

THE PSORIATIC CAPILLARY

ITS NATURE AND VALUE IN THE IDENTIFICATION OF THE UNAFFECTED PSORIATIC.

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THE capacity of psoriasis to affect any part of the skin, its onset as a minute focal lesion and its variability of expression in affected families, suggest that there is some generalized underlying cutaneous abnormality in people subject to this condition. The intermittent clinical state of psoriasis would be the overt manifestation of this abnormality.

Gilje, O'Leary and Baldes (1953) redescribed the specific appearances of the capillaries found in psoriatic plaques. The main element is the capillary ball formation in which the apex of the capillary loop in the dermal papilla is curled like the coil of an electric bulb. These forms are present in the centre of the psoriatic plaque and lesser degrees of the abnormality are present at the margin of the plaque. The dilated capillary tips are the basis of the Auspitz sign of clinical practice. Gilje *et al.* observed that these abnormal capillaries became shortened and less tortuous, apparently returning to normal, during healing. Gilje, Kierland and Baldes (1954) found the same capillary form in pityriasis rubra pilaris.

Kortanyshev (1939) examined the unaffected skin of the forearm of 25 patients with psoriasis. He found abnormal capillary dilatation in 16 patients and concluded that the first changes in psoriasis must occur in the dermis. Madden (1941) reported the histological presence of persistent abnormal capillaries in the site of old psoriatic lesions and also in the uninvolved skin. Davis and Lawler (1958) found that examination of normal skin in psoriatics showed a varying number of abnormally tortuous capillaries and they suggested that more attention should be paid to the role of capillaries in psoriasis. Lawler and Vineyard (1960) using a cellophane stripping technique with capillary microscopy confirmed Madden's observation that abnormal capillary forms persisted up to nine months after clearance in affected areas. They examined the unaffected skin of the forearms of ten psoriatics in sites not previously affected with psoriasis and noted that—"except for occasionally tortuous capillaries"—the vascularity was normal. They did not think this abnormality was significant.

Telner and Fekete (1961) also reported the presence of capillaries more tortuous than normal in the uninvolved skin of psoriatics and demonstrated a subclinical Koebner phenomenon in which a line of abnormally dilated

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capillaries persisted beyond the time of normal vasodilatation underlying a scratch of the epidermis. They concluded that there was an essential difference in the reaction to trauma between the psoriatic individual as seen in the capillaries.

Ross, McElligott and Rout (1964) demonstrated the persistence of dilated capillaries in previously affected areas which had been treated with dithranol paste. They also observed persisting areas of focal parakeratosis but were not able to relate these areas to the dilated capillaries. Frank, Steiner, Bender and Winston (1964) found capillary dilatation persisting after treatment with flurandrenalone applications and observed the same abnormality in the apparently uninvolved skin of some patients with psoriasis. They concluded that the involvement was generalized to some degree despite the absence of clinically apparent lesions.

Holti (1964) using a refined thermometric technique has observed that psoriatic patients do not show the same temperature rise as normal controls in the areas of skin treated with a vasodilating agent.

The present study was prompted by the observation of abnormal capillary forms in apparently unaffected skin during the examination of the capillaries of patients with psoriasis receiving treatment with a dithranol paste.

INVESTIGATION.

The skin was studied with a Watson stereoscopic microscope and illuminated by a Watson focusing spot lamp. For routine purposes the dorsum of the distal phalanx of the left middle or fourth fingers was examined, the patient resting the digit in a moulded acrylic block. Two areas of the flexor aspect of the left forearm were examined with the patient resting the arm between sandbags. Immersion oil was placed upon the skin and was covered with a 2×2 cm. coverslip on the finger and 2×3 cm. cover-slip on the forearm. The whole area of skin covered by the oil was examined. Magnifications of 12.5 to 100 diameters were used.

For photography a medium dark green filter was attached to the spot lamp with a paper filter-holder. A Leitz Mikas camera attachment with a Leica camera body was inserted into one eyepiece of the microscope. Light-meter readings were taken from the other eyepiece. H.P.3 film was used generally but where fine-grain was needed (Fig. 1) F.P.3 film was used, requiring four times the length of exposure.

The lesions of seven patients with psoriasis were studied in detail and also the unaffected skin of the trunk and limbs. Examination of the trunk and limbs was found difficult because of movement, and inspection of the fingers and forearm proved most satisfactory for clinical purposes. Microscopic examination was preceded by observation with a $\times 10$ lens. Two of the six psoriatic patients were examined at weekly intervals during treatment with a dithranol paste regime and then the same areas were examined six months after discharge.

By arrangement, fifteen patients were referred for examination by Dr. Malcolm Thompson, Physician in Physical Medicine. These were patients who had skin lesions past or present of doubtful significance as judged by the rheumatologist, no skin lesions but a family history of psoriasis, or a polyarthropathy of unknown aetiology (Rose-Waaler test negative). Details of their personal and family histories were withheld until the tests were completed. These patients were examined independently by Dr. Holti using the technique described in his paper (1964). The detailed results of thermometric studies are reported by him.

The capillaries of the affected skin of four patients with eczema were also examined for comparison. Eleven "normal controls" of the same sex and matched for age with psoriatic patients were examined. The room temperature was 65–70° F. (18.5–21° C.) but some controls were studied when the temperature was 80° F. 26.5° C.).

RESULTS.

The characteristic abnormal capillaries seen in a plaque of psoriasis are illustrated in Fig. 1 ($\times 25$). The line illustration shown in Fig. 2 illustrates some of the characteristic forms at higher magnification. The form is produced by an irregular coiling of the capillary apparently the result of marked elongation. In places the capillary wall is irregularly dilated showing a fusiform aneurysmal appearance. In addition an orange discoloration is frequently present in the pericapillary tissues which blurs the capillary wall in places (Fig. 3). Towards the margin of the plaque the forms were simple and less coiled. In Fig. 2 the capillaries would appear to be grouped in circles—a feature revealed by photography.

Examination of the unaffected skin of patients with psoriasis showed that modifications of the abnormal form of capillaries found within the psoriatic lesions were sparsely distributed, either singly or in discoid groups of six to eight capillaries. These capillaries were different from the normal in that the width of the afferent and efferent limbs was the same size; there was lengthening of the capillary with coiling and irregular dilatations of the vessel wall. Occasionally pericapillary blood pigment was present. Many of the forms bore a resemblance to a half-opened parachute. These forms were found on the trunk, buttocks and limbs but for ease of examination the dorsa of the fingers and flexor aspect of the forearms were used.

Appearances during treatment with dithranol paste.—During treatment with a regime outlined by Ingram (1954, 1955), a marked simplification of the coiling of the capillary ball occurs in the first 72 hours. This appears to be due to a shortening in length of the capillary. Thereafter, the changes are more gradual.

Long term observation of affected areas during and after treatment.—Two men aged 55 and 62 years were examined during treatment with a dithranol paste regime. The site of a plaque of psoriasis in the flexor aspect of the forearm was recorded in relation to fixed anatomical structures. The lesion was examined and photographed before treatment and at the end of three weeks when the patients were clinically free of psoriasis. The capillary changes described previously were observed and though reduced in number many loosely coiled forms were presented at the end of treatment.

As with other patients, abnormal capillaries were found on the unaffected skin of the forearms and dorsa of the fingers. The same sites of the plaques were examined at the end of six months. Though each patient showed a

slight exacerbation about the elbows and knees, the rest of the skin was clear of psoriasis.

At this time the areas that were previously affected were clinically and microscopically indistinguishable from the rest of the arm which had been unaffected. An occasional abnormal form was present but no more than the solitary dilated capillary or group of such capillaries found in the adjacent skin.

Observations upon 15 patients with arthropathy.—None of these patients

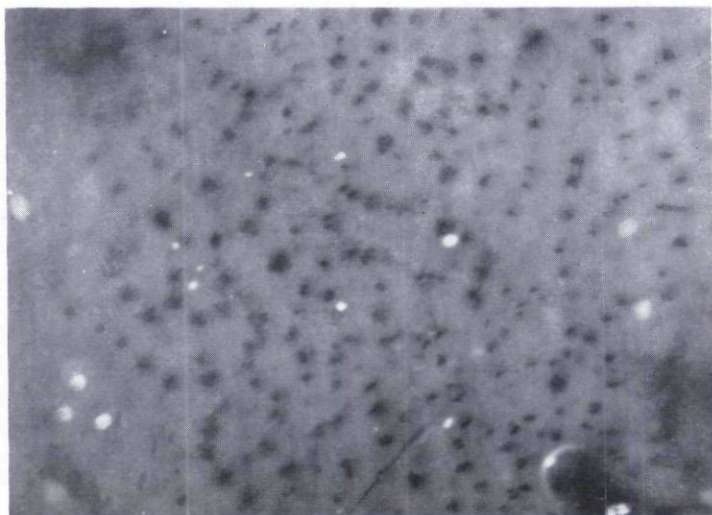


FIG. 1.

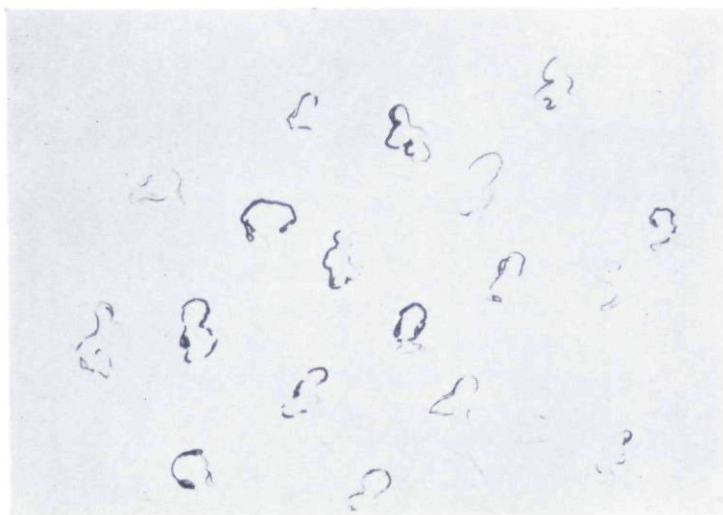


FIG. 2.

had clinical evidence of psoriasis. Thirteen patients had definite appearances of the capillary abnormality of the unaffected skin described previously. Of the patients regarded as psoriatic, one only had a past history of psoriasis but eight of the thirteen patients had a close relative affected with psoriasis. The two patients who were regarded as normal gave neither a personal nor a family history of the condition.

During this study, following previous experience with higher magnifications, it was possible to identify the psoriatic capillaries with a $\times 10$ lens observing the skin through oil and a coverslip with bright side illumination.

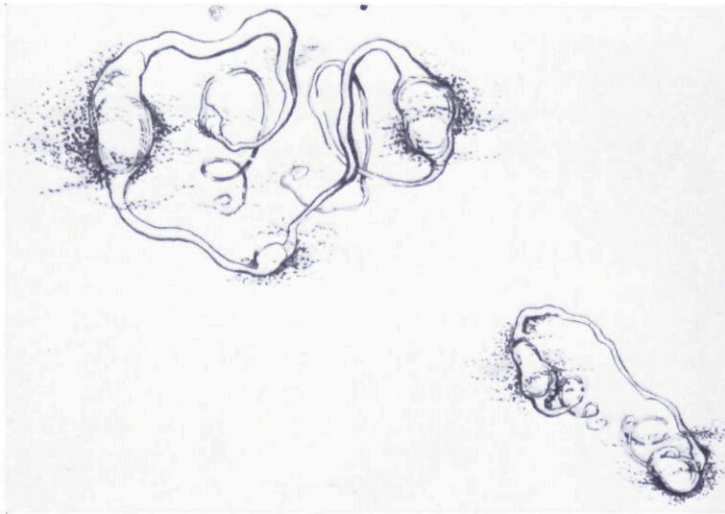


FIG. 3.

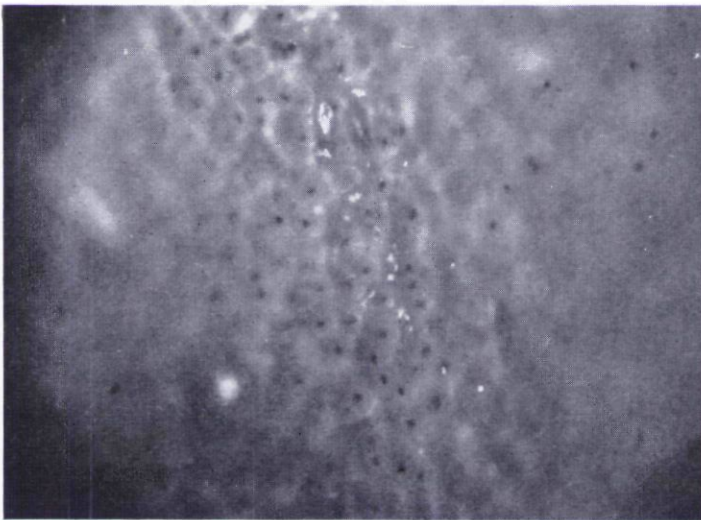


FIG. 4

Dr. Holti determined independently that the thermometric reaction was characteristic of psoriasis in twelve of these patients and low normal in one patient. This group possess psoriatic type capillaries. The remaining two patients showed a normal reaction by both methods of examination. It was possible to forecast the result of thermometric studies from the number of psoriatic capillaries present. According to the overall appearance, a forecast of a positive result, a moderately positive result or one that was in the overlapping range of normal was given. This was completely accurate in 14 patients but in the remaining patient who was obese and somewhat oedematous, although one group of psoriatic capillaries was seen, there were not enough capillaries visible to express an opinion on the probable functional behaviour.

These observations are to be continued and the series of arthropathic patients enlarged (Thompson and Holti 1964).

Eczema.—The appearances in four patients were studied in detail. The capillaries which were dilated in the eczematous reaction had not the irregularity of wall seen in psoriatic capillaries. Though lengthened, their convolutions were less complicated than in psoriasis (Fig. 4, $\times 25$, cf. Fig. 1). Pericapillary exudate of pigment was rarely present giving a more clear-cut appearance than in psoriasis. The eczematous capillaries were seen projecting into dermal papillae which were enlarged with oedema but no "ball formation" was present. The groups of capillaries tended to have straighter margins as compared with the disk-like groups in psoriasis.

Control studies.—No significant evidence of psoriatic capillaries was found in eleven normal control subjects studied. Very occasionally a single capillary was seen bearing a resemblance to the psoriatic capillary but groups of these were not found. Eight patients were examined at a room temperature of 65–70° F. (18.5–21° C.) but three were studied at a room temperature of 80° F. (26.5° C.). They were sweating moderately and showed widespread vasodilatation of the forearm and finger capillaries. Extensive and time-consuming examination did not reveal the presence of psoriatic capillaries.

Patients of particular interest.

Case 1.—A man aged 58 presented with a generalized exfoliating eruption in which a few pustules were observed. He had previously received intermittent systemic courses of a fluorinated steroid preparation. Pustular psoriasis was suspected but there were no other stigmata of psoriasis present and his personal and family histories were negative for the condition. Capillary microscopy revealed the presence of the psoriatic type of capillaries. The skin reaction gradually subsided. Ten months later plaques of psoriasis became visible, confirming the diagnosis.

Case 2.—A man aged 62 presented with a history of pustular lesions present on the soles of his feet for two years. The clinical appearances were suggestive

of pustular psoriasis. Scrapings from the toe clefts and lesions did not reveal fungus. There were no stigmata of psoriasis and his personal and family history were negative for psoriasis. Examination of two fields on the flexor aspect of the forearm and dorsa of two fingers revealed the presence of psoriatic capillaries.

Case 3.—A woman aged 42 complained of a widespread scaling and itching eruption present for three months. There was no personal or family history of psoriasis. On examination a few psoriasiform plaques were present on a background suggestive of seborrhoeic dermatitis. On extensive investigation no psoriatic capillaries were found. The patient's eruption cleared completely in eighteen days with anti-infective measures and bland local applications. The diagnosis of seborrhoeic dermatitis was confirmed.

Case 4.—A man aged 24 who gave a two-year history of well-circumscribed itching and scaling patches present on the back of his hands. These had been resistant to treatment for eczema and despite no personal or family history of psoriasis, this condition was suspected. No psoriatic capillaries were present in the lesion or in the unaffected skin. Thermometric examination (G. Holti) showed a normal reaction. At the time of writing, the lesions are responding well to non-specific occlusive treatment and the diagnosis is regarded as eczema.

DISCUSSION.

In observing capillary changes in the skin, it is desirable to work at a reasonably constant temperature. A high environmental temperature causing vasodilatation makes the interpretation of observations more difficult, as does a thick horny layer or the presence of medicaments on the skin.

Capillary appearances are of course influenced by blood flow which is dependent on arteriolar tonus. Whether the change seen in psoriasis is primary or is dependent upon biochemical epidermal changes is not yet clear. Further investigation of the unaffected epidermis and dermis in the incipient changes following injury of the skin in active psoriasis, the Koebner phenomenon, may resolve the problem.

The rapid return of capillaries towards a normal pattern in psoriasis under treatment with dithranol corresponds to the return of the turnover of epidermal cells to normal described in previous work (Ross *et al.* 1964).

The capillary changes described are of interest in relation to the clinical observation that psoriatic lesions often start as punctate foci which expand and may become confluent to form plaques. The more extensive relationship of the epidermis to capillary loops normally present about the elbows and knees (Montagna, 1962) may explain these sites of election of psoriasis in which the epidermis is observed to proliferate evenly about the dermal papilla (Ross, 1964).

It would confirm many of these presumptions if it could be known that the punctate foci of parakeratosis observed by Ross *et al.* (1964) correspond to the individual or grouped capillary changes described. The significance of the circular patterns of capillaries in psoriatic lesions is not apparent but may be related to the arrangement of sweat glands about the hair follicles (Ross, 1965).

The psoriatic type of arthropathy may be seen in patients without personal or family evidence of psoriasis (Baker *et al.*, 1963*a* and *b*) as may the affection of palms and soles described as pustular psoriasis (Ingram, 1958). A number of such patients examined in this study have been shown to possess capillaries with the features of those described as characteristic of psoriasis. It would be interesting to investigate the capillaries of the skin in those infants described by Warin and Faulkner (1961) as suffering from a napkin rash resembling psoriasis.

The capillary changes observed in the skin of psoriatic and potentially psoriatic patients are of diagnostic value. It would seem probable that this inborn predisposition to react by the development of psoriasis may be much higher in the population than the actual incidence of psoriasis—a feature observed in diabetes and in the atopic diathesis.

SUMMARY.

The presence of an abnormal capillary morphology in psoriasis lesions is confirmed. Such capillary forms may be present in the unaffected skin of psoriatics. The forms are also found in a significant number of patients with sero-negative polyarthropathy and are related to thermometric abnormalities (Holti). The diagnostic value of the findings is indicated.

The co-operation of Dr. Malcolm Thompson in referring patients with arthropathy is gratefully acknowledged. Miss D. Mustart, A.T.D. was responsible for the drawings of the capillary appearances and also drew attention to the circular patterns of capillaries revealed by photography. The encouragement and criticisms of Professor J. T. Ingram and Dr. G. Holti are appreciated.

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