Heat erythema (hot water bottle rash, infrared radiation, Erythema ab igne, EAI) is a reticulated erythema, pigmented dermatosis resulting from a multiple effect of moderate heat or infrared radiation. The intensity of infrared radiation causing this condition is not enough to provoke burns. The EAI is also known as “toasted skin syndrome” and “fire stains”, a localized skin lesion, reflecting itself by the reticular hyperpigmentation, dark erythema, epidermal atrophy, and telangiectasias [1].

There was time when this condition was associated with people affected by the open fire (oven-based) exposure, most commonly as a professional effect of heat source use by the foundry workers, bakers, or due to the often use of hot water bottles, electric heatpads [2], electric sheets and/or covers, heated car seats [3; 4]. The EAI is provoked by a chronic multiple moderate heat exposure originating from the external heat source. The effect, though not long-lasting, results in a skin hyperthermia within a range of 43-47°C and brings forth certain histopathological changes; similar changes are observed with solar damage. Although the pathogenic EAI mechanisms are under-explored, some studies demonstrate the moderate heat has a synergistic effect with an ultraviolet irradiation, causing the DNA denaturation occurring in the squamous cell carcinomas (SCCs) in vitro [5].

At the moment, this pathology turns into a topical issue among the notebook users, holding computers in the laps [6; 7; 8]. Some notebooks generate some considerable heat, resulting in EAI, when they are held on their knees for a long time [8]. It is true that the powerful processor laptops may get heated up to 50°C and provoke burns [7]. The laptop lying in the user’s lap exerts a direct effect via the laptop’s heat-up elements, including the central processor and graphic processor. The cooling ventilator being occluded by the user’s thighs may increase the laptop’s temperature and prevent the free air current. In the review by R.R. Riahi and P.R. Cohen (2012) [7], there are 15 EAI cases described and attributed to the laptop use. Out of 15 patients, 9 cases were women (60%) with a mean age of 25 years at the moment of diagnosis. The men (6 out of 15 patients, 40%) af-
ected by the laptop-caused erythema had an average age of 20 years at the moment of diagnosis. The duration of laptop use varies from two weeks to two years.

The EAI may occur at various sites, is often asymmetrical and often does not elicit complaints. The early skin lesions disappear spontaneously in a few weeks or months after the heat source is moved away from the skin. Nevertheless, the long-standing lesions may be provoked by the constant hyperpigmentation.

Although the EAI is considered a clinical diagnosis, histological data may significantly assist in a differential diagnosis making, especially when the complicated or dubious cases are involved. The histopathological changes are non-specific [9] and involve epidermal atrophy, hyperkeratosis and parakeratosis, as well as some aspects of lichenification. There are profuse melanophages found in the derma, there are occasional changes of elastic fibers, similar to the actinic elastosis. There are also melanin and hemosiderin deposits and telangiectasia formations, as well as perivascular infiltration of polymorph nuclear cells.

The rheumatologists consider this pathology to be of a clinical interest, as skin conditions may resemble skin lesions attributed to the systemic connective tissue disorders. Following the above-mentioned description, we present the study of EAI case of a young female patient, subject to various examinations intended to ascertain the skin change genesis.

The patient N., 34 years old, complained of consistent skin changes at the site of left thigh and left knee
Hb – hemoglobin, ESR – erythrocyte sedimentation rate.

The screening for the autoimmune conditions did not reveal any disorders found. The cryoglobulins were not counted. The clinical urine tests did not demonstrate any changes. The tests for hepatitis B and C produced negative results. The X-ray examination of chest organs performed at 07.02.2019 did not reveal any pathology.

On 15.01.19, the patient was subjected to the skin biopsy of the anterior left thigh, where a piece of tissue of 13x4x6 mm was extracted (Fig. 2, 3, 4). The study was performed by the anatomic pathologist at the Kharkiv oblast clinical hospital. The study of extracted biopsy material colored by the hematoxylin and eosin stain showed that there were thinned-out sites (atrophy) of epidermis observed, the hyperkeratosis (cornification of the superior layers of the flat cell epithelium) with scaling (peeling) of the cornified cells, parakeratosis occurring in the epidermis (characterized by the nuclear retention in the corneum), vacuole dystrophy of the single keratinocytes; smoothing-down of the dermal papillae, densification of the collagen fibers, interstitial swelling (attributed to the inflammation), expansion of the interdermal vessels, perivascular inflammatory infiltrates containing accumulations of microxyphil leukocytes and mononuclear cells.

Having collected a careful anamnesis of the patient, we found out that during half a year she had a daily working session at home, holding the notebook in her lap whose heat-producing battery was located on the left side. Thus, the patient’s left thigh was exposed to a daily dose of heat during half a year. On performing the analysis of that case, results of extra tests and comparing them with the visual alterations and reference data, we made a conclusion that it was the case of a heat erythema or Erythema ab igne.

While analyzing this clinical case, we’d like to draw attention to the following aspects. In the modern society, the long-lasting exposure to the heat produced by the laptops [6; 10] or electric pads [2] turns out one of the commonest cause of heat erythema and inflammation. The patients are often missing these skin lesions due to their asymptomatic character. The data on this condition’s prevalence are not found in the reference literature, there are few descriptions of individual cases [7; 8; 11]. However, it became a useful experience obtained through diagnostics and management.

Other conditions similar to Erythema ab igne due to its mesh appearance include livedo reticularis and livedo racemosa, cutis marmorata and congenital cutis mar-

### Table 1. Total blood count of the N patient.

| Дата     | Эритроциты, x10^12/л | Hb, г/л | Судорожный индекс | Лейкоциты, x10^9/л | Сегментов. | Нейтрофилы, % | Тимп. | Лимфоциты, % | Микрофилы, % | Эозинофилы, % | Базофилы, % | Лимфоциты, % | Моноклоналы, % | ESR, мм/час |
|----------|-----------------------|--------|------------------|-------------------|------------|-----------|-------|-------------|-------------|---------------|-------------|-------------|----------------|---------------|----------|
| 30.01.19 | 3.9                   | 119    | 0.72             | 7.3               | 378        | 2         | 55    | 1           | 0           | 38            | 6           | 37          | 9              | 21            |
| 06.02.19 | 3.7                   | 109    | 0.71             | 8.2               | 292        | 1         | 49    | 4           | 0           | 37            | 9           | 37          | 9              | 21            |

Hb – hemoglobin, ESR – erythrocyte sedimentation rate.
morata telangiectatica. The differential distinctions are presented in Table 2.

The skin alterations were initially misinterpreted and treated with topical ointments containing glucocorticoids and vascular medication by Pentoxifylline, entirely inadequate and ineffective for this case. At the further stages, the skin alterations were also misinterpreted as vasculitis signs or the autoimmune connective disorders. The patient had a lot of extra lab studies prescribed, and thus the correct diagnosis was delayed.

The heat erythema is an extremely rare condition, drawing attention both of the rheumatologists and adjunct specialists (dermatologists, vascular surgeons, infectionists and other specialists requesting interpretation of skin alterations). It is associated, on one hand, with a rarity of this pathology, patients consulting dermatologists and vascular surgeons get an ineffective topical or vascular therapy (see above). On the other hand, only a careful anamnesis and analysis of possible associations with heat exposure may help make a correct diagnosis. On the early revelation of this association and eradication of heat exposure, a quick reversible regression of skin alterations with no medical intervention is possible, which is proved by the case of our patients. A long-standing exposure to the heat source may result in an inevitable skin lesion. The reference literature informs of a secondary development of skin malignant neoplasms, such as squamous-cell carcinoma and Merkel’s cell carcinoma at the damaged site [12; 13].

The most important treatment method for this pathology is an immediate eradication of heat source. For most cases, the drug treatment is not required. A long-standing exposure associated with a durable hyperpigmentation is effectively treated by Tretinoin and Hydroquinone, or by Fluorouracil (5-FU) [14]. In our case, the heat source eradication provokes a reversible development of skin alterations after two months with a complete disappearance of all symptoms.

This clinical case illustrates an importance of timely awareness-raising and information campaigns for the specialists familiarizing them with a rare pathology in order to ensure a correct approach to the treatment tactics.

### Table 2. Differential distinctions of the heat erythema and its clinical imitations

<table>
<thead>
<tr>
<th>Nosology</th>
<th>Subjects</th>
<th>Clinical manifestations</th>
<th>Localization</th>
<th>Associations</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat erythema (Erythema ab igne)</td>
<td>Most common for the middle-aged or elderly women; the latter facts concern the young people using laptops for work</td>
<td>Localized reticular erythema, correlating with a vascular pattern; turns more cyanotic with time</td>
<td>The skin surface is exposed to the heat source</td>
<td>Due to the chronic heat exposure; the long-standing exposure is associated with squamous-cell carcinoma and Merkel’s cell carcinoma</td>
<td>Eradication of heat source or reduction of its use; possible prescription of Fluorouracil (5-FU), positive effect of Tretinoin and Hydroquinone</td>
</tr>
<tr>
<td>Livedo reticularis</td>
<td>Young and middle-aged women</td>
<td>Sites of spotty reticular pattern of cyanotic shade, possible hyperpigmentation sites, consistent, symmetrical and reversible</td>
<td>Mostly located on the limbs (preferably thighs)</td>
<td>May be idiopathic, physiological or sign of an anti-phospholipid syndrome</td>
<td>Treatment depends on the cause</td>
</tr>
<tr>
<td>Livedo racemosa</td>
<td>Young and middle-aged women</td>
<td>Sites of cyanotic spotty reticular vascular pattern, possible hyperpigmentation sites, consistent character, ‘irregular’ broken reticular pattern (based on “tree limb” pattern)</td>
<td>Mostly located on the proximal limbs and trunk</td>
<td>May be associated with Sneddon’s syndrome, systemic lupus erythematosus, dermatomyositis, anti-phospholipid syndrome</td>
<td>Treatment depends on the cause</td>
</tr>
<tr>
<td>Cutis marmorata</td>
<td>Neonates, infants</td>
<td>Wavy, spotty, reticular pattern of hyperpigmentation</td>
<td>Mostly located on the lower limbs</td>
<td>Exposure to the cold temperatures</td>
<td>Warming-up</td>
</tr>
<tr>
<td>Cutis marmorata telangiectatica congenita</td>
<td>Neonates</td>
<td>Durable reticular vascular pattern</td>
<td>Mostly located on one limb; if the trunk is involved, there is a common distinct delineation along the median</td>
<td>Congenital disorder associated with a limb asymmetry and vascular malformations, as well as neurological or visual anomalies</td>
<td>Usually improves with time</td>
</tr>
</tbody>
</table>
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Тема праці: Неповноцінна патологія захворювань шкіри, що складається з невибачливих діяннях патології шкірних структур, що веде до неправильного лікування та високої кількості непотрібних лабораторних та інструментальних досліджень. Під час підготовки та проведення лікування та інструментальних досліджень виникає неправильна інформація, що призводить до високої кількості непотрібних лабораторних та інструментальних досліджень. Клінічні захворювання шкіри звичайно є часово-просторовими, але вибагливими для інших досліджень.
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Клинический случай тепловой эритемы (Erythema ab igne), вызванной использованием ноутбука

Резюме. Тепловая эритема (Erythema ab igne) — это локализованное кожное заболевание, проявляющееся ретикулярной гиперpigментацией, темной эритемой, эпидермальной атрофией и телеангиэктазиями. Она вызвана повторяющимся и длительным воздействием умеренного тепла или инфракрасного излучения, которого недостаточно для получения ожогов. В наши дни тепловая эритема чаще всего наблюдается после многократного использования грелок, инфракрасных ламп и обогревателей. В последнее время увеличилось число тепловых поражений кожи у молодых людей, которые во время работы держат ноутбук на бедрах и коленях. Для ревматологов данная патология может представлять клинический интерес, поскольку кожные изменения могут напоминать поражения кожи при системных заболеваниях соединительной ткани. Представлено описание клинического случая поздней диагностики тепловой эритемы у молодой женщины вследствие работы с ноутбуком. Поздняя диагностика обусловлена недостаточной информированностью врачей о данной патологии, что может приводить, как в описанной нами ситуации, к неправильному лечению и большому количеству не нужных лабораторных и инструментальных исследований.

Ключевые слова: тепловая эритема; поражение кожи; лифедо; ноутбук; воздействие тепла на кожу; клинический случай