

## PATTERNS OF CLINICAL NAIL APPEARANCES IN PATIENTS WITH CUTANEOUS PSORIASIS

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### Abstract

**Background and aim.** Nail manifestations are often an overlooked aspect in psoriatic disease, cutaneous and joint involvement being far more often reported and investigated. The reported prevalence of nail changes varies in literature, specific fingernail clinical features having different degrees of occurrence. The aim of this study was to describe specific clinical patterns of fingernail alterations in adult patients with plaque-type psoriasis in a university hospital in the North-West of Romania.

**Methods.** Clinical data of 35 patients with fingernail psoriasis were collected and analyzed. Psoriasis Area and Severity Index (PASI) and Nail Psoriasis Severity Index (NAPSI) scores were used to quantify disease extension in each patient.

**Results.** PASI score proved linearly correlated with NAPSI score ( $p < 0.05$ ). The age of onset of fingernail psoriasis was positively correlated with age of onset cutaneous psoriasis ( $p < 0.0001$ ). Furthermore, the duration of cutaneous involvement and NAPSI proved significantly related ( $p < 0.05$ ). The third fingernail in the right hand and first fingernail in the left hand were in most of the cases severely affected. The most common observed nail pattern was pitting, followed by salmon patches and subungual hyperkeratosis.

**Conclusion.** Important nail changes appear even in moderate forms of cutaneous psoriasis. Particular localization of specific fingernail psoriasis pattern enables the possibility of detecting early stage disease.

**Keywords:** psoriasis vulgaris, nail pattern, NAPSI

### Introduction

Psoriasis represents a chronic inflammatory skin disease, with a multi-factorial pathogenetic determination, involving skin, nails, and joints. Environmental, immunological and genetic factors influence this incurable disease, leading to various degrees of severity and prolonged evolution [1].

Manuscript received: 14.04.2016

Received in revised form: 17.05.2016

Accepted: 13.06.2016

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Psoriasis general prevalence was estimated to be approximately 2-3% of the world's population [2]. Nail involvement in psoriasis, as reported by different studies, varies between 10-55% [3-5], while Van Laborde et al. stated that there is 80% to 90% lifetime incidence of nail involvement in psoriatic patients [6]. In up to 5% of patients, clinical changes suggesting nail psoriasis may occur in the absence of typical cutaneous lesions [7], while in patients with psoriatic arthritis the prevalence of nail involvement may be as high as 80.5% [8,9].

Both nail bed and nail matrix involvement in the course of the disease result in heterogeneous specific clinical signs. The esthetic aspect, impaired functionality and increased psychological stress in these patients require a better recognition of clinical nail injury patterns and an accurate evaluation of the degree of nail psoriasis [10].

In Romania, data about the nail changes in psoriasis are scarce. This study aimed at determining the nail changes and identifying their patterns, if any, in patients with plaque-type psoriasis.

## Material and methods

### Study design

This observational, cross-sectional cohort study was conducted from July 2014 to December 2014 in the Dermatology Department, Emergency County Hospital, Cluj-Napoca, Romania. The study included 35 patients (age over 18 years), with psoriasis vulgaris with both cutaneous and fingernail active lesions.

Patients under systemic treatment (for nail or cutaneous psoriasis) or applying topical treatment for fingernail psoriasis, at the time of the clinical examination or within 6 months prior to the examination were excluded from our study.

We excluded patients with fingernail psoriasis and concomitant onychomycosis (proven by direct microscopy examination and/or mycological culture) and patients using artificial nails. Patients with clinical psoriatic arthritis or other inflammatory conditions affecting joints, such as rheumatoid arthritis, were also excluded.

The protocol was approved by the Iuliu Hațieganu University of Medicine and Pharmacy Ethics Committee, Cluj-Napoca, Romania (301/28.07.2014) and all subjects gave their written consent prior to enrollment.

### Clinical data

Data about age, gender, age of onset of cutaneous and nail psoriasis, duration of cutaneous and nail disease, Psoriasis Area and Severity Index (PASI) and Nail Psoriasis Severity Index (NAPSI) were collected for each of the 35 patients. The dermatological examination was made by the same clinician in order to provide consistency in clinical evaluation.

For each patient we assessed the severity of skin disease using the PASI score, taking into account the clinical aspect of the lesions (erythema, induration, desquamation) reported to the affected area [11]. PASI score value ranges from 0-no disease to 72- maximal disease.

In psoriasis, nail involvement implies nail bed and nail matrix changes. Nail bed changes include onycholysis, oil drop (salmon patch) dyschromia, splinter hemorrhages, and subungual hyperkeratosis. Nail matrix changes include pitting, leukonychia, red spots in the lunula, and crumbling. For each patient we assessed the severity of nail involvement using NAPSI score [12]. Through NAPSI score we evaluated the presence of any of the 8 clinical

signs mentioned above in each quadrant of a fingernail. NAPSI score value ranges from 0-8/fingernail, 0-40/hand, 0-80/both hands. A NAPSI score >1 was considered as nail involvement.

### Statistical analysis

The collected data were submitted to statistical analysis using Statistics software (v. 8, StatSoft, USA). Categorical variables were summarized as absolute and relative frequencies and comparisons between groups were conducted by Z-test for proportions. Continuous variables were summarized as mean  $\pm$  standard deviation for normally distributed variables and median (Q1-Q3) (where Q1=25<sup>th</sup> percentile and Q3=75<sup>th</sup> percentile) for those variables that proved not following the normal distribution. Student t-test was used to compare continuous variable on independent groups for data with normal distribution; otherwise, Mann-Whitney test was used. Comparisons on numerical variable that proved not to follow normal distribution between right and left hands were conducted with Wilcoxon test. The relation between quantitative variable normally distributed was tested with Pearson correlation coefficient. Spearman's rank correlation coefficient was used for assessing the relation between quantitative variables that proved not to follow normal distribution. A 5% significance level was used and any p values smaller than 0.05 were considered statistically significant.

## Results

Thirty-five subjects with age between 20 and 84 years old fulfilled the inclusion criteria and agreed to participate in this study. A significantly higher percent of subjects included in the study were male (60%,  $p=0.0157$ ). The main characteristic of the investigated subjects (age, age of onset and duration of cutaneous and nail psoriasis) are presented in Table I.

The percentage of early-onset psoriasis (before age 40 years old) was 60%, without significant differences between genders (F:M=57.14%:61.90%;  $p=0.7788$ ). Nail involvement started predominantly after the onset of the cutaneous lesions with a median delay of 5 years (the range varied from 1 to 45 years, (Q1-Q3) is (2-10)). Three patients presented nail alterations before cutaneous lesions; two of them had both nail and cutaneous involvement before the age of 40.

The PASI score took values from 7 to 30.5 with a mean of  $16.92 \pm 6.06$  and no significant differences between genders. NAPSI score took values from 14 to 42, without significant differences between genders.

No significant differences regarding PASI or NAPSI scores were observed on early-onset psoriasis compared to non-early-onset psoriasis (Table II).

The age of onset of fingernail psoriasis was positively linearly related with the age of onset cutaneous psoriasis (Pearson correlation coefficient  $R=0.7887$ ,  $P<0.0001$ ). A significant correlation was found between

duration of cutaneous involvement and NAPSI (Spearman correlation coefficient  $\rho=0.3538$ ,  $P=0.0370$ ).

Mean age of onset of fingernail psoriasis was 46.29 years ( $\pm 13.89$ , SD) and the mean duration of nail disease was 5.14 years ( $\pm 4.62$ , SD).

Specific psoriatic lesions were found in 81.71% of fingernails. The percentage of involved fingernails was 79.43% for the right hand vs. 84.00% for the left hand.

Mean NAPSI score was  $27.77 \pm 6.62$ , both hands being approximately equally affected (mean NAPSI left hand  $13.91 \pm 3.26$  vs. mean NAPSI right hand  $13.86 \pm 3.96$ ).

Nail bed involvement was more severe in the right hand, while nail matrix was more affected in the left hand.

The third fingernail in right hand and first fingernail in the left hand were the most affected (the total fingernail NAPSI was 161 and 137, respectively). The least affected fingernails were the fifth finger in both hands. When comparing nail bed to nail matrix involvement in the same fingernail we found that nail bed was severely affected in the 1st digit of the left hand ( $p=0.0018$ ), and in the 2nd and 4th fingernail of the right hand ( $p=0.0064$  and  $p=0.0041$ , respectively). Nail matrix was severely affected in the 3rd and 5th fingernail of the left hand ( $p=0.0057$  and  $p=0.0191$ ,

respectively) (Table III).

All the eight signs included in NAPSI score were registered. When reported to all fingernails the most frequently overall observed nail pattern was pitting (67.43%), followed by salmon patches and subungual hyperkeratosis (each in 39.14% of all fingernails). The least observed psoriasis fingernail pattern were leukonychia and red spots in the lunula (9.71% and 4.29%, respectively).

Salmon patches, onycholysis, splinter hemorrhages ( $p=0.0285$ ), pitting ( $p=0.0005$ ), leukonychia and nail crumbling were more frequently observed in left hand fingernails, while subungual hyperkeratosis ( $P=0.0110$ ) and red spots in the lunula were more in the right hand fingernails (Table IV).

Considering each fingernail separately, pitting was most frequent in the third digit of the left hand (in 97.14% of the third digits affected), followed by salmon patches (80%) and onycholysis (71.43%) both in the first digit of the same hand. Onycholysis and leukonychia were not observed in any of the fifth digits of the right hand, and splinter hemorrhages, leukonychia, red spots in the lunula and nail crumbling were not observed in any of the fifth digits of the left hands (Table V).

**Table I.** Characteristics of the study group.

Characteristic	All subjects (n=35)	Female (n=14)	Male (n=21)	Statistic (P)
Mean age <sup>a</sup>	51.89 $\pm$ 14.91	47.14 $\pm$ 12.32	55.05 $\pm$ 15.90	-1.57 (0.1261)
Mean age of onset cutaneous psoriasis <sup>a</sup>	39.31 $\pm$ 14.05	38.86 $\pm$ 11.76	39.62 $\pm$ 15.67	-0.15 (0.8778)
Duration of cutaneous psoriasis <sup>b</sup>	9(5–15.5)	7.5 (5–10)	9 (7–21)	-1.21 (0.2354)
Mean age of onset fingernail psoriasis <sup>a</sup>	46.29 $\pm$ 13.89	42.14 $\pm$ 12.08	49.05 $\pm$ 14.60	-1.46 (0.1525)
Duration of fingernail psoriasis <sup>b</sup>	4 (2–6.5)	2 (2–5.25)	4 (2–7)	-1.35 (0.1780)

a: mean years $\pm$ SD, where SD = standard deviation; Student t-test

b: median (Q1–Q3), Q1 = 25<sup>th</sup> percentile; Q3 = 75<sup>th</sup> percentile; Mann-Whitey test

**Table II.** Characteristics of psoriatic patients expressed as means and standard deviations.

Score	early-onset psoriasis (n=21)	non-early-onset psoriasis (n=14)	Statistic (P)
PASI	17.67 $\pm$ 6.28	15.80 $\pm$ 5.74	0.89 (0.3784)
NAPSI	28.62 $\pm$ 6.74	26.50 $\pm$ 6.47	0.93 (0.3613)

PASI score proved linearly related with NAPSI score, with a correlation coefficient of 0.9538 ( $P=8.55 \cdot 10^{-19}$ ).

**Table III.** Nail bed and nail matrix NAPSI reported to each fingernail and comparison between bed and matrix NAPSI for each finger.

	Fingernail total NAPSI	Nail bed NAPSI	Nail matrix NAPSI	P
1 <sup>st</sup> Right	110	58	52	0.2343
1 <sup>st</sup> Left	137	78	59	0.0018
1 <sup>st</sup> Right	87	56	31	0.0064
1 <sup>st</sup> Left	88	47	41	0.4330
1 <sup>st</sup> Right	161	86	75	0.1044
1 <sup>st</sup> Left	115	48	67	0.0057
1 <sup>st</sup> Right	101	65	38	0.0041
1 <sup>st</sup> Left	125	60	65	0.3078
1 <sup>st</sup> Right	22	9	13	0.1422
1 <sup>st</sup> Left	22	6	16	0.0191

**Table IV.** Specific psoriasis nail patterns in each hand and comparisons between hands. Data indicate the overall number and percentage of each specific fingernail change.

	Alln (%)	Rightn (%)	Leftn (%)	<i>P</i>
Salmon patches	137 (39.14)	68 (38.86)	69 (39.43)	0.9130
Subungual hyperkeratosis	137 (39.14)	80 (45.71)	57 (32.57)	0.0110
Onycholysis	136 (38.86)	66 (37.71)	70 (40.00)	0.6602
Splinter hemorrhages	79 (22.57)	31 (17.71)	48 (27.43)	0.0285
Pitting	236 (67.43)	103 (58.86)	133 (76.00)	0.0005
Leukonychia	34 (9.71)	16 (9.14)	18 (10.29)	0.7164
Red spots in the lunula	15 (4.29)	10 (5.71)	5 (2.86)	0.1869
Nail crumbling	79 (22.57)	34 (19.43)	45 (25.71)	0.1588

**Table V.** Specific psoriasis nail patterns in each fingernail and comparisons between hands. Data indicate the overall number and percentage of each specific nail change present in each fingernail.

	Salmon patches n (%)	Subungual hyperkeratosis n (%)	Onycholysis n (%)	Splinter hemorrhages n (%)	Pitting n (%)	Leukonychia n (%)	Red spots in the lunula n (%)	Nail crumbling n (%)
1 <sup>st</sup> Right	25 (71.43)	18 (51.43)	6 (17.14)	8 (22.86)	27 (77.14)	6 (17.14)	0 (0.00)	10 (28.57)
1 <sup>st</sup> Left	28 (80.00)	23 (65.71)	25 (71.43)	6 (17.14)	32 (91.43)	6 (17.14)	2 (5.71)	14 (40.00)
<i>P</i>	0.0603	0.0061	<0.0001	0.1799	0.0002	0.9999	0.0012	0.0233
2 <sup>nd</sup> Right	8 (23.53)	16 (47.06)	16 (47.06)	8 (23.53)	15 (44.12)	4 (11.76)	6 (17.65)	3 (8.82)
2 <sup>nd</sup> Left	10 (28.57)	12 (34.29)	13 (37.14)	12 (34.29)	28 (80.00)	3 (8.57)	0 (0.00)	3 (8.57)
<i>P</i>	0.2820	0.0142	0.0589	0.0254	<0.0001	0.3227	<0.0001	0.9339
3 <sup>rd</sup> Right	19 (54.29)	23 (65.71)	23 (65.71)	6 (17.14)	33 (94.29)	1 (2.86)	1 (2.86)	11 (31.43)
3 <sup>rd</sup> Left	10 (28.57)	10 (28.57)	18 (51.43)	11 (31.43)	34 (97.14)	1 (2.86)	2 (5.71)	9 (25.71)
<i>P</i>	<0.0001	<0.0001	0.0061	0.0016	0.1869	0.9999	0.1869	0.2353
4 <sup>th</sup> Right	15 (42.86)	21 (60.00)	20 (57.14)	2 (5.71)	18 (51.43)	5 (14.29)	1 (2.86)	9 (25.71)
4 <sup>th</sup> Left	20 (57.14)	8 (22.86)	11 (31.43)	19 (54.29)	28 (80.00)	8 (22.86)	1 (2.86)	19 (54.29)
<i>P</i>	0.0070	<0.0001	<0.0001	<0.0001	<0.0001	0.0381	0.9999	<0.0001
5 <sup>th</sup> Right	1 (2.86)	1 (2.86)	0 (0.00)	7 (20.00)	10 (28.57)	0 (0.00)	2 (5.71)	1 (2.86)
5 <sup>th</sup> Left	1 (2.86)	4 (11.43)	3 (8.57)	0 (0.00)	11 (31.43)	0 (0.00)	0 (0.00)	0 (0.00)
<i>P</i>	0.9999	0.0016	<0.0001	<0.0001	0.5592	0.9999	0.0012	0.0240

## Discussion

Skin manifestations are the most common complaint in patients with psoriasis, while nail involvement remains often an overlooked aspect of the disease. In the last decade, nail manifestations of the disease became the object of elaborated characterization and recognized quantification methods. In Romania, there are no reports on nail psoriasis neither regarding epidemiological data, or the specific clinical patterns in the affected nails. Furthermore, few studies describing the frequency and the degree of involvement of each fingernail were published in the scientific literature [8,13-15].

The relatively small number of patients that finally participated in our study (35 adult psoriatic patients) is explained by the exclusion of those patients who were

under any systemic treatment for cutaneous or nail psoriasis despite the fact that they presented nail changes. Because onychomycosis can present clinical aspects similar to nail psoriasis [16,17], and to prevent from interfering with NAPS score, we also excluded patients with nail psoriasis and simultaneous onychomycosis. The most frequent methods used to diagnose onychomycosis are direct microscopy examination and/or mycological culture, but these methods are not able to make the difference between primary onychomycosis and a secondary fungal colonization of a psoriatic nail. A nail biopsy could have helped to obtain a higher accuracy in this matter.

We have also excluded patients who had had used artificial nails, at any time of their lives, due to the fact that acrylic nails can induce severe onychodystrophy and

psoriasisform changes including onycholysis and subungual hyperkeratosis [18].

Nail changes that appear in patients with psoriasis are observed in about 80% of patients with concomitant psoriatic arthritis [8,9]. Anatomical and imaging studies of the nail unit and its connection to the distal interphalangeal joint help us understand why psoriatic arthritis patients, concurrently develop inflammatory nail changes [19-21].

We chose to exclude from our study those patients having clinical signs of psoriatic arthritis, because the clinical examination assessment of the nail could have been influenced by this association.

In our study, the mean PASI score was 16.92 and proved linearly related with NAPSII score, reflecting that disease of moderate severity can present with important nail changes. This result is similar to data reported by large European studies on nail psoriasis [22-23]. Even though Rich et al. did not find an initial correlation between baseline NAPSII and PASI score, there was an increasingly over time improvement of NAPSII scores and positive correlation with PASI in a group of patients treated with infliximab [24].

In our group of patients, the age of onset of fingernail psoriasis positively correlated with the age of onset cutaneous psoriasis, suggesting that an early involvement of the skin is associated with a longer duration of the nail disease. Similar data were reported by other studies [4,15]. The correlation we have found between the duration of cutaneous psoriasis and NAPSII score argues that a long standing skin involvement can cause a more severe nail disease.

Most of the fingernails proved affected in our study (81.71%), with a mean NAPSII score of 27.77 ( $\pm 6.62$ SD), our results being in line with those reported by van der Velden et al. (mean number of fingernails involved was 8.3 ( $\pm 6.62$ SD) and mean NAPSII score of 26.6 ( $\pm 14.5$ SD)) [15]. The third fingernail in right hand and first fingernail in the left hand were the most frequent involved fingernails. Brazzelli et al. reported the fourth fingernail as the most affected in both hands [8].

The most prevalent clinical pattern in our nail psoriasis group was pitting (67.43% of the fingernails,  $P=0.0005$ ), followed by salmon patches and subungual hyperkeratosis (39.14% each,  $p=0.9130$  and  $p=0.0110$ ). Our results are in agreement with other recent studies that reported pitting as the most frequent nail psoriasis pattern observed [8,24-26]. Nevertheless, reports on the prevalence in fingernail psoriasis patterns differ in the literature, onycholysis [14,27,28], subungual hyperkeratosis [29] or oil-drop discoloration [30] were each stated as being the most common clinical feature of fingernail involvement. This variation in reported data may partially be explained by differences in definitions or in the process of depicting the morphostructural changes in the nail unit.

The least observed psoriasis fingernail patterns in

our study were leukonychia and red spots in the lunula (9.71% and 4.29%, respectively). Van der Velden et al. conducted a case-control study on 49 patients and reported leukonychia with a frequency of 65% of healthy control subjects, raising the question of whether this nail change should be maintained in NAPSII score [15]. Red spotted lunula was an infrequent observed nail psoriasis pattern, our result (4.29%) being in consistence to those showed in other studies: 0.4% by Aktan et al. [31] 1.3% by Kyriakou et al. [30] or 10.2% by Rich et al. [24].

When taking into account each nail pattern separately, we found pitting as being the most frequent psoriatic feature in the third digit of the left hand (97.14%), this result being in line to that reported by Brazzelli et al. (28.5%), although in a higher percent/proportion [8]. Compared to the same study, in which they observed onycholysis more commonly in the first fingernail of the right hand (21.2%), we have found that the same nail pattern was more frequently observed in the first fingernail of the left hand (71.43%). This result may derive from a different population sample or different environmental factors.

In conclusion, important nail changes appear in moderate forms of cutaneous psoriasis, and this study offers definite information regarding particular localization of specific patterns in fingernail involvement, making early diseases stage detection possible. To the best of our knowledge this is the first study in Romania providing detailed description of nail changes in patients with plaque-type psoriasis, and one of the fewest international studies reporting complete morphological manifestations of nail psoriasis for each fingernail.

### Acknowledgement

This paper was published under the frame of the European Social Fund, Human Resources Development Operational Programme 2007-2013, project no. POSDRU/159/1.5/138776.

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