

THE SIGNIFICANCE OF HISTOPATHOLOGY IN THE DIAGNOSIS OF DERMATOMYCOSES

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SUMMARY

Besides the potassium hydroxide mount and culture methods, the classical diagnostic steps in mycology include histopathological examination of biopsied tissue. Therefore, the characteristic patterns of histopathological reaction in dermatomycoses, as well as certain histopathological "clues", will be discussed in detail. These indicators permit the dermatopathologist to request the special stains (i.e.: PAS-stain) necessary to specifically search for fungal elements, and thus make the diagnosis of dermatomycoses, irrespective of the clinical diagnosis. We conclude that histopathologic examination has a special place in the diagnosis of dermatomycoses and can be regarded as a substantial supplement to the KOH-preparation.

KEY WORDS:

Dermatomycoses, Histopathological reaction patterns, Histopathological "clues"

INTRODUCTION

In many cases, the clinical diagnosis of dermatomycoses poses no great problems and is readily made by the experienced dermatologist or the physician interested in mycoses (so-called dermatological sight diagnosis). When the clinical picture is not so unequivocal, the diagnosis is often verified by means of a potassium hydroxide mount, should a dermatophytosis have been considered in the differential diagnosis (1). Fungal cultures are of little significance for the primary diagnosis of skin mycoses, and also of secondary importance for the practicing dermatologist.

Besides the potassium hydroxide mount and culture methods, the classical diagnostic steps in mycology include

histopathological examination of biopsied tissue. The significance of the latter in diagnosing dermatomycoses will be discussed below.

HISTOPATHOLOGICAL EXAMINATION

For the histopathological study of dermatomycoses, a small punch biopsy of 3 to 4 mm diameter, fixed in formalin suffices. Visualization of the causative agent, in the cases of dermatomycoses almost exclusively hyphae and spores, is relatively easy to achieve by using specific staining techniques (PAS; Grocott-Gömöri).

The difficulty in the histopathological evaluation of skin mycoses, however, lies in the circumstance that HE-staining

is used for routine samples. The resulting pale blue fungal structures, localized in the cornified layer or in the keratin of the hair follicles, are nearly imperceptible, even for the experienced histopathologist.

Therefore, the characteristic patterns of histopathological reaction in dermatomycoses (epidermophytoses and trichophytoses), as well as certain histopathological “clues”, will be discussed in detail. They are important indicators for the possible presence of fungal infection, and their recognition should prompt the use of special stains to confirm the presence of dermatophytes (Table 1) (2).

Table 1: Important histopathological reaction patterns and “clues”, which suggest the possibility of a dermatomycosis.

Histopathological Reaction Patterns

- * Superficial perivascular dermatitis
- * Spongiotic dermatitis
- * Psoriasiform dermatitis
- * Folliculitis und perifolliculitis
- * Granulomatous dermatitis

Histopathological “Clues”

- * Neutrophils within the stratum corneum
- * “Sandwich sign”

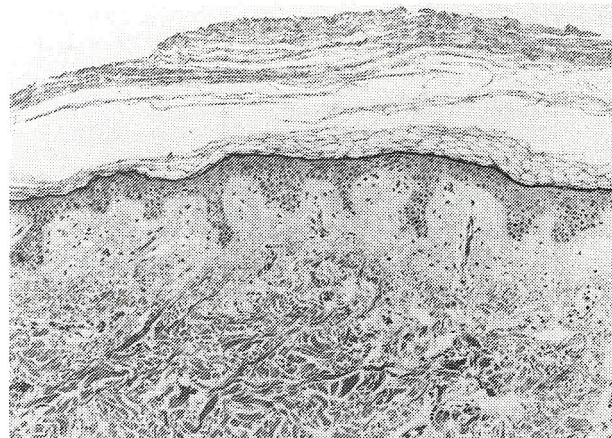
HISTOPATHOLOGICAL REACTION PATTERNS

SUPERFICIAL PERIVASCULAR DERMATITIS

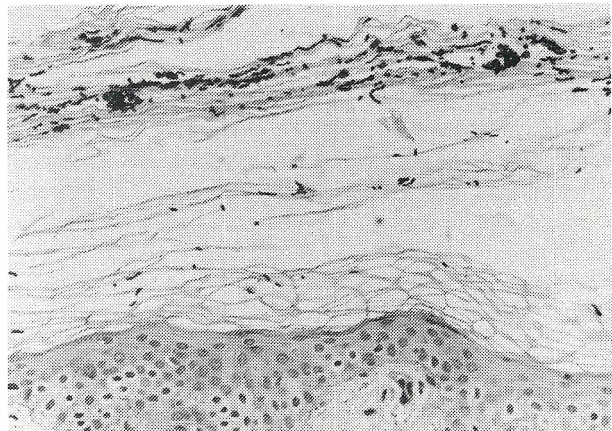
This histopathologic reaction pattern is characterized by a sparse to moderately dense perivascular inflammatory cell infiltrate devoid of epidermal involvement. In many cases, the definitive correlation of this histopathological picture to a specific diagnosis is extremely difficult. In 1985 A.B. Ackerman published an algorithmic method to aid in reaching a diagnosis from this special reaction pattern (3). Among other possibilities, that of pityriasis versicolor should be entertained in the presence of superficial perivascular dermatitis and a slightly thickened cornified layer displaying basket-weave configuration (Fig. 1a). Even with HE-stain, especially when the microscope condenser is lowered, numerous pale blue to light gray hyphae and small aggregates of spores can be discerned in the orthokeratotic stratum corneum. This typical finding appears much more impressive with PAS-staining (Fig. 1b).

SPONGIOTIC DERMATITIS

This is the most common pattern of skin reaction seen in inflammatory dermatoses. It features a mostly perivascular,



a) Note a slightly thickening of a basket-weave orthokeratotic stratum corneum in this HE-stained specimen.



b) With PAS-stain, numerous hyphae and spores can be demonstrated in the cornified layer.,

Fig. 1: Superficial perivascular dermatitis in pityriasis versicolor.

predominantly lymphocytic infiltrate in the upper dermis, associated with variably pronounced spongiosis (intercellular edema) of the epidermis. Scattered intraepidermal lymphocytes are found in the spongiotic areas, and focal parakeratosis is often seen in the stratum corneum directly above the latter. Immediately surrounding these foci of parakeratosis, but also in the compact cornified layer, hyphae and spores are evident in epidermomycoses. These fungal structures are difficult to discern, especially within parakeratotic foci, even for the experienced microscopist. Thus, the routine preparation of a PAS-stain is recommended when this reaction pattern is seen.

PSORIASIFORM DERMATITIS

Acanthosis of the epidermis with clublike, regularly elongated rete ridges is designated as psoriasiform epidermal hyperplasia. In psoriasis vulgaris, it is combined with confluent hyperparakeratosis and the stratum granulosum usually is missing. In addition, the high-power view of the upper stratum spinosum, but also of the parakeratotic layer, discloses numerous isolated neutrophils, which sometimes aggregate to small "abscesses". This histopathological picture is characteristic for psoriasis vulgaris. Nearly identical morphological features, however, are observed in psoriasiform and squamous-keratotic epidermomycosis. Since the visualization of the infectious agent in the parakeratotic stratum corneum of psoriasiform dermatitides is extremely difficult, the appropriate special stains should be made when this reaction pattern is observed, irrespective of the clinical diagnosis.

FOLLICULITIS AND PERIFOLLICULITIS

This pattern, too, is already recognizable under scanning magnification, and is characterized by a perifollicular inflammatory reaction, generally with a mixed cellular infiltrate, along with spongiotic changes in the follicular epithelium. Lymphocytes or neutrophils can also be seen in the follicular epithelium, the latter sometimes arranged "abscess-like" in the follicular keratin. The fungal structures in the follicular keratin may be difficult to identify in HE-stained sections. Staining with PAS is necessary to differentiate trichomycosis from folliculitis or perifolliculitis of other cause, such as chronic discoid lupus erythematoses or an acneform eruption (Fig. 2).

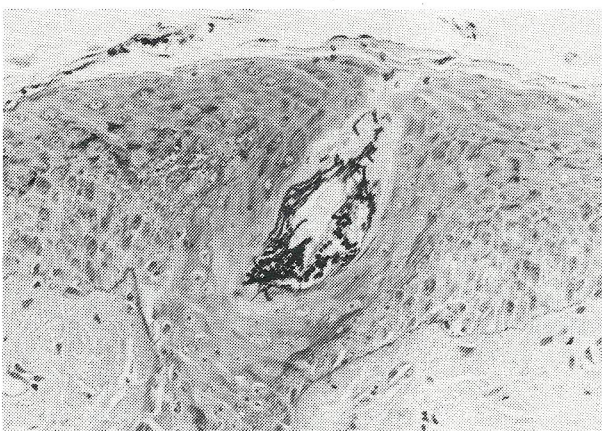


Fig. 2: Spongiotic dermatitis and folliculitis in trichomycosis corporis. PAS-stain. There is slight spongiosis surrounding a follicular infundibulum filled with numerous hyphae.

GRANULOMATOUS DERMATITIS

This exclusively dermal reaction pattern is rarely seen in the epidermo- and trichomycoses preponderantly occurring in Central Europe. An exception is granulomatous trichophytosis of the lower leg, which in effect represents a granulomatous variant of folliculitis or perifolliculitis (4). The significance of a granulomatous reaction in connection with dermal and subcutaneous mycoses is evident.

HISTOPATHOLOGICAL "CLUES"

NEUTROPHILS WITHIN THE STRATUM CORNEUM

Neutrophils in the cornified layer of the epidermis are a typical histopathological feature, regularly observed in eruptive forms of psoriasis vulgaris or pityriasis lichenoides et varioliformis acuta. In addition, when neutrophils are present in the stratum corneum, infectious processes such as impetigo, early syphilis II, but especially dermatomycoses should be considered (5).

It should be emphasized that in orthokeratotic, but also in parakeratotic zones of the cornified layer, fungal structures are found in immediate proximity to the collections of neutrophils (Fig. 3).

"SANDWICH SIGN"

In some cases, inflammatory dermatoses are characterized by a bizonal arrangement of the cornified layer. Superficially, the latter forms a continuous band and is displaying a basket-weave configuration. Below this is seen a cleft, and then a confluent, narrow, compact orthokeratotic or parakeratotic band directly bordering the stratum granulosum. In the superficial dermatomycoses, fungal elements are often found

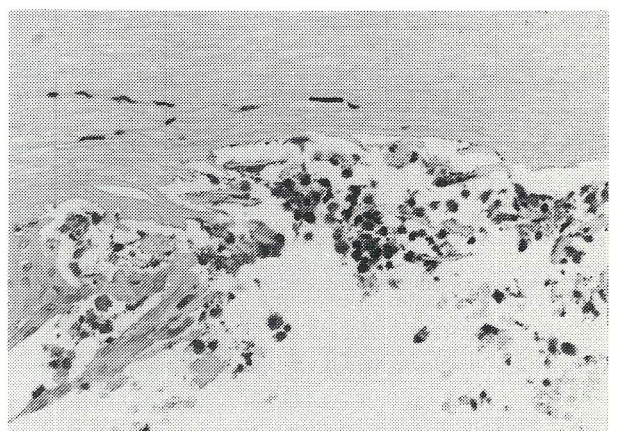


Fig. 3: Neutrophils in the stratum corneum in epidermomycosis manuum. PAS-stain. In immediate proximity to a small collection of neutrophils, several hyphae can be seen in the compact cornified layer.

embedded between these two zones of differing keratin structure (Fig. 4). In many cases, they may already be identified as such in HE-stained sections (6).



Fig. 4: "Sandwich sign" in epidermomycosis corporis. PAS-stain. Some hyphae and spores may be discerned, which are embedded sandwich-like between two different zones of cornification.

This "Sandwich sign" has a dual significance. First, the clearly visible two-layered structure of the stratum corneum, which is already apparent under scanning magnification, immediately invites consideration of a dermatomycosis. Secondly, the search for the fungal elements and their identification is facilitated by knowledge of their localization, namely between the two morphologically different cornified layers (6).

DISCUSSION

Knowledge of the above-mentioned histopathological reaction patterns and especially the histopathological "clues"

elaborated by A.B. Ackerman is of decisive importance for the diagnosis of a superficial fungal infection. These indicators permit the dermatopathologist to request the special stains necessary to specifically search for fungal elements, and thus make the diagnosis (2,3,5,6). It should be particularly emphasized that in most cases, histopathological examination of an inflammatory dermatosis is only performed when a mycosis has not been considered clinically. Table 2 shows a compilation of the most frequent clinical diagnoses when biopsy specimens were submitted, and the subsequent histopathological diagnosis was dermatomycosis.

Table 2: Frequent clinical diagnoses accompanying samples subsequently verified histopathologically as dermatomycoses.

- Granuloma anulare
- Psoriasis
- Figurate erythemas
- Contact dermatitis
- Chronic discoid lupus erythematoses
- Lymphocytic infiltration
- Pyodermia
- Mycoses

In this connection, it should be mentioned that lately a new trend has developed. Increasingly, punch biopsies are performed and submitted for histopathological examination when a dermatomycosis is strongly suspected clinically. The reason for this may be that making a potassium hydroxide mount apparently is not as simple as often stated, and in addition is more time consuming than a punch biopsy. Furthermore, when dermatophytoses have been pre-treated with corticosteroids, often almost no scaly material remains available for the KOH-preparation. Thus, the application of this examination is hampered and its diagnostic value is diminished.

Histopathologic examination has a special place in the diagnosis of dermatomycoses. It may be seen as a substantial supplement to the potassium hydroxide mount.

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