CLINICAL REPORT

Distinct Patterns and Aetiology of Chromonychia

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Abnormal colouring of the nails may be a sign of underlying systemic or local disorders. This study investigated the prevalence and causes of chromonychia as a whole, as well as of each subtype. Among 163 patients with chromonychia, trauma was the pathogenesis in up to 20.9% (34/163) of cases. The most common subtype was melanonychia (54.0%; 88/163), followed by leukonychia (23.9%), red (8.6%), green (6.7%), yellow (4.9%) and blue (1.8%) nails. Nail matrix naevus (33.3%; 29/88) was the most common cause of melanonychia, while skin diseases (41.0%; 16/39), such as psoriasis (75%, 12/16) and alopecia areata (18.8%; 3/16), in addition to systemic diseases (33.3%; 13/39) including anaemia (38.5%, 5/13) and chronic renal failure (15.4%; 2/13) were the dominant causes of leukonychia. As chromonychia may be the first or only sign of an underlying disorder, it should alert physicians and patients to the need for a prompt and thorough evaluation.

Key words: green nail; leukonychia; melanonychia; nail discoloration; internal medicine; skin disease.

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Chromonychia is an abnormality in the colour of the nail plate or subungual tissue. Common patterns of nail discoloration include black, white, red, green, blue, and yellow dyschromias (1). Interestingly, these nail discolorations can be useful as diagnostic clues to underlying issues, such as skin or systemic diseases, drug exposure, benign or malignant tumours, associated trauma, infections, and exogenous agents (1, 2). As the number of patients with chromonychia visiting dermatological clinics increases, a diagnostic algorithm for the disease is required.

The aim of the present study was to evaluate the epidemiology and aetiology of chromonychia in Korean patients. While previous reports have focused on each entity individually, especially melanonychia (3, 4), we analysed the prevalence and causes of nail discoloration as a whole as well as for individual entities. In our study, chromonychia was considered a unique category different from onychomycosis and therefore fungal infection was excluded.

METHODS

Study design

This retrospective study included 163 patients with chromonychia who visited Chonnam National University Hospital, Gwangju, South Korea from January 2003 to December 2016. From medical records data were extracted and assessed regarding patients' demographic characteristics (age and sex), relevant medical history (related systemic or skin diseases and medication), trauma history, physical findings (colour, affected number, site, and pattern), infection (bacterial and fungal cultures) and exogenous agents that were applied. Because of the risk of nail deformity, histopathological examination was only performed for 50 patients when clinical findings were indicative of malignant or benign tumour or when patients were anxious about the possibility of malignancy and requested a nail unit biopsy. This retrospective study was approved by the institutional review boards of the participating hospital.

Definition and classification of chromonychia

Melanonychia is defined as a deposition of brown or black pigment in the nail plate from increased pigment production within the nail matrix (5). Patients with melanonychia were subdivided depending on the width of the band: less than 3 mm, 3 mm to less than 6 mm, 6 mm or wider, and total nail plate involvement. Leukonychia is defined as an opaque white discoloration of nail (1). It is classified as true or apparent, depending on whether the origin is in the nail matrix or nail bed. True leukonychia is further divided into total, subtotal, punctate, transverse, and longitudinal subtypes depending on the extent and pattern of involvement. Pseudoleukonychia, in which the abnormality is not derived from the matrix or the nail bed, mainly caused by onychomycosis, was not included in our study. Other patients with chromonychia were categorized into red, green, blue, and yellow nail groups according to nail colour.

RESULTS

Chromonychia

A total of 163 patients with chromonychia visited our department. Their mean age was 43.0 ± 21.9 years. There were 70 males and 93 females, a male:female ratio of 0.75:1. The specific presentations and causes of chromonychia are detailed in **Table I**.

Melanonychia

Eighty-eight patients (55.3%; 88/163) had melanonychia, mean age 43.6 ± 23.8 years. There were 34 males and 54 females, a male:female ratio of 0.6:1. The causes of melanonychia are detailed in **Table II**. The causes

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Table I. Summary of clinical features and aetiologies of chromonychia in relation to nail colour

Category	Trauma *n* (%)	Periungual tumour *n* (%)	Drug *n* (%)	Skin disease *n* (%)	ETN pigmentation *n* (%)	NAL *n* (%)	NMN *n* (%)	Melanoma *n* (%)	Systemic disease *n* (%)	Bacteria *n* (%)	Exogenous agent *n* (%)	Total *n* (%)
Melanonychia	17[a]	1	3	2	13	10	29[a]	13	0	0	0	88 (54.0)
Leukonychia	6	4	0	16[a]	0	0	0	0	13[a]	0	0	39 (23.9)
Red nail	0	14[a]	0	0	0	0	0	0	0	0	0	14 (8.6)
Green nail	0	0	0	0	0	0	0	0	0	11[a]	0	11 (6.7)
Blue nail	0	0	3[a]	0	0	0	0	0	0	0	0	3 (1.8)
Yellow nail	0	0	0	4[a]	0	0	0	0	1	0	3[a]	8 (4.9)
Total	23 (14.1)	19 (11.7)	6 (3.7)	22 (13.5)	13 (8.0)	10 (6.1)	29 (17.8)	13 (8.0)	14 (8.6)	11 (6.7)	3 (1.8)	163 (100)

[a]Two most common causes in each entity.
ETN: ethnic type nail; NAL: nail apparatus lentigo; NMN: nail matrix naevus.

of trauma-induced pigmentation included occupational trauma, housekeeping work, nail biting, and indoor climbing in 8 (47.1%), 5 (29.4%), 2 (11.8%) and 2 patients (11.8%), respectively. Periungual tumour-induced pigmentation was observed in one patient, in whom the underlying tumour was a viral wart. The culprit drugs of drug-induced pigmentation were hydroxyurea, phenytoin and sulfasalazine. Skin disease-induced pigmentation was caused by acanthosis nigricans in 2 patients. Ethnic-type nail (ETN) pigmentation was most commonly observed on multiple nails (84.6%; 11/13) and was more prevalent on fingernails than toenails. All of the lesions involving nail apparatus lentigo (NAL) were observed on a single nail and were less than 6 mm wide. Nail matrix naevus (NMN) was found mainly on a single nail (93.1%; 27/29), was more common on fingernails than toenails, and most frequently affected the right second fingernail. The width of most NMN lesions was less than 6 mm (86.2%; 25/29). Ungual melanoma was found on only one nail, and the most frequently affected site was the first digit (53.8%; 7/13). Most lesions (92.3%; 12/13) showed total involvement or at least 6-mm width. The one case of lesion width between 3 and 6 mm presented irregular longitudinal brown-to-black lines. Nail matrix biopsy specimens revealed 7 and 6 cases of invasive ungual melanoma and melanoma *in situ*, respectively.

Leukonychia

Thirty-nine patients (24.5%; 39/163) had leukonychia. Their mean age was 36.5 ± 19.9 years. There were 24 males and 15 females, a male:female ratio of 1.6:1. The causes and presentations of leukonychia are outlined in **Table III**. Trauma-induced leukonychia was caused by nail biting, frequent manicure application, and occupational trauma in 4 (66.7%), one (16.7%), and one patient (16.7%), respectively. Most patients presented with partial leukonychia (83.3%), while only one patient (16.7%) presented with subtotal leukonychia. Periungual tumour was observed in 4 patients, in which the underlying tumours were wart, fibroma, glomus tumour, and onychopapilloma. All lesions involved the thumbnails and resulted in longitudinal leukonychia. The most common related skin disease was psoriasis (75%; 12/16), followed by alopecia areata (18.8%). While punctate leukonychia was observed in 9 (75%, 12/16) and 3 (25%) patients with psoriasis and alopecia areata, respectively, transverse leukonychia was observed in 3 (75%, 3/4) and one patient (25%; 1/4) with psoriasis and acrodermatitis

Table II. Summary of clinical features of melanonychia lesions by category

				Width, mm					Digit									
Category	Patients *n* (%)	Age, years	M:F	< 3	≤ 3–<6	≤ 6	Total nail plate	Site	R5	R4	R3	R2	R1	L1	L2	L3	L4	L5
Trauma-induced	17 (19.3)	45.6	7:10	6 (15.4)	5 (21.7)	4 (25.0)	2 (20.0)	FN	–	2	2	3[a]	2	2	1	–	1	–
								TN	–	–	1	1	3[a]	4[a]	2	–	–	1
Periungual tumour-induced	1 (1.1)	76.0	0:1	1 (2.6)	–	–	–	FN	–	–	–	–	–	–	–	–	–	–
								TN	–	–	–	–	1	–	–	–	–	–
Drug-induced	3 (3.4)	69.7	1:2	–	2 (8.7)	1 (6.3)	–	FN	2	2	2	2	3[a]	3[a]	2	2	2	2
								TN	1	1	1	1	1	1	1	1	1	1
Skin disease-induced	2 (2.3)	12.0	0:2	2 (5.1)	–	–	–	FN	2[a]	2[a]	2[a]	2[a]	2[a]	2[a]	2[a]	2[a]	2[a]	2[a]
								TN	–	–	–	–	–	–	–	–	–	–
Ethnic-type nail pigmentation	13 (14.8)	43.5	3:10	5 (12.8)	5 (21.7)	3 (18.8)	–	FN	3	5	6	4	7[a]	9[a]	6	5	2	2
								TN	1	1	1	1	3	3	1	1	1	1
Nail apparatus lentigo	10 (11.4)	29.0	2:10	8 (20.5)	2 (8.7)	–	–	FN	–	–	1	1	2[a]	1	2[a]	–	1	–
								TN	–	–	1	–	–	2[a]	–	–	–	–
Nail matrix naevus	29 (33.0)	39.0	13:16	17 (43.6)	8 (34.8)	2 (12.5)	2 (20.0)	FN	–	–	3	6[a]	4	5[a]	2	1	1	–
								TN	–	1	1	–	3	2	1	1	–	–
Ungual melanoma	13 (14.8)	54.0	8:5	–	1 (4.3)	6 (37.5)	6 (60.0)	FN	–	1	1	1	3[a]	2[a]	1	–	1	–
								TN	–	–	–	–	1	1	–	–	–	1

[a]Two most common sites in each entity.
FN: fingernail; L: left; R: right; TN: toenail.

Table III. Summary of clinical features of leukonychia lesions by category

Category	Patients, *n* (%)	Age, years	M:F	Type						Site	Digit									
				True							R5	R4	R3	R2	R1	L1	L2	L3	L4	L5
						Partial														
				Total	Subtotal	Punctate	Transverse	Longitudinal	Apparent											
Trauma-induced	6 (15.4)	34.3	3:3	–	1 (20.0)	2 (14.3)	3 (42.9)	–	–	FN	2	2	4[a]	4[a]	4[a]	4[a]	3	3	3	2
										TN	–	–	–	–	1	1	–	–	–	–
Periungual tumour-induced	4 (10.3)	49.5	4:0	–	–	–	–	4 (100.0)	–	FN	–	–	–	–	2[a]	2[a]	–	–	–	–
										TN	–	–	–	–	–	–	–	–	–	–
Skin disease-induced	16 (41.0)	33.1	10:6	–	–	12 (85.7)	4 (57.1)	–	–	FN	6	7	8	9	8	12[a]	8	10[a]	9	5
										TN	–	–	–	–	–	–	–	–	–	–
Psoriasis	12 (30.8)	37.0	7:5	–	–	9	3	–	–	FN	6	7	7	8	5	9[a]	7	9[a]	9	5
										TN	–	–	–	–	–	–	–	–	–	–
Alopecia areata	3 (7.7)	28.3	2:1	–	–	3	–	–	–	FN	–	–	1	1	2[a]	3[a]	1	1	–	–
										TN	–	–	–	–	–	–	–	–	–	–
Acrodermatitis continua of Hallopeau	1 (2.6)	1	1:0	–	–	–	1	–	–	FN	–	–	–	–	1[a]	1[a]	–	–	–	–
										TN	–	–	–	–	–	–	–	–	–	–
Malignant acanthosis nigricans	0 (0)	–	–	–	–	–	–	–	–	FN	–	–	–	–	–	–	–	–	–	–
										TN	–	–	–	–	–	–	–	–	–	–
Systemic disease-induced	13 (33.3)	37.6	7:6	2 (100.0)	4 (80.0)	–	–	–	7 (100.0)	FN	3	3	8[a]	8[a]	8[a]	6	9[a]	8[a]	5	3
										TN	1	1	1	1	3	2	2	2	1	1
Anaemia	5 (12.8)	26.6	4:1	–	1	–	–	–	4	FN	1	1	3	3	3	3	4[a]	4[a]	3	–
										TN	1	1	1	1	1	1	1	1	1	1
Chronic renal failure	2 (5.1)	62.5	1:1	–	–	–	–	–	2	FN	1	1	2[a]	2[a]	1	1	1	1	1	1
										TN	–	–	–	–	–	–	–	–	–	–
Other diseases[b]	6 (15.4)	38.5	2:4	2	3	–	–	–	1	FN	1	1	4[a]	4[a]	4[a]	2	3	2	1	1
										TN	–	–	–	–	2	1	1	1	–	–

[a]Two most common sites in each entity. [b]Includes gout, liver cirrhosis, pneumonia, scleroderma, Sjögren's syndrome and systemic lupus erythematosus.
FN: fingernail; L: left; R: right; TN: toenail.

continua of Hallopeau, respectively. The most common related systemic disease was anaemia (38.5%; 5/13), followed by chronic renal failure (15.4%), gout (7.7%), liver cirrhosis (7.7%), pneumonia (7.7%), scleroderma (7.7%), Sjögren's disease (7.7%), and systemic lupus erythematosus (7.7%). Half of the patients presented apparent leukonychia (53.8%; 7/13), while the other half showed either subtotal (30.8%) or total (15.4%) leukonychia.

Red/green/blue/yellow nails

Fourteen, 11, 3 and 8 patients had red (8.6%; 14/163), green (6.7%), blue (1.8%) and yellow (4.9%) nails, respectively (**Table IV**). In red nails, the most common cause was glomus tumour (42.6%; 6/14), followed by granuloma pyogenicum (21.4%), fibroma (21.4%), and myxoma (14.3%). The most common symptom was pain (78.6%; 11/14), whereas the other patients complained of unusual appearance (21.4%). The lesions were more prevalent on the fingernails (71.4%; 10/14) particularly the thumbnails (40.0%; 4/10), compared with the toenails (28.6%). Green nail was caused by *Pseudomonas aeruginosa* (100%; 11/11), while blue nail was related to hydroxyurea, minocycline and anti-malarial drugs. Yellow nail, by contrast, was caused by lichen planus (50%; 4/8), exogenous agents (37.5) and systemic disease

Table IV. Summary of clinical features of red/green/blue/yellow nails by category

Category	Patients *n* (%)	Age, years	M:F	Colour				Site	Digit									
				Red	Green	Blue	Yellow		R5	R4	R3	R2	R1	L1	L2	L3	L4	L5
Periungual tumour-induced	14	46.4	6:8	14 (100.0)	–	–	–	FN	1[a]	1[a]	–	1[a]	2[a]	2[a]	1[a]	1[a]	1[a]	–
								TN	–	–	–	–	1[a]	–	1[a]	–	–	1[a]
Bacterial infection-induced	11	53.9	1:2	–	11 (100.0)	–	–	FN	–	–	1	1	3[a]	1	–	–	–	–
								TN	–	–	–	–	4[a]	4[a]	–	–	–	–
Drug-induced	3	42.3	1:2	–	–	3 (100.0)	–	FN	1[a]	2[a]	2[a]	2[a]	2[a]	1[a]	2[a]	1[a]	1[a]	1[a]
								TN	–	–	–	1[a]	1[a]	1[a]	–	–	–	–
Systemic disease-induced	1	34	1:0				1 (12.5)	FN	–	–	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]	–	–
								TN	–	–	–	–	–	–	–	–	–	–
Exogenous agent-induced	4	45.7	1:2	–	–	–	3 (37.5)	FN	1[a]	1[a]	2[a]	2[a]	2[a]	2[a]	1[a]	1[a]	1[a]	1[a]
								TN	–	–	–	–	–	–	–	–	–	–
Lichen planus	4	50.5	1:3	–	–	–	4 (50.0)	FN	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]
								TN	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]	4[a]
Ochronosis	0	–	–	–	–	–	–	FN	–	–	–	–	–	–	–	–	–	–
								TN	–	–	–	–	–	–	–	–	–	–

[a]Two most common sites in each entity.
FN: fingernail; L: left; R: right; TN: toenail.

(12.5%). The culprit agents included henna and tobacco and the related systemic disease was hepatitis.

DISCUSSION

Among types of nail discoloration, leukonychia has been reported as the most common disease entity (1). In our study, however, melanonychia was the most common type of chromonychia, accounting for 54.0% of cases. Since 73.9% (65/88) of the patients with melanonychia, compared with 33.3% (13/39) of the patients with leukonychia, visited our dermatological clinic within the last 5 years, this discordance could be a result of recently increased general awareness of melanoma. The most common cause of chromonychia was NMN (17.8%; 29/163), followed by trauma (14.1%). However, as *P. aeruginosa*-induced green nails are related to microtrauma as well as water exposure, trauma may account for up to 20.9% (34/163) of cases of chromonychia. Our findings suggest that emphasis on prevention and education regarding trauma can reduce cases of chromonychia by up to one-fifth.

Although trauma was a major cause of both melanonychia and leukonychia, the clinical presentations differed between the diseases. Melanonychia was associated with longitudinal lines, as opposed to leukonychia, which presented mostly as punctate or transverse lines. In terms of pathogenesis, melanocytes that are interspersed within the nail matrix can be activated by mechanical stress, resulting in longitudinal lines (6). By contrast, trauma can impact on keratinocytes and cause nail matrix arrest that leads to transverse lines (7). The common causes of trauma also differed between melanonychia and leukonychia. Occupational trauma and housekeeping work were common causes of melanonychia, whereas nail biting and frequent application of manicures were more common in leukonychia. Taloni et al. (8) reported that activation of melanocytes is subject to compressive stress. In contrast, mechanical stretch highly affects the proliferative capacity and mitogen-activated protein kinase activation of keratinocytes compared with melanocytes (6). As nail biting and application of manicures involve more stretching than compression and are more intermittent compared with occupational trauma, such as working while wearing rubber boots, it is possible that the different characteristics of mechanical stress and cellular susceptibility may contribute to these different manifestations of chromonychia.

Compared with the studies conducted in Poland (4) and France (9), NMN and ETN pigmentation were more common causes of melanonychia in this study. Palicka & Rhodes (10) reported that the prevalence of acral naevus increased directly with the degree of skin pigmentation. In addition, ETN pigmentation has been mainly observed in dark-skinned individuals (11). Our data, which is consistent with these reports, supports the possibility of different genetic susceptibility to melanonychia across ethnicities. Interestingly, acanthosis nigricans, which is more common in darker skin (12), was the major cause of skin-disease-induced melanonychia in our population, in contrast to the previous European studies in which no patients had acanthosis nigricans. Our data suggests that NMN, ethnicity and acanthosis nigricans may be risk factors for melanonychia in dark-skinned individuals.

Our results also indicate that the number of involved digits and width of lesions differ with different aetiologies in patients with melanonychia. While drug exposure (100%), skin disease (100%) and ETN pigmentation (84.6%) were primarily associated with multiple nail involvement, NAL (100%), ungual melanoma (100%), NMN (93.1%) and trauma (70.6%) were associated mainly with single nail involvement. Twelve of 13 patients with ungual melanoma (92.3%) showed either total nail involvement or bands of 6 mm or wider (**Fig. 1**a), most commonly involving the first digits (53.8%; 7/13). The only ungual melanoma patient with a band less than 6 mm wide demonstrated irregular black colour variegation, prompting melanoma evaluation. As both ungual melanoma and acral melanocytic naevus, which may mimic melanoma, are more prevalent in dark-skinned individuals, differentiating ungual melanoma is more challenging in Asians compared with in white populations (10, 11). In accordance with previous reports (9, 11), single nail melanonychia on trauma-susceptible digits, bands wider than 6 mm or total nail involvement, and colour variegation were alerting signs of melanoma in our study. Even if the band is less than 6 mm wide, clinical features, such as Hutchinson's sign, nail dystrophy, and triangular lesions necessitate evaluation for melanoma (11). Recently, an objective discrimination index for evaluating dermoscopic images of melanonychia had shown to be useful in differentiation of ungual melanoma from benign lesions as well as long-term follow-up of children and adolescents who presented with melanonychia mimicking melanoma (13, 14).

Previously reported causes of leukonychia include infections, drugs, skin diseases, systemic diseases, dietary defects, trauma and malignancy (15). In our study, skin diseases (41.0%; 16/39) and systemic diseases (33.3%) were the dominant causes of leukonychia. Psoriasis (75%, 12/16) and alopecia areata (18.8%) were the most common skin diseases linked to leukonychia. On clinical presentation, all patients presented punctate and transverse patterns, which are partial subtypes of true leukonychia. Previous studies have shown that punctate leukoplakia was the most common nail feature in both psoriasis and alopecia areata (73.0% and 61.8%, respectively), whereas other subtypes of leukonychia were observed in 0.9–1.3% and no cases of psoriasis and alopecia areata, respectively (16–19). These results are consistent with our data, suggesting that the major pre-

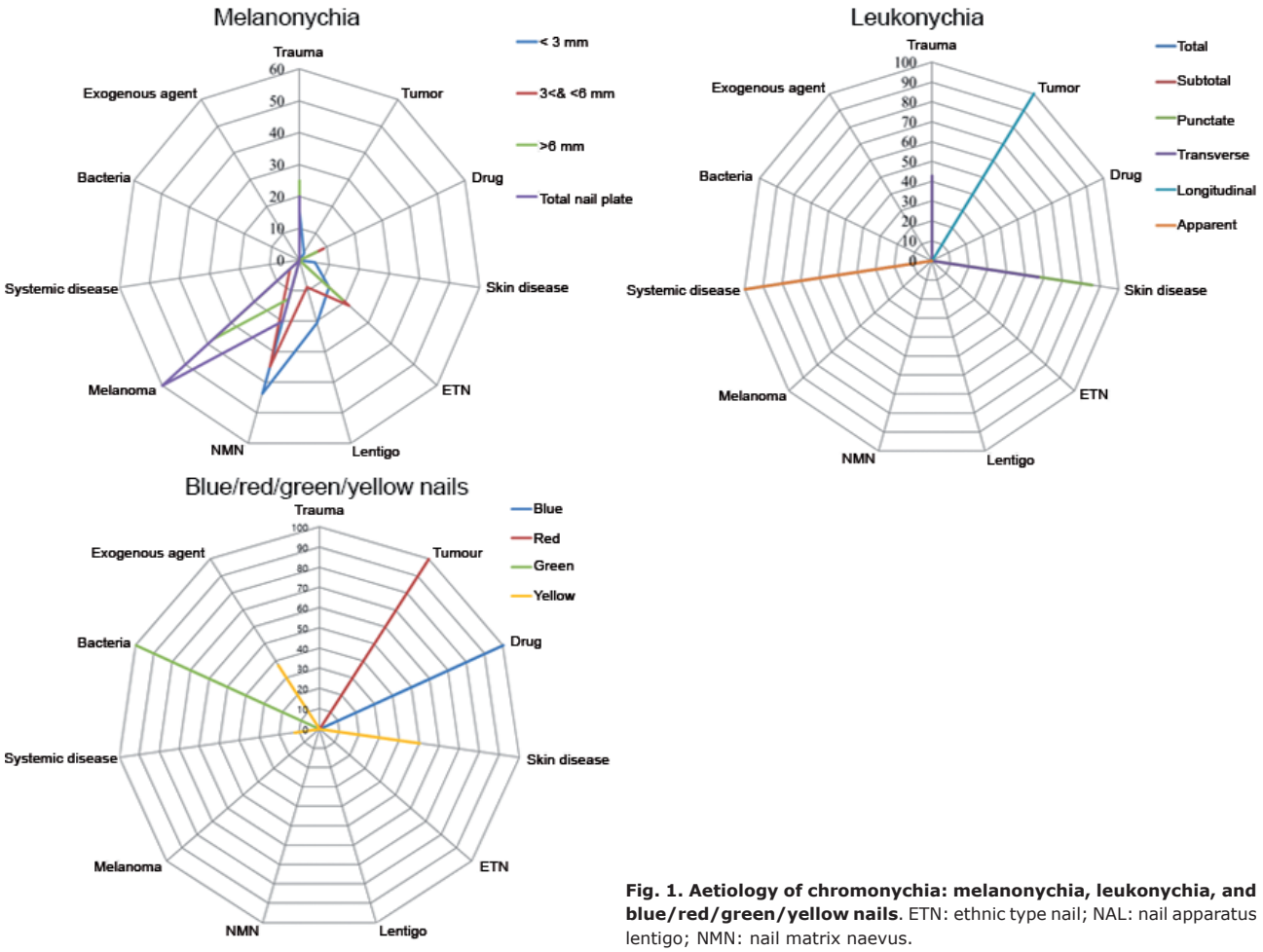

Fig. 1. Aetiology of chromonychia: melanonychia, leukonychia, and blue/red/green/yellow nails. ETN: ethnic type nail; NAL: nail apparatus lentigo; NMN: nail matrix naevus.

sentation of leukonychia in psoriasis and alopecia areata is the partial form of true leukonychia. Interestingly, the pathogenesis of punctate leukonychia in alopecia areata is similar to that of psoriasis, in which lesions originate from parakeratotic and inflammatory cells within the nail matrix (17, 18).

Among systemic diseases, anaemia (38.5%, 5/13) and chronic renal failure (15.4%) were the major causes of leukonychia. Our cohort included total (15.4%, 2/13) and subtotal (30.8%) subtypes of true leukonychia and apparent leukonychia (53.8%), with no cases of punctate leukonychia. In a previous study, apparent leukonychia was reported to associate with systemic disease (2). In addition, total or subtotal leukonychia are commonly indicated in familial cases and systemic conditions, such as ulcerative colitis, typhoid fever, liver cirrhosis, and leprosy, whereas punctate leukonychia has been reported to be associated mainly with microtrauma, along with skin conditions such as psoriasis and alopecia areata (1, 19–21). Our data suggest that punctate leukonychia may denote associations with skin diseases, including psoriasis and alopecia areata, while total, subtotal, and apparent leukonychias may indicate associations with systemic diseases (Fig. 1b).

Red nail or erythronychia can involve the nail bed either longitudinally or diffusely or be limited to the lunulae. Several conditions, including Darier's disease, lichen planus, amyloidosis, warty dyskeratoma, glomus tumour, onychopapilloma, Bowen's disease, and melanoma, have been reported to cause longitudinal erythronychia (15). Red lunula, on the other hand, has been observed in psoriasis, alopecia areata, and systemic lupus erythematosus (1). In contrast to previous studies, all patients in this study presented with longitudinal erythronychia, not red lunula. Histological examination revealed skin tumours in all cases (Fig. 1c). As most patients reported pain (78.6%) caused by the skin tumour, we consider that pain is the major trigger for visiting the hospital, not the presentation of erythronychia itself. We believe that other aetiologies of longitudinal erythronychia as well as red lunulae are may be under-reported as a result of low interest and awareness of the presentation by both patients and physicians.

Green nail is caused by *P. aeruginosa* in subjects who are continually exposed to water or subject to mechanical trauma, especially in elderly subjects. The patients in our study were frequently in contact with water and sustained microtrauma, as they were working as farmers (36.4%;

4/11), dishwashers (36.4%), and professional divers (27.3%). Interestingly, the commonly involved digits were the great toenails (66.7%; 8/12) and right thumbnail (25%), which are particularly susceptible to trauma. As growth of *P. aeruginosa* is limited in dry environments (22), such patients should avoid frequent water contact and trauma and dry the affected area after water exposure to decrease the risk of relapse.

Blue nail is most commonly caused by drugs, including minocycline, antimalarials, cyclosphosphamide, doxorubicin and bleomycin (1). Wilson's disease, glomus tumour, advanced AIDS infection and exogenous agents are also known to cause blue nail discoloration. Yellow nail can develop secondary to systemic conditions, such as hypoalbuminaemia, jaundice, carotenaemia, rheumatoid arthritis and AIDS; skin diseases including lichen planus; drugs including hydroxyurea, tetracycline, penicillamine and gold; or other exogenous agents (1, 23). In our study, blue (1.8%) and yellow (4.9%) nails accounted for a small portion of chromonychia, which may reflect the low prevalence of blue and yellow nails as they are mostly reported as cases without precise data regarding epidemiology (1, 24, 25). Interestingly, however, previous studies have shown that diagnoses of jaundice, a cause of yellow nail, can differ across ethnicities because of different prevalence, thresholds for evaluation among clinicians, and also possibly skin coloration (26). As Asians have a more yellow skin tone compared with other ethnicities, yellow nail may be overlooked or require a higher threshold for evaluation, thus hindering its diagnosis. Therefore, we suggest that nail discoloration should be evaluated with high suspicion during routine cutaneous examination, especially in patients with Fitzpatrick's skin type III and IV.

Major limitations of this study include the small number of patients and retrospective design. Therefore, further prospective investigations of chromonychia with larger patient groups are needed to better understanding the epidemiology and aetiology of chromonychia subtypes.

In conclusion, nail discoloration can help reveal the underlying systemic or local disorder. As it may be the first or only symptom, a simple presentation of chromonychia should alert both physicians and patients to the need for prompt and thorough evaluation.

The authors have no conflicts of interest to declare.

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