the back extending to the buttocks. *P. formosus* was identified by culture of samples from the cutaneous lesions. We treated the infection with intravenous micafungin and lanoconazole ointment application. The skin lesions improved dramatically and healed without scar tissue formation.

Conclusion: Neonatologists should consider opportunistic *P. formosus* infections. This is the first report to describe that micafungin is effective for *P. formosus* cutaneous infection in extremely premature infants.

1. Introduction

Extremely premature infants show a variety of characteristics of prematurity, especially vulnerability of the skin, which easily leads to infections. In premature infants born at 23 weeks of gestation, the stratum corneum is nearly absent and the dermis is deficient in structural proteins [1]. Therefore, these infants are at risk of increased permeability to exogenous materials, infections, and the like [1]. Extremely premature infants often contract opportunistic infections not only because of their skin structure, but also because of their immature immune system. Fungal infections are the most common type of opportunistic infections in premature infants, and systemic fungal infections are associated with high mortality rates [2,3]. Therefore, they often receive antifungal prophylaxis [4]. However, despite precautions, fungal infections may still occur in extremely premature infants.

We report here a case of cutaneous infection due to *Paecilomyces formosus*, a rare fungal species, in an extremely premature infant. We obtained written permission from the patient's parents for this report.

2. Case report

Two extremely preterm male neonates who were monochorionic diamniotic twins were born at 23 weeks of gestation. The mother was a 23-year-old primigravida who developed an intrauterine infection, presenting with abdominal pain, uterine contractions, protrusion of the gestational sac, and an increased leukocyte count (19,330/μL). She had received intravenous antibiotics (flomoxef sodium and clindamycin phosphate) and tocolytic therapy (ritodrine hydrochloride and magnesium sulfate) to prevent premature labor; however, emergency Caesarian section was performed because of sudden premature rupture of membranes.

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The Apgar scores were 3 and 7 at 1 and 5 min for the first twin and 2 and 6 for the second one; their weight was 520 g and 474 g, respectively. They required immediate intubation and were admitted to the neonatal intensive care unit where they underwent routine assistance practices. They was placed in separate incubators with appropriate heating and high humidity and received fluid therapy via umbilical catheters. According to our routine protocol, they received a prophylactic dose of ampicillin and fluconazole to prevent systemic bacterial and fungal infections.

On day 6 after birth, the second twin developed yellowish-brown nodules on the skin of the back, which gradually spread to the buttocks (Fig. 1). The patient had no fever or lethargy. We suspected that the cutaneous lesions were caused by the high temperature and humidity in the incubator. We applied white petrolatum to the skin lesions after collecting samples for culture. However, the cutaneous lesions did not improve. On day 12 after birth, fungi thought to be *Paecilomyces* spp. were detected in the cultures. Accordingly, we discontinued intravenous fluconazole therapy and white petrolatum application. Intravenous micafungin therapy and lanoconazole ointment application were initiated. Thereafter, the skin lesions improved dramatically and healed without scar tissue formation. The pathogenic microorganism was identified as *P. formosus* based on the morphological features and DNA sequence analysis of the internal transcribed spacer region [5]. The first twin had no infection.

3. Discussion

We have described here a case of cutaneous infection caused by *P. formosus* in an extremely premature infant, with the only clinical sign of infection being the appearance of yellowish-brown nodules on the skin of the back extending to the buttocks.

Typically, *Paecilomyces* spp. rarely cause infections in humans [6–8]. If these fungi are detected in blood, urine, or cerebrospinal fluid cultures, they are commonly regarded as contaminants [6]. It has been reported that *Paecilomyces lilacinus* and *Paecilomyces variotii* cause opportunistic infections typically affecting the eyes and skin in immunodeficient patients [7–9]. Some reports have described *Paecilomyces* spp. infections in adult patients with immunodeficiency or post-traumatic disorders, but there are few reports of such infections in pediatric patients [6,7,10–13]. In this case, *P. formosus* was cultured from the cutaneous lesions. We initiated intravenous micafungin therapy and lanoconazole ointment application, which lead to a drastic improvement of the cutaneous lesion. Culture of skin swab specimens were not positive for *P. formosus* after these therapies. Therefore, we estimated that *P. formosus* has a low pathogenicity as a microbial pathogen. To our knowledge, this is the first report of *P. formosus* infection in an extremely premature infant.

Extremely premature infants have a poor immune system and highly vulnerable skin [14]. This jelly-like immature skin has a poor barrier function and easily permits the passage of microorganisms that can cause serious infection, including sepsis [1,14].

In our patient, we first applied white petrolatum to the skin lesions to protect the very immature skin. However, this was not effective. On day 12 after birth, *Paecilomyces* spp. were detected in the cultures. Subsequently, treatment with intravenous micafungin and lanoconazole ointment was highly effective in controlling the skin lesions. Micafungin was administered for 22 days, with no side effects.

Micafungin inhibits the production of beta-1,3-glucan, an essential component of fungal cell walls, and is an echinocandin antifungal drug. This medication is the safest available antifungal drug, with minimal adverse effects in both children and adults [15–17]. Previous reports have demonstrated that micafungin is effective in treating *Paecilomyces* spp. infections, such as skin lesions and ocular infections [18,19]. Micafungin is a relatively new antifungal agent and is strongly bound to protein, with good penetration into various tissues [17]. In vitro, for *Paecilomyces* spp., the minimum inhibitory concentration (MIC) of fluconazole is very high but that of micafungin is low [19,20]. Some reports have demonstrated the safety of micafungin even in preterm infants [17,21]. Therefore, we first selected intravenous micafungin for treating this case of *P. formosus* cutaneous infection.

Many types of weak organisms can cause serious infections in very preterm infants. Our experience shows that *Paecilomyces* spp. is one such microorganism that may cause opportunistic infections. In conclusion, the early detection and effective treatment of infections in very preterm infants is crucial for good outcomes.

Conflicts of interest

The authors declare no conflicts of interest.

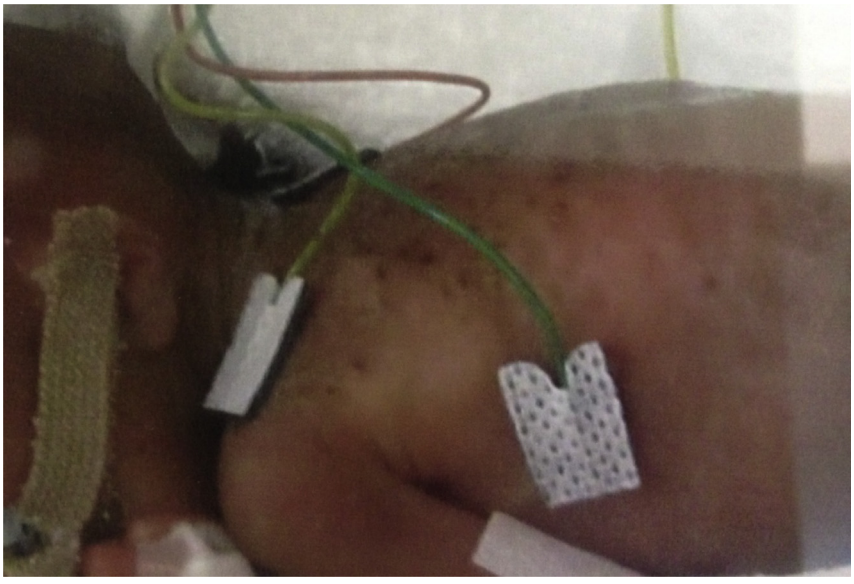

Fig. 1. Yellowish-brown nodules observed on the back of an extremely premature infant.

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