

THE CAPILLARY RESPONSES IN PSORIATIC SKIN*

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The etiology of psoriasis remains obscure. The primary site of involvement of tissues, namely, epidermis, dermis or vasculature is equally doubtful. This study was undertaken to elucidate, if possible, in which structure the first change in psoriasis can be localized. The present thoughts on this subject are well stated by Shelley and Arthur (1). Kuta and Neumann, (2) investigated changes in dehydrogenase activity in epidermal cells after trauma. They report that there is an increase in this enzyme activity in psoriasis earlier than any other observed change. The earliest biopsy study reported in this study was on the sixth day and it showed histologically only non-specific acanthosis. Szodoray (3), reports on biopsy specimens taken at various time intervals after trauma to skin. His findings tend to place the earliest changes in psoriasis in the capillaries.

This study was undertaken in an attempt to localize the first pathological alteration in psoriasis, by the use of capillary microscopy. By this method it was possible to study the behaviour of the capillaries *in vivo*, as well as to make observations repeatedly on the same site. We used apparatus similar to the one used by Gilje, O'Leary and Baldes, (4).

DESCRIPTION OF APPARATUS

A binocular, bi-objective dissecting microscope was used as a capillary microscope with a magnification of 15, 45 and 90. The lightsource for observation was a 7 volt 30 watt microscope lamp equipped with a double Corning glass heat filter to prevent dilatation of the capillaries from the heat of the light bulb. The photographs were made using Kodachrome daylight film in a Zeiss-Winkel microscope camera with a direct viewing focusing device. The final magnification of the photographs is 6.3 and 38. The light source for the photography were two strobe lights (Thriftlite Model 2 X).

METHOD

Unselected cases of psoriasis were scarified in most instances on the volar aspect of the forearm.

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Some of the scarifications were made in the deltoid and gluteal areas. Following this, clinical photographs and capillary microscopic photographs were taken at intervals of 24 hours for six to seven days and after this period at longer intervals. The first photograph was taken after 12 hours and the longest follow up with capillary microscopy was three weeks. In a number of patients biopsy specimens of the scarified site were taken at various intervals to compare the clinical and capillary microscopic appearance with the histologic changes.

Four control scarifications were made on non-psoriatic persons, and while they had no overt dermatologic disease, three were males and two of them showed male type baldness with some evidence of seborrhea.

Ten psoriasis patients were examined, four women ranging in age from 25 to 70, six men between the ages of 27 to 70. The patients were arbitrarily divided into the following groups:

I. Eruptive stage	2
II. Chronic stationary	7
a. widespread large plaques	2
b. widespread guttate	2
c. widespread minimal	3
III. Symptomless	1

The duration of the psoriasis varied from 2 to 40 years.

As further controls capillary microscopic pictures were taken of:

1. a well formed psoriatic papule
2. the non-involved skin of a psoriatic patient
3. the skin of a non psoriatic individual without skin disease

All control pictures were taken on the volar surface of the forearm. The volar surfaces of the forearm were chosen for this study for two reasons:

1. It is not a regularly involved area in psoriasis and as it is generally well protected and covered, additional trauma may be more easily avoided.
2. This area can also be easily and conveniently observed under the microscope.

FINDINGS

The capillary changes in all psoriatic individuals examined in this study showed identical features regardless of the stage and the age of the psoriasis and regardless of whether they developed a clinically observable Koebner lesion on the site of scarification.

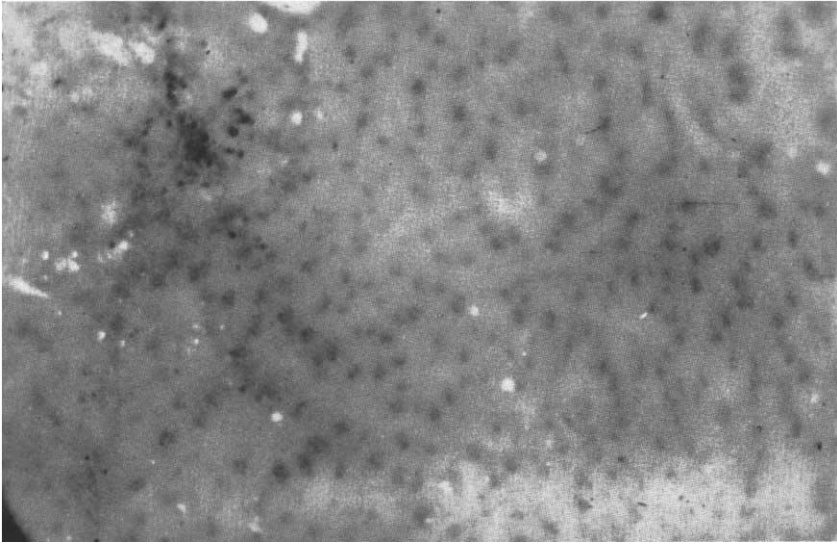


FIG. 1. Capillary microscopic appearance of a psoriatic lesion. Many, regularly arranged tortuous and dilated capillaries.

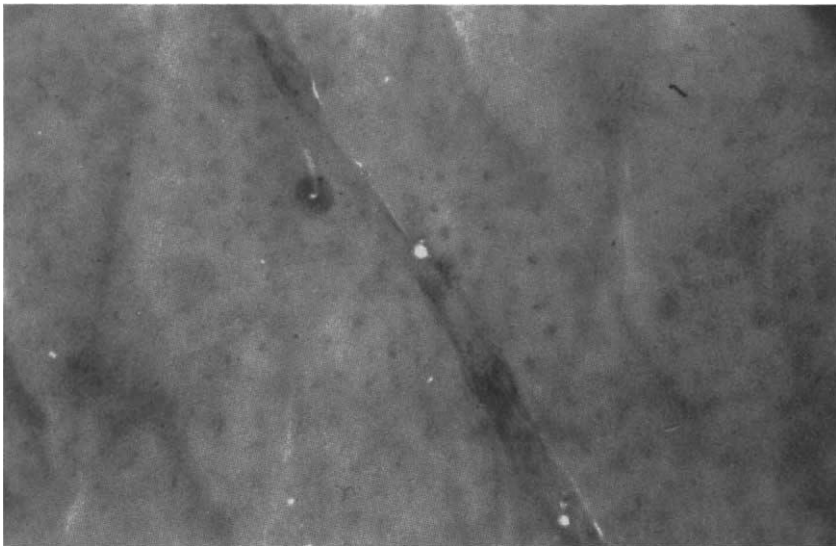


FIG. 2. Capillary microscopic picture of the scarified area in a psoriatic patient who did not react with a Koebner phenomenon. The capillaries show the typical appearance characteristic for psoriasis. 24 hours after scarification.

The uninvolved skin in the psoriatic patient shows capillaries which are somewhat more tortuous than in the non psoriatic person. In a psoriatic lesion, the now well recognized pattern of cotton ball capillaries, described by Gilje, may be seen (Fig. 1). The evolution of the capillary changes in the individual who does not respond to trauma with a clinical psoriasis lesion, is inter-

esting, inasmuch as it seems to point up an intrinsic reaction pattern peculiar to capillaries in the psoriatic. The scarification evolves in a manner comparable to normal when examined grossly. After 24 hours it is indistinguishable from the scratch on the non psoriatic individual. When observed by the capillary microscope, however, the non-psoriatic skin shows only more

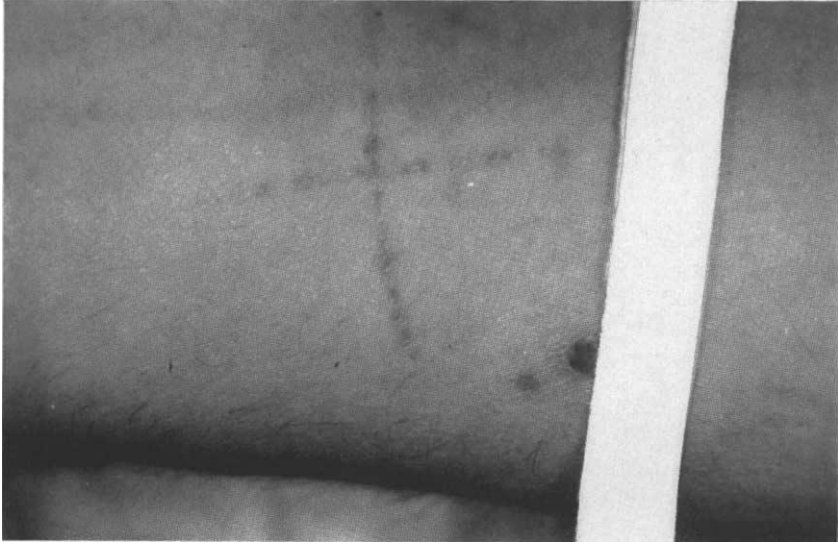


FIG. 3. Appearance of the scarified area in a psoriatic individual in whom the trauma was followed by a Koebner phenomenon. 6 days after scarification.



FIG. 4. Capillary microscopic picture 6 days after trauma. This shows capillaries more tortuous and the area involved somewhat larger.

or less evenly dilated capillaries, while the psoriatic patient, even after this short period, shows capillaries grouped in an oval pattern with the increase of tortuosity leading to cotton ball capillaries (Fig. 2). This has been observed in every psoriasis patient which we have followed, and who did not respond with a Koebner lesion. After 72 hours the scarification on the non psori-

atic individual was almost healed and only occasional capillaries were still dilated. In the psoriatic patient the scarification did not heal as readily and the capillary picture is more characteristic of psoriasis. Nine days after scarification in the psoriatic individual the microscopic picture shows capillaries similar to the ones present before scarification. We propose the term

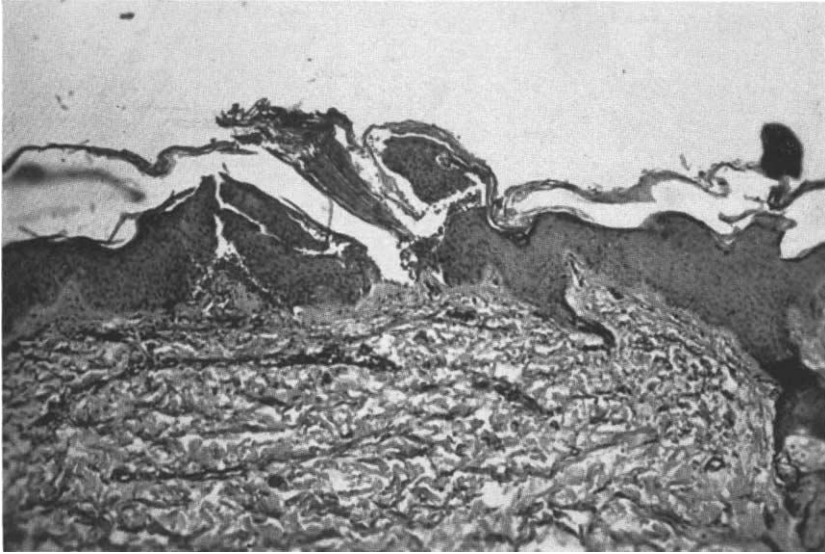


FIG. 5. Biopsy 6 days after trauma. No changes characteristic of psoriasis are as yet to be seen



FIG. 6. Clinical appearance 10 days after trauma. Raised, scaly psoriasis lesions are visible along the line of scarification.

"Subclinical Koebner Phenomenon" for this reaction pattern of the capillaries in the psoriatic, even when the trauma does not eventuate in a clinical psoriatic lesion. This term was first employed by Skutta in a personal communication to one of us (F. Z.).

The initial behavior of the capillaries after trauma in the psoriatic individual is the same whether this trauma is productive of a Koebner phenomenon or not. After 24 hours the clinical picture is similar to the one with a negative Koebner phenomenon and with the capillary

microscope the typical capillaries may be seen. In the same patient after 6 days, the line of scarification, instead of healing, became wider and seeded with small, but characteristic psoriatic lesions (Fig. 3). The capillary microscope picture shows more well developed cotton ball capillaries and the site involved is somewhat larger (Fig. 4). Biopsy specimen taken at this time reveals the absence of features of psoriasis histologically, showing that the characteristic capillary pattern preceded the histological changes (Fig. 5). Ten days after the scarification in this patient the

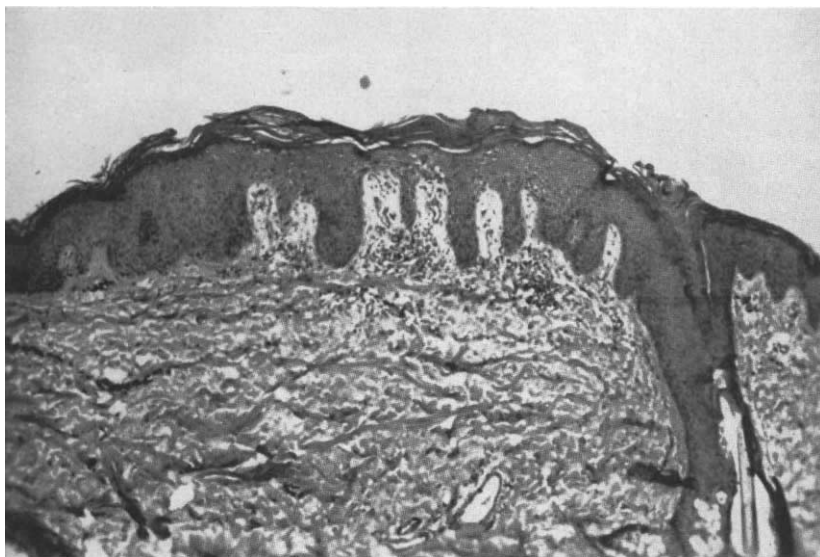


FIG. 7. Biopsy 10 days after trauma. Histological changes compatible with psoriasis are now apparent.

clinical appearance leave no doubt that a Koebner phenomenon has developed (Fig. 6) and a second biopsy specimen taken at this time reveals the histological picture of psoriasis (Fig. 7).

We conclude from this that the first visible change in a provoked lesion of psoriasis appears in the capillaries. It is not possible at 24 to 48 hours to predict which psoriatic individual will react with a Koebner phenomenon. What determines the regression of capillary reaction in some cases and the progression to a full blown Koebner reaction in others during this period of 24 to 48 hours after provocation, is not known. It is tempting to think that if it were known, it would throw some light upon the pathogenesis of this

disease. There is an essential difference in the reaction of the capillaries to trauma in the psoriatic and in the non psoriatic individual.

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DISCUSSION

MAJOR WILLIAM R. VINEGARD (Washington, D. C.): First I would like to ask if in this area, where the attempt to create a Koebner phenomenon was done, whether the visualization with the capillary microscope was accomplished prior to creating the trauma? In our experience at Walter Reed, primarily the studies by Dr. Lawler and Dr. Davis, we were unable to substantiate the presence of dilated capillaries in areas of the skin of psoriatic individuals which had never previously been involved with psoriasis. Also we recently completed some work in which we have

studied patients following all forms of therapy for psoriasis. We never observed regression of the vascular pattern following cessation of all activity of the clinical lesion.

E. M. FARBER (Palo Alto, Calif.): Our studies, using similar methods, indicate that the capillaries are generally involved in the nail bed in those with active psoriasis. I am curious to know whether your patients had an active phase of psoriasis.

Secondly, there does seem to be capillary involvement in normal appearing skin of the

person with psoriasis. In H and E sections of normal appearing skin, there may be capillary dilatation. If so, then one can predict where the psoriasis may occur later in life. The capillary changes do not seem to interfere with blood flow. Plethysmographic studies show normal rates of blood flow in the digits of psoriatics and skin temperature responses both on heating and cooling of the total body are normal.

DR. D. JOSEPH DEMIS (Washington, D. C.): This is a very interesting study; I would only like to suggest that removal of the keratin immediately prior to photography might enhance the visibility of the capillaries.

DR. PAUL TELNER (in closing): I wish to thank the discussors, for their very pertinent questions.

The first question is well taken. I am not certain that the area in question was never involved in the psoriatic process. The history in these cases does not reveal it. We have also chosen the volar aspect of the forearm because it is relatively seldom involved in psoriasis.

The second question deals with the nailfold capillaries in active psoriasis. The observations

which we made on our patients has not shown a particular regular pattern in psoriasis. The capillaries are dilated and the bloodflow is probably more than adequate. It was recently shown by a histopathologist in Leeds, (Curran, R.: The Elaboration of Mucopolysaccharides by Vascular Endothelium, *J. Path. Bact.* **74**: 347-352, 1957) that not only the mast cell but also the endothelial cells of capillaries lay down hyaluronic acid and sulfated mucopolysaccharides. Changes in the laying down of these substances may well, and this is conjecture, result in modification of the keratinization process.

The question regarding the use of epidermal stripping gave us some thought. Some years ago, when Dr. Davis gave his paper on capillary microscopy using the stripping method, I remarked in discussion that I thought that secondary changes would alter capillary reaction. We intentionally did not use this method in order to minimize extraneous trauma, apart from the one we applied, although I do admit that it increased our difficulties in visualizing the capillaries.