

CASE REPORT

GREEN NAIL SYNDROME, A RARE INFECTION OF *PSEUDOMONAS AERUGINOSA* IN THE NAIL

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ABSTRACT

Objective: A nail infection is a common case caused by fungal infection, thus can make any bacterial correlated infection in the nail can be under-diagnosed. However, *Pseudomonas aeruginosa* can cause nail infection known as green nail syndrome (chromonychia).

Method: A 3 year old girl presented with greenish discoloration on the nail plate of the right toenail since previous a month. She came from well-educated family, but the water resource at their home was not good enough. The specimen of nail scraping was sent to the microbiology laboratory. The Gram from nail scraping didn't show any significant result. After 24 hours, a greenish colony, non-lactose fermenter on the Mac Conkey and a dominant blue-green color colony on the blood sheep agar had grown. The

colonies are beta hemolytic, flat and spreading. They were also positive to oxidase and catalase.

Result: The Gram result from the colony was showed as basil negative Gram. Identification from Vitex 2[®] concluded as *Pseudomonas aeruginosa* that resistant to all penicillin derivate and 2nd generation of cephalosporin. However the isolate was still sensitive to ceftazidime, carbapenems, quinolones and amino-glycosides. The treatment was decided using topical fluoroquinolone nadifloxacin, and gave a significant result in a month

Conclusion: Green nail syndrome that is caused by *P. aeruginosa* infection could be treated by topical fluoroquinolone for 1-2 months

Keyword: green nail syndrome, nail infection, *pseudomonas aeruginosa*, fluoroquinolone

INTRODUCTION

Nail is a compact structure, the nail plate is keratinized which provides protection to the skin of the phalanges.¹ Fungi is the most common agent for nail infection, however some of bacteria can infect the nail and disturb nail integrity that may ruin the aesthetic of the nail. *Pseudomonas aeruginosa* can cause serious infection in the nail known as chloronychia or green nail syndrome.

Chloronychia is described as green discoloration of the nail plate, that can be caused by the pyocyanin pigment of *Pseudomonas aeruginosa*.^{2,3} All of the species in the family in *Pseudomonas* can produce a pigment which phenazines as the most abundant. Pyocyanin is soluble phenazine pigment with blue green colour.^{2,3} The infection of nail with greenish-black, greenish-brown and greenish-yellow in nail plate with non-tender paronychia and onycholysis can be suspected as *Pseudomonas aeruginosa* infection.³ Most of nail infection

caused by *Pseudomonas aeruginosa* have correlation with person who have prevalent contact with water, soaps, detergent, microtrauma in the nail and its soft skin tissue or compromised immune system.^{4,5}

Here we present green nail syndrome in young children with predisposition low quality of water resources.

CASE DESCRIPTION

A 3 years old girl presented with greenish discoloration on nail plate of the right toenail since a month ago. The nail discoloration was spreading from the first to the second toe, and its discoloration area become wider slowly in the meantime. There was no history of trauma, or chronic/congenital diseases and there weren't any others clinical complains. However, the mother said that the patient like to play within water pond which had low quality of water supply.



Figure 1. The greenish black toe nail of 3 year-old girl

The microbiological specimen was taken from nail scraping in greenish nail, before starting scraped the nail, we

clean the nail surface with sterile NaCl 0.9%. and we conducted a Gram stain and KOH 20% stain. We inoculated the specimen into blood sheep agar (BSA), Mac Conkey agar and sabouroud dextrose agar. However, both of microscopic diagnostic didn't showed any significant result. In 24 hours after incubation in 35-37°C, there was a greenish colonies growth in the Mac Conkey agar, non-lactose fermenter, positive for oxidase and catalase reaction. In BSA the colonies growth as greenish dark blue colony, beta hemolytic. The Gram stain from both agars were Gram negative bacilli. No growth in the sabouroud dextrose agar even after 48 hours. The grown colonies were identified using Vitex 2® and identified as *Pseudomonas aeruginosa* (95%). The antimicrobial susceptibility testing has been showed the isolate were resistant to all penicillin's and second generation of cephalosporin's derivate, however it's still sensitive to ceftazidime, the group of carbapenem, quinolone, and aminoglycoside. We gave the topical fluoroquinolone (nadifloxacin) to the patient, since oral quinolone is contraindication, for a month.⁶ The nail condition was getting better in a month and discoloration had disappear slowly.

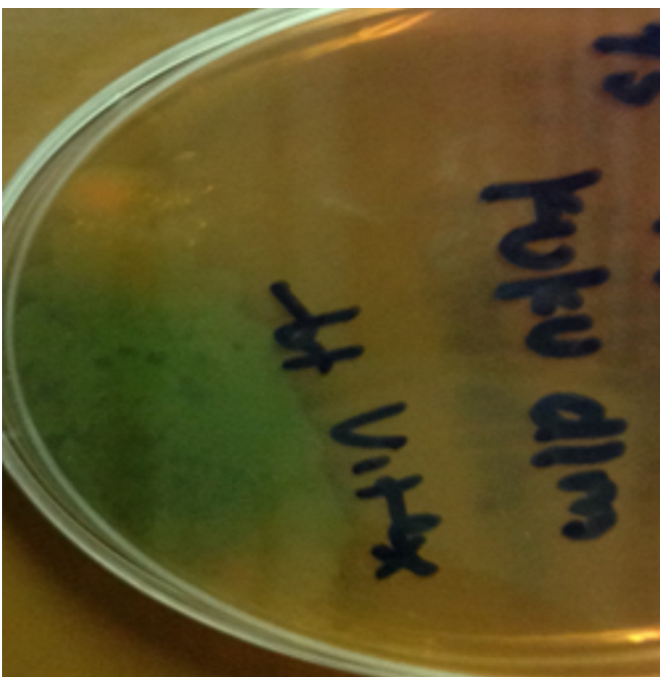


Figure 2. The greenish colony in mac conkey agar from nail scrapping specimen (left = picture taken from backside of the petri-disc; right: the colonies shown from front side of petri-disc)

DISCUSSION

Green nail syndrome (GNS) is a nail disease characterized by onycholysis and blackish or dark green discoloration of the nail bed.⁷ Patients generally have a history of prolonged contact with a moist and watery environment, which is an ideal place for the growth of *Pseudomonas aeruginosa*.² In this case the patient was active

and often playing water which was the biggest risk factor for infection by *Pseudomonas aeruginosa*. In most reports of GNS, the most risk factor is contact with water or a humid environment. Cases of GNS in women, 35 years of age predispose for swimming.⁵ Generally healthy people are resistant to the infection of *Pseudomonas aeruginosa*, but if there occurs damage or minor trauma to the skin, then these can be an entry point for bacteria to become invasive. In addition, GNS infection can occur in patients with risk

factors such as minor trauma, onychotillomania and basic diseases of the skin and nails.⁴

Pseudomonas aeruginosa bacteria are aerobic, Gram-negative, motile rods that do not ferment lactose that are clearly visible on MacConkey (see Figure 2). Microbiological examination shows typical results for *Pseudomonas aeruginosa*, as given example are Gram-negative rods with green colonies produced by the pyocyanin pigment, does not ferment lactose, catalase and oxidase positive.⁸

Discoloration of the nail plate to dark green tends to be black, due to the presence of pigments resulting from the metabolism of *Pseudomonas aeruginosa* namely the pigment pyocyanin and pyoverdine, which are typical markers of GNS as found in this case (see Figure 1). Bacteria that can penetrate the epidermal barrier will cause inflammatory reactions and infections up to hyponychium which can ultimately cause onycholysis.

GNS treatment can be done by giving a combination of antiseptic, topical antibiotics and may sometimes require minor surgery to remove infected nails. But naturally *Pseudomonas aeruginosa* is a bacterium that is multi-resistant to various classes of antibiotics. Based on the results of sensitivity tests on *Pseudomonas aeruginosa* bacterial isolates from nail scrapings, it was found that bacterial isolates were resistant in all penicillin groups and second generation cephalosporins. In patients who are 3 years old, topical antibiotics are the best choice. Ceftazidime as the antibiotic of choice is not available topically, so aminoglycosides (gentamicin, amikacin, tobramycin) and topical fluoroquinolones are an alternative choice.⁹ The GNS case report publication states that the patient improved with topical nadifloxacin therapy commonly used for acne therapy. Bae Y, et al (2014) prove that administration of tobramycin eye ointment to infected nails gives good results after use for 2 months. Although nadifloxacin is not present in the sensitivity test results, the sensitive results in ciprofloxacin can be used as a benchmark because nadifloxacin is a fluoroquinolone of the same class as ciprofloxacin.⁶

CONCLUSION

Nail infections can be caused by *Pseudomonas aeruginosa* with the most common risk factor being prolonged contact with water and a humid environment. Topical therapy of the fluoroquinolone (nadifloxacin) group for 1-2 months on infected nails can be a good choice.

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