Erythema ab igne (EAI) is a skin condition caused by chronic exposure to heat; removal of the heat source often will result in self-resolution of the rash.

Erythema ab igne can be a sign of underlying illness in patients self-treating chronic pain with application of heat.

Recognition and discontinuation of the exposure with close observation are key components in the treatment of EAI.

Erythema ab igne (EAI) (also known as toasted skin syndrome) was first described in the British Journal of Dermatology in the 20th century, though it was known by physicians long before. Reticular netlike skin changes were seen in association with patients who spent extended time directly next to a heat source. This association led to the name of this condition, which literally means “redness by fire.” Indeed, EAI induced by chronic heat exposure has been described across the world for centuries. For example, in the cold regions of northern China, people used to sleep on beds of hot bricks called kang to stay warm at night. The people of India’s Kashmir district carried pots of hot coals called kangri next to the skin under large woven shawls to stay warm. In the past, Irish women often spent much time by a turf- or peat-burning fire. Chronic heat exposure in these cases can lead not only to EAI but also to aggressive types of cancer, often with a latency of 30 years or more.

More recently, the invention of home central heating led to a stark decrease in the number of cases associated with combustion-based heat, with a transition to etiologies such as use of hot water bottles, electric blankets, and electric space heaters. Over time, technological advances led to ever-increasing potential causes for EAI, such as laptops or cell phones, car heaters and heated...
Erythema ab igne begins as mild, transient, and erythematous macules and patches in a reticular pattern that resolve minutes to hours after removal of the heat source. With weeks to months of continued or repeated application of the heat source, the affected area eventually becomes hyperpigmented where there once was erythema (Figures 1 and 2). Sometimes papules, bullae, telangiectasia, and hyperkeratosis also form. The rash usually is asymptomatic, although pain, pruritus, and dysesthesia have been reported. Dermoscopy of EAI in the hyperpigmented stage can reveal diffuse superficial dark pigmentation, telangiectasia, and mild whitish scaling. Although the pathogenesis has remained elusive over the years, lesions do seem to be mostly associated with cumulative exposure to heat rather than length of exposure.

Etiology of EAI
Anatomic Location—The affected site depends on the source of heat (Table). Classic examples of this condition include a patient with EAI presenting on the anterior thighs after working in front of a hot oven or a patient with chronic back pain presenting with lower-back EAI secondary to frequent use of a hot water bottle or heating pad. With evolving technology over the last few decades, new etiologies have become more common—teenagers are presenting with anterior thigh EAI secondary to frequent laptop use; patients are holding warm cell phones in their pant pockets, leading to unilateral geometric EAI on the anterior thigh (front pocket) or buttock (back pocket); plug-in radiators under computer desks are causing EAI on the lower legs; and automobile seat heaters have been shown to cause EAI on the posterior legs. Clinicians should consider anatomic location a critical clue for etiology.

Social History—There are rarer and more highly specific causes of EAI than simple heat exposure that can be parsed from a patient’s social history. Occupational exposure has been documented, such as bakers with exposure to ovens, foundry workers with exposure to heated metals, or fast-food workers with chronic exposure to infrared food lamps. There also are cultural practices that can cause EAI. For example, the practice of cupping with moxibustion was shown to create a specific pattern in the shape of the cultural tool used. When footbaths with Chinese herbal remedies are performed frequently with high heat, they can lead to EAI on the feet with a linear border at the ankles. There also have been reports of kotatsu (heated tables in Japan) leading to lower-body EAI. These cultural practices also are more common in patients with darker skin types, which can lead to hyperpigmentation that is difficult to treat, making early diagnosis important.

Medical History—Case reports have shown EAI caused by patients attempting to use heat-based methods for pain relief of an underlying serious disease such as cancer, bowel pathology (abdominal EAI), spinal disc prolapse (midline back EAI), sickle cell anemia, and renal pathology (posterior upper flank EAI). Patients with hypothyroidism or anorexia have been noted to have generalized EAI sparing the face secondary to repeated and extended hot baths or showers. One patient with schizophrenia was shown to have associated thermophilia due to a delusion that led the patient to soak in hot baths for long periods of time, leading to EAI. Finally, all physicians should be aware of iatrogenic causes of EAI, such as use of warming devices,
ultrasound-based warming techniques, and laser therapy for lipolysis. Inquire about the patient’s surgical history or intensive care unit stays as well as alternative medicine or chiropractic visits. Obtaining a history of medical procedures can be enlightening when an etiology is not immediately clear.7,55,56

**Diagnosis**

Erythema ab igne is a clinical diagnosis based on recognizable cutaneous findings and a clear history of moderate heat exposure. However, when a clinical diagnosis of EAI is not certain (eg, when unable to obtain a clear history from the patient) or when malignant transformation is suspected, a biopsy can be performed. Pathologically, hematoxylin and eosin staining of EAI classically reveals dilated small vascular channels in the superficial dermis, hence a clinically reticular rash; interface dermatitis clinically manifesting as erythema; and pigment incontinence with melanin-laden macrophages consistent with clinical hyperpigmentation. Finally, for unclear reasons, increased numbers of elastic fibers classically are seen in biopsies of EAI.7

**Differential Diagnosis**

The differential diagnosis for a reticular patch includes livedo reticularis (Figure 3), which usually manifests as a more generalized rash in patients with chronic disease or coagulopathy such as systemic lupus erythematosus, cryoglobulinemia, or Raynaud phenomenon. When differentiating EAI from livedo reticularis or cutis marmorata, consider that both alternative diagnoses are more vascular appearing and are associated with cold exposure rather than heat exposure. In cases that are less reticular, livedo racemosa can be considered in the differential diagnosis. Finally, poikiloderma of Civatte can be reticular, particularly on dermoscopy, but the distribution on the neck with submental sparing should help to distinguish it from EAI unless a heat source around the neck is identified while taking the patient’s history.7

In babies, a reticular generalized rash is most likely to be cutis marmorata (Figure 4), which is a physiologic response to cold exposure that resolves with rewarming of the skin. A more serious condition—cutis marmorata telangiectatica congenita (Figure 5)—is usually present at
birth, most frequently involves a single extremity, and notably does not resolve with rewarming. This is an important differential for EAI in children because it can be associated with vascular and neurologic anomalies as well as limb asymmetry. Finally, port-wine stains can sometimes be reticular in appearance and can mimic the early erythematous stages of EAI. However, unlike the erythematous stage of EAI, the port-wine stains will be present at birth.7

Emerging in 2020, an important differential diagnosis to consider is a cutaneous manifestation of COVID-19 infection. An erythematous, reticular, chilblain-like or transient livedo reticularis-like rash has been described as a cutaneous manifestation of COVID-19. Although the pathophysiology is still being elucidated, it is suspected that this is caused by a major vaso-occlusive crisis secondary to COVID-19–induced thrombotic vasculopathy. Interestingly, the majority of patients with this COVID-related exanthem also displayed symptoms of COVID-19 (eg, fever, cough) at the time of presentation,57-60 but there also have been cases in patients who were asymptomatic or mildly symptomatic.60

In some cases, EAI is an indication to screen for an underlying disease. For example, uncontrolled pain is an opportunity to improve interventions such as modifying the patient’s pain-control regimen, placing a palliative care pain consultation, or checking if the patient has had age-appropriate screenings for malignancy. New focal pain in a patient with a prior diagnosis of cancer may be a sign of a new metastasis. A thermophilic patient leaves opportunity to assess for underlying medical causes such as thyroid abnormalities or social/psychological issues. Geriatric patients who are diagnosed with EAI may need to be assessed for dementia or home safety issues. Patients with a history of diabetes mellitus can unknowingly develop EAI on the lower extremities, which may signal a need to assess the patient for peripheral neuropathy. Patients with gastroparesis secondary to diabetes also may develop EAI on the abdomen secondary to heating pad use for discomfort. These examples are a reminder to consider possible secondary comorbidities in all diagnoses of EAI.7

Prognosis
Although the prognosis of EAI is excellent if caught early, failure to diagnose this condition can lead to permanent discoloration of the skin and even malignancy.6 A rare sequela includes squamous cell carcinoma, most commonly seen in chronic cases of the lower leg, which is likely related to chronic inflammation of the skin.61-65 Rare cases of poorly differentiated carcinoma,66 cutaneous marginal zone lymphoma,67 and Merkel cell carcinoma68 have been reported. Patients diagnosed with EAI should receive normal periodic surveillance of the skin based on their medical history, though the physician should have an increased suspicion and plan for biopsy of any nodules or ulcerations found on the skin of the affected area.7

Treatments
Once the diagnosis of EAI is made, treatment starts with removal of the heat source causing the rash. Because the rash usually is asymptomatic, further treatment typically is not required. The discoloration can resolve over months or years, but permanent hyperpigmentation is not uncommon. If hyperpigmentation persists despite removal of the heat source and the patient desires further treatment for discoloration, there are few treatment options, none of which are approved by the US Food and Drug Administration for this condition.7 There is some evidence
for the use of Nd:YAG lasers to reduce hyperpigmentation in EAI. There have been some reports of treatment using topical hydroquinone and topical tretinoin in an attempt to lighten the skin. If associated hyperkeratosis or other epithelial atypia is present, the use of 5-fluorouracil may show some improvement. One case report has been published of successful treatment with systemic mesoglycan and oral over-the-counter vitamins have been tried with some improvement. It is also conceivable that medications used to treat postinflammatory hyperpigmentation may be helpful in this condition (e.g., kojic acid, arbutin, mild topical steroids, azelaic acid). Patients with darker skin may experience permanent discoloration and may not be good candidates for alternative treatments such as laser therapy due to the risk for inducible hyperpigmentation.

**Conclusion**

No matter the etiology, EAI usually is a benign skin condition that is treated by removal of the causative heat source. Once a diagnosis is made, the clinician must work with the patient to determine the etiology. Care must be taken to ensure that there are no underlying signs, such as chronic pain or psychiatric illness, that could point to associated conditions. Rarely, sequelae such as cancers have been documented in areas of chronic EAI. Once the heat source is identified and removed, any remaining hyperpigmentation usually will self-resolve over months to years, though this may take longer in patients with darker skin types. If more aggressive treatment is preferred by the patient, laser therapy, topical medications, and oral over-the-counter vitamins have been tried with minimal responses.

**REFERENCES**

ERYTHEMA AB IGNE


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