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Case Report

A Case Study of Erythromelalgia: Exploring the use of Lidocaine Infusion in Pain Management

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Abstract

Background:
Erythromelalgia is a rare and debilitating condition characterized by episodic burning pain, erythema, and swelling, primarily affecting the extremities. Diagnosis is based on clinical history and the exclusion of differential diagnoses, as no confirmatory tests exist.

Case Presentation:
We report a 45-year-old male with a complex history of refractory pain for 4 years. His episodic pain predominantly affects the dorsum of the hands and feet, occasionally involving the face. The patient experiences burning sensations, erythema, and swelling episodes lasting up to two days, significantly impacting his quality of life. Chronic daily hip and ankle pain, from suspected avascular necrosis, further compound his condition. Despite extensive pharmacological and interventional treatments, including sympathetic blocks, dorsal root ganglion pulsed radiofrequency, and a lidocaine infusion, symptom relief remains limited.

Discussion:
It is unclear if the patient presents with primary or secondary erythromelalgia. Secondary is distinguished by asymmetrical distribution and association with systemic conditions such as hypertension and psoriasis. Genetic tests for mutations on SCN9A are pending, a cause of primary erythromelalgia. Management remains challenging due to the condition's heterogeneous etiology and incomplete pathophysiological understanding. Lidocaine infusions, although not curative, offer the potential for symptom relief in refractory cases. Other reported cases have highlighted its role, often transitioning to mexiletine for maintenance therapy.

Conclusion:
The diagnostic complexity and therapeutic challenges of erythromelalgia highlight the need for individualized, multidisciplinary management strategies. Further research is warranted to optimize treatment protocols, including the role of lidocaine and other sodium channel blockers in refractory cases.

Case Report

A 45-year-old gentleman first presented to the pain clinic in 2021, with a complex history of refractory symptoms affecting multiple areas, including his bilateral hips, hands, feet, and ankles. His pain journey began following a COVID-19 vaccine booster, which he believes is the onset of his symptoms. The patient experiences episodic pain primarily in the dorsum of the hands and feet, often starting with itchiness, followed by redness and swelling, before progressing to a deep burning sensation but not tender to touch. These episodes last for approximately two days, and while the pain does not impair his ability to grip objects or walk, it significantly impacts his comfort and quality of life. The right hand is more frequently affected, but when the feet are involved, they are affected bilaterally. Occasionally, all four areas are involved at once. He also reports swelling beneath the eyes during these episodes. The frequency of these episodes is variable, occurring every two to three months, though there have been periods of weekly flare-ups. He has identified exercise, such as swimming, as a possible trigger. The pain improves only slightly with cold water or ice, however, it is temporarily relieved by massaging the affected areas. Over the years, he has been provisionally diagnosed with Raynaud's phenomenon, chronic regional pain syndrome and fibromyalgia. Now the current working diagnosis is erythromelalgia.

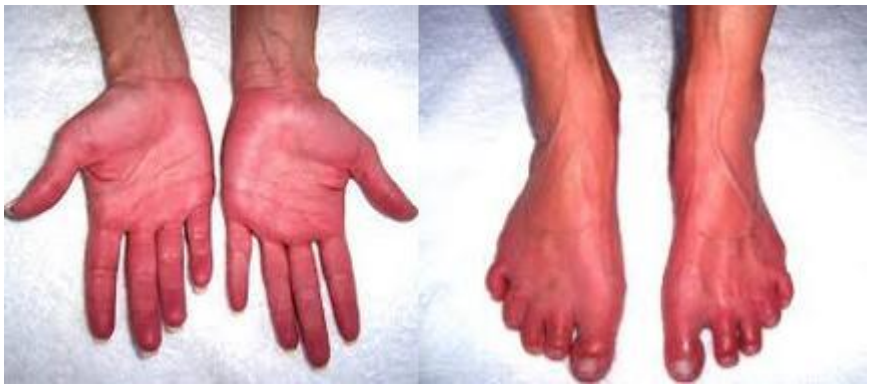

Figure 1. Photographs of the hands and feet showing bilateral erythema and swelling.

In addition to this episodic pain, the patient suffers from persistent bilateral hip and ankle pain, describing a sensation of instability as though the joints might "fall out of place." This chronic pain affects him daily, making routine activities such as climbing stairs and getting out of bed challenging. The MR Pelvis in December 2024 revealed bilateral femoral head avascular necrosis with associated diffuse femoral head and neck marrow oedema. Other imaging performed over the years include an X-ray of the right foot from June 2022 showed mild degenerative changes in the big toe metatarsophalangeal joint, with no fractures. The MR Whole Spine from September 2021 indicated that the spinal canal is capacious throughout, and a haemangioma was noted in the body of L2. A right hand X-ray from June 2019 revealed no fractures. A neurophysiology EMG performed in 2021 showed no evidence of large-fibre polyneuropathy, with normal conduction studies of the lower limb.

Pharmacological treatments have been extensively explored. Topical ointments such as Diclofenac and capsicum cream were trialed but had no effect. Systemic treatments,

including pregabalin, duloxetine, and inhaled 15% cannabis, failed to provide any relief. The only medication that offered some benefit was Oramorph (morphine sulfate oral solution).

The patient has undergone numerous interventions to manage his pain. In July 2021, he underwent a right L3 and L4 sympathetic block with pulsed radiofrequency, which provided limited relief. Between May 2022 and May 2024, he received three sessions of bilateral L2 dorsal root ganglion pulsed radiofrequency. More recently, in September 2024, he underwent a bilateral L2 nerve root block. These had minimal improvement. In December 2024, he was given a lidocaine infusion of 200 mg over one hour. Despite these procedural interventions, his pain persists.

The past medical history includes uncontrolled hypertension, asthma, psoriasis, recurrent renal colic, and a scaphoid fracture. He smokes one packet of cigarettes daily. He denies any family history of pain conditions. He does not recall any traumatic injuries to the affected sites. He has a history of injuries from earlier years including a right knee injury from a motorbike accident at the age of 18, and a right thumb dislocation with a scaphoid fracture at the age of 14 neither of which required any surgical intervention.

Discussion

Erythromelalgia is a rare condition characterized by burning pain in the extremities, most commonly affecting both lower limbs symmetrically, and associated with erythema and warmth. The upper limbs, face, ears, and tongue may also be affected, and attacks can occur unilaterally [1]. The pain fluctuates in intensity and duration, typically appearing later in the day [2].

Primary erythromelalgia is an inherited type of the condition that occurs without other organic compromise [1]. Secondary erythromelalgia is associated with an identifiable cause [3]. The diagnosis is based on the patient's history, physical examination during an episode, and the exclusion of differential diagnoses, as no confirmatory diagnostic test exists [2]. Clinical diagnostic criteria proposed by Thompson et al. include burning extremity pain, exacerbation by warming and relief with cooling, erythema, and increased skin temperature [4]. Thermography can reveal increased skin temperature, although it is not necessary for diagnosis [5]. Oedema may occasionally be present.

Erythromelalgia is more commonly observed in females, with a mean age of onset between 50 and 60 years [1]. The underlying mechanism is thought to involve dysregulation of endogenous temperature control through vasodilation of thermoregulatory arteriovenous anastomoses [3]. This hypothesis describes tissue hypoxia caused by impaired microvascular blood flow in the skin, alongside increased thermoregulatory flow via arteriovenous shunts [5]. Triggers for the condition include physical activity and exposure to warm temperatures.

The pathogenesis of erythromelalgia remains incompletely understood, making the management challenging. Primary erythromelalgia is autosomal dominant, associated with a mutation in the SCN9A gene, which may be sporadic. This gene codes for voltage-gated sodium channels, Nav1.7, found in sympathetic ganglia and nociceptive sensory neurons of the dorsal root ganglia. The mutation causes prolonged activation of these neurons, playing a key role in pain transmission [1, 6]. By contrast, the pathogenesis of secondary erythromelalgia is thought to involve platelet activation, leading to thrombotic occlusions in the extremities and prostaglandin production explaining its inflammatory nature. Primary erythromelalgia typically has a symmetrical distribution and a younger age of onset, whereas secondary erythromelalgia often presents asymmetrically in older individuals [6].

Associated underlying disorders for secondary erythromelalgia include

myeloproliferative diseases, neoplasias, autoimmune diseases, connective tissue disorders, toxins, infections, and neuropathies [3]. Several drugs, such as verapamil, nicardipine, bromocriptine, pergolide, and mercury poisoning, have also been implicated [5]. The erythema seen in erythromelalgia may or may not have a clear demarcation [1]. Patients may report symptoms such as allodynia, hyperalgesia, itch, or anhidrosis/hypohidrosis of the affected skin [1].

In cases associated with myeloproliferative disorders, aspirin has been shown to be effective [3]. Interestingly, erythromelalgia has been reported to precede the diagnosis of myeloproliferative disease by several years [2], urging the importance of routine follow-up with complete blood counts.

Nonpharmacological management includes addressing psychological concerns and controlling triggers such as heat exposure, anxiety, physical activity, stress, alcohol ingestion, spicy foods, and vasodilator drugs [1]. Patients are encouraged to continue exercising and adapt to their limitations. Cooling the areas with ice, cold water, or fans should be avoided or limited, as these practices can lead to tissue damage [3]. Elevating the affected extremity may provide relief.

Pharmacological treatments are generally initiated with topical therapies. Lidocaine 4-5% cream or patches, or compounded amitriptyline 2% with ketamine 0.5-5%, are preferred options for pain relief [3]. Topical lidocaine stabilizes hyperexcitable membranes by inhibiting voltage-gated sodium channels, reducing hyperalgesia [1]. Other topical options include capsaicin cream, gabapentin cream, diclofenac gel, and menthol-methyl salicylate cream. For redness, compounded midodrine, phenylephrine, oxymetazoline, timolol maleate, and brimonidine tartrate may be used [3]. Amitriptyline and ketamine also exert effects by inhibiting serotonin and norepinephrine reuptake or by acting as NMDA receptor antagonists [3].

A step-wise approach to systemic therapies has been proposed by Ma et al. in their review of medical management options based on levels of evidence [3]. Step 1 involves aspirin 325 mg orally, followed by gabapentin (up to 2400 mg) or pregabalin (75-300 mg) in Step 2. Step 3 includes SSRIs, sodium channel blockers such as mexiletine or carbamazepine, or other agents like corticosteroids, antihistamines, beta-blockers, magnesium, and immunoglobulins, although evidence for these is limited. Sympathetic blocks, epidurals, and sympathectomy have been attempted with variable success [6]. In cases associated with infection, surgery, or trauma, early administration of high-dose corticosteroids (e.g., prednisolone 40 mg or higher) is recommended to prevent irreversible nociceptor damage [1].

Lidocaine infusions are an option for severe cases. These are typically administered as a weight-based bolus (1-2 mg/kg), a fixed bolus (50-100 mg), or a continuous infusion (1 mg/kg per hour). Side effects include slurred speech and altered mental status [3]. Lidocaine's lack of specificity for the Nav1.7 channel may limit its utility, although mexiletine and ranolazine, which target this channel more specifically, have shown efficacy [6]. Ketamine infusions have also been described in paediatric cases [3].

Hanabusa et al reports a case of a 66-year-old patient with erythromelalgia secondary to psoriasis, where low-dose aspirin effectively improved both the pain and psoriatic lesions, despite the failure of other treatments such as intravenous lidocaine, ketamine, and oral steroids [11]. Our patient's psoriasis was stable with topical treatment therefore it is unclear if his case of erythromelalgia is secondary to the psoriasis.

Besides ours, other cases have been described where lidocaine infusions have been used a s a treatment for erythromelalgia. Nathan et al. described an 11-year-old with primary erythromelalgia successfully treated with intravenous lidocaine, titrated to a serum level of 2-5 μg/ml. This reduced pain episodes to 1-3 per day over four nights, after which oral mexiletine was introduced, with a maintenance dose of 150 mg thrice daily [7].

Elgueta et al. reported a 9-year-old presenting with acute pain unresponsive to standard therapies. A lidocaine bolus (1 mg/kg) followed by a 4 mg/kg infusion over three hours resulted in significant relief. Subsequent oral mexiletine (1 mg/kg) and regular adjunct therapies maintained improvement [8].

Scott et al. presented a 25-year-old man with severe erythromelalgia-associated pain and ulcers. A 450 mg lidocaine infusion followed by mexiletine (300 mg twice daily, later increased) achieved sustained improvement over two years [9].

A retrospective Mayo Clinic study analysed 168 patients with erythromelalgia, reporting significant functional impairment, including inability to walk long distances, drive, or maintain employment. Additionally, 21.8% experienced skin damage, 16.1% infections, 12.6% ulcers, and 1.1% gangrene. Compared with the general population, erythromelalgia patients had significantly increased morbidity and mortality [10]

Conclusion

Erythromelalgia remains a diagnostic and therapeutic challenge due to its rarity, variable presentation, and poorly understood pathophysiology. This case demonstrates the significant impact of refractory erythromelalgia on quality of life and the limitations of current pharmacological and interventional options. A review of other case studies show lidocaine intravenous infusion could offer relief, supporting its role as an adjunctive therapy in severe cases.

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