

SHORT REPORTS

Skin Blood Flow in Psoriasis during Goeckerman or Beech Tar Therapy

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Skin blood flow (SBF) was measured by the laser Doppler technique in lesional and clinically normal skin of 8 patients with psoriasis vulgaris during Goeckerman or beech tar therapy. The SBF measurements were performed before therapy and 1, 2, and 3-4 weeks after treatment was initiated. The results were compared to a clinical psoriasis index based on the objective assessment of infiltration, erythema, and scaling of the psoriatic plaques. The pre-treatment value of SBF in lesional skin was about 9 times higher than that of clinically normal skin. During therapy SBF of involved skin decreased rapidly approaching that of uninvolved skin after 3-4 weeks. Furthermore, there was a significant linear correlation between the SBF values and the clinical psoriasis index. It is concluded that SBF in psoriatic lesions decreases significantly during Goeckerman or beech tar therapy, and that this variable might be used to obtain a quantitative measure of the disease activity.

Key words: Laser Doppler flowmetry; Skin blood flow; Antipsoriatic therapy. (Received February 7, 1984.)

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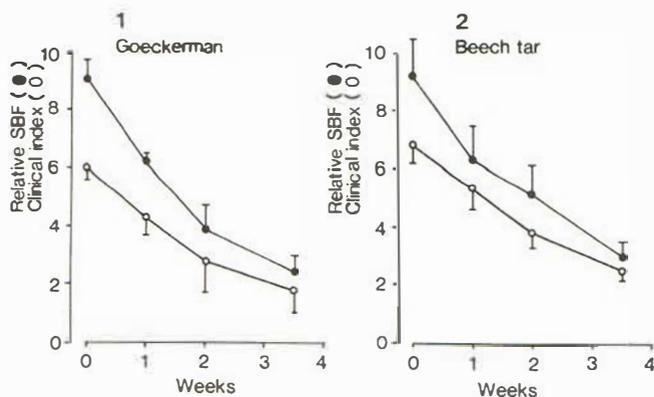
Dilated, tortuous, and elongated capillaries can be demonstrated regularly in the upper dermis of psoriatic skin (1). Recently, we have demonstrated a 5-fold increase of the cutaneous blood flow of involved psoriatic skin as compared to uninvolved skin using atraumatic ¹³³-xenon wash-out technique (2).

In the present study the skin blood flow (SBF) was measured by the laser Doppler technique (Periflux[®], Perimed, Sweden) (3, 4) in lesional and clinically normal skin of 8 patients with psoriasis vulgaris during Goeckerman or beech tar therapy. A significant reduction of SBF was observed during therapy. Furthermore, a linear correlation between SBF and the visual assessment of infiltration, erythema, and scaling of the psoriatic plaques was found. It is concluded that SBF might be used to obtain a quantitative measure of the disease activity.

MATERIAL AND METHODS

Eight patients (23-74 years, mean 48 years) with untreated psoriasis vulgaris involving on average 50% of the total skin surface were studied after informed consent was obtained. Patients with pustular or guttate psoriasis were excluded. The patients were either treated with Goeckerman therapy with 2% coal tar gel and medium-wave ultraviolet (UV-B) irradiation or beech tar bath therapy without ultraviolet radiation exposure. Prior to the first investigation only bland topical treatment was applied.

SBF was measured by means of a laser Doppler flowmeter (Periflux[®] microvascular flowmeter, Perimed, Sweden). The instrument measures the blood cell movements in the capillaries and arterio-venous shunts in a hemisphere with a radius of about 1 mm in the skin (3). The light from the laser is lead by an optical fibre to the skin surface and is back-scattered with Doppler-shifted frequencies from moving blood cells and with unshifted laser frequencies from stationary tissues. The blood flow value is the normalized square root mean value of the frequency spectrum, which appears at the instrument panel as units of volts (4). The instrument was adjusted to a band width of 4 kHz and gain at 10. The filter was set at high value in order to smooth out fluctuations due to the cardiac cycle.



Figs. 1-2. Mean values of relative psoriasis skin blood flow (●) and clinical psoriasis index (○) of 4 patients treated with Goeckerman (Fig. 1) and 4 patients treated with beech tar (Fig. 2). Vertical bars indicate ± 1 SEM.

All patients were examined after 1/2 h of rest in the supine position at constant room temperature, 21-22°C. In each patient two psoriatic plaques (at least 5 cm in diameter) and two sites of clinically normal skin were selected in the same anatomical region. SBF of these sites were measured before and 1, 2, and 3-4 weeks after therapy was initiated. In each skin site the recorded SBF was the mean value of 5 measurements. The *relative SBF* was calculated as the ratio of mean SBF of involved skin to uninvolved skin.

At each examination a visual assessment of infiltration, erythema, and scaling of the selected psoriatic plaques preceded the SBF measurements. Each parameter was graded on a score of 0-3, zero being clear and 3 the most severe (5). A *clinical psoriatic index* was calculated as the sum of these three parameters.

Students' *t*-test for paired observations and linear correlation by least squares' method were used for statistical evaluation. $p > 0.05$ was regarded as not significant.

RESULTS

Before therapy SBF was about 9 times higher in lesional skin as compared to clinically normal skin. During the first week of both Goeckerman and beech tar therapy, SBF of lesional skin decreased rapidly approaching that of uninvolved skin after 3-4 weeks (Figs. 1 and 2). The clinical psoriatic index also decreased substantially during both treatments. When all 8 patients were considered as a single group, significant reductions were observed in both relative SBF and clinical psoriasis index at each examination after therapy was initiated ($p < 0.001-0.05$). Furthermore, a linear correlation between this parameter and the relative psoriatic SBF was found ($r = 0.84$, $p < 0.001$) (Fig. 3).

DISCUSSION

The ultrastructure of the capillary loops in psoriatic lesions has been studied by Braverman & Sibley during Goeckerman or PUVA therapy (6). Although the skin vessels are reduced in length and coiling, the capillary loops remained dilated for months after successful phototherapy. It was suggested that the therapeutic response to Goeckerman therapy might be mediated through the microvasculature rather than through an antiproliferative effect on the basal cells of the epidermis (6).

Only few investigations on the functional state of the skin vessels in psoriasis have been performed during therapy. Rajka & Thune studied the filling of the subpapillary venous plexus (reflex photometry) and the arteriolar dilatation (photoelectric pulse plethysmography) in psoriatic skin during 3-6 weeks of phototherapy (7). In eleven of the fifteen tested patients a change towards normal in these parameters was observed during the

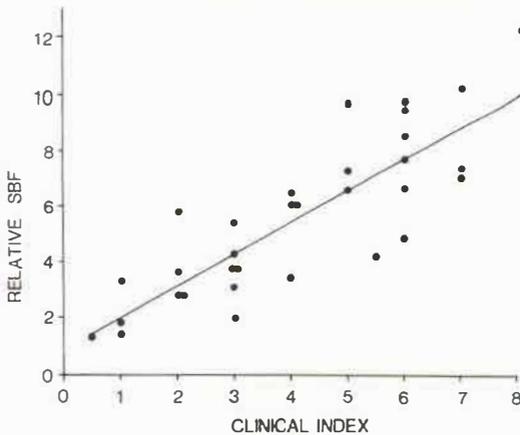


Fig. 3. Relative psoriatic skin blood flow in relation to the clinical psoriasis index obtained by visual readings ($r=0.84$, $p<0.001$).

treatment period. However, due to technical reasons no definite conclusions could be drawn. Others have used reflectance spectrophotometry to measure the changes in skin haemoglobin (correlated to the amount of cutaneous blood in the superficial plexus) in psoriatics during PUVA therapy (8). Initially, the haemoglobin index of lesional skin decreased rapidly, approaching that of uninvolved skin during the second or third week. Based on these results it was suggested that the disease activity may well be mirrored by that of the vascular compartment of the psoriatic skin. Recently, a reduction in the microvascular leakiness of involved skin vessels was demonstrated after 3–4 weeks of phototherapy (9).

The response of the laser Doppler flowmeter (Periflux[®]) is considered to reflect the blood flow in skin capillaries as well as arteriovenous anastomosis (3). In skin areas without shunt vessels the cutaneous blood flow measured by the laser Doppler flowmeter and the ¹³³-xenon wash-out technique has been found to parallel, and furthermore the laser Doppler method was able to measure relative cutaneous blood flow changes during hyperaemia (4). In accordance with recent ¹³³-xenon wash-out measurements (2), the present results indicate that SBF is several times higher in psoriatic lesions as compared to clinically normal skin. Furthermore, SBF decreased significantly during both Goeckerman and beech tar therapy. However, after 3 to 4 weeks of therapy SBF of involved skin was still 2–3 times higher than in uninvolved skin. The present results are in accordance with the changes in skin haemoglobin of psoriatics observed during therapy (8).

Previously, we have quantitated patch-test responses by SBF measurements (10). In all patients in the present study, the changes in visual assessment of disease activity (clinical psoriasis index) corresponded to the changes in SBF (Figs. 1, 2). A significant correlation was found between these parameters when all measurements were pooled together (Fig. 3).

The laser Doppler flowmeter is easy to handle, the technique is non-invasive and the measuring period is not too time-consuming for routine investigations. The present results indicate that this technique might be used to obtain a quantitative measure of the disease activity during evaluation of antipsoriatic treatments.

ACKNOWLEDGEMENT

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