

A Double-blind Study of Superficial Radiotherapy in Psoriatic Nail Dystrophy

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In a double-blind controlled study, superficial radiotherapy (SRT) was given to psoriatic fingernails as three fractionated doses of 150 cGy (90 kV, 5 mA, 1.00 mm aluminium filter). The treated nails demonstrated a significant fall in scoring on a clinical rating scale 10 and 15 weeks after therapy (mean scores = 4.4 and 4.6 respectively) when compared with a mean pre-treatment score of 5.5 at week 0 ($p < 0.0001$ and $p < 0.05$ respectively); the treated nails also showed significant clinical improvement when compared with the sham-treated nails at weeks 10 and 15 ($p < 0.05$). Mean nail thickness in treated nails 15 weeks after therapy was significantly thinner (mean thickness = 0.75 mm) than that of sham-treated nails (0.88 mm, $p = 0.005$), but the difference was not significant at week 20. The rate of linear nail growth was unaffected. SRT appears to confer a definite albeit temporary benefit on psoriasis of the nails at this dosage. Key words: Clinical rating scale; Sham radiotherapy; Fractionated dose.

(Accepted September 2, 1991.)

Acta Derm Venereol (Stockh) 1992; 72: 134–136.

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The nails may be involved in half of all patients affected by psoriasis. The changes range from mild to severe and may include nail pitting, onycholysis, subungual hyperkeratosis and complete destruction of the nail plate. Effective therapeutic options are limited, but superficial radiotherapy (SRT, 60–120 kV, half-value layer 0.5 to 2.0 mm aluminium), despite its declining use, remains a treatment modality for nail psoriasis (1,2). Finnerty (3) has claimed that SRT produces excellent and long-lasting improvement in psoriasis of the nails. Lindelöf (4) demonstrated that Grenz ray therapy improved psoriatic nail dystrophy when the nails were of normal thickness. To our knowledge, this study is the first published double-blind controlled trial to assess the efficacy of superficial radiotherapy in psoriasis of the nails.

PATIENTS AND METHODS

Inclusion and exclusion criteria

Ten patients with severe psoriatic nail dystrophy involving all fingernails were selected from the dermatology clinic. None was receiving active treatment for their nail dystrophy. Subjects who were under the age of 40, females in the reproductive age group, those who were receiving systemic therapy such as cytotoxic agents, retinoids or PUVA or who had a past history of skin neoplasia or previous radiotherapy, were excluded from the study. Informed written consent was obtained from each patient. The study had been approved by the medical ethics committee.

Treatment

Superficial radiotherapy was administered to the distal phalanx of each individual finger of a randomly preselected hand. A 50 mm diameter cylindrical lead applicator was used to limit the field size and the remainder of the body was shielded with a lead apron. The machine (Watson ST150) was maintained and calibrated fortnightly by the Medical Physics Department to ensure correct dosimetry. The machine factors were 90 kV, 5 mA, half-value layer 1.00 mm aluminium filter and the focus skin distance was 100 mm. Three fractionated doses of 150 cGy were given at 2-weekly intervals. The radiotherapist randomly selected one hand for active treatment while 'sham' radiotherapy was administered to the other hand as a control. Neither the patients nor the assessors were aware which side was being actively treated until the end of the trial. The patients' nails were assessed at -10, 0, 10, 15 and 20 weeks (week 0 being the time when the first course of radiotherapy was delivered).

Assessment

1) *Visual assessment:* Each nail was clinically scored using a simple rating scale (0 = normal, 1 = slightly affected, 2 = moderately affected and 3 = severely affected) for each of these clinical features: pitting, onycholysis, subungual hyperkeratosis and destruction of the nail plate. This visual rating scale allows a range of scoring points from 0 to 12 for each nail, hence providing a convenient numerical description of the clinical severity of psoriatic involvement from the normal (total score = 0) to the grossly affected (total score = 12).

2) *Rate of nail growth:* The thumb and index fingernails of each hand were marked on each visit with a transverse groove tangential to the lunula, the rate of nail growth (in mm per week) was calculated from the distance advanced as measured by electronic caliper during that time interval. The resolution of the caliper (Mitutoyo 500-115) was 0.01 mm.

3) *Nail thickness:* Three measurements of the nail thickness in millimetres were obtained using the electronic caliper from the central and lateral margins of the free edge of each nail.

RESULTS

Patients

Of the 10 patients who entered the trial, 2 defaulted and were excluded before radiotherapy commenced. The mean age of the 8 subjects was 55 years, range 42–68. There were 7 men and 1 woman. Five patients received active treatment of the fingernails of right hand and the remaining 3 had active treatment to the left.

Visual assessment

The pre-treatment visual rating of the radiotherapy-treated nails (treated group, $n = 40$) achieved higher mean scores at -10 and 0 weeks when compared to the sham-treated nails (untreated group, $n = 40$) but the difference was not statistically significant (Table I). The treated group demonstrated a significant fall in the visual rating score at 10 and 15 weeks when compared with the base-line scores at week 0 (paired t -test, $p < 0.0001$ and $= 0.046$ respectively) and vis-à-vis the control nails at 10 and 15 weeks (unpaired t -test, $p = 0.03$ and

Table I. Mean and SEM of visual score, nail thickness and growth rate in radiotherapy-treated and sham-treated nails

	Number of weeks				
	-10	0	10	15	20
<i>Visual score</i>		*	*	**	
		**			
Treated (n = 40)	6.4±0.4	5.5±0.4	4.4±0.3	4.6±0.4	4.6±0.5
Untreated (n = 40)	6.0±0.4	5.4±0.4	5.4±0.6	5.5±0.4	4.8±0.3
Unpaired <i>t</i> -test	NS	NS	<i>p</i> = 0.03	<i>p</i> = 0.047	NS
<i>Nail thickness (mm)</i>					
Treated (n = 40)	0.98±0.07	1.10±0.08	0.79±0.04	0.75±0.03	0.77±0.05
Untreated (n = 40)	0.97±0.06	1.20±0.09	0.84±0.04	0.88±0.04	0.78±0.04
Unpaired <i>t</i> -test	NS	NS	NS	<i>p</i> = 0.005	NS
	-10 to 0	0 to 10	10 to 15	15 to 20	
<i>Growth rate (mm/week)</i>					
Treated (n = 16)	0.98±0.06	0.85±0.04	0.83±0.05	0.87±0.07	
Untreated (n = 16)	0.92±0.08	0.86±0.04	0.88±0.05	0.87±0.05	
Unpaired <i>t</i> -test	NS	NS	NS	NS	

* Paired *t*-test of treated nails at 0 and 10 weeks, *p* < 0.0001; ** paired *t*-test of treated nails at 0 and 15 weeks, *p* = 0.046; unpaired *t*-test between treated and untreated groups at a certain time, tested at 5% level; NS, not significant.

0.047, respectively). The control nails scored lower during the post-treatment period but not significantly differently when compared with the treated nails.

Linear rate of nail growth

The mean rate of linear nail growth before radiotherapy in our patients was 0.92 mm per week, which was significantly higher when compared with the mean rate of nail growth (0.75 ± 0.03 mm per week, *p* < 0.05) in 5 normal control subjects. The radiotherapy-treated nails demonstrated a slightly diminished growth rate 10, 15 and 20 weeks post-treatment when compared with the control nails, but the difference was not statistically significant (Table I).

Nail thickness

The mean nail thickness was 1.02 mm before treatment commenced, which was significantly different from the mean nail thickness (0.56 ± 0.01 mm, *p* < 0.0001) in 5 normal control subjects. The treated nails demonstrated a significant reduction in mean nail thickness at 15 weeks when compared with the untreated nails, but the difference was not significant at 20 weeks. The control nails showed a reduction in nail thickness in the post-treatment period, but not significantly different from the treated nails (Table I).

DISCUSSION

It is generally assumed that epidermal cell hyperproliferation and incomplete cell differentiation, which have both been demonstrated in cutaneous psoriasis, similarly affect the nail matrix. Despite recent advances in the management of skin

psoriasis, an effective and long-lasting treatment for psoriatic nails remains elusive. Photochemotherapy (5) and injection of steroids into the proximal nailfold (6) are sometimes effective but the benefit is often short-lived and the latter procedure is particularly unpleasant for the patient.

Finnerty (3) reported 3 patients with severe psoriatic nail involvement who were successfully treated with SRT. The total dose given ranged between 400 and 600 cGy; 2 of the 3 patients showed gradual improvement over 14 months and the third over 4 months. Since all the nails were treated in that study, it is impossible to rule out spontaneous remission. Lindelöf (4) recently published a double-blind controlled trial to assess the effect of Grenz ray therapy on psoriatic nails in 22 patients. A complete remission of psoriasis occurred in the treated nails in only one patient. Seven showed a slight improvement and the remaining 14 failed to show any change. The assessment of the therapeutic response was based on a broad clinical impression without any objective measurements of the nail changes. All the nails that responded to Grenz ray therapy appeared to the author to be of normal thickness. Since the half-value depth in tissue of Grenz rays is only 0.5 mm, it would not be expected to penetrate the nail matrix of abnormally thickened psoriatic nails. Therefore, in our opinion, Grenz rays are of limited value in the treatment of psoriasis of the nails.

Our double-blind controlled study employed objective measurements of the rate of linear nail growth and nail thickness in addition to clinical assessments. Each patient was observed for a total of 30 weeks, including 10 weeks pre- and 20 weeks post-treatment. We used 2 three-fractionated dose of 150 cGy fortnightly at 90 kV to a total of 450 cGy. There was significant clinical improvement at 10 and 15 weeks in the

radiotherapy-treated nails. This improvement was paralleled by a significant reduction in nail thickness at 15 weeks. Interestingly, the rate of nail growth was not significantly reduced. The improvement was not sustained, however, as no significant difference between the treated and untreated nails was demonstrable at week 20. The apparent clinical improvement and the reduction in nail thickness in the control nails during the post-treatment period are probably the result of fluctuation in the disease process.

None of our patients experienced any discomfort as a result of the treatment. At the end of the study, one patient noticed improvement in the actively treated hand, while 2 patients noticed improvement in both hands and in one there was a deterioration in the actively treated hand. The remaining 4 patients did not observe any subjective changes.

Superficial radiotherapy (90 kV, 150 cGy \times 3) appears to have a definite though temporary beneficial effect on psoriatic nails. Further studies need to be carried out using an increased total X-ray dose, mindful of the fact that no area of skin should be subjected to more than 1000 cGy in a lifetime (7). In addition, the use of a thicker aluminium filter (i.e. >1.00 mm) could produce deeper tissue penetration.

It has been suggested that the benefit of treatment may not become apparent for many months (3). This seems improbable, but we intend to keep these patients under review every

third month over a 2-year period in order to watch for any delayed response. As we are unable to demonstrate any sustained benefit of SRT, we would not recommend its general use in patients with psoriatic nail dystrophy.

ACKNOWLEDGEMENT

We thank Miss B. Rowlands for technical assistance.

REFERENCES

1. Baran R, Dawber RPR. Diseases of the nails and their management. Oxford: Blackwell Scientific Publications, 1984; 157-171.
2. Scher RK. Psoriasis of the nail. *Dermatol Clin* 1985; 3: 387-394.
3. Finnerty EF. Successful treatment of psoriasis of the nails. *Cutis* 1979; 23: 43-44.
4. Lindelöf B. Psoriasis of the nails treated with Grenz rays: A double-blind bilateral trial. *Acta Derm Venereol (Stockh)* 1989; 69: 80-82.
5. Marx JL, Scher RK. The response of psoriatic nails to oral photochemotherapy. *Arch Dermatol* 1980; 116: 1023-1026.
6. Peachey RDG, Pye RJ, Harman RPM. The treatment of psoriatic nail dystrophy with intradermal steroid injections. *Br J Dermatol* 1976; 95: 75-78.
7. Rowell NR. A follow-up study of superficial radiotherapy for benign dermatoses: recommendations for the use of x-rays in dermatology. *Br J Dermatol* 1973; 88: 583-590.