

# *Evaluation of the number of hair follicles in psoriatic lesions of glabrous skin*

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## ABSTRACT

**Introduction.** In analyzing biopsies of psoriatic lesions the impression is produced that the number of hair follicles is decreased. In the literature no unequivocal data could be found to decide whether the number of hair follicles was decreased or this was rather an optic impression due to epidermal hyperplasia. The studies published on the so-called "psoriatic alopecia" are few and contradictory.

**Methods.** In each of 30 patients two punch biopsies were done: the first from a psoriatic lesion and the second from clinically non-altered surrounding skin of the gluteal region. In 20 cases the biopsy specimens were of 4 mm diameter and in 10 cases the diameter was 6 mm. The number of follicles was counted in five horizontal histologic slices at the level of the infundibular part of the follicle. The mean value per cm<sup>2</sup> was calculated according to the equation  $a = r^2\pi$ . Student's t - test of  $p < 0.05$  was used for statistical evaluation.

**Results.** The mean value of the number of hair follicles from psoriatic lesions amounted to 32.37 follicles/cm<sup>2</sup>, while in the clinically unaltered skin the analogue value was 32.96 follicles/cm<sup>2</sup>. The deviation was statistically not significant at the level of 0.05.

There was no correlation between the number of hair follicles and patient's age or duration of the disease.

**Conclusion.** The number of hair follicles in psoriatic lesions is not decreased compared to follicles in perilesional healthy skin. An inadequate impression may be caused by the acanthosis of the epidermis.

## KEY WORDS

hair follicle,  
number,  
psoriatic  
lesions,  
glabrous  
skin

## *Introduction*

In typical cases the clinical diagnosis of psoriasis is easy. Atypical forms of psoriasis, however, frequently seen in everyday work, represent a diagnostic problem. In such cases histopathologic investigation is of great help, as it usually shows a typical histologic picture.

Sometimes it is difficult to make a precise diagnosis based on current criteria for histopathologic differentiation (1,2). The most difficult is the diagnosis in cases of isolated psoriasis on the scalp as well as isolated psoriasis on the palms and soles (3,4,5).

By routine reading histopathologic slides the impression is produced that in psoriatic lesions the number of hair follicles is decreased as compared to the normal skin. In the literature few data can be found regarding alterations of hair follicles in psoriasis, and even those are contradictory.

The aim of the present study was to establish possible differences in the number of hair follicles in psoriatic lesions compared to the clinically non-involved skin in the same patients. An eventual difference in the number of follicles could be helpful as a diagnostic criterion in histopathologic differentiation of atypical psoriatic cases.

The histologic symptoms of psoriasis depend on the type and duration of the skin lesion, its localization as well as on the therapy prior to biopsy.

The current criteria for histopathologic differentiation of psoriasis are: hyperkeratosis with parakeratosis, regular acanthosis, reduction or total absence of the granular layer of epidermis, increased mitotic activity in keratinocytes of the basal layer, elongation of papillae containing dilated, tortuous capillaries and more or less dense infiltrations including lymphocytes, histiocytes, some mastocytes and in the early phase neutrophils, migration of neutrophils into the epidermis, deposits of neutrophils in parakeratotic areas of the corneal layer and Kogoj's spongiform pustules.

Parakeratosis with or without deposits of neutrophils, spongiform pustules and Munro's microabscesses are the most significant criteria in histopathologic differentiation of psoriasis (6). All other criteria are nonspecific and may also be present in other inflammatory skin diseases.

In making the differential diagnosis of psoriatic alterations on the scalp, severe forms of seborrheic dermatitis are particularly relevant, as sometimes their histologic differentiation from psoriasis is practically impossible.

A difficult problem is the differentiation of psoriasis on palms and soles where the histologic picture is rarely typical. Studies regarding this problem show that in clinically unclear cases a histologic investigation is helpful only in cases when the histologic symptoms are characteristic (7).

## Material and methods

The study included 30 male patients with clinically evident psoriasis, aged 19-68 years.

All patients had a generalized form of psoriasis and apart from local therapy all of them had received systemic PUVA treatment. No cytostatics were administered. No hair loss was noted in any of our patients, neither anamnesticly nor clinically.

In each patient two punch biopsies were carried out under local anesthesia with 2% xylocaine. The first biopsy was taken from a psoriatic lesion in the gluteal region and the second from surrounding clinically unaltered skin.

From all specimens paraffin histologic preparations, routinely stained with hemalum and eosin, were made. All specimens were investigated in horizontal sections made at the level of the infundibular part of the follicles. In all specimens the number of follicles was counted in five sections and calculated as the mean value per cm<sup>2</sup> according to the equation:  $a = r^2\pi$ .

In the final statistical analysis of data, obtained by counting the follicles in all samples of clinically altered as well as unaltered skin, the t-test of  $p < 0.05$  was used for statistical evaluation.

The statistical analysis included the following data: the number of follicles/cm<sup>2</sup> in samples from the psoriatic lesion, the number of follicles/cm<sup>2</sup> in samples from clinically unaltered skin, the sum of all corresponding values, the mean value, variability and SD. There is also a statistical presentation of the number of follicles with regard to the age of the patients and the duration of the disease (Table 1).

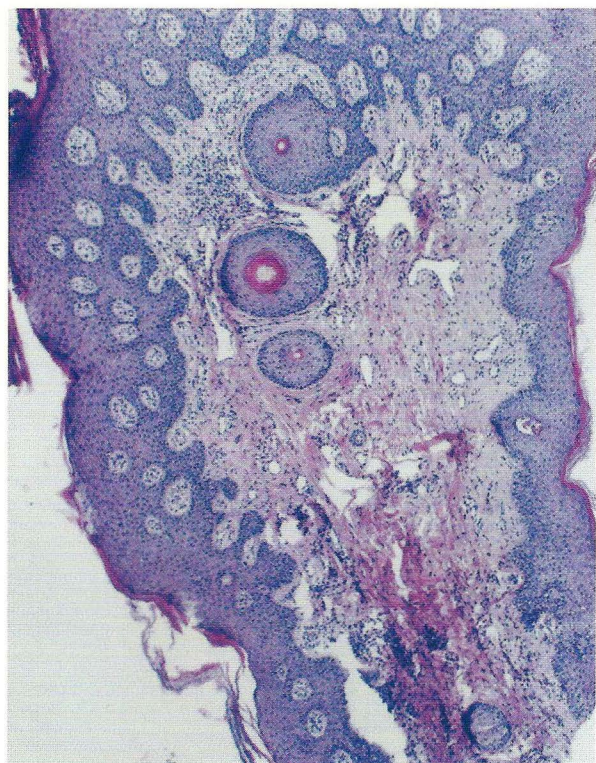
## Results

1. The values obtained show that there were no statistically significant differences in the number of follicles in psoriatic lesions as compared to the number of follicles in clinically unaltered skin of the same region. (Figures 1a,1b,2a,2b).

The mean value of the number of follicles in samples from psoriatic lesions was 32.37/cm<sup>2</sup>, in samples from

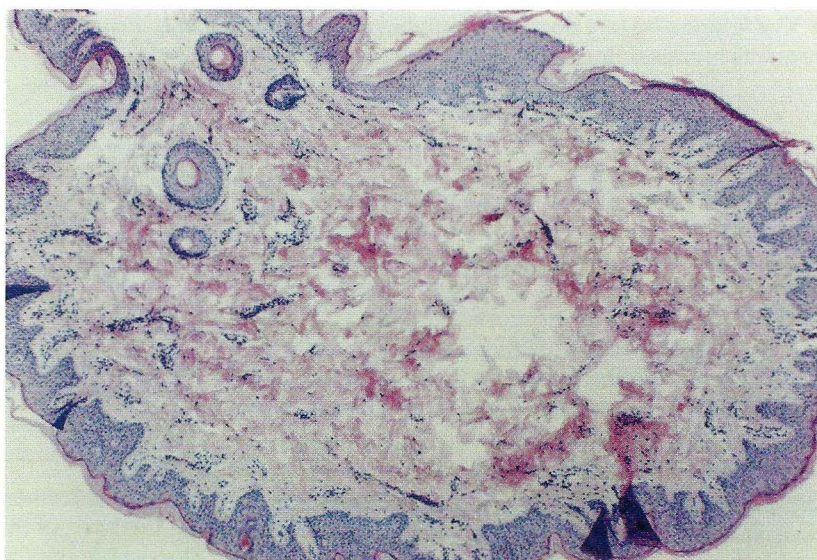
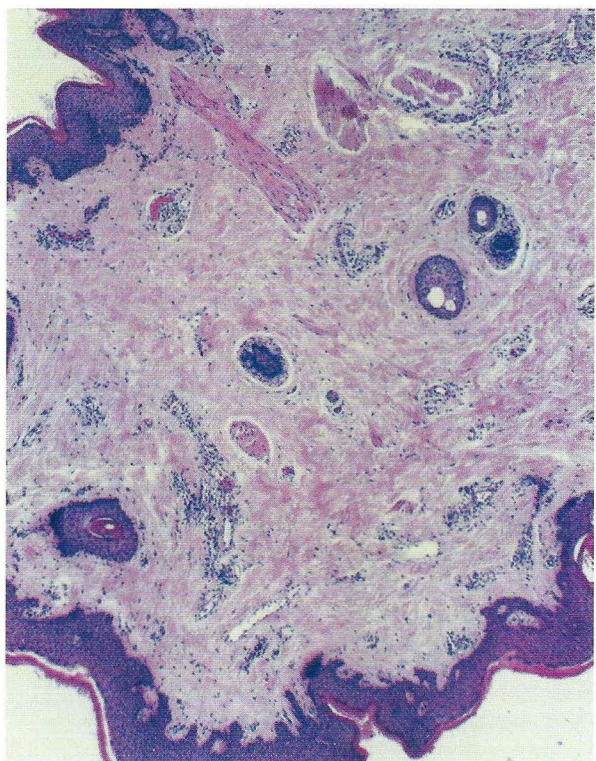
Table 1. Presentation of statistically analysed data of altered and unaltered skin samples of patients.

|                                               | <b>X ± SD</b> | <b>Xmin</b> | <b>Xmax</b> |
|-----------------------------------------------|---------------|-------------|-------------|
| <b>Age (years)</b>                            | 49 ± 13       | 19          | 68          |
| <b>Duration of disease (years)</b>            | 12 ± 8        | 1           | 30          |
| <b>No. foll/cm<sup>2</sup> (healthy skin)</b> | 32.96 ± 5.99  | 23.88       | 42.48       |
| <b>No. foll/cm<sup>2</sup> (lesion)</b>       | 32.37 ± 6.11  | 23.88       | 42.48       |
| <b>Difference</b>                             | 0.59 ± 1.76   | - 3.19      | 6.37        |



**Fig. 1a.** Horizontal section of involved skin sample (patient M.A.). Anatomically normal follicular units (HE 10x2).

**Fig. 1b.** Horizontal section of uninvolved skin sample (same patient). Anatomically normal follicular units (HE 10x2).

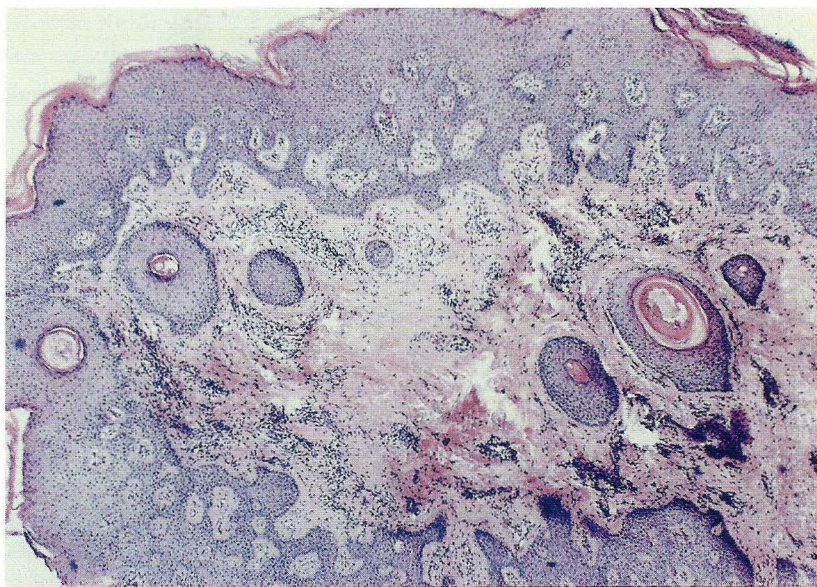


**Fig. 2a.** Horizontal section of involved skin sample (patient R.S.). Anatomically normal follicular units (HE 10x2).

clinically unaltered skin  $32.96/\text{cm}^2$ . The difference of  $0.59 \pm 1.76$  is not statistically significant as evidenced by the t-test  $p < 0.05$  (Table 1).

2. There was no correlation between the number of follicles and the age of the patients and the duration of the disease. The coefficient of correlation with regard to age of patients was  $-0.1152$ ; the coefficient regarding the duration of the disease was  $-0.1485$  ( $p < 0.05$ ) (Table 1).

**Fig. 2b.** Horizontal section of uninvolved skin sample (same patient). Anatomically normal follicular units (HE 10x2).



3. The impression of a decreased number of follicles in psoriatic lesions is due to hyperplasia of the epidermis.

## Discussion

As already stated in the introduction, few data on hair follicle alterations in the skin of psoriatic patients can be found in the literature.

In their electron microscopy study on changes in hair follicles of psoriatic patients, Wyatt et al. found in 1972 that dystrophic alterations of hair follicles were more frequent in psoriatics than in the control group of healthy subjects (8). Whether these dystrophic alterations are connected with pathogenetic occurrences or whether they are the result of long-term therapeutic procedures in psoriatics was not elucidated.

In a study on "psoriatic alopecia" in 1972, Shuster differentiates three types of hair loss:

- Hair loss limited to the psoriatic lesion as the most frequent type of psoriatic scalp alopecia;
- Acute hair loss in psoriatic lesions as well as in clinically unaltered skin of the scalp, characterized by an increased number of hair follicles in the telogen phase;
- Alopecia with "follicular destruction" or cicatricial alopecia, a very rare form of psoriatic alopecia, which was also, verified histologically (9).

Shuster's study does not exclude the possibility that the telogen effluvium is perhaps merely a chance manifestation or the reaction to long-term therapy. Moreover, the results of the study are based only on clinical data and on a small number of cases.

In 1978, Verbov described a case of cicatricial scalp alopecia in a female psoriatic patient. Histologic investigation revealed atrophy of the epidermis, follicles and of sebaceous glands as well as collagen sclerosis (10).

Identical changes were also detected by Rodrigues et al. in 1983 (11). In 1985 Siemund described in detail two cases with destructive changes in the follicles in patients with scalp psoriasis. According to his opinion, the hair loss is the result of histologically confirmed inflammatory changes in the dermis causing the destruction of follicles. The cause of these changes still remains unknown (12).

Diffuse alopecia is most common in erythrodermic forms, but its appearance is also possible in the course of other forms of psoriasis. One of the causes of psoriatic alopecia is doubtlessly the routine removal of psoriatic scales (13).

In their morphometric and histologic study of 28 cases of scalp psoriasis Haedington et al. found that there was no significant difference between the number of follicles in psoriatic lesions as compared to clinically unaltered skin of the scalp in the same patients (14).

In 1989 Runne and Kroneisen published an ex-

tensive study on 34 patients with psoriatic scalp alopecia. The course of hair loss was acute in 53% of patients, chronically recurrent in 15% and chronically progressive in 32%. In all cases histologic investigation confirmed the clinical diagnosis of psoriasis. In some patients the histologic picture included a perifollicular lymphocytic infiltrate, probably causing the subsequent destruction of follicles. In the course of the disease, inflammatory processes of the foreign-body granuloma type developed, causing cicatrization and thus definitive alopecia. After local therapy, complete regression of alopecia occurred in 70% of cases. On the basis of these data the authors concluded that psoriatic alopecia is the result of the basic disease, psoriasis, which responded well to local antipsoriatic therapy (15).

In 1993 Runne et al. completed their extensive study. On the basis of their results they believe that psoriatic alopecia doubtlessly exists as a special entity and that its occurrence is not so rare. The authors are of the opinion that the problem of psoriatic alopecia is a good example of how a false assumption can obstruct the acceptance of a scientific truth (16,17).

In their histological investigation in 1990, Wright and Messinger confirmed the inflammatory destruction in the infundibular part of the hair follicle in three patients with scalp psoriasis. Due to the similarity of histologic alterations in all subjects, the authors believe that cicatricial alopecia may be a symptom of psoriasis, which observation is not to be generalized due to the small number of patients under observation (18).

In 1990 Orfanos believed that the causes of hair loss on the scalp of psoriatics were:

- Alterations of the bulb with subsequent hair thinning and abnormal keratinization of the hair in psoriatic lesions;
- Moderate telogen effluvium in psoriatic skin;
- Cicatricial alopecia which is rare and actually represents the result of secondary folliculitis and other traumatic agents in the course of the disease (19).

Berth-Jones et al. attempted in 1990 to clarify the changes in the dynamics of the hair cycle causing so-called "etretinate alopecia". This study included 22 subjects treated in a period of 12 months. There were no marked alterations of anagen effluvium, but there was an increase in the number of hair in the telogen phase. Histologic investigation was not included in this study (20).

Degenerative changes in the hairs of two female patients treated with etretinate were described by Shauder et al. in 1992. Their findings suggest etretinate-induced alteration of the expression of the psoriatic phenotype in the keratin composition of hair in psoriatic patients (21).

In 1995 Kretzschmar et al. established that periodical hair loss as a result of psoriasis is a generally accepted

occurrence, but it has not been explained whether psoriasis can cause alopecia. The authors described the case of a female patient with the typical clinical picture of psoriasis and cicatricial scalp alopecia. Histology revealed fibrous alterations at the site of previously existing follicles. As other possible causes for hair loss were excluded an etiopathogenetic connection between psoriasis and cicatricial alopecia was assumed. This is an extremely significant observation since prompt and appropriate treatment of psoriasis can prevent cicatricial alopecia (22).

## Conclusion

The results of our study are in approximate correspondence with the study by Haedington et al., but we believe that the scalp is not an appropriate site for the histopathologic confirmation of scalp psoriasis. The diagnosis is extremely difficult, frequently even impossible, due to the similarity with other inflammatory scalp dermatoses (5). The dynamics of the scalp hair follicle differ from the dynamics of the follicle in other parts of the body; it changes intensively with age and reacts differently to various stimuli (e.g. hormones).

Therefore in our study we used skin samples from the gluteal region.

The results obtained with the quantification of hair follicles in psoriatic lesions refuted our working hypothesis regarding the decreased number of follicles and showed that it is merely a visual impression caused by psoriasiform acanthosis present in psoriasis.

In the course of our study and after examining the

available literature we became aware that the problem of the so-called "psoriatic alopecia" described by several authors, doubtlessly exists. Its cause is yet unknown. Whether alterations in follicle function are etiologically conditioned by psoriasis or whether they occur, as a result of long-term antipsoriatic therapy is a question, which remains to be answered.

We believe that hair loss in psoriatic patients is a symptomatic occurrence due to:

- Routine removal of scales from psoriatic lesions, either mechanically or medicamentously;
- Long-term treatment with various local and systemic drugs;
- Psoriasis is a chronic, recurrent inflammatory dermatosis. At any rate, chronic perifollicular inflammation, combined with the two above mentioned factors, is an important cause of degenerative changes in the follicles and of transitory or permanent hair loss in psoriatic lesions in the form of psoriatic alopecia.

Data from the literature as well as our own observations serve to confirm that hair loss in psoriasis is reversible and can be prevented by prompt treatment. There is no evidence that a decrease in the number of follicles is the cause of hair loss.

In the course of our study we observed no occurrence of scars in the dermis. In most cases only a lymphohistiocytic infiltrate was present around the unaltered follicles. In all cases histologic symptoms characteristic for psoriasis were found.

The results of our study did not clarify the cause of hair loss in psoriatic lesions with certainty. However, they can serve as useful data for further studies.

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