An Update on the Disappearing Nail Bed

Ralph Daniel · Babaev Meir · Shemer Avner

Private Practice Dermatology Clinic, Jackson, MS, USA

Keywords

Nail disease · Onycholysis · Nail bed · Onychomycosis · Nail surgery

Abstract

Background: The nail bed may epithelialize and develop dermatoglyphics after long-standing onycholysis. We have called this phenomenon the disappearing nail bed (DNB). DNB may present as a shortened or narrow nail bed. **Methods:** Examination of all 20 nails was performed in each patient enrolled to the study. DNB was defined as the presence of a nail which is at least 20% shorter and/or narrower than the identical nail on the opposite hand or foot. Age, sex, and nail history were recorded. Fungal studies were done on all patients with DNB if that nail exhibited clinical signs of onychomycosis. **Results:** Of 540 patients, 71 (13.15%) showed DNB. Sixty patients had only the toenails involved, and 10 patients had only the fingernails involved. One patient had both toenails and fingernails involved. The average age for fingernail DNB was 67.2 years and 69.6 years for toenails DNB. Nail history was remarkable for biting in 8 patients, nail trauma in 11 patients, and surgery in 12 patients. With respect to the toenails, onychomycosis was found in 22 patients of the DNB group. **Conclusions:** Our study suggests that DNB is a common phenomenon, which is more likely to appear in advancing age and is associated with onychomycosis.

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Introduction

The first and only study on the disappearing nail bed (DNB) was published in 2005 [1]. The normal nail bed does not have a granular layer [2, 3]. If the nail plate does not cover the nail bed for a period of time (as is the case with onycholysis), the nail bed may epithelialize like the tip of the digit and even develop dermatoglyphics or finger/toe prints. We have called this phenomenon the DNB [1]. DNB may present as a shortened and/or narrow nail bed (Fig. 1). This brief study was undertaken to obtain additional information on DNB.

Materials and Methods

This study was carried out in a private practice dermatology clinic in Jackson, MS, USA. The study began on March 27, 2014 and ended on May 5, 2014. We asked every patient seen in the clinic between those dates if they would give permission to participate in the study. We chose inclusion of at least 500 but not more than 550 patients in the study as endpoint. All 20 nails were examined in each patient.

For the purposes of this paper, we defined DNB as the presence of a nail which is at least 20% shorter and/or narrower than the identical nail on the opposite hand or foot. Measurements were taken for short nails from the proximal nail fold to the end of the attached nail where, distal to that, epithelialization became apparent. Measurements for narrow nails were taken transversely. If only 1 digit was involved, it was compared to the same digit on the opposite extremity. If the same digit on the opposite extremity was

Fig. 1. Distal fingernail onycholysis with DNB. DNB, disappearing nail bed.

Fig. 2. Distal toenail onycholysis with DNB. DNB, disappearing nail bed.

also involved, then the appearances of other digits were used as reference points. For each patient, age, sex, and whether they had DNB was recorded. Any nail history including trauma, nail biting, nail tearing, past surgery on that digit, onychomycosis, or inflammatory nail disorder was also recorded.

Patients were determined to have onychomycosis in the nail exhibiting DNB if one or both of the following were present: (1) potassium hydroxide stain showing hyphae, and (2) positive fungal culture showing the presence of a dermatophyte.

Cultures were performed on Mycosel agar and plain Sabouraud's agar with chloramphenicol. The fungal cultures were examined for the presence or absence of a dermatophyte. Fungal studies were carried out in all patients with DNB if that nail exhibited clinical signs of onychomycosis, including onycholysis, subungual hyperkeratosis, dermatophytomas, etc., or for any other sign suspected of being a manifestation of onychomycosis.

One of the authors examined and interviewed all patients, did all nail measurements, and read all fungal studies. All subjects provided their informed consent, and the study protocol was ap-

Table 1. DNB characteristics in fingernails and toenails

	Fingernails, <i>n</i> (%)	Toenails, <i>n</i> (%)
Number of patients	11	61
Gender		
Male	7	39
Female	4	22
Average age, years	67.2	69.6
Biting	8 (72.7)	n/a
Onychotillomania	1 (9)	n/a
Pincer	1 (9)	0
Trauma	1 (9)	10 (16.3)
Short nails	n/a	42 (68.8)
Narrow nails	n/a	19 (31.1)
Surgery	0	11 (18)
Onychomycosis	0	22 (36)
Onychogryphosis	n/a	8 (13.1)

DNB, disappearing nail bed; n/a, not applicable.

proved by the institute's committee on human research. Data were entered in Microsoft Excel and analyzed using IBM SPSS statistics version 24 for Windows. The Pearson χ^2 test was used to compare parameters such as age and gender, and $p < 0.05$ was considered statistically significant.

Results

In total, 540 patients gave permission to be included in the study. Of these, 301 (55.74%) were male and 239 (44.36%) were female; the average age was 63.9 years. Of all patients in the study, 71 (13.15%) showed DNB, and of these, 45 (63.34%) were male and 26 (46.36%) were female. Differences between male and female gender were not significant ($p = 0.985$). The average age of patients showing DNB was 69.25 years, and a statistically significant association was found between age and DNB ($p < 0.001$).

Sixty patients had only the toenails involved, while 10 patients had only the fingernails involved. One patient had both toenails and fingernails involved. The characteristics of DNB are summarized in Table 1.

DNB of the Fingernails

The average age of patients with fingernail DNB was 67.2 years, 7 patients were male and 4 patients were female. Nail history was remarkable for biting in 8 patients, onychotillomania in 1 patient, history of trauma in 1 patient, and a finding of pincer nail in 1 patient.

DNB of the Toenails

The average age of patients with toenail DNB was 69.6 years, 39 (63.39%) patients were male and 22 (36.61%) patients were female. In 42 patients, we found shorter nails and in 19 patients, we found narrow nails. Onychomycosis was found in 22 patients, mostly males ($p = 0.029$). Ten patients had a history of nail trauma and 11 patients had a history of previous surgery; 8 patients had a finding of onychogryphosis.

In the narrow nail DNB subgroup, 15 patients were male and 4 patients were female. The average age of this subgroup was 74.2 years. Onychogryphosis was found in 8 patients, pincer nail in 2 patients, and past nail trauma in 3 patients.

Statistical analysis of associations between age, gender, and other characteristics in the fingernail DNB subgroup did not yield any significant p values. Statistical analysis of the same parameters in the toenail DNB subgroup showed a significant association between male gender and toenail onychomycosis ($p = 0.029$). This significant p value implies a possible association between older age and toenails onychomycosis ($p = 0.039$). Association between DNB and nail habits, history of trauma or surgery, and nail diseases could not be analyzed because we did not have a control group with similar data.

Discussion

DNB is a rather new concept and relatively little is known about it. It is most often associated with some degree of onycholysis [1–6]. In this study, DNB was diagnosed in 13.15% of patients. It is more frequently found in patients of advancing age. DNB and onychomycosis were more frequently present in elderly men. It may manifest itself in a nail that is shorter and/or narrower. DNB was found to appear with onychomycosis, onychogryphosis, and same digit surgery, although no statistical sig-

nificance could be claimed about this association. History of trauma was also recorded in cases of DNB. In toenail DNB, the great toenail was most commonly involved (Fig. 2). The most common association in fingernails is nail biting (onychophagia). When asked, most patients were unaware when the condition began or even that they had it. Some attempts have been made in the past to repair DNB by surgical interventions [7, 8].

The lack of a control group limits the interpretation of the study results, thus preventing us from clearly associating any particular nail disease or trauma with the occurrence of DNB.

It is not clear how long the nail bed needs to be uncovered before it epithelializes. This has important implications, as once DNB forms, it is more difficult to get the nail plate to reattach. When the distal digit is not normally covered by the nail plate, especially in toenails, the distal digit shape may be distorted. As a result of this distortion, more ingrown nails may occur as well as prolonged onycholysis. Ingrown nail is commonly found after onychomycosis is treated, and when the new, healthy nail grows out, it often is ingrown. The nail bed exposure period is a possible focus for future research.

Another focus for further research is the “digital memory” that enables creation of dermatoglyphics (finger/toe prints) on skin that originally had no prints. This “digital memory” may have implications for digit/skin repair in the future.

Statement of Ethics

The study was approved by the local ethics committee.

Disclosure Statement

The authors report no relevant conflicts of interest.

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