Trachyonychia: Review and Update on Clinical Aspects, Histology, and Therapy

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Key Words

Trachyonychia · Evaluation · Histology · Treatment · Therapy

Abstract

Trachyonychia is a disorder of the nail unit that most commonly presents with rough, longitudinally ridged nails (opaque trachyonychia) or less frequently, uniform, opalescent nails with pits (shiny trachyonychia). The term trachyonychia refers to 'rough nails.' This article comprehensively reviews the clinical, histologic, and therapeutic aspects of trachyonychia. The authors' preferred evaluation and management strategies of trachyonychia are included.

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Introduction

Trachyonychia is a disorder of the nail unit that most commonly presents with rough, longitudinally ridged nails (opaque trachyonychia) or less frequently, uniform, opalescent nails with pits (shiny trachyonychia). The term trachyonychia refers to 'rough nails.' The appearance has also been likened to the nails being rubbed with sandpaper, and has therefore also been referred to colloquially as 'sandpapered nails.' It can involve from one nail up to all twenty nails, and multiple nails are usually affected at the time of presentation to a physician.

Trachyonychia can occur in patients of all ages, though children tend to be more frequently affected. The condition can evolve idiopathically as well as in association with a wide variety of dermatologic and nondermatologic diseases. Trachyonychia was described as early as 1950 by Alkiewicz [1]. Hazelrigg et al. [2] termed the acquired, idiopathic version of this clinical entity as twenty nail dystrophy (TND) in 1977 because it was initially described as uniformly affecting all twenty nails and toenails. However, later reports describe cases of characteristic nail changes occurring in some nails and not others or in different degrees of severity in all twenty nails.

There have been arguments to abandon the term TND because it carries no specific significance or information on the underlying cause of the disorder [3]. We agree and avoid the use of the term TND because there are multiple conditions which can result in dystrophy of all twenty nails, aside from trachyonychia. The term TND lacks specificity. The scientific literature includes commentaries dividing trachyonychia into two subtypes, opaque and shiny trachyonychia, arguing that this division may provide more information on the severity of the condition [3, 4].

While trachyonychia has a characteristic appearance, there are overlap clinical features with other nail unit dermatoses, so an open mind for a complete differential diagnosis should be maintained. In particular, onychomy-

Fig. 1. Opaque trachyonychia. The nails show a rough surface, longitudinal ridges, and a 'sandpapered' appearance.

Fig. 2. Shiny trachyonychia. The nails have many pits within the nail plate and reflect light, giving a shiny appearance.

Table 1. Types of trachyonychia

	Opaque trachyonychia	Shiny trachyonychia
Clinical characteristics	More common Thickened nails, with prominent longitudinal ridges May have a 'sandpapered' appearance	Uniform, shiny nails with pits that reflect light

cosis may appear very similar to trachyonychia, so early appropriate evaluation for that disorder is needed. In this review, we will describe the clinical characteristics of trachyonychia, the evaluation and workup of the condition, hallmark histopathological characteristics, and potential therapeutic options.

Clinical Characteristics

Rough nails with excessive longitudinal ridging are typically seen in patients with trachyonychia. The nail plates may be thickened or thinned. Cuticles are usually thickened and ragged [5]. The two different subtypes of trachyonychia were first described by Baran [6] in 1981 and are categorized by their clinical appearance and severity (table 1). Opaque trachyonychia, the more severe type, is characterized by rough nails that appear to have been rubbed by sandpaper (fig. 1). The less severe type, shiny trachyonychia, is characterized by shiny, opalescent nails with numerous pits (fig. 2). Although both opaque trachyonychia and shiny trachyonychia can both be seen

in association with alopecia areata, shiny trachyonychia is most often linked to alopecia areata. The histopathologic differences between these two subtypes have been well described by Tosti et al. [7]. Nail changes in the case of opaque trachyonychia are produced by a remittent, waxing and waning inflammatory insult to the nail matrix that never ceases [7]. However, in the case of shiny trachyonychia, there is an intermittent, focal, and regularly recurrent inflammatory insult to the matrix that is separated by periods of normal matrix function [7]. These differences in the distribution and timing of inflammation within the nail unit result in the two distinct clinical types of trachyonychia. It has been reported that of the two types, opaque trachyonychia is more commonly seen [5] and can be characterized by a more severe clinical course [8].

Trachyonychia was initially thought to occur exclusively in children, but subsequently cases in adults had also been recognized. It remains more common in the pediatric population with the peak age of onset between the age of 3 and 12 years [9, 10]. The incidence of trachyonychia in both adults and children is not known. One study found childhood onset trachyonychia to have a male predominance compared to adult onset trachyonychia which has been reported to have a female predominance [11], but these findings have not been confirmed in other patient populations. In those patients with both trachyonychia and alopecia areata, there is a variable temporal relationship between nail changes and disease progression. One study found roughly similar numbers of patients experiencing nail changes before, after, and simultaneous to hair loss [12].

Table 2. Dermatologic and nondermatologic diseases associated with trachyonychia

a Dermatologic

Commonly associated diseases

- 1 Alopecia areata/alopecia universalis [6, 7, 12]
- 2 Lichen planus [26, 31]
- 3 Psoriasis [32]

Uncommonly associated diseases

- 1 Ichthyosis vulgaris [33]
- 2 Vitiligo [34, 35]
- 3 Atopic dermatitis [36]
- 4 Pemphigus vulgaris [29]
- 5 Incontinentia pigmenti [37]
- 6 Congenital cutaneous candidiasis [38]
- 7 Hereditary punctate palmoplantar keratoderma [39]
- 8 Darier's disease [40]
- 9 Judo nails [41]
- 10 Knuckle pads [42]
- 11 Hay-Wells syndrome [43]

b Nondermatologic

Nondermatologic diseases associated with trachyonychia

- 1 Immunoglobulin A deficiency [44]
- 2 Balanced translocation 46, XX, t(6q13;10p13) [45]
- 3 Immune thrombocytopenic purpura [46]
- 4 Autoimmune hemolytic anemia [46]
- 5 Amyloidosis [47]
- 6 Sarcoidosis [48]
- 7 Reflex sympathetic dystrophy [49]
- 8 Down syndrome [50]

There have been many reports of idiopathic trachyonychia, which is characterized by the development of isolated nail involvement in the absence of a personal history or signs of cutaneous disease [9]. In these patients, opaque trachyonychia is the more common clinical subtype. Multiple reports of a hereditary form of trachyonychia exist in the literature occurring in monozygotic twins [13, 14] and within three generations of one family [15], suggesting that there may be some underlying genetic predisposition. All familial cases were described as occurring in the absence of any skin changes or abnormalities.

In our experience, a majority of cases of trachyonychia referred to the nail clinic are idiopathic. However, trachyonychia has been associated with a number of dermatologic and nondermatologic diseases, and the most frequent associations are with alopecia areata/universalis, psoriasis, and lichen planus (table 2a, b). Some chemotherapeutic agents and kinase inhibitors have also been reported to cause trachyonychia [16, 17].

Koilonychia has been reported to occur concurrently with other hallmark manifestations of trachyonychia, and in the absence of other known associated conditions [8, 9, 18–21]. In our experience, koilonychia is commonly found clinically with the opaque subtype of trachyonychia.

Evaluation

When evaluating a patient with trachyonychia, it is important to consider other causes of nail dystrophy in the differential diagnosis. We employ a four-step process in evaluating patients who present with clinical findings of trachyonychia (fig. 3). First, a personal and family history of skin disorders is obtained, as well as a careful examination of the skin, mucosa, and hair to evaluate for associated disorders [5]. Because of overlap features of trachyonychia with onychomycosis, it is helpful for a patient with newly diagnosed trachyonychia to be evaluated for onychomycosis. To accomplish this, we utilize nail clippings for histopathologic examination, including Periodic Acid-Schiff (PAS) staining. This procedure is noninvasive, bears little to no risk to the patient, and may also provide other clues to the underlying diagnosis. For example, histologic features of nail unit psoriasis may be present [22] in a nail clipping from a patient with idiopathic trachyonychia.

In general, nail unit biopsies are disfavored in the evaluation of trachyonychia or to further establish a specific underlying diagnosis. However, nail unit biopsy has a role in trachyonychia for severe cases, recalcitrant cases, or when the clinical diagnosis is ambiguous [23]. Longitudinal nail unit biopsy has the advantage of evaluation of multiple anatomic areas of the nail unit. If a nail unit biopsy reveals a primary cause for trachyonychia, such as psoriasis or lichen planus, systemic therapies may be implemented. One study found longitudinal biopsy helpful in making a diagnosis in 52.3% of TND cases [23]. However, 65.6% of patients in this study had concomitant cutaneous findings of different dermatoses [23]. Since these patients had nail findings associated with other dermatologic conditions, it is difficult to extrapolate this evidence to cases of true idiopathic trachyonychia. Because there is a potential for postprocedure nail dystrophy, secondary infection, and reduction of total nail width [23], careful risk/benefit analysis must be implemented before performing the procedure. Other types of nail unit biopsies could be considered but have the disadvantage of examining less area of a particular nail unit, and the distribution

Fig. 3. Algorithm for the evaluation of trachyonychia.

Fig. 4. Treatment algorithm for trachyonychia.

of the inflammation present may be variable, making a definitive diagnosis more difficult.

Histopathology

While biopsy is not routinely performed in the evaluation of trachyonychia, there have been several studies that have evaluated the histopathologic features of it. Wilkinson et al. [24] were the first authors to identify a distinctive histology in cases of idiopathic trachyonychia of focal spongiotic inflammation of the nail matrix. Based on this, other authors have proposed that idiopathic trachyonychia may be a subgroup of endogenous eczema affecting only the nail matrix or alternatively an autoimmune response against the nail matrix [25].

Many studies and case reports describe histologic findings of patients with trachyonychia (table 3a, b). Tosti et al. [9, 12] have looked in detail at the histopathology of the nail unit in patients with both idiopathic trachy-

nychia and trachyonychia associated with alopecia areata. They found that in both variants of trachyonychia, the majority of patients exhibit spongiotic changes in the nail apparatus and nail unit epithelia associated with mild-to-moderate lymphocytic infiltration and exocytosis [9, 12]. Of 43 patients with reported idiopathic trachyonychia and nail unit biopsy specimens, 7 were reported to have findings of lichen planus [9, 26, 27], 4 to have psoriasiform changes [9, 28], and 1 to have histological characteristics of pemphigus vulgaris [29] (table 4a). The 1 patient with pemphigus vulgaris on nail unit biopsy [29] went on to develop mucocutaneous lesions.

Of 16 patients with trachyonychia associated with alopecia areata, 14 were reported to exhibit spongiotic changes on nail biopsy (table 4b). The remaining 2 patients were reported to have histological changes characteristic of lichen planus [12, 30]. One of these patients went on to develop cutaneous lichen planus 6 months after the biopsy and therefore likely did not have nail changes secondary to alopecia areata, but rather lichen planus involving the nail unit [12].

Treatment

In many patients, nail changes of trachyonychia are self-limited. Children have a shorter duration of disease than adults, with one study reporting a median disease duration of 32.5 ± 9.7 months in children versus 77.0 ± 10 months in adults ($p = 0.002$) [11]. The same group also found a longer disease duration in female patients (82.5 ± 12.7 months) than male patients (63.7 ± 14.8 months) ($p = 0.007$) [11]. Upon follow-up of 12 patients with trachyonychia, 50% had spontaneous resolution within the first 6 years, with an average disease duration of 42 months [4]. Another study found that 82% of pediatric patients had an improvement in their nails after an average of 66 months of follow-up regardless of treatment type and duration [10]. While there is no definitive data on the amount of time it takes trachyonychia to improve, there is a good deal of evidence that nail findings improve on

Table 3. Treatment options for idiopathic and disease-associated trachyonychia

Authors [Ref.], year	Patients	Intervention	Outcome
a Treatment options for idiopathic trachyonychia – topical			
Park et al. [52], 2015	39 adult and pediatric patients	Calcipotriol/betamethasone dipropionate ointment once daily to the proximal nail fold for 6 months	4.2% of nails had complete response; 94.4% of nails had partial response
Khoo et al. [53], 2001	4 pediatric patients	Single-dose triamcinolone acetonide 2.5–10 mg/ml injections	Degree of pitting reduced to 15% of the nail surface area after 2 months and 42% of the nail surface area after 4 months
Halkier-Sørensen et al. [54], 1990	1 patient	Topical psoralen plus PUVA at 0.7–1.4 cm ³ three times per week	Significant improvement after 7 months
b Treatment options for idiopathic trachyonychia – systemic			
Lee et al. [55], 2012	15 patients (all ≥17 years old)	Cyclosporine 2.5–3 mg/kg/day; if patients had significant improvement, the dose was decreased to 1.5 mg/kg/day; treatment period was 8–24 months	After 6 months, 87% significant improvement, 12% slight improvement After 12 months (follow-up of 6 of 15 patients), 33% complete resolution, 67% significant improvement
Mittal et al. [56], 2001	1 pediatric patient	Betamethasone 4 mg with breakfast twice per week, no treatment in the remaining 5 days	Improvement after 2 months and full clearance of nail abnormalities in 6 months
Mostafa [57], 1989	1 patient	Chloroquine phosphate 250 mg twice daily	Clearance of nail abnormalities in 6 months
Seghal et al. [58], 2005	1 pediatric patient	Triamcinolone 10 mg and hydrocortisone acetate 20 mg injection under ketamine-induced anesthesia and oral griseofulvin 10 mg/kg in single or divided doses for 6 months	Improvement in nail abnormalities after 4 weeks
c Treatment options for disease-associated trachyonychia			
Pierard et al. [59], 1996	5 patients with psoriasis	Cyclosporine 3 mg/kg/day for 3 months with a taper in steps 0.5 mg/kg/day every second week	Improvement in segmental mean depth of roughness after 2–3 months of treatment
Tosti et al. [60], 2006	1 adult patient with psoriasis	Acitretin 0.3 mg/kg/day for 7 months	Complete resolution of nail dystrophy
Soda et al. [61], 2005	1 adult patient with alopecia areata universalis	Tazarotene 0.1% gel once daily overnight on affected nails and periungual skin for 3 months	Significant clinical improvement; relapse after 5 months off treatment with clearance after the second course of treatment

their own over time. Because trachyonychia is a nonscarring condition, observation of the nails affords minimal long-term risk to the patient. As a result, counseling, reassurance, active nonintervention, and the tincture of time are reasonable treatment options for this disease.

While trachyonychia is not harmful to the patient, nail diseases have been shown to have a negative effect on the

patients' quality of life. For those who request treatment, various treatment options have been well documented in patients with trachyonychia (table 3a, b). In this table, we have included treatments attempted on only 1 or 2 patients, since there are very few large-scale controlled studies in patients with this disease. There is no single evidence-based therapy that is reliably effective, and it can

Table 4. Reported histopathologic features of idiopathic trachyonychia and trachyonychia associated with alopecia areata

Histopathological characteristic	Nail biopsies, n [Ref.]
a Idiopathic trachyonychia	
Spongiotic changes	27 [1, 9, 24, 25, 36]
Psoriasis	4 [9, 28]
Lichen planus	7 [9, 26, 27, 51]
Pemphigus vulgaris	1 [29]
b Trachyonychia associated with alopecia areata	
Spongiotic changes	14 [12, 25]
Lichen planus	2 [12, 30]

be difficult to choose a specific therapy due to limited data. In addition, there is no objective measure for assessing improvement in these patients so it is difficult to quantify degree of clinical improvement in a way that is meaningful in comparing one treatment to another. In patients who have trachyonychia associated with an underlying disease, treatments for the associated disease may be beneficial in improving the appearance of the nails (table 3c). In patients with shiny trachyonychia, nail cosmetics are a low-risk treatment option that may help alleviate the visibility of nail changes. Male patients with shiny trachyonychia may consider a clear polish to improve the appearance of the nails.

Despite the benign and often self-limited nature of the disease, some patients will desire therapy. Our treatment algorithm begins with observation/active nonintervention followed by a trial period of topical treatments (fig. 4). In our experience, most patients are referred to the nail specialty clinic after failing topical medications. In this case, if the patient requests further treatment, nail unit steroid injections may be considered. In our experience, for pediatric patients in particular, pretreatment with an anesthetic cream and use of a vibratory device can help with the discomfort of nail unit injections.

In adults, we have a lower threshold for active treatment and intervention, since the appearance of the nails

can be bothersome and can affect quality of life. In particular, adults who have professions with frequent interaction with the public, and where the hands are often visible, such as salespeople, often are concerned about the nail changes of trachyonychia affecting their professional success. Since trachyonychia is a benign condition and children tend to have shorter disease courses, pediatric patients warrant a more conservative approach. If children are bothered by their nails or parents push for treatment, the same algorithm can be applied (fig. 4).

Summary

The exact etiology of the inflammation that affects the nail unit in patients with trachyonychia continues to remain unclear. Tosti et al. [7] have suggested that based on the clinical and pathologic appearance of the nails, idiopathic trachyonychia may represent a subset of alopecia areata that is limited to the nails. Because trachyonychia is associated with a number of dermatologic diseases (table 2a), patients who present clinically with trachyonychia should undergo a comprehensive skin exam. Additionally, these patients need future follow-up as nail changes associated with idiopathic trachyonychia can sometimes precede the development of other cutaneous diseases. It is important to counsel patients on the benign nature of the disease and the generally good prognosis. Even with counseling, some patients may experience distress over their nail changes and request treatment. The age of the patient, the subtype of trachyonychia, the severity of trachyonychia, prior treatments attempted, and associated dermatologic and nondermatologic diseases should all be taken into account when determining the best treatment regimen for the patient.

Disclosure Statement

The authors have no conflicts of interest to disclose.

References

1 Alkiewicz J: Trachyonychia. *Ann Dermatol Syphiligr* (Paris) 1950;10:136–140.

2 Hazelrigg DE, Duncan WC, Jarratt M: Twenty-nail dystrophy of childhood. *Arch Dermatol* 1977;113:73–75.

3 Baran R, Dawber R: Twenty-nail dystrophy of childhood: a misnamed syndrome. *Cutis* 1987;39:481–482.

4 Sakata S, Howard A, Tosti A, Sinclair R: Follow-up of 12 patients with trachyonychia. *Australas J Dermatol* 2006;47:166–168.

5 Chu DH, Rubin AI: Diagnosis and management of nail disorders in children. *Pediatr Clin North Am* 2014;61:293–308.

6 Baran R: Twenty-nail dystrophy of alopecia areata. *Arch Dermatol* 1981;117:1.

- 7 Tosti A, Bardazzi F, Piraccini BM, Fanti PA, Cameli N, Pileri S: Is trachyonychia, a variety of alopecia areata, limited to the nails? *J Invest Dermatol* 1995;104(5 suppl):27S–28S.
- 8 Gordon KA, Vega JM, Tosti A: Trachyonychia: a comprehensive review. *Indian J Dermatol Venereol Leprol* 2011;77:640–645.
- 9 Tosti A, Bardazzi F, Piraccini BM, Fanti PA: Idiopathic trachyonychia (twenty-nail dystrophy): a pathological study of 23 patients. *Br J Dermatol* 1994;131:866–872.
- 10 Kumar MG, Ciliberto H, Bayliss SJ: Long-term follow-up of pediatric trachyonychia. *Pediatr Dermatol* 2015;32:198–200.
- 11 Lee YB, Cheon MS, Park HJ, Cho BK: Clinical study of twenty-nail dystrophy in Korea. *Int J Dermatol* 2012;51:677–681.
- 12 Tosti A, Fanti PA, Morelli R, Bardazzi F: Trachyonychia associated with alopecia areata: a clinical and pathologic study. *J Am Acad Dermatol* 1991;25:266–270.
- 13 Commens CA: Twenty nail dystrophy in identical twins. *Pediatr Dermatol* 1988;5: 117–119.
- 14 Karakayali G, Lenk N, Gungor E, Gur G, Alli N: Twenty-nail dystrophy in monozygotic twins. *J Eur Acad Dermatol Venereol* 1999;12: 192–193.
- 15 Pavone L, Li Volti S, Guarneri B, La Rosa M, Sorge G, Incorpora G, et al: Hereditary twenty-nail dystrophy in a Sicilian family. *J Med Genet* 1982;19:337–340.
- 16 Chen W, Yu YS, Liu YH, Sheen JM, Hsiao CC: Nail changes associated with chemotherapy in children. *J Eur Acad Dermatol Venereol* 2007;21:186–190.
- 17 Lau YM, Lam YK, Leung KH, Lin SY: Trachyonychia in a patient with chronic myeloid leukaemia after imatinib mesylate. *Hong Kong Med J* 2014;20:464 e2.
- 18 Sehgal VN: Twenty nail dystrophy trachyonychia: an overview. *J Dermatol* 2007;34:361–366.
- 19 Crosby DL, Swanson SL, Fleischer AB: Twenty-nail dystrophy of childhood with koilonychia. *Clin Pediatr (Phila)* 1991;30:117–119.
- 20 Richert B, André J: Nail disorders in children: diagnosis and management. *Am J Clin Dermatol* 2011;12:101–112.
- 21 Jeanmougin M, Civatte J: Sandy nails and twenty-nail dystrophy of childhood (in French). *Apropos of 2 cases. Dermatologica* 1984;168:242–246.
- 22 Stephen S, Tosti A, Rubin AI: Diagnostic applications of nail clippings. *Dermatol Clin* 2015;33:289–301.
- 23 Grover C, Khandpur S, Reddy BS, Chaturvedi KU: Longitudinal nail biopsy: utility in 20-nail dystrophy. *Dermatol Surg* 2003;29:1125–1129.
- 24 Wilkinson JD, Dawber RP, Bowers RP, Fleming K: Twenty-nail dystrophy of childhood. Case report and histopathological findings. *Br J Dermatol* 1979;100:217–221.
- 25 Jerasutus S, Suvanprakorn P, Kitchawengkul O: Twenty-nail dystrophy. A clinical manifestation of spongiotic inflammation of the nail matrix. *Arch Dermatol* 1990;126:1068–1070.
- 26 Scher RK, Fischbein R, Ackerman AB: Twenty-nail dystrophy: a variant of lichen planus. *Arch Dermatol* 1978;114:612–613.
- 27 Wilkinson JD, Dawber RP, Fleming K, Bowers R: Twenty-nail dystrophy. *Arch Dermatol* 1979;115:369.
- 28 Kechijian P: Twenty-nail dystrophy of childhood: a reappraisal. *Cutis* 1985;35:38–41.
- 29 Berker DD, Dalziel K, Dawber RP, Wojnarska F: Pemphigus associated with nail dystrophy. *Br J Dermatol* 1993;129:461–464.
- 30 Kanwar AJ, Ghosh S, Thami GP, Kaur S: Twenty-nail dystrophy due to lichen planus in a patient with alopecia areata. *Clin Exp Dermatol* 1993;18:293–294.
- 31 Tosti A, Piraccini BM, Cambiaghi S, Jorizzo M: Nail lichen planus in children: clinical features, response to treatment, and long-term follow-up. *Arch Dermatol* 2001;137:1027–1032.
- 32 Schissel DJ, Elston DM: Topical 5-fluorouracil treatment for psoriatic trachyonychia. *Cutis* 1998;62:27–28.
- 33 James WD, Odom RB, Horn RT: Twenty-nail dystrophy and ichthyosis vulgaris. *Arch Dermatol* 1981;117:316.
- 34 Peloro TM, Pride HB: Twenty-nail dystrophy and vitiligo: a rare association. *J Am Acad Dermatol* 1999;40:488–490.
- 35 Khandpur S, Bansal A, Sharma VK, Bhatti SS, Singh MK: Twenty nail dystrophy in vitiligo. *J Dermatol* 2007;34:189–192.
- 36 Braun-Falco O, Dorn M, Neubert U, Plewig G: Trachyonychia: 20-nail dystrophy (in German). *Hautarzt* 1981;32:17–22.
- 37 Scardamaglia L, Howard A, Sinclair R: Twenty-nail dystrophy in a girl with incontinentia pigmenti. *Australas J Dermatol* 2003;44:71–73.
- 38 Clegg HW, Prose NS, Greenberg DN: Nail dystrophy in congenital cutaneous candidiasis. *Pediatr Dermatol* 2003;20:342–344.
- 39 Gupta R, Mehta S, Pandhi D, Singal A: Hereditary punctate palmoplantar keratoderma (PPK) (Brauer-Buschke-Fischer syndrome). *J Dermatol* 2004;31:398–402.
- 40 Sehgal VN, Chatterjee K, Chaudhuri A, Verma P, Sharma S: Twenty-nail dystrophy and Darier's (Darier-White) disease. *Skinmed* 2015;13:313–315.
- 41 Shelley WB, Shelly ED: Portrait of a practice. *Cutis* 1995;56:91–92.
- 42 Runne U: Twenty nail dystrophy mit knuckle pads. *Zeitschr Hautkr* 1980;55:901.
- 43 Tonolli VM, Stolf HO, Tonello CS, Pires RB, Abbade LPF: Syndrome in question. Hay-Wells syndrome. *An Bras Dermatol* 2014;89: 363–364.
- 44 Leong AB, Gange RW, O'Connor RD: Twenty-nail dystrophy (trachyonychia) associated with selective IgA deficiency. *J Pediatr* 1982; 100:418–420.
- 45 Balci S, Kanra G, Aypar E, Son YA: Twenty-nail dystrophy in a mother and her 7-year-old daughter associated with balanced translocation 46, XX, t(6q13;10p13). *Clin Dysmorphol* 2002;11:171–173.
- 46 Germain-Lee EL, Zinkham WH: Twenty-nail dystrophy associated with hematologic abnormalities. *Acta Paediatr Scand* 1991;80: 977–980.
- 47 Que SK, Sloan B, Dadras SS: Trachyonychia, cutis laxa, and easy bruising of the skin. *Amyloidosis. JAMA Dermatol* 2014;150:1357–1358.
- 48 Aranegui B, Garcia-Cruz A, de la Torre C, Gonzalez-Valladares MG: Trachyonychia and sarcoidosis. *J Am Acad Dermatol* 2010; 63:159–160.
- 49 Pucevich B, Spencer L, English JC 3rd: Unilateral trachyonychia in a patient with reflex sympathetic dystrophy. *J Am Acad Dermatol* 2008;58:320–322.
- 50 Norton SA, Demidovich CW 3rd: Down syndrome, alopecia universalis, and trachyonychia. *Pediatr Dermatol* 1993;10:187–188.
- 51 Baran R, Dupre A, Christol B, Bonafe JL, Sayag J, Ferrere J: Vertical striated sand-papered twenty-nail dystrophy. *Ann Dermatol Venereol* 1978;105:387–392.
- 52 Park JM, Cho HH, Kim WJ, Mun JH, Song M, Kim HS, et al: Efficacy and safety of calcipotriol/betamethasone dipropionate ointment for the treatment of trachyonychia: an open-label study. *Ann Dermatol* 2015;27:371–375.
- 53 Khoo BP, Giam YC: A pilot study on the role of intralesional triamcinolone acetonide in the treatment of pitted nails in children. *Singapore Med J* 2000;41:66–68.
- 54 Halkier-Sørensen L, Cramers M, Kragballe K: Twenty-nail dystrophy treated with topical PUVA. *Acta Derm Venereol* 1989;70:510–511.
- 55 Lee YB, Cheon MS, Eun YS, Cho BK, Park YG, Park HJ: Cyclosporin administration improves clinical manifestations and quality of life in patients with 20-nail dystrophy: case series and survey study. *J Dermatol* 2012;39: 1064–1065.
- 56 Mittal R, Khaitan BK, Sirka CS: Trachyonychia treated with oral mini pulse therapy. *Indian J Dermatol Venereol Leprol* 2001;67:202–203.
- 57 Mostafa WZ: Lichen planus of the nail: treatment with antimalarials. *J Am Acad Dermatol* 1989;20:289–290.
- 58 Sehgal VN, Sharma S, Khandpur S: Twenty-nail dystrophy originating from lichen planus. *Skinmed* 2005;4:58–59.
- 59 Pierard GE, Pierard-Franchimont C: Dynamics of psoriatic trachyonychia during low-dose cyclosporin A treatment: a pilot study on onychochronobiology using optical profilometry. *Dermatology* 1996;192:116–119.
- 60 Tosti A, Bellavista S, Iorizzo M, Vincenzi C: Occupational trachyonychia due to psoriasis: report of a case successfully treated with oral acitretin. *Contact Dermatitis* 2006;54:123–124.
- 61 Soda R, Diluvio L, Bianchi L, Chimenti S: Treatment of trachyonychia with tazarotene. *Clin Exp Dermatol* 2005;30:301–302.