

Chronic chilblains: the clinical presentation and disease course in a large paediatric series

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Abstract

Objectives

Children often present during winter with painful, red-purple swollen fingers and/or toes, usually misdiagnosed as Raynaud's phenomenon. Pernio, or chronic chilblains, is a localised inflammatory lesion of the skin resulting from an abnormal response to cold. The aim of this study was to better characterise the clinical presentation of chronic chilblains in children.

Methods

This is a single-centre retrospective study of patients referred to our paediatric rheumatology clinic with cold, purple, and painful hands. Patients were identified from the paediatric rheumatology clinic database, at the Safra Children Hospital, Israel. Data of the clinical presentation, physical findings, laboratory investigations and the course of the disease were extracted from the patients' charts and analysed.

Results

A total of 33 patients (27 females, sex ratio 4.5:1) were identified. Patients age at presentation was 13.5 ± 2.1 , and disease duration was 2.0 ± 1.0 winters. Patients presented with prolonged capillary refill time (100%) and abnormal modified Allen test (75.6%). Fingers swelling was the most common finding (81.8%), followed by proximal interphalangeal joint (PIPs) swelling (63.6%), skin ulceration (54.5%), and dry, irritated skin (45.5%). Nailfold capillary microscopy was normal in all patients. The only abnormal laboratory test was the test for anti-nuclear factor (ANA) in 25%.

Conclusion

We report a large series of children with a unique symptomatology consisting in chronic chilblains.

Key words

Raynaud's phenomenon, cold, children, cold sensitivity, chilblains

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Introduction

During the winter, children often present with painful, red-purple swollen fingers and/or toes. Several syndromes may account for chronic painful hands accompanied by colour and temperature changes such as Raynaud's phenomenon (RP), acrocyanosis, reflex sympathetic dystrophy, pressure urticaria, cold-induced urticaria, panniculitis, vasculitis, erythromelalgia, systemic lupus erythematosus (SLE), dermatomyositis and chilblains (1-4). Over the last two decades, we have encountered a group of patients with soft tissue swelling of the fingers, hands, and toes, who were all referred to our rheumatology clinic with the diagnosis of RP. However, the condition that most closely fits the description of these patients is chronic chilblains. Chilblains, meaning cold sore-chill (cold) and blegen (swelling), was first described in 1894 by Corlett (5). These lesions are described as bilateral and symmetrical, erythematous or violaceous, and painful or pruritic. They occur within 12 to 24 hours after the exposure to cold and are distributed over the exposed parts of the body such as hands, feet, ears, and nose. Acute chilblains is short, lasting 1 to 2 weeks, but chronic chilblains may last weeks and months. The condition usually starts in early winter and vanishes in spring, but often recurs the next winter (6). Chronic chilblains can be idiopathic, or associated with connective tissue disease (CTD) (7), mainly SLE. Ulceration may also be present. Chronic chilblains occur all over the world, especially in areas with a temperate climate (8). The precise incidence of this condition in children is unknown, but some authors claim it to be extremely rare, less than 1 in a million (9). Data on chronic chilblains in the paediatric population are very limited (9, 16, 17). Thus, our goal in this study was to evaluate the clinical and laboratory findings in our 33 paediatric patients with chronic chilblains.

Materials and methods

Patients

The study group comprised 33 patients (27 females, sex ratio 4.5:1) aged 16 years old or younger, who were re-

ferred to the rheumatology clinic of Edmond and Lily Safra Children Hospital, Sheba Medical Centre during the years 2000-2010, and diagnosed with chronic chilblains. The paediatric rheumatology centre of the Safra Children Hospital is a tertiary referral centre in Israel, with an average of 2500 clinic visits/year. The data were collected retrospectively from the patients' charts. Inclusion in the study group was based on the existence of persistent blue-purple colour changes of the hands and/or feet during the cold season, with at least two of the following criteria:

1. pain in hands/fingers/feet, with or without swelling;
2. xerosis or erythaema of hands/feet skin; and
3. cold sores.

Exclusion criteria included known connective tissue disease, heart disease, and lung disease. A database of all paediatric rheumatology patients referred to the Safra Children's Hospital, Sheba Medical Centre, was used for extracting the data.

Demographic data, family history clinical manifestations, and laboratory test results, were summarised for the entire cohort.

A standard capillary refill test was performed in all the patients (10). A value of 3 seconds and higher was considered abnormal, based on the published literature (and on our testing of age-matched controls [n=30, unpublished results]). In addition, a modified Allen test was performed in all patients (11). Test result was considered abnormal if pallor continued 15 seconds after the release of manual compression. Nail-fold capillary microscopy, using an ophthalmoscope, was also measured in all patients. Doppler studies for arterial blood flow of the radial and ulnar arteries were performed only in 6 patients. A cold stress test was performed in the first few patients. The patients immersed their hands in ice water for four minutes, followed by a three-minute recovery. Recovery of skin temperature, vibratory perception threshold and complaints of finger pain were determined. However, due to the suffering involved in the test performance and as none of the patients showed ab-

Competing interests: none declared.

Table I. Clinical and laboratory findings in 33 patients with chronic chilblains.

	n (%)
Age, mean±SD (years)	13.5 ± 2.1
¹ Winters number	2.0 ± 1.0
Physical examination	
Painfull purple bluish skin discolouration of distal extremities	33 (100)
Finger swelling, n (%)	27 (81.8)
² PIP arthritis, n (%)	21 (63.6)
Skin ulceration, n (%)	18 (54.5)
Dry irritated skin, n (%)	15 (45.5)
Feet involvement, n (%)	10 (30.3)
Capillary refill time (seconds)	4.8±2.5 vs. 1.8±0.5 in controls
³ Abnormal modified Allen test (%)	25 (75.8)
Laboratory investigation	
WBC	6.3 ± 1.9
HgB	13.6 ± 0.9
Platelets	258 ± 39
ESR	11 ± 7
⁴ Positive ANA test, n (%)	5 (25)

¹Winters: number of winters of recurrent symptoms; ²PIP: proximal interphalangeal joints; arthritis was defined by the presence of joint effusion; ³Positive Allen test – flashing time >15 seconds; ⁴ANA test was available only for 20 patients.

**Fig. 1.**

normality, we abandoned this test. Skin biopsy, reported to be of low informative value in chronic chilblains, was not performed (7).

The study was approved by the Institutional Review board of Sheba Medical Centre.

Results

For this study, 33 patients were identified. The demographics and clinical characteristics are presented in Table I. Patients' mean age at presentation was 13.5±2.1 (range 8.5–15.5 years), and

disease duration was 2.0±1.0 winters (range 1–4.6). None of the patients had an underlying disease. Per anamnesis, symptoms abated during spring and reappeared in winter. All patients lacked the episodic nature of Raynaud's phenomenon (RP).

On physical examination, 21/33 patients (63.6%) had proximal interphalangeal joint (PIP) swelling (asymmetrically swollen fingers with tender and swollen PIP joints) (Fig. 1). Fingers swelling was the most common finding (81.8%), followed by skin ulceration

(54.5%) and dry irritated skin (45.5%). Capillary refill time was prolonged in all patients (4.8±2.5 vs. 1.8±0.5 seconds for patients and controls respectively, $p<0.05$), and the modified Allen test was abnormal (>15 seconds flashing time) in 25 patients (75.6%) (Table I, Fig. 2-5). Nailfold capillary microscopy, using an ophthalmoscope, was normal in all patients. Nail changes such as white discolouration and pitting were observed in only 2 patients. Laboratory tests were carried out, including CBC, ESR, CRP, serum immunoglobulins, ANA, C3, C4 and cryoglobulins. CBC, ESR, CRP, and serum immunoglobulins were normal in all patients. Levels of complement factors C3 and C4 were available for 20 patients and were normal. Tests for anti-nuclear factor (ANA) were available for 20 patients; the test was positive in 25% (titers range was 1:80–1:160). Cryoglobulins were tested in 6 patients; the results were negative. Doppler studies for arterial blood flow were conducted on 6 patients, who showed decreased flow upon cold exposure. A cold stress test was performed in the first five patients and was normal. No joint imaging was performed in any of the patients.

For 27 patients (82%), the only therapy recommended was dressing warmly. Calcium-channel blockers or nitroglycerine skin patches were prescribed for the most severe cases (6,18%) with some alleviation of the symptoms. Most patients who were offered medical treatment refused it, due to the potential adverse effects (local skin irritation, headache, and dizziness) of those treatments.

Discussion

Herein, we report a group of patients, mostly females, in the second decade of life, who presented with cold, purple, painful, and swollen fingers during winter time in Israel. In the majority of these patients, PIP swelling, cold ulcers, and dry, irritated skin were present. Physical examination of the fingers showed asymmetrically swollen, mildly tender and swollen PIP joints. Slow capillary filling and reduced blood flow in the radial and ulnar arteries in response to

cold were observed. Vascular hyper-responsiveness was also evident by Doppler sonography in some of the patients. Laboratory investigation was unrevealing, except for positive ANA tests in a quarter of the patients. None of the patients had an underlying disease.

Most of the patients in this cohort were referred with a diagnosis of RP. In RP, initial pallor is typical and it is necessary for the diagnosis, although some authors recognise cyanotic RP as a none classic form of the disorder (12). Attacks are usually triggered by cold or emotional stimulus, and they persist for several minutes; skin flushing follows re-warming (the tricolour of the French flag) (13). The diagnosis of RP is sometimes disputable, with many different assessment methods and classification (14). The diagnosis of RP is unlikely in our patients, for the following reasons: none of the patients reported a pallor phase or the three-colour changes of RP; all patients had persistent cold and purplish hands, even when warm; and the vast majority of the patients had either soft tissue swelling or PIP swelling, which are not in the scope of RP. Acrocyanosis was also ruled out, as in this condition, the persistent blue or cyanotic discolouration of the extremities is not associated with pain or swelling. Panniculitis, cold-induced urticaria, skin vasculitis, and cutaneous polyarteritis nodosa were ruled out in these patients because, in these diseases, the lesions are warm, rather than cold, and not associated with PIPs (proximal interphalangeal joints) swelling (4, 15). In addition, none of the patients fulfilled the clinical American College of Rheumatology revised criterion for SLE.

The most closely similar phenomenon to our patients' presentation is idiopathic chronic chilblains (pernio). We identified in the literature three retrospective series on chronic chilblains in paediatric patients (16-18). Our series is, to our knowledge, the largest one reported. We believe that this disease is most often misdiagnosed, and the large number of patients in our centre is due to a greater awareness, rather than a really higher prevalence of the disease. Slow capillary filling and reduced

Fig. 2.



Fig. 3.



Fig. 4.

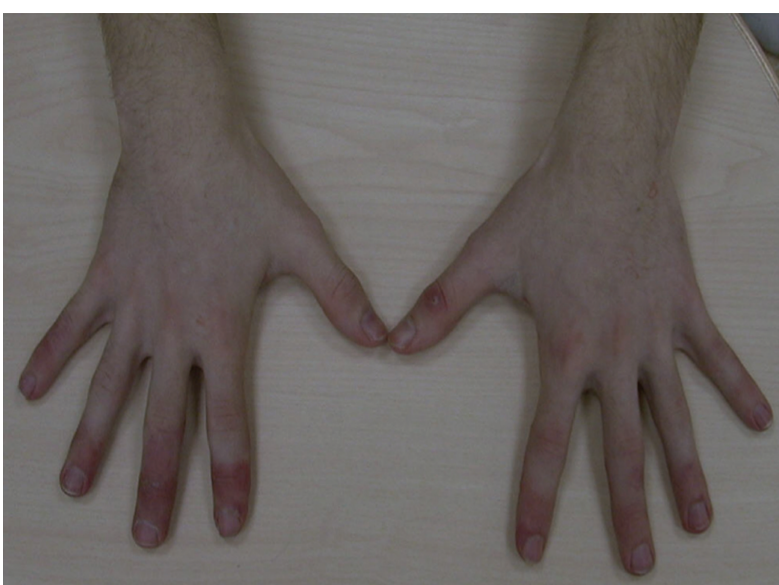




Fig. 5.

blood flow in the radial and ulnar arteries in response to cold were present in all our patients, but not previously reported. Moreover, PIP swelling was present in the majority of our patients. In many of these cases, we suspected that the PIP swelling was due to joint effusion, however no imaging data are available to support this notion.

The increased rate of positive ANA test in these patients, which was previously reported by others (18), is intriguing. Positive ANA, as an isolated finding, does not predict the development of connective tissue disease (CTD) (19, 20). Additionally, none of the patients in our cohort had signs of an autoimmune disease during the follow-up (average of 2 years, range 1–4.6 years). Antinuclear antibodies were detectable in similar frequency also in patients with fibromyalgia (FM) (20), in whom no predisposition for autoimmune diseases was found. In individual cases, FM can eventually precede the development of connective tissue disease. Thus, we cannot rule out the possibility of developing CTD in our patients in the far future.

Since Israel is a subtropical hot country, with a winter temperature rarely dropping below 0°C, we were surprised to find a relatively high prevalence of patients with this presentation. None of the patients reported exposure to extreme cold or wetness. Chronic chilblains are indeed reported from area with damp cold winter (16).

The precise etiology of chronic chilblains is unknown; both abnormal nerve control of the blood vessel diameter and nerve sensitivity to cold exposure have been suspected as being contributing factors (5). Histopathology of chronic chilblains lesions most often lacks the signs of vascular injury, which makes vasculitis less likely, and instead shows perivascular and perieccrine infiltrate (22). Our findings of abnormal modified Allen and capillary refill tests suggest a defect in vascularisation, however, it is unclear whether the defect is primary or secondary to cold injury.

Treatment of chronic chilblains is primarily focused on prevention of exposure to cold and keeping extremities warm during the winter season as the majority of episodes are self-limiting. Other suggestions for treatment for chronic chilblains are nitroglycerine skin patches, nifedipine and vitamin D3 (23–25). Most of our patients who were offered medical treatment refused or discontinued it after a short time, due to the potential adverse effects (local skin irritation, headache, and dizziness) of those treatments.

A possible limitation is that this was a retrospective study and available data such as Doppler studies and cryoglobulins, imaging of the swollen PIPs, were not uniform in all cases. The strengths of this study, on the other hand, lie in the large size of the patient cohort, the setting of the study (a single large

centre for paediatric rheumatology, located in a tertiary children's hospital), the collection of patients over a decade, with an in-clinic computerised data collection system.

Herein, we report a series of children with chronic chilblains. We believe that this syndrome is not very rare and is often mistaken for Raynaud's phenomenon. Based on our series, we suggest that work-up of these patients should include ANA.

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