Assessment of the human immune system course

Department of Internal medicine No.2

Clinical methods of assessing the human immune status

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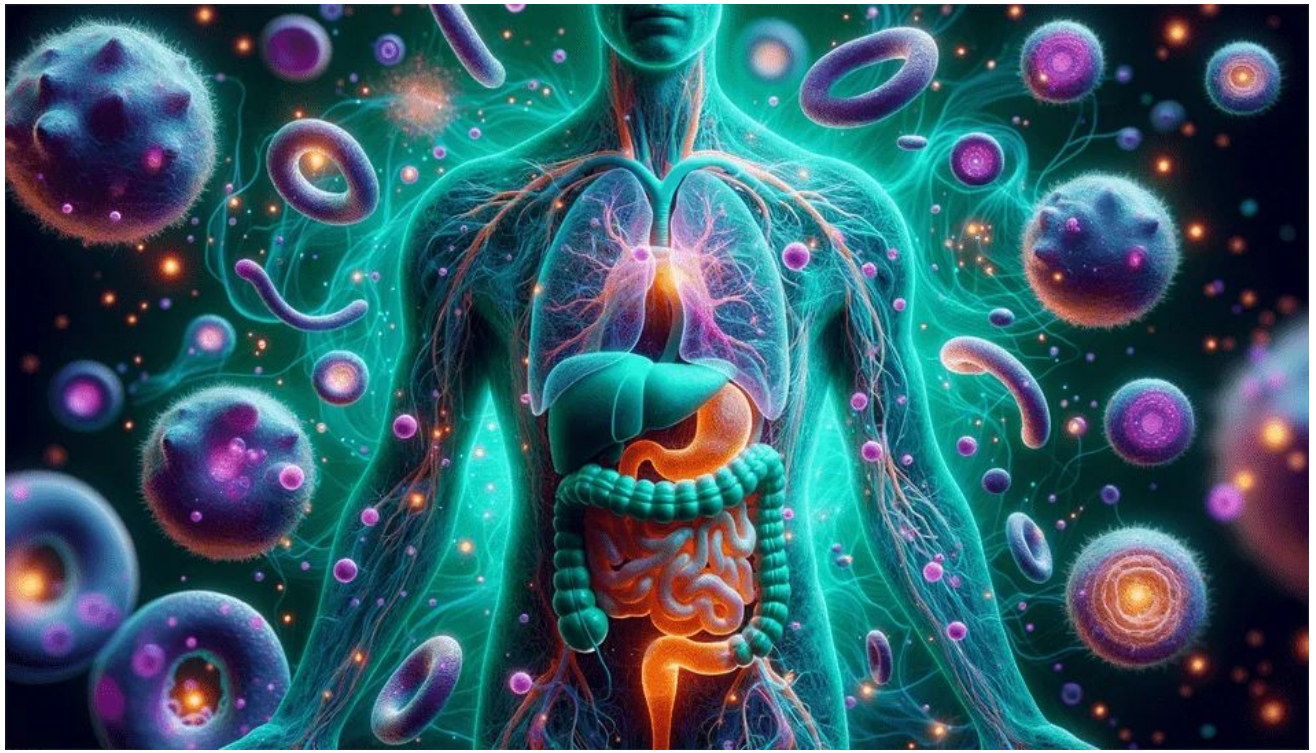
Intro

1. **The concepts of "immunological research method" and "method for assessing the human immune status" are distinguished.**
2. **For an effective assessment of a person's immune status, not only immunological research methods are used**

Methods of studying the human immune status

- Anamnesis
- Clinical examination
- Instrumental diagnostic methods (x-ray, functional)
- Laboratory (general clinical, biochemical, immunological, genetic)



Immune system dysfunction syndromes

- Infectious (immunodeficiency) syndrome
- Lymphoproliferative,
- Autoimmune
- Allergic

1. Four or more new ear infections within 1 year.
2. Two or more serious sinus infections within 1 year.
3. Two or more months on antibiotics with little effect.
4. Two or more pneumonias within 1 year.
5. Failure of an infant to gain weight or grow normally.
6. Recurrent, deep skin or organ abscesses.
7. Persistent thrush in mouth or fungal infection on skin.
8. Need for intravenous antibiotics to clear infections.
9. Two or more deep-seated infections including septicemia.
10. A family history of PI.

10 FOR ADULTS Warning Signs of Primary Immunodeficiency

Primary Immunodeficiency (PI) causes children and adults to have infections that come back frequently or are unusually hard to cure. 1:500 persons are affected by one of the known

1. Two or more new ear infections within 1 year.
2. Two or more new sinus infections within 1 year, in the absence of allergy.
3. One pneumonia per year for more than 1 year.
4. Chronic diarrhea with weight loss.
5. Recurrent viral infections (colds, herpes, warts, condyloma).
6. Recurrent need for intravenous antibiotics to clear infections.
7. Recurrent, deep abscesses of the skin or internal organs.
8. Persistent thrush or fungal infection on skin or elsewhere.
9. Infection with normally harmless tuberculosis-like bacteria.
10. A family history of PI.

Secondary Immunodeficiencies

Causes include

- Systemic disorders (eg, diabetes, undernutrition, HIV infection)
- Immunosuppressive treatments (eg, cytotoxic chemotherapy, bone marrow ablation before transplantation, radiation therapy)
- Prolonged serious illness

Secondary immunodeficiency also occurs among critically ill, older, or hospitalized patients. Prolonged serious illness may impair immune responses;

impairment is often reversible if the underlying illness resolves.

Indication for an assessment of immune status

1. Detailed examination of the human health.
2. Genetic defects of the immune system (primary immunodeficiency).
3. Acute and chronic bacterial, viral and protozoan disease (hepatitis, sepsis, chronic pneumonia, leishmaniasis, AIDS etc.).
4. Autoimmune diseases (rheumatism, rheumatoid arthritis, systemic lupus erythematous, etc).
5. Dermatoveneral diseases (contact dermatitis, pemphigus, mycosis fungoides, syphilis, etc.).
6. Tuberculosis and leprosy.

Indication for an assessment of immune status

7. Allergic diseases (bronchial asthma, atopy, etc.).

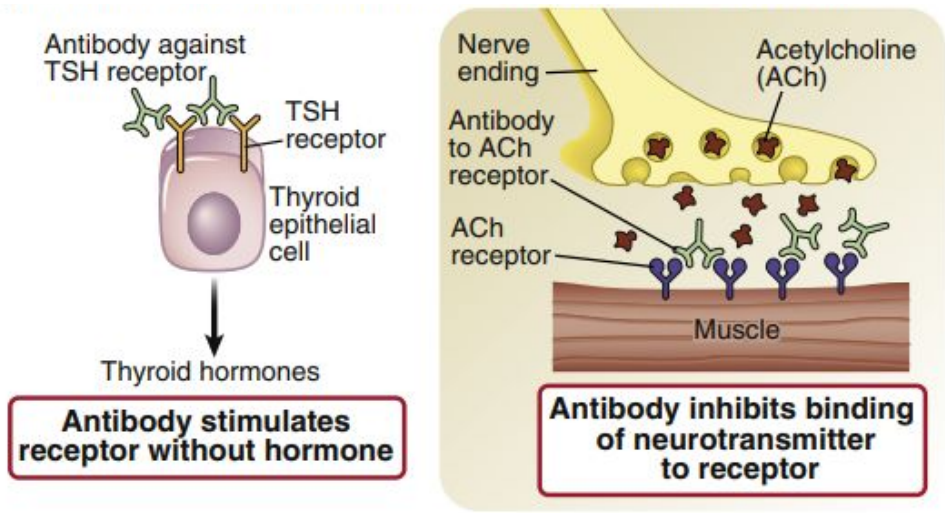
8. Malignant tumors (leukosis, lymphogranulomatosis, lymphosarcoma etc.).

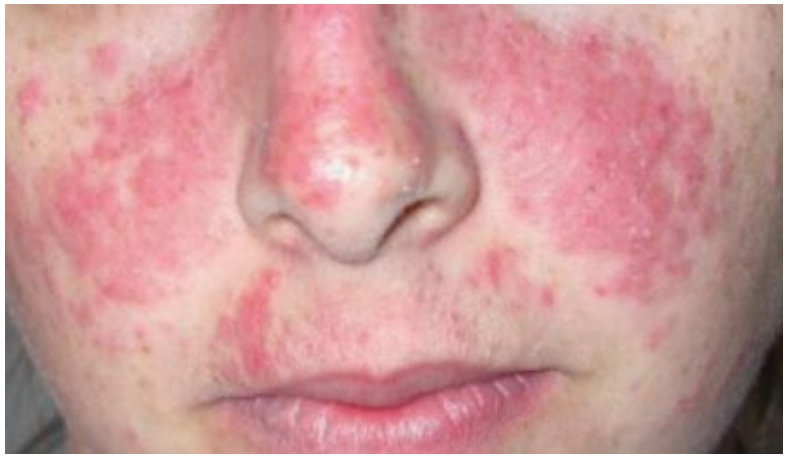
9. Psychical diseases (narcomania, schizophrenia, etc.).

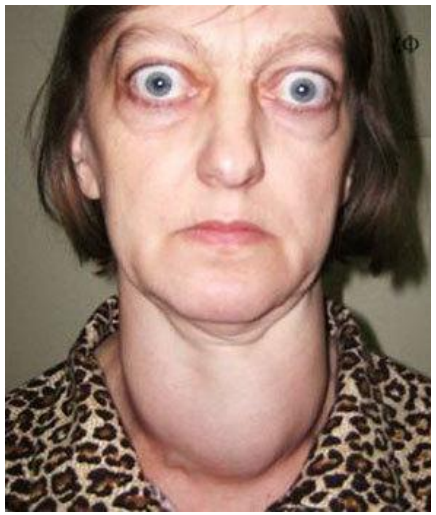
10. Examination of the patients in gerontological and endocrinological hospitals.

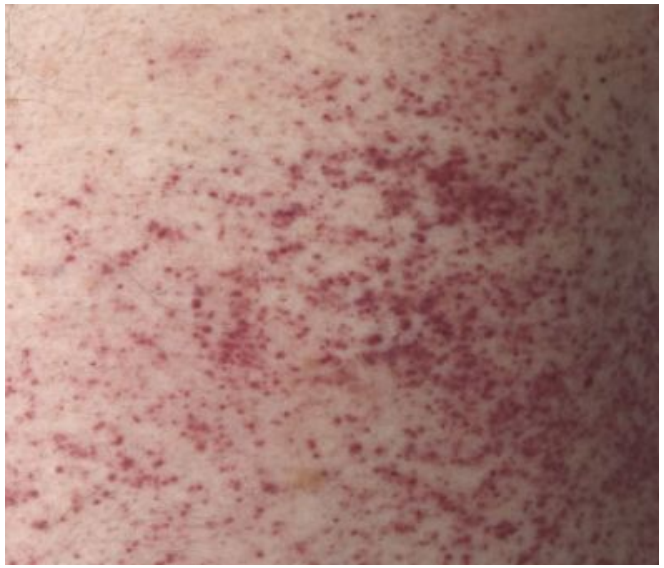
11. The control of cytostatic, immunosuppressive and immunostimulation therapy.

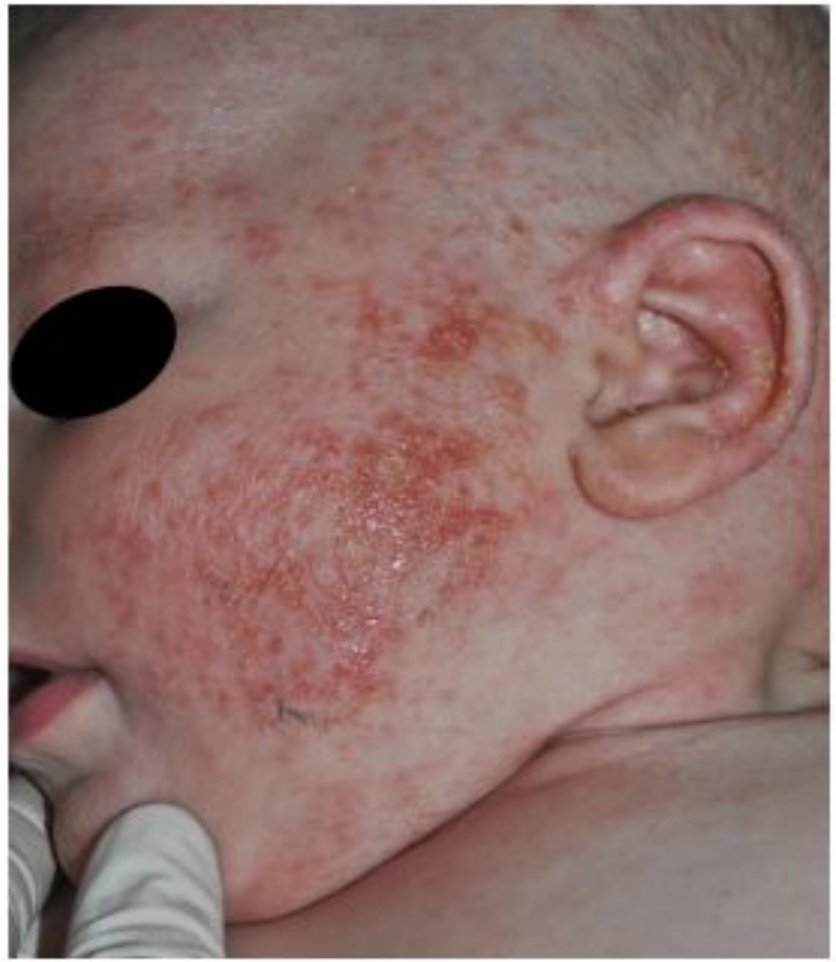
12. Examination of the recipients before and after transplantations.

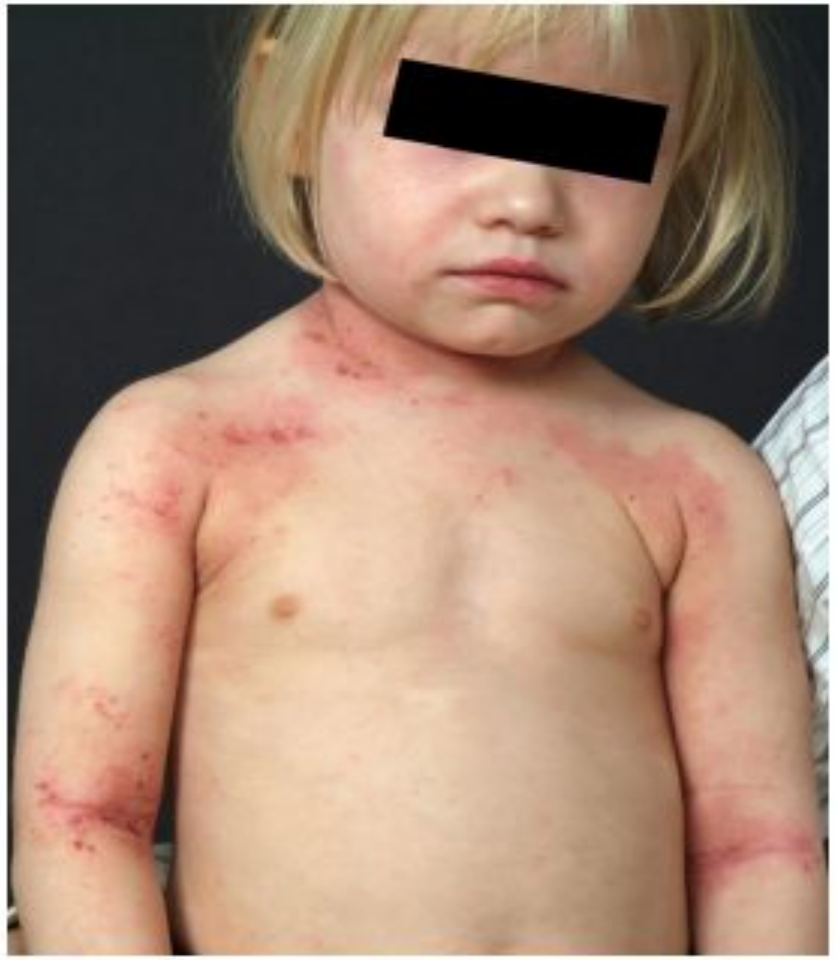

Antibody against TSH receptor
TSH receptor
Thyroid epithelial cell
Thyroid hormones
Antibody stimulates receptor without hormone
Nerve ending
Acetylcholine (ACh)
Antibody to ACh receptor
ACh receptor
Muscle
Antibody inhibits binding of neurotransmitter to receptor

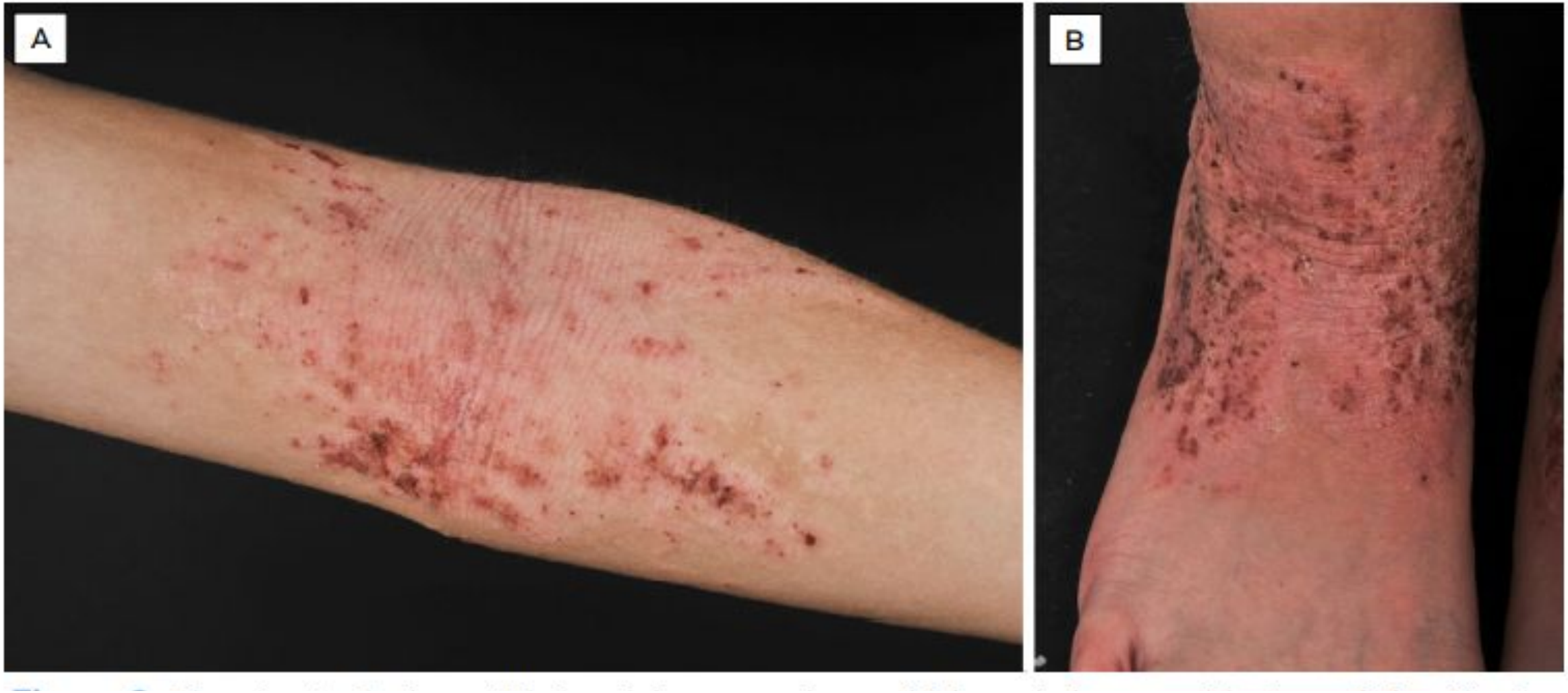


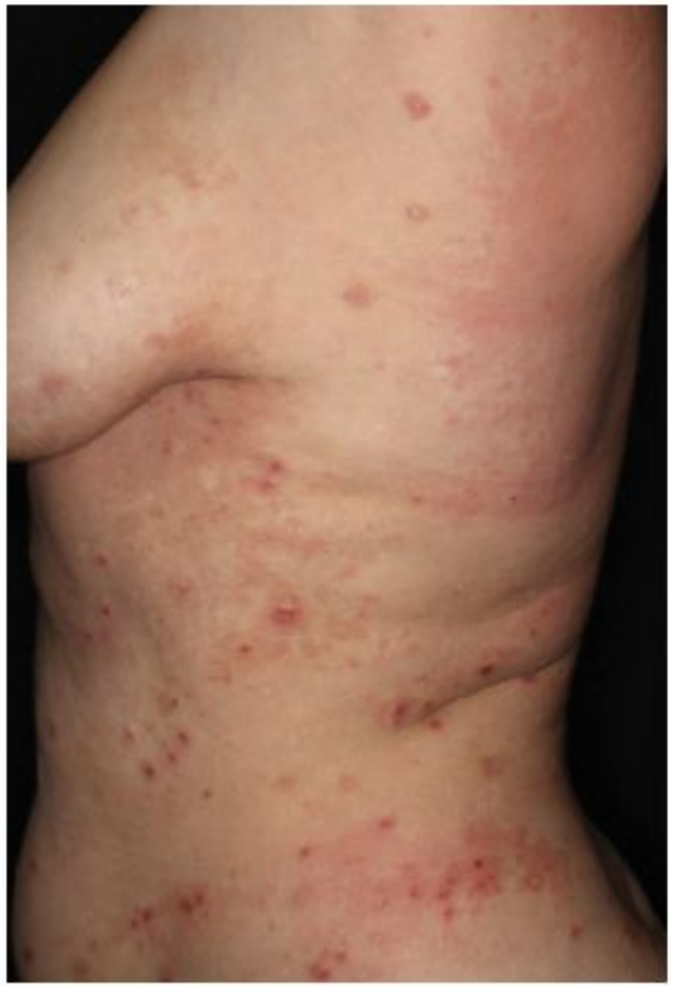


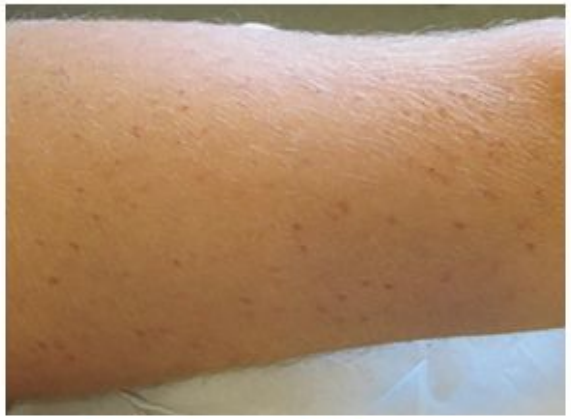




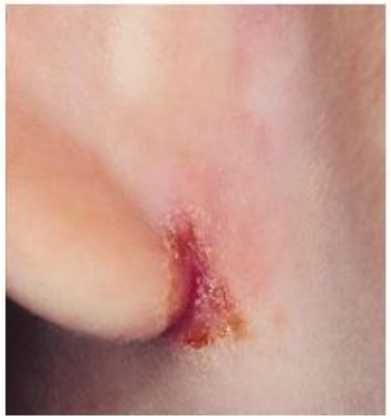



A
B

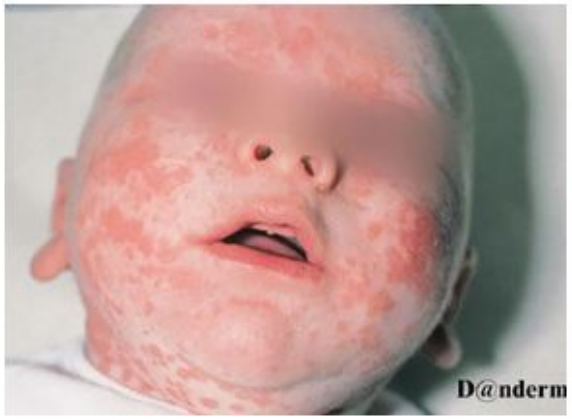




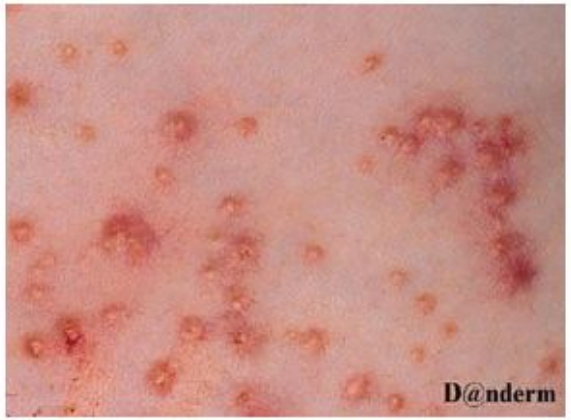
Papular atopic dermatitis



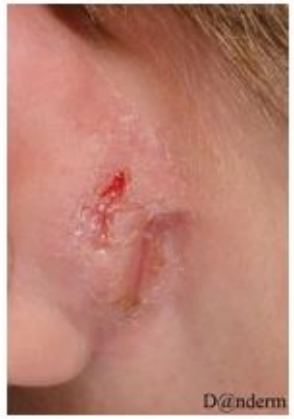
Infected fissure on the earlobe



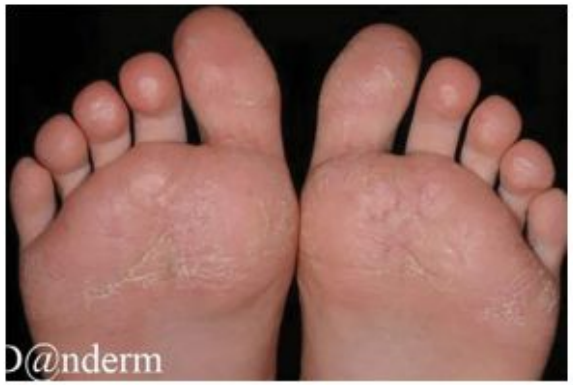
Psoriasiform dermatitis



Pityriasiform (follicular type) of atopic dermatitis



Retroauricular fissure



Atopic winter feet in a child

Figure 1 Examples on clinical presentation of special and minimal forms of atopic dermatitis. (*The authors would like to acknowledge Professor Niels Veien from Aalborg, Denmark for permission to use the clinical pictures from his online database, Danderm*)

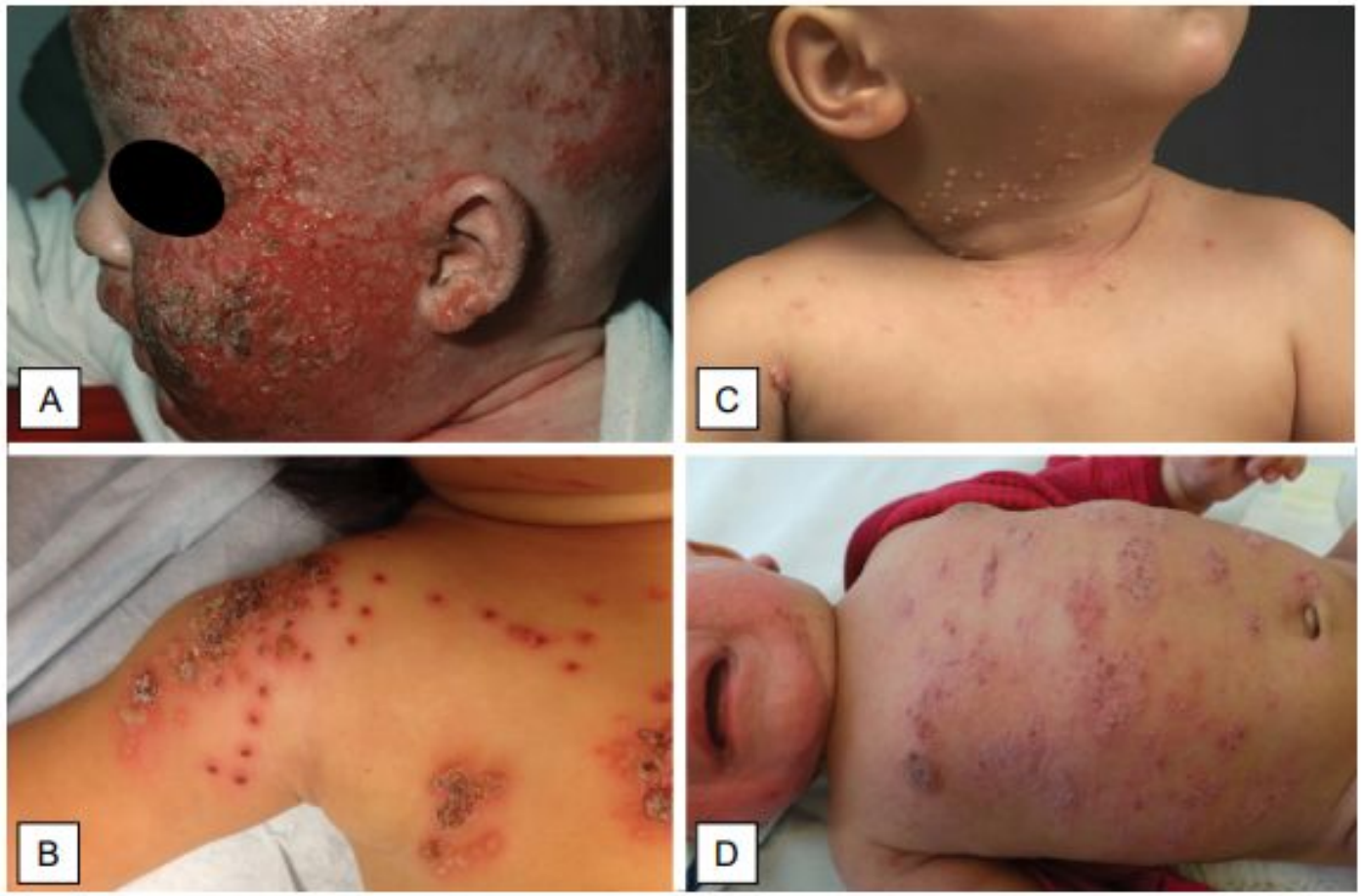


Figure 1 Most common infectious complications of atopic eczema: A: impetiginization of eczema; B : eczema herpeticum; C: eczema molluscatum; D: eczema coxsackium

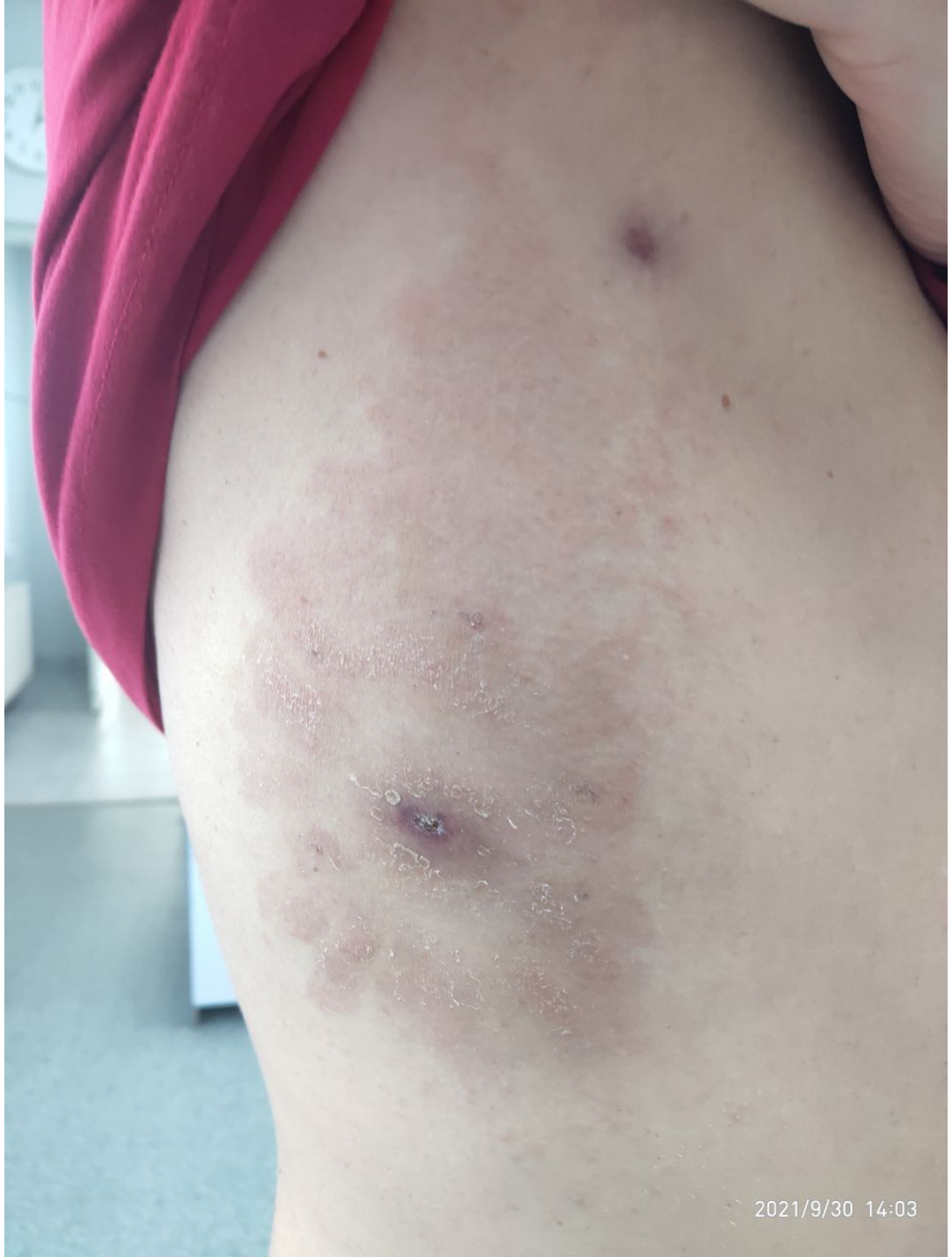
The first level tests for assessment of immune status (approximate):

1. Determination of total quantity of lymphocytes in peripheral blood (absolute and relative);
2. Determination of T– and B–lymphocytes in peripheral blood;
3. Determination of the concentration of the main classes of immunoglobulins;
4. Determination of phagocytic activity of leukocytes.

The second level tests for assessment of immune status (analytical):

1. Determination of subpopulations of T lymphocytes (CD4 + and CD8 +);
2. Leukocyte migration inhibition test;
3. Examination of proliferative ability of T– and B–lymphocytes (lymphocyte blast transformation test);
4. Cutaneous tests of hypersensitivity;
5. Determination of circulating immune complexes;
6. Determination of B-lymphocytes which carry superficial immunoglobulins;
7. Assessment of immunoglobulins synthesis in B-lymphocytes culture;
8. Assessment of activity of K–cells and NK–cells;
9. Examination of the components of the complement system;
10. Assessment of different stages of phagocytosis.

Physical examination is the **process of evaluating objective anatomic findings through** the use of observation, palpation, percussion, and auscultation.
The information obtained must be thoughtfully integrated with the **patient's history and pathophysiology**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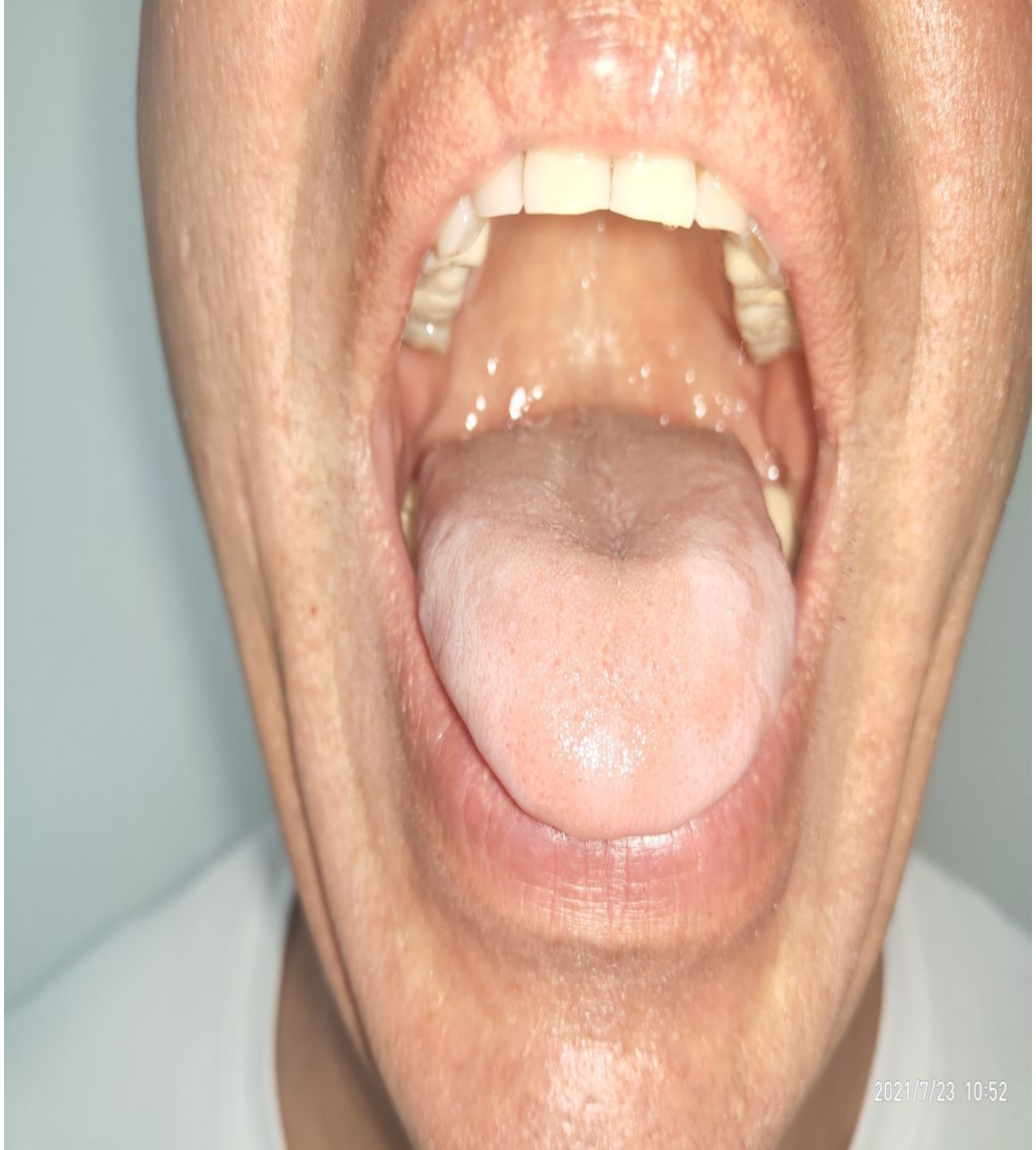
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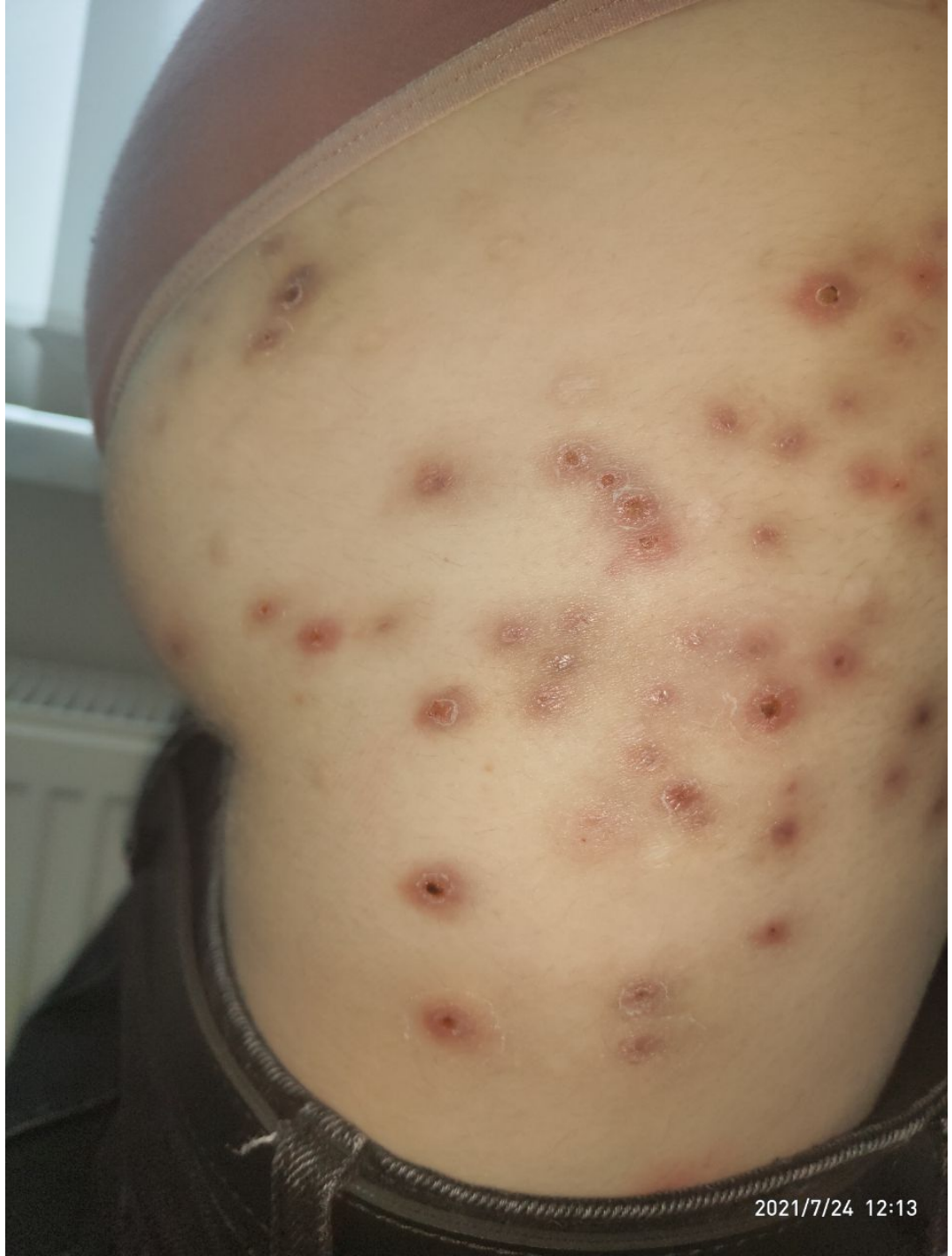
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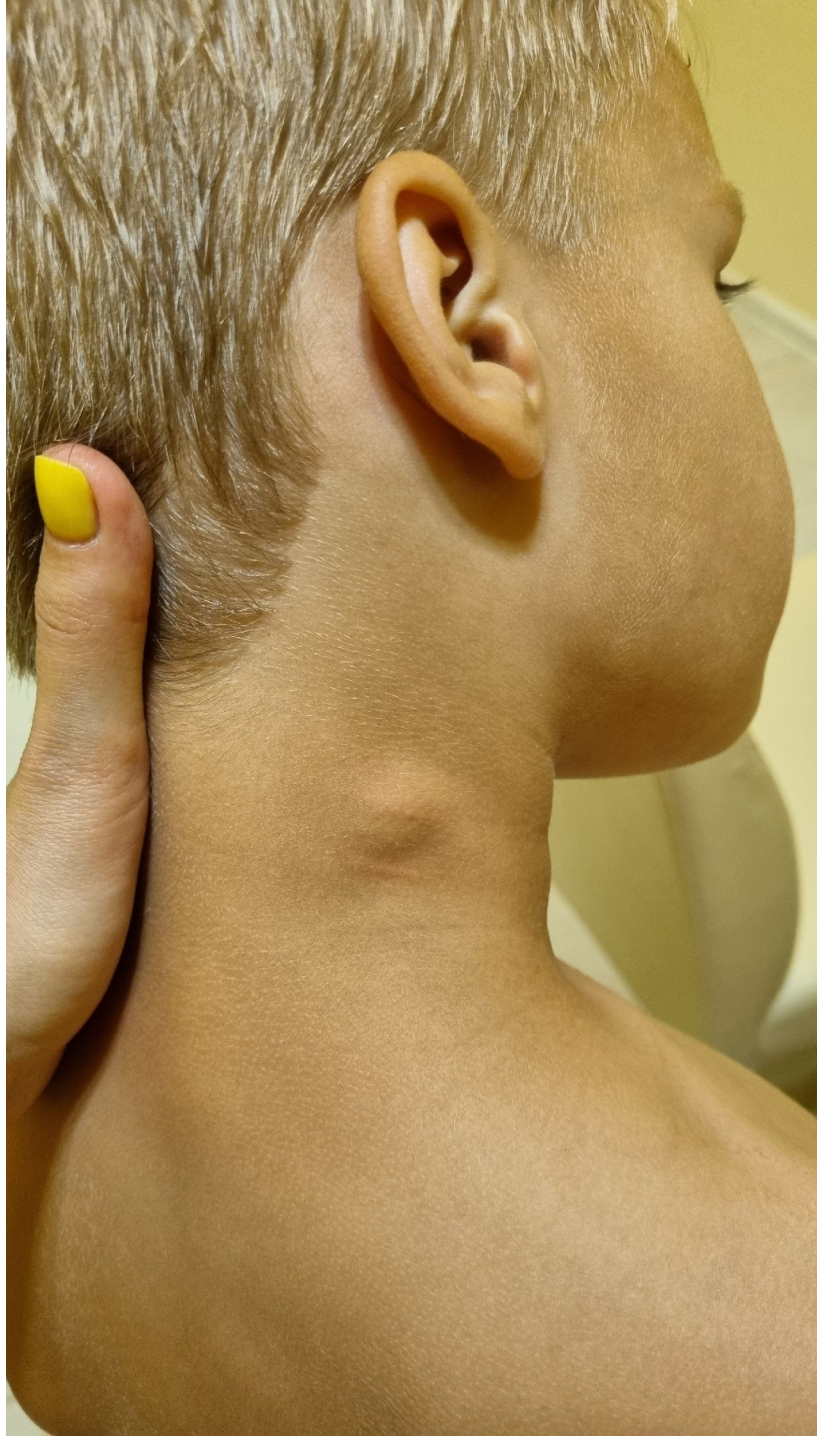
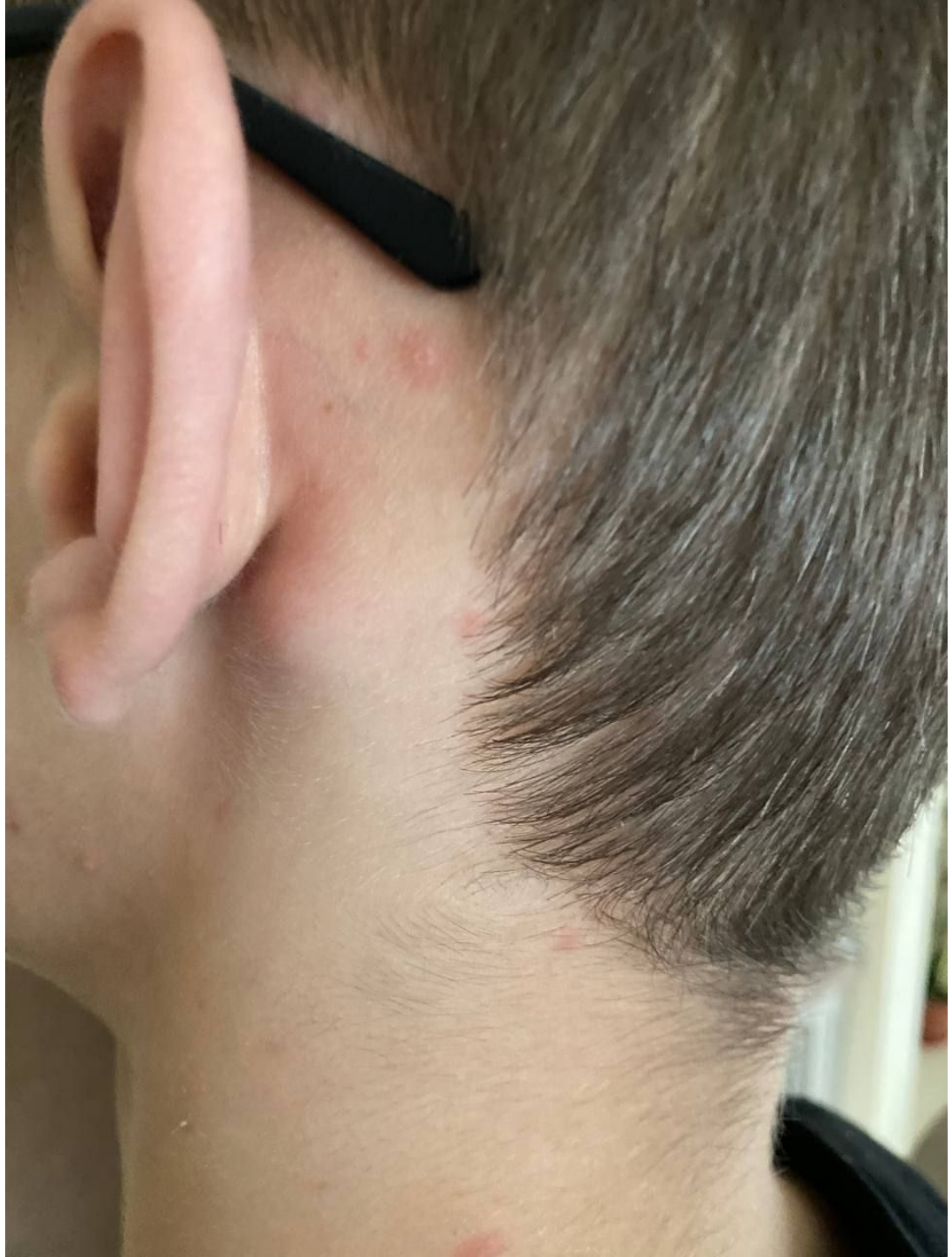
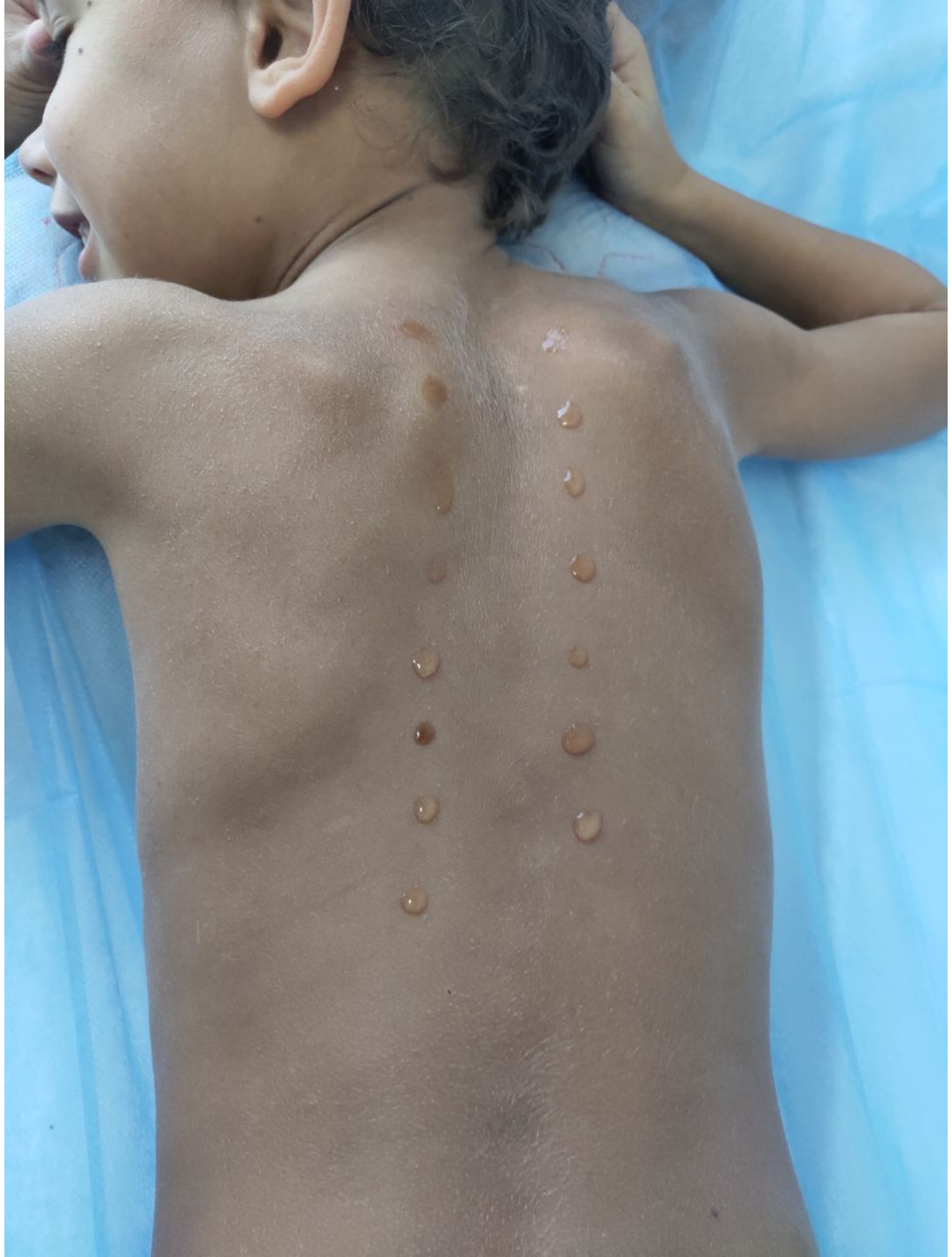
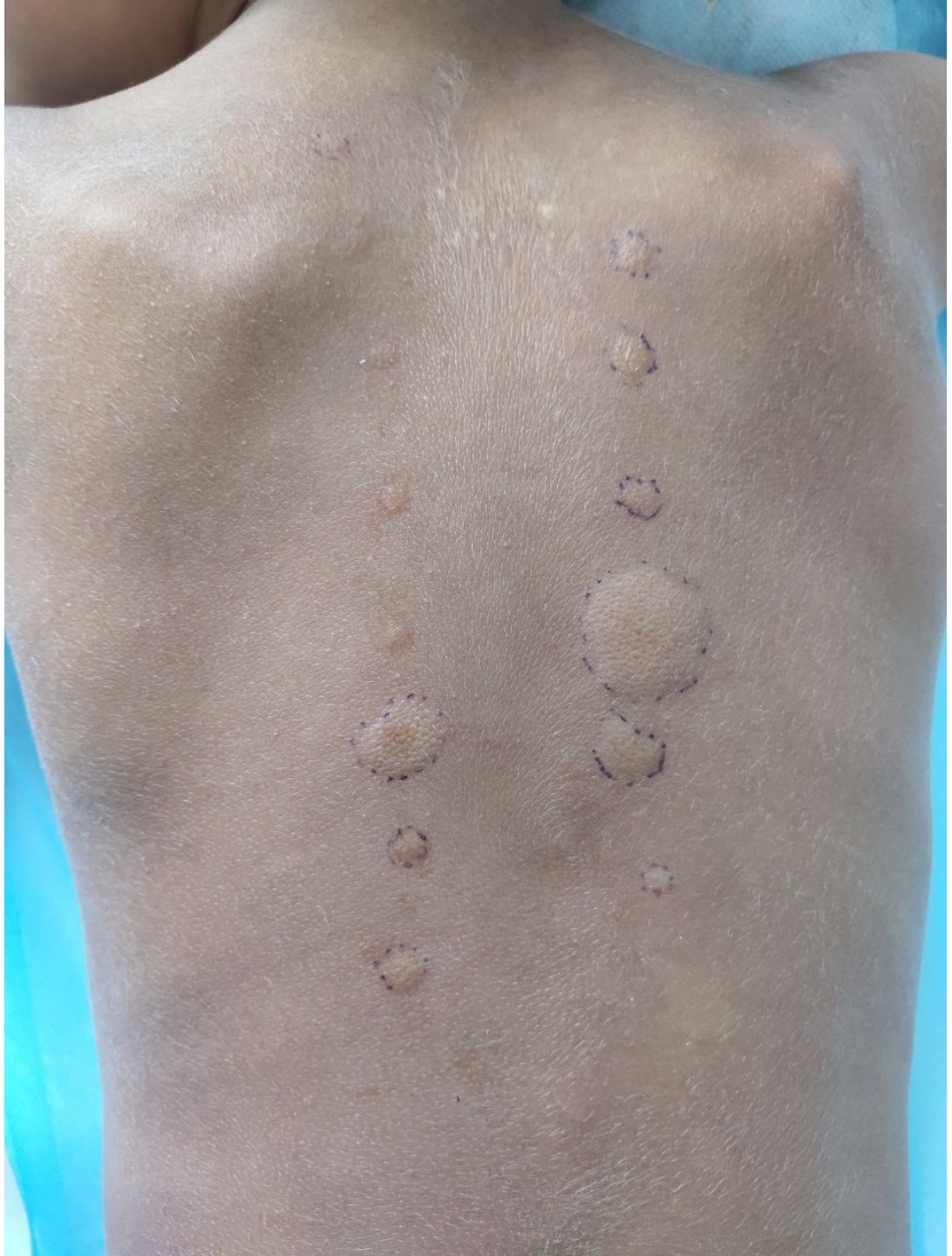
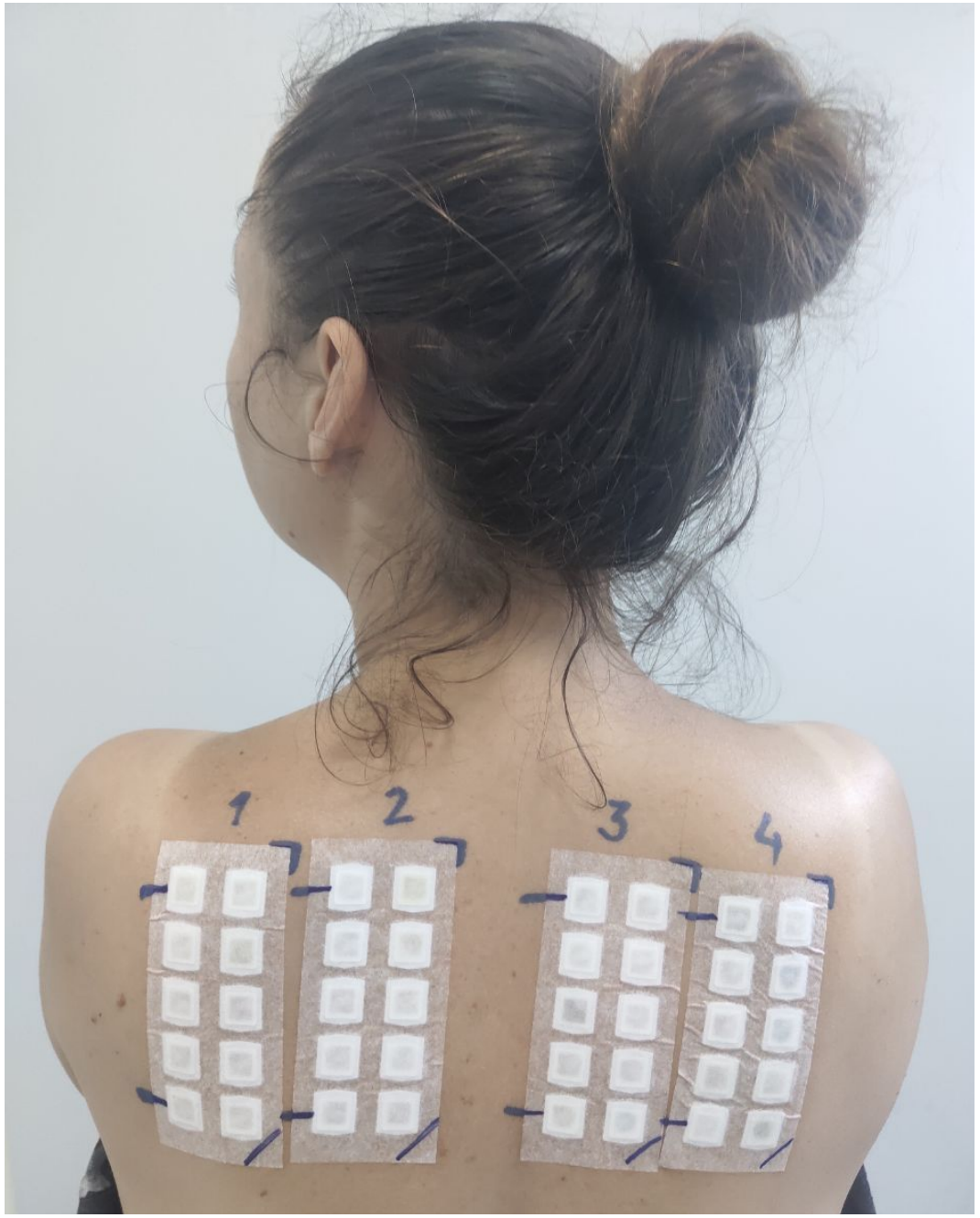




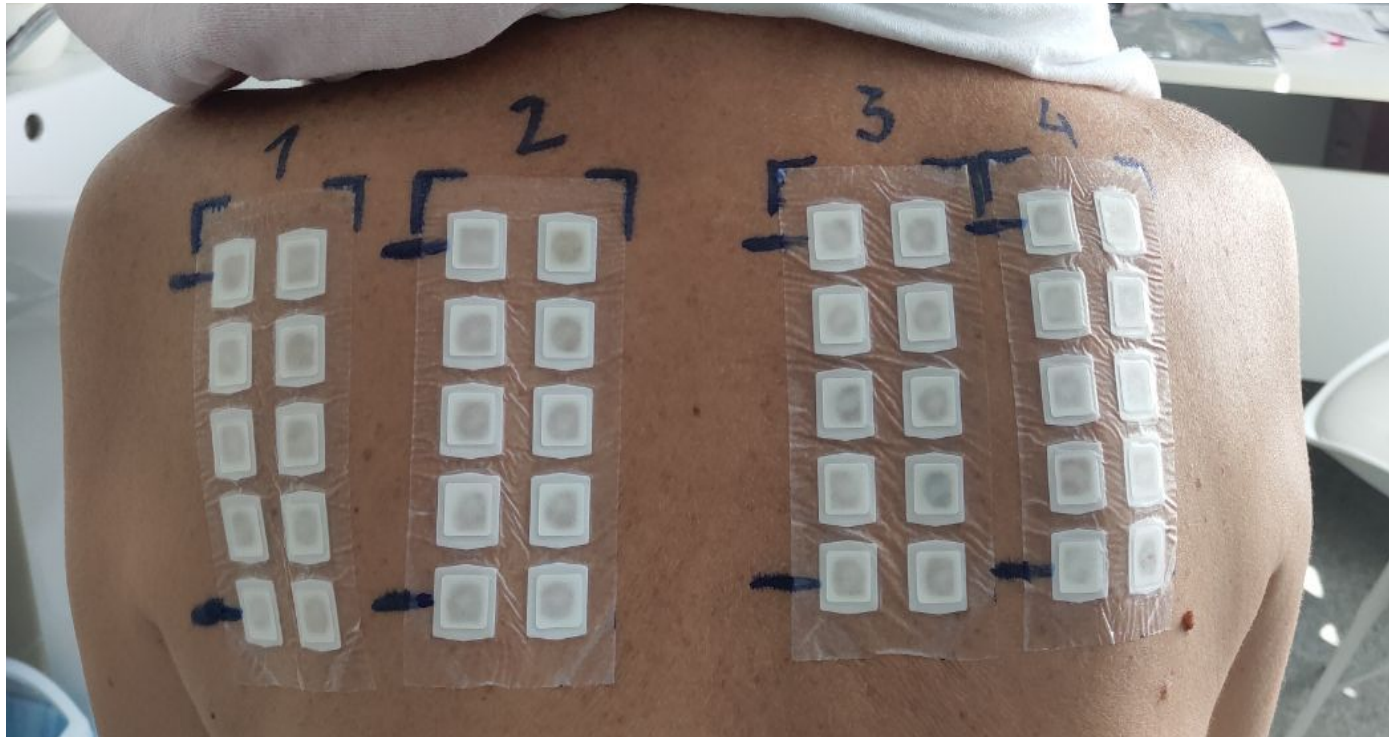




SKIN-PRICK TESTING
IgE-mediated hypersensitivity



PATCH TESTING
for Delayed type
of hypersensitivity



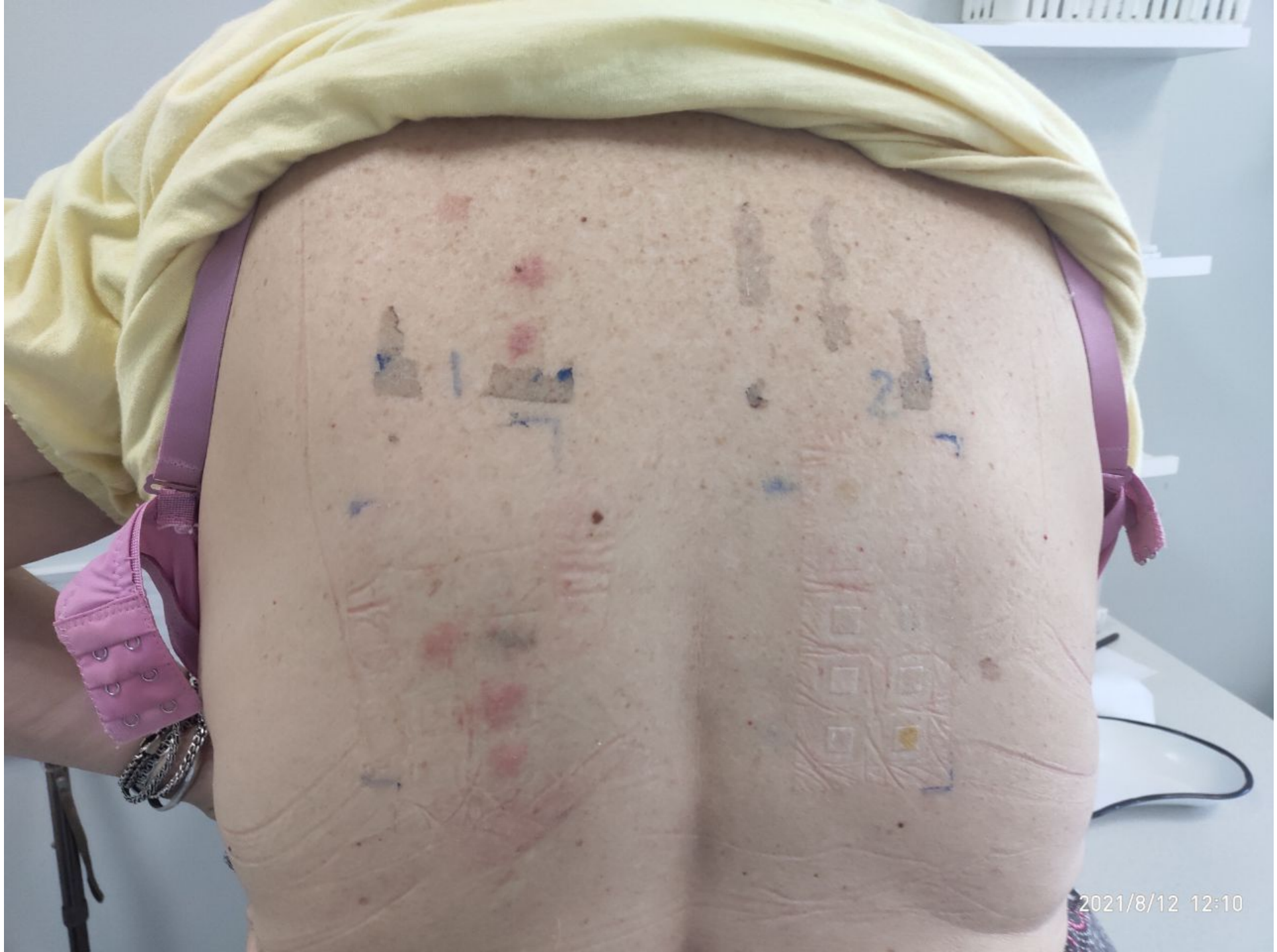

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Figure 1 Tuberculin syringe with 25G needle and flat end plunger drawn up with 0.02 ml solution

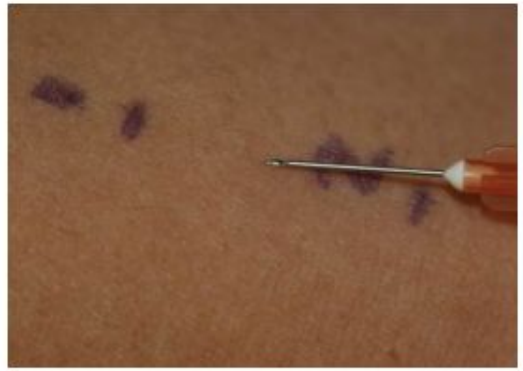


Figure 2 Inject with the bevel of the needle facing upwards

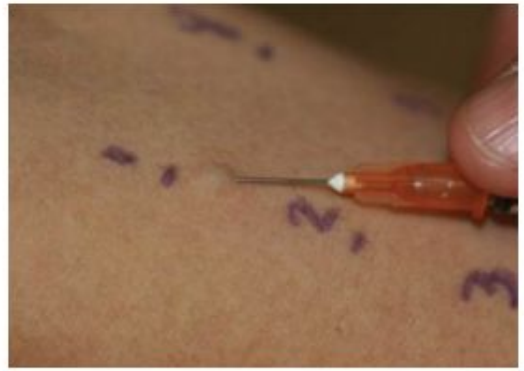


Figure 3 Pierce skin tangentially in the upper dermis (at about 10° angle to the skin surface) and inject the whole volume (0.02 ml)

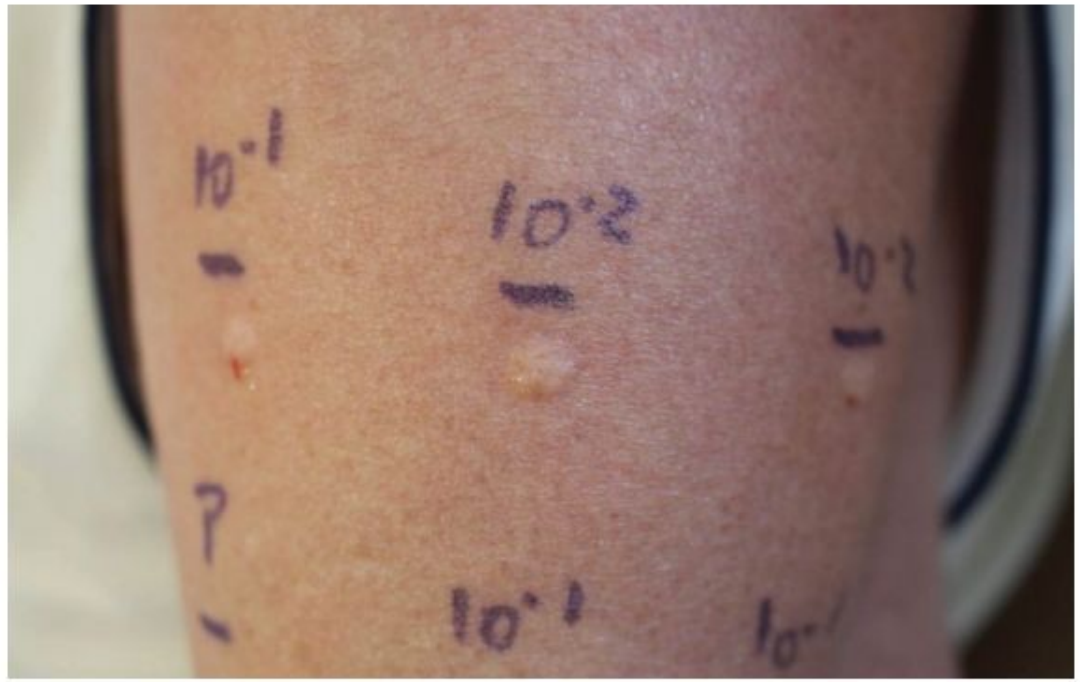
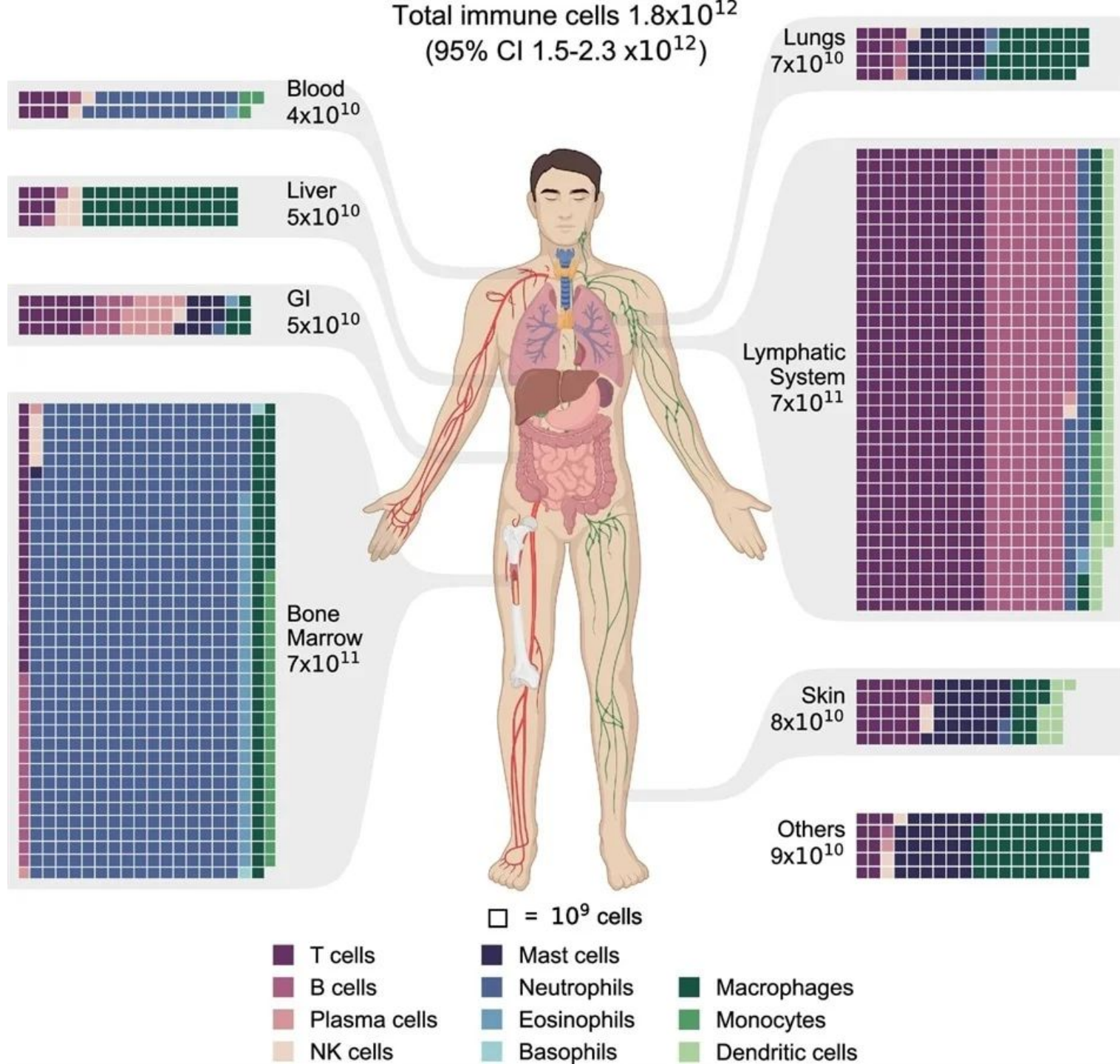
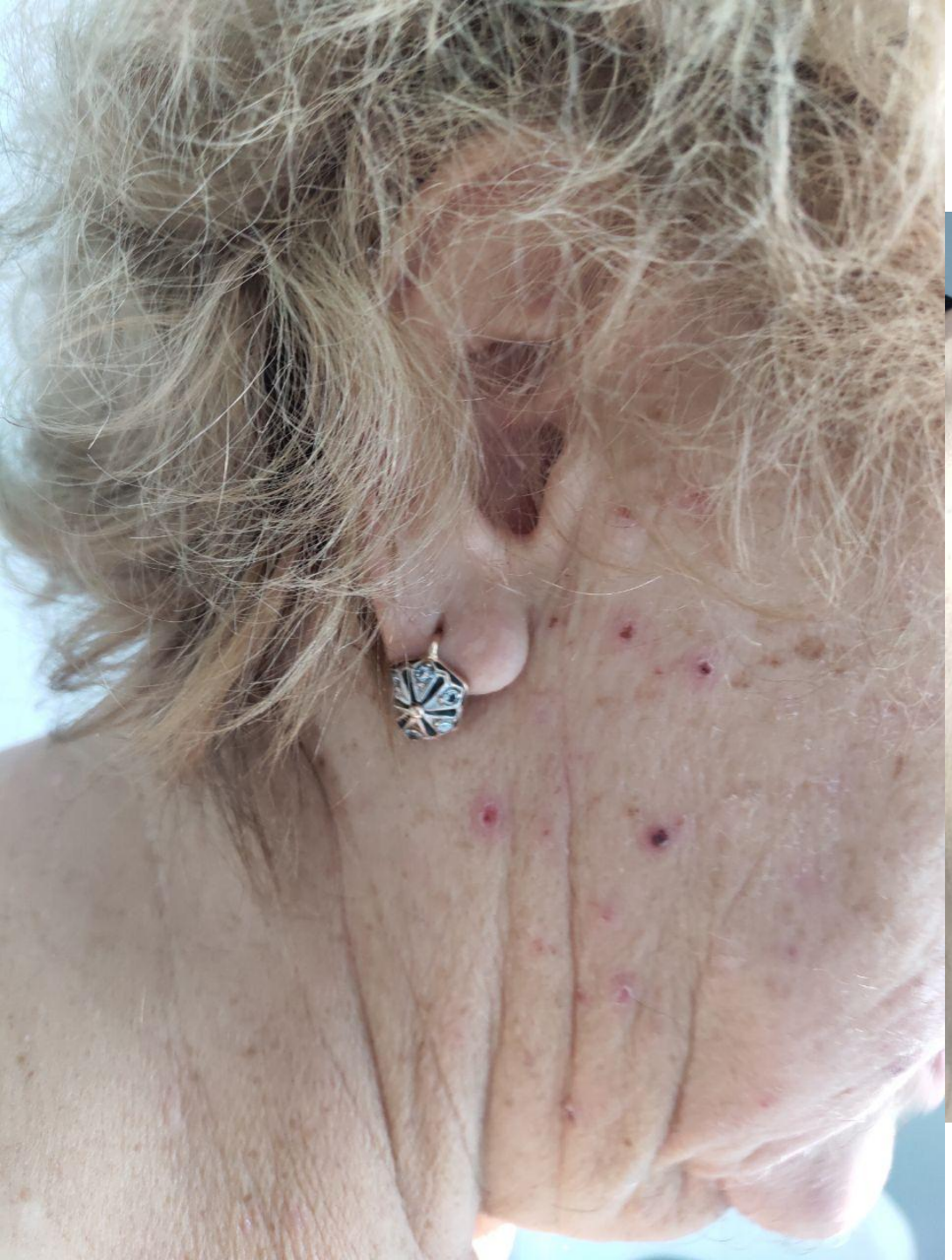
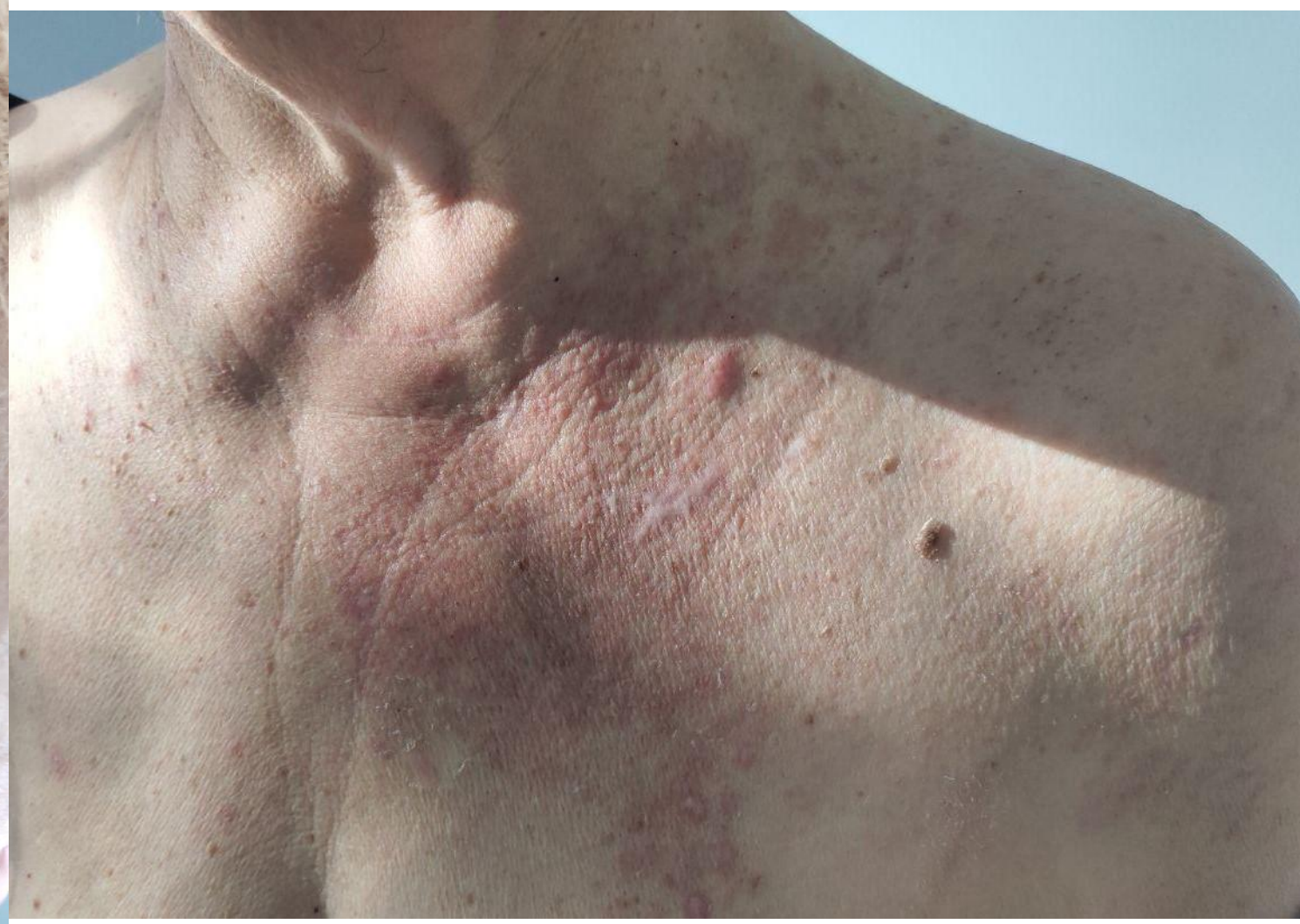


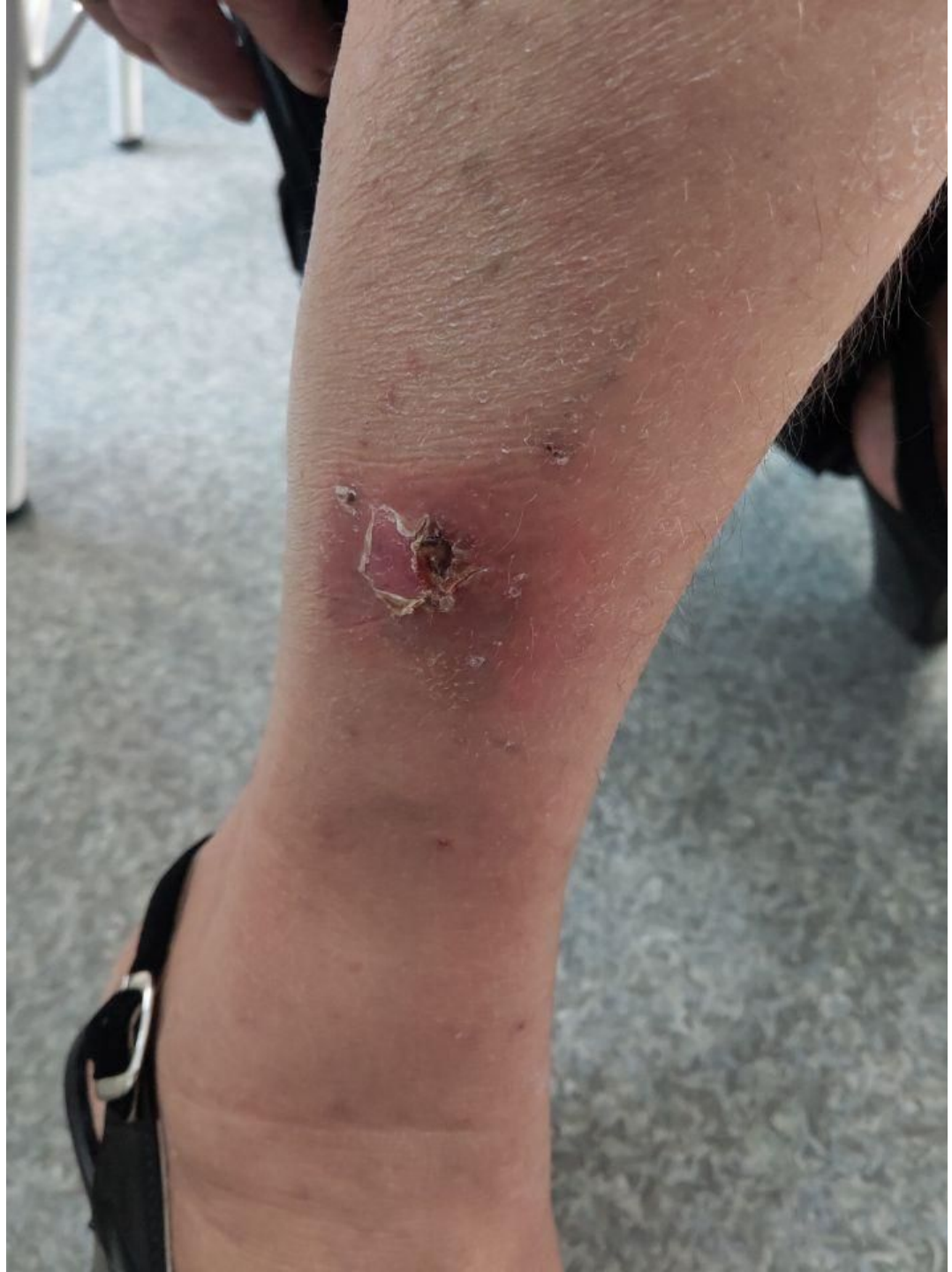
Figure 4 The injection wheal has a specific feature in "peau d'orange"

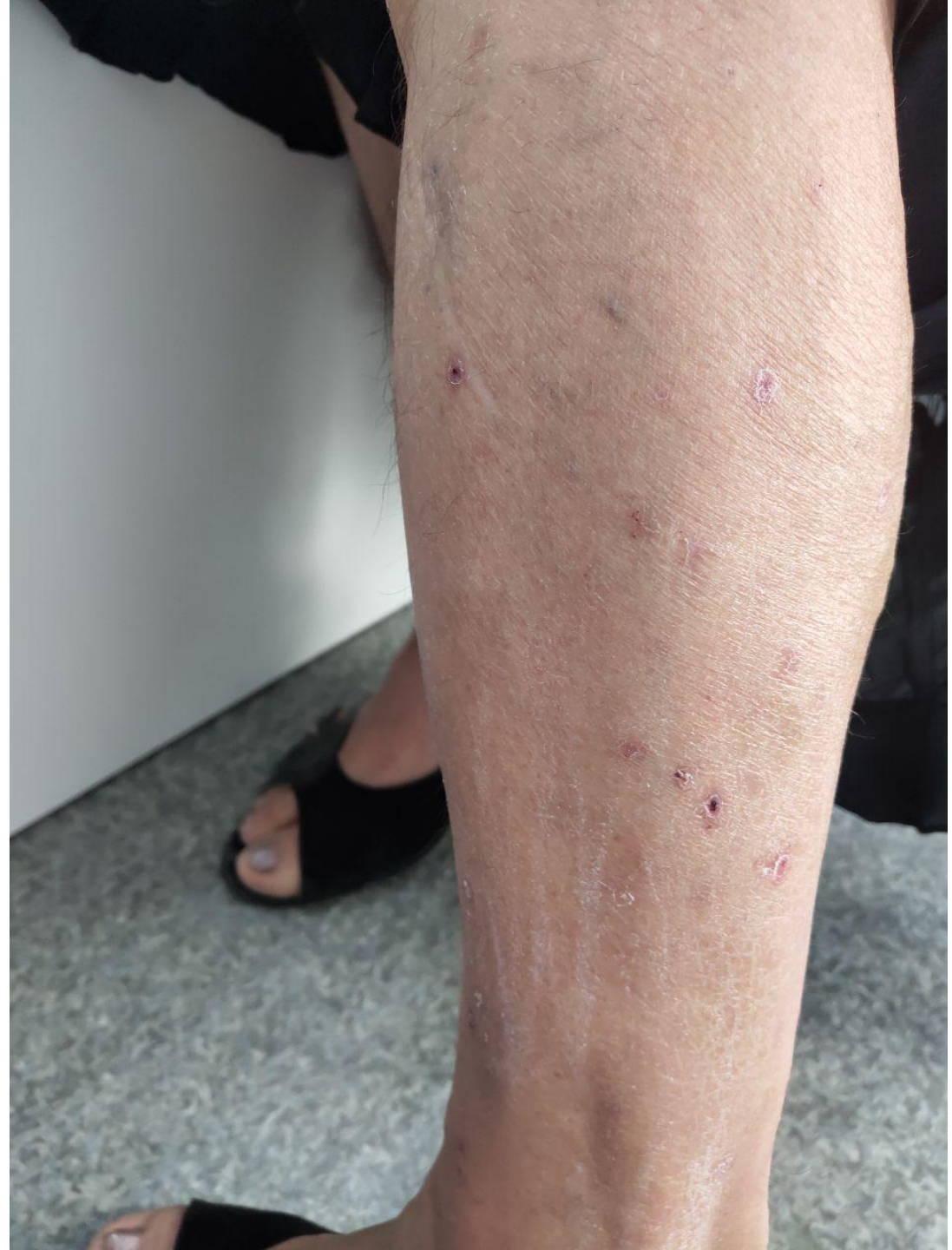
With **skin testing**, most immunocompetent adults, infants, and children react to 0.1 mL of Candida albicans extract (1:100 for infants and 1:1000 for older children and adults) injected intradermally. Positive reactivity, defined as erythema and induration > 5 mm at 24, 48, and 72 h, excludes a T-cell disorder. Lack of response does not confirm immunodeficiency in patients with no previous exposure to Candida


Total immune cells 1.8x10^12
(95% CI 1.5-2.3 x10^12)
Blood
4x10^10
Liver
5x10^10
GI
5x10^10
Bone
Marrow
7x10^11
Lungs
7x10^10
Lymphatic
System
7x10^11
Skin
8x10^10
Others
9x10^10
□ = 10^9 cells
T cells
B cells
Plasma cells
NK cells
Mast cells
Neutrophils
Eosinophils
Basophils
Macrophages
Monocytes
Dendritic cells









Wbc = 3,11 G/l (3,6-10,5)

Erythrocytes = 3,84 Т/l (3,85-5,20)

Hb = 113 g/l (118-158)

Platelets = 148 Г/l (203-455)

Neutrophils = 32% (50-70), 1 Г/l (2-7)

segmented neutrophils = 31%, 0,96 Г/l (1,7-6,9)

Lymphocytes = 64% (20-44)

circulating immune complexes = 118 ODU (<115)

CD3+ = 52,7% (60-80), 0,67*10*9/l (0,8-22)

CD3+CD4+HLA-DR+ = 12,4% (2-9)

CD3+CD8+ = 14,9% (19-35), 0,21*10*9/l (0,3-09)

CD19+ = 33,6% (7-19), 0,4 (0,1-0.4)

B-lymphocyte population is heterogeneous,
different levels of CD45 expression