NAIL STUDIES IN RHEUMATOID ARTHRITIS*

BY

E. B. D. HAMILTON

*Rheumatism Research Unit, Medical Research Council, Canadian Red Cross Memorial Hospital,
Taplow, Bucks*

Nail changes have been recognized for many years in patients suffering from rheumatoid arthritis (Garrod, 1890; Bannatyne, 1898), but there have been few attempts to estimate their frequency (Short, Bauer, and Reynolds, 1957). Pronounced longitudinal ridges, which often have a beaded appearance, were observed to be a common though non-specific phenomenon in these patients, and the impression had been formed that they occurred at an earlier age than in the general population. Such changes have been described as nail atrophy, but dystrophy is perhaps a better description.

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Incidence and Type of Nail Changes

In order to collect further information, a survey has been made of the nail appearances in 186 consecutive patients with rheumatoid arthritis seen during a one-year period. All had a chronic polyarthritis with a positive Rose-Waaler test, and they were of both sexes in the proportion of one male to four females. The findings in this group were compared with those in 186 hospital in-patients of roughly similar age and sex distribution.

Personal observation was made of all the finger nails of both hands, and longitudinal ridging if present was graded as slight or severe (Fig. 1).

Fig. 1a.—Slight nail ridging in rheumatoid arthritis; note presence of nail-fold vascular lesion.

Fig. 1b.—Severe nail ridging in rheumatoid arthritis.

A record was made of any nails that had been subjected to trauma, and the findings in these nails were not included in the final analysis.

Results.—The incidence of severe ridging and beading, as judged in two or more nails, was higher in the patients with rheumatoid arthritis, in all age groups, than in the controls, but in both the rheumatoid and the control groups, it increased with age (Table I).

TABLE I
INCIDENCE OF TROPHIC NAIL CHANGES WITH AGE

Age Group (yrs)	Rheumatoid Arthritis		Controls	
	No. of Cases	Percentage Beading + Severe Ridging	No. of Cases	Percentage Beading + Severe Ridging
20-29	13	0	20	0
30-39	25	4	19	0
40-49	36	11	34	3
50-59	51	26	34	18
60-69	47	53	40	27
Over 70	14	57	39	33

It has been suggested that nail changes are related to duration of disease activity (Short, Bauer, and Reynolds, 1957), but in this study the relationship is less clear-cut than that with age (Table II).

TABLE II
INCIDENCE OF TROPHIC NAIL CHANGES WITH DURATION OF RHEUMATOID ARTHRITIS

Duration (yrs)	No. of Cases	Percentage Beading + Severe Ridging
0-5	74	24
6-10	50	24
11-15	30	37
Over 15	28	32

Other abnormalities noted during the course of the survey are shown in Table III. There was a

TABLE III
PERCENTAGE INCIDENCE OF ABNORMALITIES OTHER THAN RIDGING AND BEADING

Abnormality	Rheumatoid Arthritis	Controls
Palmar Flush	8	0.5
Vascular Lesions	5.5	0.5
Transverse Ridging	4	5
Leuconychia	4	3
Varicosities on Fingers	2	0
Unexplained Clubbing	1	0
Pitting of Nails	0.5	0

definite increase in the incidence of palmar flushing, such as is frequently seen in liver disease and in pregnancy, and in four patients it was associated with marked redness of the finger tips. Nail-edge or nail-fold vascular lesions similar to those previously described by Bywaters (1949, 1957) were seen in ten cases, and in seven they were associated with severe ridging and beading. Transverse ridging, which was usually confined to a single nail, and leuconychia were not more common in the rheumatoid group. Thickening and discolouration of the nails and atrophy of the skin of the fingers were common but difficult to assess.

One case merits a more detailed description.

A woman aged 65 had suffered from severe rheumatoid arthritis for 30 years, and her nails consisted of yellow, heaped-up, crusted material, which was shed at intervals (Fig. 2, opposite). *Post mortem* section revealed extreme keratin formation with abscesses underlying the nail plate and marked endarteritis of the nail-bed vessels (Fig. 3, opposite). The possibility that this was a case of pustular psoriasis in association with rheumatoid arthritis was considered, but the patient had a positive Rose-Waaler test, and there was no psoriasis of the skin, and none of the features of psoriatic arthropathy (Wright, 1959). The macroscopic appearances were similar to those described in some cases of Reiter's syndrome by Montgomery, Poske, Barton, Foxworthy, and Baker (1959) and in four cases of keratoconjunctivitis sicca by Thompson and Eadie (1956).

The cause of the longitudinal nail ridges and their frequent beaded appearance is unknown. It has been observed that following removal of a nail, when growth is resumed, the ridges reappear in the same position as before. Lewis (1954) and Lewis and Montgomery (1955) cited evidence that the dorsal surface of the nail may be formed from the roof of the nail-fold, and described in the senile nail-fold keratinizing whorls of generative cells which they thought to be responsible for the ridging. Samman (1959), by a dye injection technique, has demonstrated the presence of capillary loops in the roof of the nail-fold. It is possible that changes in these vessels may be responsible for the nail dystrophy in rheumatoid arthritis, and it is interesting that there was a high incidence of such changes in those patients who showed nail-edge or nail-fold vascular lesions. Lewis, in his studies on the senile nail, found thickening of the vessel walls in the nail generative areas, and Sunderland and Ray (1952) have shown reduced nail growth following arterial ligation.

Another possibility is that the changes might be present more frequently in proximity to involved

Fig. 2.—Unusual nail dystrophy in a case of rheumatoid arthritis of 30 years' duration.

Fig. 3.—Section of nail-bed of case shown in Fig. 2.

joints, as is the case of the nail lesions in psoriatic arthropathy (Wright, 1959). This was not borne out by the survey, as no terminal interphalangeal joints were involved, and when present the changes usually occurred in all the finger nails.

Disuse is a further factor to be considered and one

patient with a long-standing hemiplegia included in the control group showed nail changes on the affected hand only. Mitchell (1871) and Head and Sherren (1905) found retarded nail growth on the fingers of a paralysed hand, and similar retardation occurred when a splint or cast was worn.

Nail Growth

Now that more accurate methods of measurement have been developed it was felt that observations on nail growth might throw light on the problem, and these have been made in both children and adults using a modification of the photographic technique of Babcock (1955).

The cases studied consisted of eight girls with Still's disease under the age of 11 and fifteen adult females with rheumatoid arthritis, all of whom were undergoing in-patient treatment. The activity of their disease varied in severity and five in each group were on systemic steroids. The nail growth rates were compared with those of thirteen children convalescing from rheumatic fever, who had normal sedimentation rates, and twenty adult female members of the hospital staff, who showed a similar age distribution to the patients with rheumatoid arthritis.

A mark was made on the lunula of both thumbs with a sharp scalpel and this was then rubbed over with black paint. Further marks were made at weekly or fortnightly intervals for at least 6 weeks. A 35-mm. miniature camera with a fixed close-up extension was used to give a magnified image for recording on film. Fixed to the end of the camera extension was a bracket to enable the finger nail to be correctly positioned against a glass frame, and it was recorded by flashlight. This record was measured in an Ediswan micro-reader which enlarged it thirty times.

In order to ascertain a possible source of error the apparatus was dismantled and reassembled seven times between exposures on the same nail. These negatives were enlarged and superimposed and no error could be detected. Observer error was 2 per cent., and the average error in adding together a series of readings on the same nail at weekly or fortnightly intervals was less than 1.5 per cent. over a 6-week period. The greatest source of error was in making the horizontal scratch mark exactly on the lunula. This error would be reduced by only having to make a mark on the lunula at the start of our observations, but we were unable to show up the lunula on our negatives with sufficient clarity to make this possible.

Results.—The mean daily nail growth rate, measured over a 6-week period in healthy female adults was 0.09 mm. per day, in adult females with rheumatoid arthritis 0.085 mm. per day, in convalescent cases of rheumatic fever under the age of eleven 0.117 mm. per day, and in Still's disease 0.115 mm. per day (Table IV).

There were wide variations in growth rate

TABLE IV
DAILY NAIL GROWTH (mm./day)

Subjects	Adult Females		Children aged 11 yrs or Less	
	Healthy	Rheumatoid Arthritis	Still's Disease	Convalescing after Rheumatic Fever
Daily Growth (mm.)	·108	·106	·158	·158
	·105	·100	·124	·147
	·101	·092	·118	·126
	·100	·090	·109	·123
	·098	·090	·108	·122
	·096	·089	·105	·117
	·096	·087	·099	·115
	·095	·082	·098	·109
	·094	·082		·105
	·094	·082		·104
	·09	·080		·104
	·088	·074		·103
	·088	·072		·086
	·087	·069		
	·086	·066		
	·085			
	·084			
	·076			
	·07			
	·064			
Average	·090	·084	·115	·117

between individuals, but for any one individual the rate remained relatively constant over the 6-week period. The rate of growth in the cases with Still's disease and rheumatoid arthritis, when the groups were taken as a whole, fell within the normal range of the comparable controls, but in children convalescing from rheumatic fever and in children with Still's disease it was significantly faster than in the adults (Fig. 4, opposite).

No correlation was found between trophic nail changes and nail growth rate, but the latter was retarded in three cases who had very severe generalized disease activity. This is well seen in one case (Fig. 5, opposite) in which the depression in growth rate preceded the increase in prednisone dosage and returned to normal when the disease activity was brought under control.

In two cases with local disease activity, the rate was not affected by the proximity of the involved joints. One was a girl aged 13 with psoriatic arthritis, three of whose terminal interphalangeal joints were involved, and the other a patient with rheumatoid arthritis who had unilateral wrist-joint involvement.

Discussion

The development of a photographic technique by Babcock (1955) has allowed nail measurements to be made with greater accuracy and at shorter time-intervals than with previous methods. Satisfactory results using this method have recently been reported by Sibinga (1959). The results reported here are at variance with those of Sibinga

Fig. 4.—Average nail growth rates in Still's disease, rheumatoid arthritis, convalescent rheumatic fever, and normal female adults.

in that there was a significant decrease in nail growth rate with age, when the rates in children were compared with those in adults ($P < 0.001$), but they confirm that there is a wide range of normal nail growth between different individuals of the same age.

Clark and Buxton (1938) showed a pronounced seasonal variation in nail growth rate, and Geoghegan, Roberts, and Sampford (1958) have reported retarded nail growth in men working in the Arctic. Most of the present observations were made in the spring and early summer, but in two children with Still's disease no difference could be found between their winter and summer rates. This is perhaps hardly surprising as the ward was centrally heated during the colder weather.

Two of the three cases with severe disease activity in whom nail growth rate was retarded were on systemic corticosteroid therapy, and this remains a possible contributory factor, but one which it is difficult to assess. Ansell and Bywaters (1956) have shown that both disease activity and corticosteroid therapy affect growth in height in Still's disease, and Godwin (1959) found that 5 mg. cortisone retarded nail growth in rats. In the case illustrated in Fig. 5 (overleaf), nail growth slowed

before the dose of prednisone was increased and returned to normal despite the higher dose, once the disease activity came under control. This retardation could be related to the body temperature, and Sibinga (1959) found nail growth arrest in 23 patients with measles in whom the body temperature exceeded 103°F .

Summary

(1) Nail changes in 186 patients with rheumatoid arthritis have been compared with those in a hospital population. The incidence of severe longitudinal ridging is increased in each age group, and would appear to be related to the age of the patient rather than to the duration of disease activity.

(2) Nail growth measurements have been made over a 6-week period in patients with Still's disease and rheumatoid arthritis, and these have been compared with those in children convalescing from rheumatic fever and in normal adult females. Growth was significantly faster in children than in adults, but taken as a whole the rates in the two groups of patients fell within the normal range. In three patients with very severe generalized disease activity, nail growth rate was retarded, but in two

Fig. 5.—Depression of nail growth in active Still's disease in a child aged 7 years.

patients studied it was not affected by the presence of local joint disease.

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Discussion

DR. O. SAVAGE (*London*) asked whether there was any association between growth in children and the growth of nails. Dr. B. Ansell has shown patients with Still's disease on steroids in whom growth in height stopped.

DR. HAMILTON said that they had not seen many cases over a long period (only two cases for more than 8 weeks), so that it was impossible to correlate any change in height with changes in nail growth. It was quite possible that increase in steroid dosage did influence nail growth.

PROF. E. G. L. BYWATERS (*London*) said that he thought that nail growth was similar to hair growth, and this was known to be quicker in hot weather. Dr. Hamilton had tested this by wearing a glove on one hand and then making measurements.

DR. HAMILTON said that the testing had shown no difference.

DR. B. ANSELL (*Taplow*) said that in Still's disease the disease activity slowed growth, but prednisolone in moderate dosage slowed it more. One patient, growing

slowly before prednisolone, stopped growing completely when given steroids. Her nail growth, however, had continued at a fairly constant rate.

DR. W. S. C. COPEMAN (*London*) asked whether there had been any qualitative observations as well as quantitative?

DR. HAMILTON said that patients with beading and ridging did not show a slower rate of nail growth than those without such changes, but no specific qualitative observations had been made.

Etude des ongles dans l'arthrite rhumatismale

RÉSUMÉ

(1) Les altérations dans les ongles de 186 malades atteints d'arthrite rhumatismale furent comparées à celles chez d'autres malades hospitalisés. La fréquence des stries longitudinales prononcées des ongles augmente avec l'âge dans chaque groupe et semble être associée plus à l'âge qu'à la durée de l'activité morbide.

(2) On a mesuré pendant plus de six semaines la croissance des ongles chez des patients atteints de maladie de Still et d'arthrite rhumatismale, et on a comparé les résultats aux chiffres obtenus chez des enfants convalescents de rhumatisme articulaire aigu et chez des femmes normales. La croissance était appréciablement plus rapide chez des enfants que chez des adultes, mais dans l'ensemble elle était similaire et

bien normale dans les deux groupes. Chez trois malades avec une activité morbide sévère et généralisée, la croissance était retardée, mais chez deux malades étudiés elle n'était pas affectée par la présence d'une maladie articulaire locale.

Estudio de las uñas en la artritis reumatoide

SUMARIO

(1) Se estudiaron las alteraciones en las uñas de 186 enfermos con artritis reumatoide en relación con las del resto de la población hospitalaria. La incidencia de acusadas strias longitudinales de las uñas aumenta en proporción directa con la edad en cada grupo y parece estar más en relación con la edad del paciente que con la duración de la enfermedad.

(2) Se midió el crecimiento de las uñas durante un período de más de 6 semanas en pacientes con enfermedad de Still y con artritis reumatoide y se compararon los resultados con cifras obtenidas en niños convalecientes de reumatismo poliarticular agudo y en adultos normales del sexo femenino. Dicho crecimiento fué significativamente más rápido en los niños que en los adultos, pero considerando los resultados en conjunto, la proporción de crecimiento en ambos grupos de enfermos está dentro de los límites normales. En tres casos de evolución mórbida grave y generalizada, el crecimiento de las uñas estaba retardado, pero en dos enfermos dicho crecimiento no fué afectado por la presencia de una enfermedad articular localizada.