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## **AN APPROACH TO DIAGNOSTIC, PROGNOSTIC AND THERAPY OF THE SKIN PATHOLOGY REVERSIBLE PATTERNS DUE TO INFECTION**

**Аннотация.** An advanced version of the concept of pathological skin patterns is proposed. The concept is substantiated by long-term (2020-2025 years) observations patients aged 65+. Its key terms such as a pattern on the skin, erythematous spots, rashes, symmetry and asymmetry of the pattern, gradient/vector (pathological and therapeutic) within the pattern, are deciphered. The diagnostic, prognostic, and therapeutic significance of the concept in relation to infection is assessed. The principles of the approach to the personalized analysis of the pathological pattern types on the skin of patients due to infection are formulated. The approach has been tested on typical cases of patterns, including reversible erythematous lesions and skin bumpy rashes of patients due to viral and bacterial infections. The therapeutic value of the proposed approach is noted. The advanced concept allows to creating an additional therapeutic strategy and tactic.

**Ключевые слова:** Skin pathology, infection, erythematous spots, bumpy rashes, therapy.

The skin is one of the sensory systems that are the first to react to infection [1, 2]. Skin pathologies are characterized by a high level of diversity and complexity of diagnostics, prognostics, and therapy. The development of approaches to understanding and explaining the features of pathological patterns on the skin of patients remains relevant.

The aim is to propose an experimental and conceptual approach to the diagnostics, prognostics and therapy of skin pathologies using the examples of erythematous disorders and bumpy rashes based on the analysis of the dynamics of pathologic pattern in connection with viral and microbial infections.

**Methods:** Pathologies of skin patterns were recorded in 65+ patients from 2020 year to 2025 year in connection with infections. The patients were vaccinated with a two-component COVID – 19 vaccine in December 2019 – January 2020 and revaccinated with a single-component COVID-19 vaccine in November 2020. The observation of skin pathologies was carried out against the background of low anti-COVID-19 immunity registered in patients, a mild anti-inflammatory reaction, the presence of post-COVID-19 fibrosis of the lower respiratory tract and bronchitis of the upper respiratory tract in patients, the presence of autoimmune pathologies (Guillain-Barre syndrome, chronic rheumatic heart disease, rheumatoid arthritis [arthritis of the joints of the extremities, neck and pelvis]), excess weight, excessive sweating. The published own data on the cases of pathological skin patterns studied by us are taken into account.



**Results:** The study focuses on pathological patterns with erythematous spots and bumpy rashes of a viral and bacterial nature. Based on observations of patients' skin pathologies, the concept of pathological skin patterns (using examples of erythematous spot lesions and bumpy rashes) in connection with infections, their prevention and therapy has been developed.

**The concept includes the following terms and provisions**

**Terms**

\**A pattern on the skin* is a mosaic single image of erythematous spots or rashes with roughly defined boundaries.

\**Erythematous spots* (uniform in color [shades of red], without protrusions, circular and elliptical spots with a diameter of 1.5-2 cm on the skin; of the same size within the pattern; spots with multiple overlap are possible [result: increased red color and uneven edges of the spot as a sign of overlapping of the original several images]); common on the hips, cheeks [on one, then on the other] and forehead [in the central area; after appearing on the cheeks].

\**Bumpy rashes*: without pustules (against the background of a decrease in anti-inflammatory reactions), homogeneous and heterogeneous (the latter as rash-in-rash, this can be seen with the development or degradation of the rash) with varying diameter of the pattern elements or units 1-6 mm and inter-element distances 1-10 mm; dense (with a minimum area spread of rash units) and a rare disjointed arrangement within the pattern, red (with shades), short-term (convalescence within 2 weeks), dynamic (rash development after a maximum [on the 1st-3rd day in terms of density and the whole number of units), completely passing through and with a residual pattern (including in case of rash-in-rash identification).

\**Rash patterns*. It is important to consider patterns in terms of the size of its area (usually 4-25 cm<sup>2</sup>), longitudinal (for example, along the limbs, above and below the elbow and knee joints) and circular pattern arrangement; in the left or right parts of the body, the central part (thoracic and frontal areas).

\**Symmetry and asymmetry of the pattern*:

- *external* symmetry and asymmetry are determined by the primary localization of the pattern on the body in comparison with other considered patterns (cases are considered as macro-symmetry or macro-asymmetry of the pattern);

- *internal* symmetry and asymmetry within the boundaries of the pattern:

- *symmetry* implies the presence of a mosaic architecture of the pattern – a symmetrical arrangement of units in the pattern relative to its center (for example, in the regular shapes with multiple sides);

- *asymmetry* is a violation of the mosaic architecture of a pattern (its "shift") against the background of the appearance in the pattern of units designed in a biased direction (vector) as part of the pattern.

\**The vector within the pattern* (in parentheses are the cases considered by the authors) is mosaic, tendentious and integral; dynamic, reflects the total direction of the distribution of units at each moment of consideration. There are directions outside or inside the pattern:

- centrifugal or centripetal (for example, in the case of a circular pattern [minimized – in the ulnar fossa, overall – in the central chest area], within a close circular pattern [for example, in the upper thigh and chest area] or within an extended elliptical pattern [for example, along the arm from the shoulder to the elbow joint and below, along the side of the body adjacent to the arm from the axillary region towards the pelvic region – an accentuated prognostic direction in accordance with the body pattern being compared]).

\**Pathology gradient within the pattern* reflects the development of pathology within the pattern from the moment of its initiation to the achievement of a residual state; reflects the current pronounced states of the pathological pattern, promising for the diagnostics of the infectious process; expressed in the directions of the gradient: out- and intra-pattern, centrifugal (including longitudinal); indicates the area for accentuated therapy (for skin treatments).



\**Therapeutic gradient within the pattern* is opposite in direction (backwards) to the pathological gradient at all moments, reflects the current pronounced states of the pattern, convenient and promising for current prevention and therapy. The directions of the gradient are: out- and intra-pattern, centrifugal and longitudinal. It is a direct guide to therapeutic effects.

### **Provisions of the concept of the skin pathological patterns (using examples of reversible erythematous spots and bumpy rashes)**

\*There is an early reaction of the body to infection, expressed in the appearance of characteristic the skin erythema spots (including as responses to a viral infection) and the skin bumpy rashes (including as responses to a bacterial infection [staphylococcal, others]) in the form of a single pattern (several patterns).

\*The appearance and characteristics of patterns are personalized.

\*Pattern analysis has diagnostic, prognostic, and therapeutic value; it helps in choosing treatment options.

\*Primary initiated patterns are characterized by pronounced primary asymmetry (macro and internal asymmetry of the pattern), which can progress and be eliminated during the dynamic development of the pattern (s).

\*The dynamics of the pattern is observed. It includes:

- in the case of internal asymmetry or symmetry of the pattern, both an increase in the density of units per area of the original image and a change in the image mosaic pattern (possible manifestation of a gradient) take place;

- in the case of macro-asymmetry and macro-symmetry of the pattern, further progression of the pathology image (centrifugal expansion of the initial circular/ ellipsoidal pattern);

\*There is a convalescence of the pattern (complete or partial, without the participation of [as longer] or with the participation of [as shorter] skin treatments).

### **The algorithm for selecting and characterizing the status of a pathological pattern includes:**

A. The choice of the type of initiated pattern (erythema spots or bumpy rash), description of the pattern (localization on the body surface, area of the image, number of units, area-related density of units).

B. The choice of symmetry or asymmetry of the pattern:

- B1: a case of macro-symmetry or macro-asymmetry (a description in contrast to two patterns of symmetrical body parts);

- B2: a case of internal (within the pattern) symmetry or asymmetry includes: internal symmetry (B2.1) (its description) or internal asymmetry (B2.2) (its description); both descriptions include the localization of the pattern on the body, other personal characteristics.

C. The nature of the dynamics of pattern B2.1 or B.2.2 registers a change in the density of units in the images (its strengthening to a maximum; at the same time, a temporary alignment of a pair of patterns with a temporary transition to their macro-symmetric state is possible); subsequent elimination of both patterns may be observed; in both cases, the presence of a gradient is recorded; short-term changes within the pattern are characteristic in some cases, there is a residual (resistant) pattern.

D. Characteristics of the gradient in the pattern (its variability, description of a possible residual gradient).

### **Examples**

Example 1: *Erythematous spots in patterns* (in a patient, patterns [5-7 units each] can be localized first on the hips, then on the cheeks and then on the forehead; in a patient 90+, multiple spots all over the face with high density [observations in 2020, Moscow]; caused by periods of local outbreaks of COVID-19; short-term, completely disappear within 10-14 days without skin treatments).

Example 2: *The rash-in-rash*. The residual pattern is a gradient bumpy rash, reduced in comparison with the initial bumpy rash (residual 7 units in the upper cheekbone of the face; not eliminated by treatments). In the final residual image version, subcutaneous bumpy rash without



visible disturbance of the upper layer of the skin is observed. Such residual pathology pattern was resistant to any cosmetic treatments (observations in 2021, Moscow). Additional examination is required.

Example 3: *Bumpy rash* initiated by a factor – polluted seawater during the first swims of the patient. Extended ellipsoid (adequate to the topography of the body); characterized by a centrifugal expansion of the pattern from the axillary region to the elbow joint and further to the hand, as well as an expansion of the symmetrical arm pattern from the axillary region down the body (in these conditions the rash is protected from sun access). Short-term, completely disappear within 10-14 days without skin treatments; double treatment with 70% alcohol reduces the time of rash elimination by 30% (observations in the summer of 2025, Sochi). A rash with an allergenic contribution (appears quickly with many small bumps and progresses rapidly [1-2 days]), is sensitive to ultraviolet radiation. There is no rash in places exposed to the sun.

#### **Recommendations for the treatment of pathological patterns (for bumpy rashes):**

\*carry out treatment (for example, with 70-96% alcohol, other antimicrobial agents) of the pattern, taking into account the area of the mosaic gradient, the rest of the adjacent inner area of the pattern, as well as the near-pattern space:

- counteract the centrifugal expansion of the pattern (apply preventive treatments of areas adjacent to the pattern in the directions of the predicted expansion of the pattern);

\*In cases of residual patterns that are resistant to the effects of treatments, additional examination is required.

The effect of pattern treatments is expressed not only in reducing the time for pathology elimination, but also in a positive change in the dynamics of the gradient in the pattern. In general, recommendations for the treatment of pathological patterns may also include: the use of antiviral drugs against infections, as well as special antimicrobial and anti-inflammatory ointments and creams; combined treatment of predicted provocative areas on the skin, including taking into account the area of the pathological mosaic vector, areas in front of the pathology vector and along it.

#### **Conclusion**

The experimental approach described above to the diagnosis and therapy of pathological patterns on the skin is universal. It will help in the diagnosis of skin pathologies, their prognosis and therapy, including in elderly patients, as well as patients with post-COVID-19 syndrome and infections of a viral and bacterial nature. Based on the proposed approach, the concept allows timely prediction of early, including fast-passing (1-2 weeks) pathological skin patterns, including taking into account skin treatments

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