


A Case of Spontaneous Recovery in an Infant with Nail Candidiasis Probably Related to Nail Trauma During Vaginal Delivery

YanJun Li^{1,*}, Xiaoyu Zhang^{1,*}, Jiaying Zhang¹, Tianhang Li², Dongmei Shi³

¹School of Clinical Medicine, Shandong Second Medical University, Weifang, Shandong, People's Republic of China; ²Department of Dermatology, Jining No. 1 People's Hospital, Jining, Shandong, People's Republic of China; ³Department of Dermatology and Laboratory of Medical Mycology, Jining No. 1 People's Hospital, Jining, Shandong, People's Republic of China

*These authors contributed equally to this work

Correspondence: Dongmei Shi, Department of Dermatology and Laboratory of Medical Mycology, Jining No. 1 People's Hospital, No. 6 Jiankang Road, Jining, Shandong Province, 272000, People's Republic of China, Tel +86 537-6051008, Email shidongmei28@163.com

Abstract: Onychomycosis in infants is a rare fungal infection. The condition is frequently linked to congenital or secondary immunodeficiency, as well as exposure to contaminated environments. In this report, we present a case of infant onychomycosis, likely infected during birth delivery from the mother with vaginal candidiasis. However, both the infant and the mother recovered spontaneously without any treatment over several months.

Keywords: *Candida albicans*, infant, neonatal candidiasis, onychomycosis, self-healing

Introduction

Onychomycosis, a fungal infection affecting the nail bed and subungual tissue, is primarily caused by dermatophytes, followed by yeasts, and molds. While onychomycosis is more commonly observed in adults, they are rare in children, especially infants. The rarity in children may be attributed to factors such as faster nail growth rate, smaller nail plate area, lower incidence of trauma, and limited environmental exposure.¹

However, newborns or fetuses may still have the opportunity to be exposed to fungal-contaminated environments, such as *Candida* environment within the uterine cavity or birth canal, as *Candida* is one of the common commensal microorganisms of the vagina.^{2,3} During pregnancy, elevated levels of estrogen can promote *Candida*, predominantly *C. albicans*, to adhere, colonize, overgrow, and even form a biofilm within vagina of a pregnant woman, leading to episodes of vulvovaginal candidiasis and occasional intrauterine infections.²⁻⁴ Concurrently, the infection in a pregnant woman increases the likelihood of the fetus acquiring *Candida* in utero or during labor and delivery, resulting in congenital or neonatal candidiasis.²

In this report, we present a case of isolated neonatal nail candidiasis caused by *Candida albicans* in a 74-day-old infant, potentially linked to trauma during vaginal delivery. Remarkably, the infant experienced spontaneous recovery without any treatment.

Case Report

A 74-day-old infant, vaginally delivered at full term without perinatal hypoxia, presented with flaky white cloudy surfaces on the third and fourth nails of the left hand for over 2 months. Initially, the affected fingernails appeared as bluish-purple macules shortly after birth. The condition was left untreated, gradually progressing over time, with the nails losing opacity, thickening, separating, and fragmenting, accompanied by the presence of white debris (Figure 1A).

A nail infection was suspected, and scraped nail debris was stained with calcofluor white. Under fluorescent microscopy, we observed the presence of pseudohyphae and yeast cells (Figure 1C). The nail debris was cultured onto Sabouraud-glucose Agar (SDA) and Potato Dextrose Agar (PDA) with Chloramphenicol at 30°C for 3 days. The round milky white yeast-like colonies of various sizes were observed (Figure 1D), and oval spores were seen under the fluorescence microscope (Figure 1E). The parallel culture on blood agar (BA) grew no colonies on day 3. Notably, there was no evidence of fungal infection, such as oral thrush, in other parts of the infant's body. Microscopic examination and fungal culture of oral scraping specimens yielded negative results.

The mother had been diagnosed vaginal candidiasis based on direct fungal microscopic test during one of her prenatal physical examinations. However, she did not receive treatment at that time. When examining the infant, a fungal microscopic examination and culture of her vaginal secretions were also conducted. Results revealed the presence of pseudohyphae and yeast cells. Isolates from the infant and the mother were identified by Matrix-Assisted Laser Desorption/ Ionization-Time of Flight (MALDI-TOF) mass spectrometry as *C. albicans*. The Internal Transcribed Spacer 1 (ITS1)/ Internal Transcribed Spacer 4 (ITS4) region sequencings of two isolates were blasted in GenBank (<https://blast.ncbi.nlm.nih.gov/Blast.cgi>), showing 100% coverage and 100% homology with No. MK805514.1. Based on the morphological characteristics and molecular sequence, the isolates were identified as *Candida albicans*.

The original plan was to initiate antifungal treatment, but the patient could not receive treatment due to the COVID-19 pandemic. After 2 months, the nail plate of the third finger naturally fell off, and significant improvement was observed in the new nail. Only a few white nails were visible at the distal and lateral ends. The nail of the fourth finger completely recovered. Four months later, the infant had completely recovered (Figure 1B), and fungal microscopic examinations and cultures showed negative results. Similarly, the mother's vaginal secretion mycological examinations turned negative without treatment.

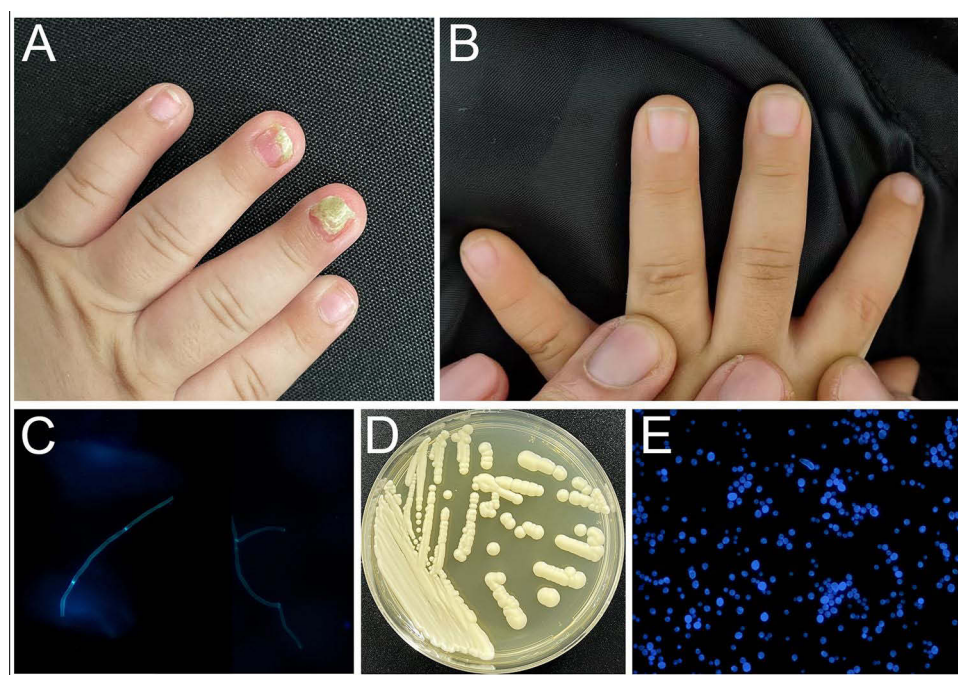


Figure 1 The front edge and side edge of the third and fourth fingers of the left hand are thickened and turned yellow with subungual hyperkeratosis and onycholysis, and the surface of the deck is uneven (A); Calcofluor white staining showing pseudohyphae under the fluorescent microscope (400×) (B); Smooth, moist, and cheese-like colonies can be seen on the Sabouraud's Dextrose Agar medium (C); Oval spores can be seen under the fluorescence microscope (400×) (D); Healthy nail plate after four months follow-up (E).

Discussion

Neonatal candidiasis refers to *Candida* infection occurring during labor and delivery.² *Candida* infections in newborns, including congenital candidiasis and neonatal candidiasis, typically manifest with superficial skin and mucosal lesions, such as diaper dermatitis, and thrush, but they can occasionally lead to invasive infections.² It is rare for a child to present with only nail involvement.

Our patient was diagnosed neonatal onychomycosis (nail candidiasis) caused by *Candida albicans*, potentially resulting from nail damage during vaginal delivery. Several factors support our hypothesis. First, we successfully isolated *C. albicans* from both the mother's vaginal secretions and the infant's nail bed. Second, there was no history of onychomycosis, tinea pedis, or other fungal infections in the mother or individuals caring for the infant. Third, there were no other significant risk factors for fungal infection history, and no family history of psoriasis, lichen planus, or yellow nail syndrome. Importantly, the affected nail part gradually became thickened and turned yellow, while other nails were not involved at that time.

It should be noted that nail intrauterine *Candida* infection, as suggested by Raval et al, could be due to the prolonged exposure of nails to fungal-contaminated amniotic fluid. Nail changes can be present at birth or develop between 2 to 6 weeks of life.^{2,5} In this case, nail involvement may be the only clinical manifestation of congenital candidiasis.² However, we were unable to determine if the mother had intrauterine candida infection during pregnancy due to the lack of placenta, umbilical cord, or amniotic membrane specimen. The mother's candidal vaginitis eventually spontaneously recovered with the decrease of estrogens levels.

Nevertheless, this case serves as a reminder for medical professionals to consider the possibility of congenital and neonatal candidiasis when encountering infants with nail dystrophy, especially in the absence of other infections or hereditary disorders. Consulting with specialists and conducting systematic examinations, including blood and even cerebrospinal fluid cultures if necessary, can aid in accurate diagnosis and appropriate management.

In our case, the infant did not receive any treatment due to the COVID-19 pandemic and was self-healed, suggesting a self-limiting possibility of infantile onychomycosis in the cases of absence of risk factors, such as a history of perinatal hypoxia, low birth weight, and broad-spectrum antibiotic use.⁶⁻⁸ The infant's normal innate immune system, a key defense against fungal infection, likely played an important role in balancing inflammation and microbiota populations.⁹ Never using broad-spectrum antibiotics means the microbiota can be properly established, thus the immune system gradually matures, which facilitates the defense and elimination of fungal infections.^{10,11} While our infant case had no family history of immune disorders, tinea pedis, or other fungal infections, the rapid growth rate of fingernails compared to toenails may have aided in shedding fungal cells, contributing to self-healing.¹²

Despite the possibility of spontaneous recovery, antifungal treatment is recommended for congenital nail candidiasis.² A systematic analysis involving 22,063 *C. albicans* in China over the last decade showed that a high proportion of isolates were resistant to miconazole, ketoconazole, itraconazole, and fluconazole.¹³ Previous reports suggested that topical treatment with ciclopirox olamine and amorolfine may be an alternative option to treat infantile onychomycosis.²

To our best knowledge, self-healing infantile onychomycosis is rare, likely contributable to *Candida albicans* from maternal vaginal candidiasis and possible nail trauma during vaginal delivery. The short-term exposure to the infection source and the limited involvement of only the fingernail may have created favorable conditions for the infants' onychomycosis to resolve spontaneously.

Ethics Approval and Consent to Participate

Institutional approval was required to publish the case details. And this study has been approved by the Institutional Research and Ethics Committee of Jining No. 1 People's Hospital to publish the case details (Ethical approval no. 2020-029). We obtained written informed consent from the patient's guardian to publish this case report. The study was carried out in accordance with the principles of the Declaration of Helsinki.

Consent for Publication

We confirm that the details of any images can be published and that the person providing consent have been shown the article contents to be published. A copy of the written consent is available by request.

Acknowledgments

We would like to express our gratitude to the patient and his family for their cooperation and consent.

Funding

This work was supported in part by grants from the National Natural Science Foundation of China (NM 82272358), Key Research and Development Plan of Jining (2022YXNS127 and 2023YXNS001).

Disclosure

The authors report no conflicts of interest in this work.

References

1. Gulgun M, Balci E, Karaoglu A, et al. Prevalence and risk factors of onychomycosis in primary school children living in rural and urban areas in Central Anatolia of Turkey. *Indian J Dermatol Venereol Leprol.* **2013**;79(6):777–782. doi:10.4103/0378-6323.120724
2. Sánchez-Schmidt JM, Vicente-Villa MA, Viñas-Arenas M, Gené-Giralt A, González-Enseñat MA. Isolated congenital nail candidiasis: report of 6 cases. *Pediatr Infect Dis J.* **2010**;29(10):974–976. doi:10.1097/INF.0b013e3181ed6c25
3. Hizkiyahu R, Baumfeld Y, Paz Levy D, Lanxner Battat T, Imterat M, Weintraub AY. Antepartum vaginal *Candida* colonization and the risk for obstetrical tears. *J Matern Fetal Neonatal Med.* **2022**;35(1):75–79. doi:10.1080/14767058.2020.1712701
4. Atencia-Carrera MB, Cabezas-Mera FS, Vizuete K, Debut A, Tejera E, Machado A. Evaluation of the biofilm life cycle between *Candida albicans* and *Candida tropicalis*. *Front Cell Infect Microbiol.* **2022**;12:953168. doi:10.3389/fcimb.2022.953168
5. Raval DS, Barton LL, Hansen RC, Kling PJ. Congenital cutaneous candidiasis: case report and review. *Pediatr Dermatol.* **1995**;12(4):355–358. doi:10.1111/j.1525-1470.1995.tb00201.x
6. Kaufman DA, Coggins SA, Zanelli SA, Weitkamp JH. Congenital cutaneous candidiasis: prompt systemic treatment is associated with improved outcomes in neonates. *Clin Infect Dis.* **2017**;64(10):1387–1395. doi:10.1093/cid/cix119
7. Bonifaz A, Saúl A, Mena C, et al. Dermatophyte onychomycosis in children under 2 years of age: experience of 16 cases. *J Eur Acad Dermatol Venereol.* **2007**;21(1):115–117. doi:10.1111/j.1468-3083.2006.01802.x
8. Benjamin DK, Stoll BJ, Fanaroff AA, et al. Neonatal candidiasis among extremely low birth weight infants: risk factors, mortality rates, and neurodevelopmental outcomes at 18 to 22 months. *Pediatrics.* **2006**;117(1):84–92. doi:10.1542/peds.2004-2292
9. Cangui-Panchi SP, Ñacato-Toapanta AL, Enríquez-Martínez LJ, et al. Battle royale: immune response on biofilms - host-pathogen interactions. *Curr Res Immunol.* **2023**;4:100057. doi:10.1016/j.crimmu.2023.100057
10. Basha S, Surendran N, Pichichero M. Immune responses in neonates. *Expert Rev Clin Immunol.* **2014**;10(9):1171–1184. doi:10.1586/1744666X.2014.942288
11. Kalbermatter C, Fernandez Trigo N, Christensen S, Ganai-Vonarburg SC. Maternal microbiota, early life colonization and breast milk drive immune development in the newborn. *Front Immunol.* **2021**;12:683022. doi:10.3389/fimmu.2021.683022
12. Yaemsiri S, Hou N, Slining MM, He K. Growth rate of human fingernails and toenails in healthy American young adults. *J Eur Acad Dermatol Venereol.* **2010**;24(4):420–423. doi:10.1111/j.1468-3083.2009.03426.x
13. Bilal H, Shafiq M, Hou B, et al. Distribution and antifungal susceptibility pattern of *Candida* species from mainland China: a systematic analysis. *Virulence.* **2022**;13(1):1573–1589. doi:10.1080/21505594.2022.2123325

Infection and Drug Resistance

Dovepress

Publish your work in this journal

Infection and Drug Resistance is an international, peer-reviewed open-access journal that focuses on the optimal treatment of infection (bacterial, fungal and viral) and the development and institution of preventive strategies to minimize the development and spread of resistance. The journal is specifically concerned with the epidemiology of antibiotic resistance and the mechanisms of resistance development and diffusion in both hospitals and the community. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/infection-and-drug-resistance-journal>