# Palmar, plantar and palmoplantar erythema in children

Charlotte De Crem [a], Hannelore De Maeseneer [b], Quentin Jordens [c], Regina Fölster-Holst [d], Dirk Van Gysel [b,e]

[a] aDepartment of Pediatrics, University Hospital Ghent, 9000 Ghent, Belgium
[b] Department of Pediatrics, Onze-Lieve-Vrouw Hospital, 9300 Aalst, Belgium
[c] Department of Pediatrics, Catholic University Hospital Leuven, 3000 Leuven, Belgium
[d] Clinic for Dermatology, Venerology and Allergology, University Clinic Schleswig-Holstein, 24105 Kiel, Germany
[e] Interdisciplinary Unit of Pediatric Dermatology, Vrije Universiteit Brussel, University Hospital Brussels, 1090 Brussels, Belgium.

dirk.van.gysel@olvz-aalst.be

## Keywords

plantar erythema, palmar erythema, palmoplantar erythema, children, diagnosis

## Abstract

Palmar, palmoplantar and plantar erythema are important clinical entities in children. These findings may be diagnostic clues to an underlying pathology. Palmar erythema has been described for decades and has a broad differential diagnosis. However, plantar erythema is a less known phenomenon and has only been described in several articles. Our aim is to give an overview of the most frequent and well-known causes of palmar, palmoplantar and plantar erythema in children and their specific presentation. We also included a list with further investigations that can be performed in order to come to the right diagnosis.

## Introduction

Palmar erythema is a well-known symptom in children but is often overlooked (1). It usually presents as a symmetric, slightly warm, painless, non-pruritic and non-scaling superficial reddening of the skin on the palmar side of the hands. The thenar and hypothenar eminences are most frequently affected (1, 2). Erythema on the plantar surface of the feet (plantar erythema) can also occur, however it is less known and reported. The combination of plantar and palmar erythema is common and comes with an extensive differential diagnosis. The broad differential diagnosis makes the evaluation of palmar, palmoplantar or plantar erythema quite challenging (2). We use the abbreviation PE for these three possible presentations of erythema. We focused on the mere presentation of palmar, plantar and palmoplantar erythema, as previously described. If the erythema is not the only or predominant dermatologic feature, it will be indicated. A classification of conditions associated with PE can be found in table 1. Our aim is to give an overview of the causes of PE in children and their specific presentation.

**Table 1 :** *Classification of PE in children.*

| |
|---|
| **Physiologic or primary** |
| Palmar<br>Idiopathic |
| Plantar<br>Idiopathic |
| Palmoplantar<br>Erythema palmare hereditarium, Idiopathic |
| **Pathologic or secondary** |
| Palmar<br>Hepatic<br>Cholestasis, Liver cirrhosis, Hemochromatosis, Wilson disease<br>Autoimmune<br>Systemic lupus erythematosus<br>Endocrine<br>Graves disease, Thyrotoxicosis, Diabetes mellitus<br>Infectious<br>Human T-lymphotropic Virus-1 associated myelopathy, Chronic HBV/HCV<br>Drug-related<br>Topiramate<br>Neoplasia<br>Hepatic tumors, Brain tumors and Lymphoproliferative disorders |
| **Plantar**<br>**Juvenile plantar dermatosis, Allergic contact dermatitis** |
| Palmoplantar<br>Infectious<br>Papular Pruritic Gloves and Sock Syndrome, Epstein Barr virus infection, Mycoplasma pneumoniae, Hand Foot Mouth disease, Erythema infectiosum, Secondary syphilis, Respiratory syncytial virus, Adenovirus, Human Parecho-Virus 3, Meningococcal septicemia, Toxic shock syndrome, Rocky mountain spotted fever, SARS-Cov-2, Varicella, Measles, Erythema subitum, Rat bite fever, Chikungunya.<br>Atopic<br>Atopic dermatitis<br>Autoimmune<br>Systemic arthritis, Kawasaki disease, Graft-versus-host disease<br>Drug-induced<br>Chemotherapy-induced acral erythema, Drug Reaction with Eosinophilia and Systemic Symptoms syndrome |

## Physiologic or primary

Palmar and plantar erythema can be a primary physiologic finding or a secondary marker of systemic pathology in children. This physiologic palmar or plantar erythema presents as diffuse mottling and involves the entire palmar or plantar surface with specking of pale areas of 1 mm or more in diameter. The pattern alters with pressure, atmospheric temperature, emotional state and elevation or position of the limb.

### Palmar erythema

Isolated palmar erythema in children is usually idiopathic. When all other possible causes are excluded, this diagnosis by exclusion can be made.

### Plantar erythema

Isolated plantar erythema is mainly considered idiopathic. Literature on primary causes of isolated plantar erythema is very scarce. This could be partially due to the lack of attention for the soles in general, especially in comparison to the more visible hands, and the lack of attention of clinicians and patients to the soles when there is no specific complaint in that area. In addition, people are inclined to attribute the cause of redness of the soles of feet to pressure that the soles experience during walking or running.

### Palmoplantar erythema

There are two primary causes of palmoplantar erythema: idiopathic palmoplantar erythema and Erythema Palmare Hereditarium (EPH).

EPH or Lane disease, is a very rare rash that presents as a symmetric, persistent, slightly bluish to vivid scarlet colored erythema of the palms and, less frequently, the soles (2-4). It usually appears at birth and remains stable throughout life. No specific treatment should be administered. It shows an autosomal dominant pattern of inheritance. Therefore, it is important to consider EPH in all children presenting with palmar erythema, especially if at least two relatives within the same family are affected (4). There is no inflammatory infiltrate on histology, however, dilated vessels in the entire dermis can be observed. Capillaroscopy shows an increased number of capillary loops running parallel to the surface (5). Dermoscopy shows red structureless areas with arborizing vessels that mainly run in parallel along follicular openings (4). The diagnosis of idiopathic palmoplantar erythema can be made when all other possible causes are excluded.

## Pathologic or secondary

### Palmar erythema

Palmar erythema can be a symptom of many different conditions (2).

The etiology of the underlying disease may be hepatic, autoimmune, endocrine, infectious, drug-induced or neoplasia related. As the pathogenesis of these diseases is often age-related, the age of onset can guide the clinician in making the most appropriate differential diagnosis.

When palmar erythema is present in the newborn or young child, a pathologic cause must be considered.

### Hepatic

Palmar erythema in liver disease can present as generalized redness of the palms, the dorsum of the hands, fingertips and nail bed. The erythema blanches when pressure is applied and it is commonly accompanied by pruritus (6).

In children, the most frequent hepatic diseases associated with palmar erythema are cholestasis (e.g. in primary sclerosing cholangitis or obstructive gallstone disease) and less commonly liver cirrhosis (2, 6). Alpha-1-antitrypsin deficiency, cholesterol ester storage disease and tyrosinemia can all present for the first time with signs and symptoms of cirrhosis, including palmar erythema, in late childhood or early adolescence. A relatively common hepatic disease that causes palmar erythema is Wilson disease. It mainly presents in the school-aged child. Hemochromatosis and hepatitis (B, C) can also lead to liver cirrhosis (2).

However, neonates and young children with underlying liver disease are less likely to present with palmar erythema and other signs of chronic liver disease than adolescents and adults (7). Treatment depends on the type of liver disease.

### Autoimmune

Children and adolescents with systemic lupus erythematosus can develop a rash with a variable morphology and location. It therefore remains a diagnostic challenge for the primary care physician, especially if the malar rash is absent. A skin biopsy for histology may facilitate accurate diagnosis (8). Treatment consists mainly of immunosuppressive drugs.

### Endocrine

Palmar erythema can also be present in patients with Graves disease, a cause of thyrotoxicosis. Aside from the infrequent occurrence of postnatal thyrotoxicosis due to maternal antibodies, the incidence of spontaneous Graves disease in children before the age of 10 is very low. However, the incidence increases with each decade until about the age of 60. The hand of the thyrotoxic person is erythematous, moist and in a state of hot hyperhidrosis (9).

Thyrotoxicosis, without an autoimmune cause such as pituary adenoma or iatrogenic by administration of iodide, is an endocrine disorder with several cutaneous manifestations including palmar erythema. It has been found in up to 18% of patients with this disorder (2). Treatment depends on the cause of thyrotoxicosis.

Diabetes mellitus is associated with palmar erythema in up to 4% of patients with type 1 and type 2 diabetes. Nevertheless, this presentation in children is rare given that cutaneous involvement is especially seen in prolonged disease (2, 10, 11). Treatment consists out of dietary measures and anti-diabetic medication (e.g. insulin).

### Infectious

Juvenile human T-lymphotropic virus-1 associated myelopathy or tropical spastic paraparesis (HAM or TSP), a chronic myelopathy characterized by slow progressing spastic paraparesis, severe sphincter disturbances and mild sensorial involvement, is frequently associated with palmar erythema. Although many authors suspect a relatively high frequency of HAM/TSP in childhood and puberty, only a scarce number of cases can be found in literature (12-14). Treatment is symptomatic. Chronic Hepatitis B or Hepatitis C infection can also present with palmoplantar erythema, however chronic disease in children is rare.

Drug induced

Palmar erythema may be observed as a result of hepatic damage related to the use of medication. However, topiramate is one of the few drugs that directly causes palmar erythema without causing liver dysfunction.

### Neoplasia

Palmar erythema has been reported as a paraneoplastic finding. The study of Noble et al. suggests an association between acral erythema and malignant tumors. It has been reported in brain tumors, hepatic tumors and lymphoproliferative disorders e.g. Hodgkin lymphoma (2, 15). However, the correlation between palmar erythema and cancer seems to be infrequent. Palmar erythema due to therapeutic regiments for neoplasia will be discussed later.

## Plantar erythema

Juvenile plantar dermatosis and shoe dermatitis are secondary causes of isolated plantar erythema. As with palmar erythema, it is also important to be differentiated from the physiologic diffuse red mottling over the entire plantar surface. These two clinical entities are included because of the clinical relevance. They both, however, present mainly with scaling and therefore can't be considered as mere plantar erythema.

Juvenile plantar dermatosis (JPD), chapped fissured feet or sweaty sock syndrome, appears with shiny or glazed erythema, increased skin markings and fissuring of the dorsal and plantar aspects of the forefeet. The rash is mainly scaling. Children complain of pain but not of itching. Some children who have JPD will exhibit features of atopic dermatitis. JPD generally occurs between the age of 3 to 14 years (16). The cause is not yet known, however some believe it to be a frictional dermatitis. The treatment consists of avoiding skin irritants, the administration of petroleum jelly and in severe cases topical glucocorticosteroids (16).

Shoe dermatitis, a form of allergic contact dermatitis, appears as a pruritic inflammation with redness and usually scaling on the toes and dorsa of feet and less frequently, on the soles of feet. The soles are often spared because the thickness of the skin is more resistant to allergens. It can appear at any age. Avoidance of the causative agent is necessary and results in resolution in 2 to 3 weeks (16).

## Palmoplantar erythema

Most causes of palmoplantar erythema are secondary and can be infectious, atopic, autoimmune or drug-induced.

### Infectious

A well-known entity is the papular-purpuric gloves and socks syndrome (PPGSS), which may present as erythema on the hands and feet in a gloves and socks distribution. It can also manifest as purpuric papules on the soles of feet. It is described in infections with parvovirus B19, Epstein Barr virus, cytomegalovirus and Mycoplasma pneumonia (17-21). In young children, hands may be more involved than feet. In addition, the petechial component may be less prominent in children (22).

PPGSS caused by Epstein Barr virus may present as a maculopapular eruption that is initially located on the trunk and then extends to the face and extremities. Other possible presentations are an urticarial eruption, a scarlatiniform eruption and a vesicular or purpuric eruption (19, 20, 23). Treatment is symptomatic. Spontaneous resolution occurs in several weeks.

The typical hand foot mouth disease (HFMD, most commonly caused by coxsackievirus CVA16 or enterovirus EV71) also presents as a maculopapular rash. It typically involves the face, trunk, breech, arms, legs, palms and feet. The rash can turn into vesicles and there is usually a history of fever. The atypical presentation of HFMD caused by coxsackievirus CVA6 is generally observed in children younger than 5 years and presents as lesions of the oral mucosa, palms and soles (22-25). Spontaneous resolution can be expected within 2 weeks.

Erythema infectiosum is the most common manifestation of parvovirus B19. It is typically associated with an erythematous rash on the trunk and extremities, including palms and soles and knows a spontaneous resolution within weeks (22, 26).

Involvement of the palms and soles in secondary syphilis is common. It usually begins as small macular lesions that evolve into macular brownish red papules (27). Treponema pallidum infection within the first 4 months of life causes a palmoplantar erythema that is often accompanied by bullae on the soles. The palmoplantar erythema has a shiny appearance and subsequently results in desquamation. Antibiotic treatment should be administered (2).

Palmar and plantar erythema has been observed in our centre in a 5-month-old and a 4-year-old girl infected with respiratory syncytial virus (RSV, figure 1) and adenovirus (figure 2), respectively. The erythema in the RSV infected infant presented 1 week after the acute clinical phase, initially as an erythema on the trunk and shoulders and subsequently as palmar and plantar erythema. The onset of the palmoplantar erythema in the preschool child infected with Adenovirus was after 3 days of fever. Differentiation with exanthema subitum should be made. Treatment is supportive. There was spontaneous resolution within 2 weeks in both cases.

Human parechovirus-3 infection presents typically with an erythematous rash that is limited to the palms and soles and is associated with hyperferritinemia. The palmoplantar erythema appears on day 3 to 5 after the onset of fever and most frequently occurs in infants below the age of 3 months. Due to the association between human parechovirus-3 and sepsis-like illness and/or meningoencephalitis, it is important to differentiate with exanthema subitum given the very similar clinical picture. Nevertheless, exanthema subitum commonly spares the extremities. The distinction with Kawasaki disease is sometimes difficult. Kawasaki disease is more common in toddlers and not in neonates (28, 29). Spontaneous resolution of the rash can be expected and treatment is supportive.

Meningococcal septicemia often presents with fever and dermatitis in infants and young adults. The rash may be maculopapular, petechial or purpuric and can involve the palms and soles. It is not considered as mere palmoplantar erythema but must be included in the differential diagnosis. The recognition is of primordial importance since the presence of a rapidly progressive hemorrhagic dermatitis, usually starting on the lower extremities, is mostly indicative of sepsis. Antibiotics should be administered immediately (27, 30). The toxic shock syndrome, caused by Staphylococcus aureus or group A Streptococcus, can present as palmar erythema, mostly together with palmar edema. Plantar erythema can also be present(27). Antibiotics

**Figure 1 :** *Palmoplantar erythema in a child with respiratory syncytial virus.*

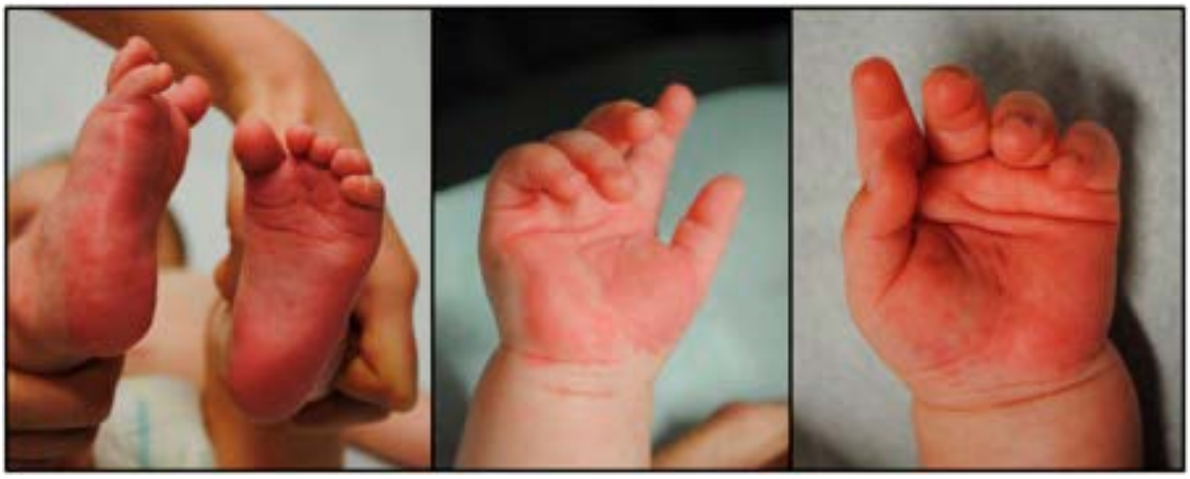
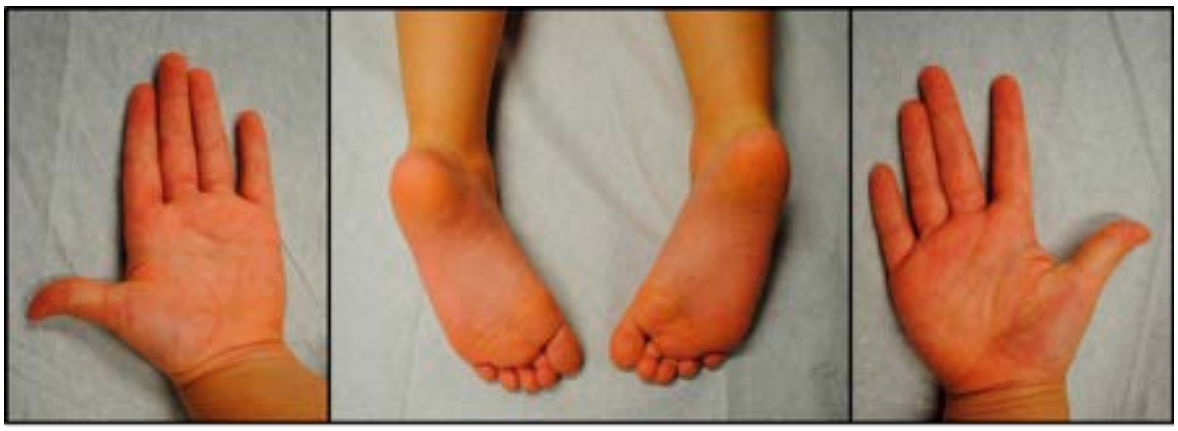


**Figure 2 :** *Palmoplantar erythema in a child with adenovirus.*



should be urgently administered. Another important disease to recognize is the Rocky Mountain spotted fever (RMSF), given a 23% mortality when the start of treatment with antibiotics is delayed. It is caused by the intracellular bacterium Rickettsia rickettsi which is endemic in the South Atlantic, the Pacific and West South-Central part of the United States. It has a median incubation period of 7 days and up to 95% of children develop a rash within the first 2 days of illness. It typically presents with fever, rash and history of tick exposure. The rash consists of 1 to 4 mm erythematous blanching macules of the ankles and wrists that can spread centripetally to involve the trunk. It involves the soles and palms in 65% of cases. In two-third of the pediatric RMSF cases with rash, the child develops petechiae. Screening for tick exposure and recent travel in endemic areas may facilitate an early diagnosis (27, 31). Antirickettsial therapy should be administered.

In children in the late phase of SARS-CoV-2 infection, a Kawasaki-like hyperinflammatory syndrome has been observed. The child presents with persistent fever and mucocutaneous involvement as seen in Kawasaki disease (among which palmoplantar erythema) and other symptoms like prodromal diarrhea, capillary leak syndrome and myocardial dysfunction (32). Neri et al. described an increase in palmar and plantar erythema during the COVID-19 pandemic. An association with SARS-CoV-2 infection however is not yet demonstrated (33).

Erythema of the palms and soles is also observed in measles and varicella. It is rarely observed in exanthema subitum, chikungunya, rat bite fever caused by Streptobacillus moniliformis, ehrlichiosis and murine typhus (22, 27, 30, 34, 35).

#### Atopic

In atopic dermatitis, palmoplantar erythema is a frequent finding. This involvement is even included in the minor diagnostic features of atopic dermatitis (36, 37). It can manifest on the palms as pronounced, erythematous maculae or reticulated erythema surrounding pale, angiospastic foci (36). In the study of Lee et al., where the presentation of atopic hand-foot dermatitis was investigated in 108 children with atopic dermatitis, about half of the children had both hand and foot dermatitis, and 43% showed solely foot involvement. The age of onset of hand-foot dermatitis was between the age of 3 and 5 years. Genetic factors play an important role in the pathogenesis of atopic dermatitis. Cholinergic hyperreactivity and susceptibility to cutaneous irritation are also believed to play an important role. Hand-foot dermatitis is mostly caused by irritation and related to nonallergic etiology (37, 38).

The study of Schuster et al. showed an increased tendency to vasoconstriction and decreased circulation of the small blood vessels both in atopic dermatitis affected skin areas as well as disease-free skin areas. The vascular pattern of the palms was not associated with other clinico-morphological features like inflammatory infiltration, papules, vesicles or clinical symptoms like itching or burning (36). Treatment is mainly local, with hydrating regiments and, depending on the severity, dermocorticoids.

#### Autoimmune

Systemic arthritis, also called adolescent-onset Still disease, accounts for 5–15% of children with juvenile idiopathic arthritis. It is characterized by arthritis with daily fever for at least 2 weeks that follows a quotidian pattern and at least one of the following features: an evanescent, erythematous rash, generalized lymphadenopathy, hepatomegaly, splenomegaly or serositis (39). Cutaneous findings occur in 90% of the patients manifesting as well-circumscribed, transient, non-pruritic, salmon-pink, macular or urticarial rash over the trunk, neck and proximal extremities (39, 40). The lesions can also develop on the face, palms or soles and they typically occur during the daily fever spikes together with joint pain or fatigue (39-41). It is frequently observed over pressure areas and can be associated with marked dermatographism or Koebner phenomenon. This may help in differentiating the rash from drug-induced or viral exanthemas (39). Referral to a rheumatologist is indicated.

Kawasaki disease is an important vasculitis with systemic symptoms in the young child and risk of coronaropathy if not recognized. It has a typical presentation with fever, conjunctival injection, oral involvement, acute cervical adenopathy, polymorphous rash and changes in the extremities (figure 3). Erythema of the palms and soles often occurs in the acute phase. A firm and sometimes painful induration of the hands or feet may also occur (42). Recent case reports describe an association between Kawasaki disease and COVID-19 (SARS-CoV-2) in children, which makes the recognition of this disease even more important (43). Administration of intravenous immunoglobulins and aspirin is indicated as soon as possible after diagnosis.

In graft-versus-host disease, cutaneous manifestations are often one of the first symptoms. Erythema on the palmoplantar regions is commonly preceded by a burning sensation or pruritus. In case of graft-versus-host disease after bone marrow transplantation, palmoplantar erythema manifests typically between day 7 and day 21. As the disease progresses, the maculopapular exanthema can involve the thorax, neck and cheeks. It can also lead to a violaceous coloration of the ears. Urgent referral to the attending hematologist is indicated (44).

#### Drug-induced

Chemotherapy induced acral erythema (hand foot syndrome, palmar-plantar erythrodysesthesia) is a symmetric, painful erythema of the palms and soles, which progresses to blistering and desquamation. It usually appears within 1 day to 3 weeks of initiation and resolves within 1 to 2 weeks after discontinuation of chemotherapy. Numerous chemotherapeutic agents have been described, including 5-fluorouracil, cytarabine, methotrexate, cyclophosphamide, paclitaxel, mercaptopurine, mitotane, hydroxycarbamide, etoposide and doxorubicin. Methotrexate is the most commonly implicated agent in children (45).

Erythema of the palms and soles rarely presents in children with drug reaction with eosinophilia and systemic symptoms syndrome (DRESS syndrome) (46-49).

## Approach to a child with palmar and/or plantar erythema

#### Recommended Investigations

In children with palmar or plantar erythema, a thorough history is paramount and should include the initial presentation, evolution and associated symptoms of the erythema. A careful family history should not be forgotten since some types of erythema have a genetic cause. This should be followed by a complete clinical examination with attention for the erythema but also for associated symptoms. Attention for specific clinical features and possible risk factors can facilitate adequate diagnosis. For example, a child with a history of transplantation that presents with palmoplantar erythema, should always receive further investigations to rule out graft-versus-host disease. In a child presenting with conjunctivitis, lymphadenopathy, fever for more than 5 days and palmoplantar erythema, the possibility of Kawasaki disease should be considered.

When the patient presents solely with plantar erythema, no further examinations are required given the known benign nature of isolated plantar erythema. However, further investigations in patients who present with persistent palmar or palmoplantar erythema without any clues are strongly recommended. Although most forms of PE have a good prognosis, in some cases the occurrence of palmar and/or plantar erythema can be an important presenting feature of a possibly life-threatening condition (e.g. cancer).

A blood sample can help to rule out the most frequent causes of PE. In table 2, a comprehensive but still incomplete list of recommended tests can be found. It can be used to guide clinicians in tackling the diagnostic odyssey for PE.

When the initial investigations are normal, more targeted investigations may be necessary, especially when there is a high clinical suspicion for a particular underlying disease. For example, in patients with respiratory symptoms, a polymerase chain reaction test (PCR test) for Mycoplasma pneumoniae and, depending on the clinical picture, a chest X-ray should be performed. In a neonate with PE with a mother with an unknown infection status, a serologic test for congenital syphilis should be done.

#### Therapy

In patients with primary PE, no treatment is indicated. If the erythema is secondary, the patient is treated according to the identified underlying cause.

For example, in Kawasaki disease, intravenous immunoglobulins and aspirin should be administered.

## Conclusion

The finding of PE in children is an important clinical sign and should not be disregarded or neglected. It has an extensive differential diagnosis with mostly reassuring causes such as viral infections that do not require treatment. However, palmar and or plantar erythema can be an important sign that indicates the presence of a possibly life-threatening underlying condition. Hence the strong recommendation for further investigations when a thorough anamnesis and clinical examination raise even the slightest suspicion for a possible underlying cause (table 2).

This article aims to remind the clinician of the significance of the presence of erythema on the palms and soles of the child. It aims to help undertake the necessary action in excluding a possible underlying cause of the encountered erythema, depending on the clinical suspicion. Overall, it is clear that cases of palmar, palmoplantar and especially plantar erythema are still largely underreported.

The lack of mentioning the presence of erythema of the palms and soles in most studies, the assumption that erythema of the palms and soles is almost always likely due to a physiologic pressure reaction and the lack of knowledge about PE as a clinical entity make the recognition and undertaking of appropriate action difficult. There is a major need for more research to confirm known associations (e.g. between PE and DRESS syndrome) and to discover new associations to have a more comprehensive view of the prevalence, epidemiology, therapy and prognosis of the child with PE. Overall, the therapy and prognosis are largely dependent on the underlying cause of PE.

The global awareness for PE is rising and should continue to rise given the possibly life-threatening underlying causes. Case reports play a very important role in the further exploration and identification of PE as a clinical symptom in different pathologies. Their publication on this issue should therefore be encouraged.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

**Figure 3:** *Palmoplantar erythema in a child with Kawasaki disease.*

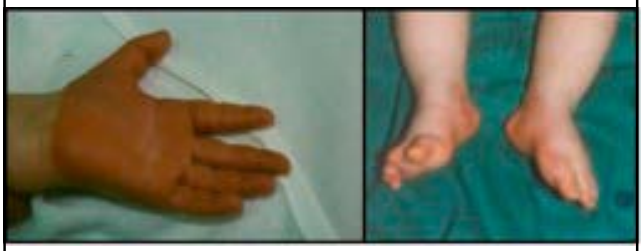


**Table 2 :** *Recommended investigations in a child with PE where an indication for further diagnostic investigation is present.*

| Location | Investigation type | Specific tests | Associated disease |
|---|---|---|---|
| Palmoplantar | Laboratory | Complete blood count, CRP | Infectious |
| | | Liver function test (AST, ALT, GGT), Bilirubin, APTT, PT, fibrinogen, INR, Vitamin K | Liver dysfunction<br>Viral infection |
| | | RF, ANA, anti-CCP, anti-SSA, anti-SSB, HLA-B27 | Juvenile idiopathic arthritis |
| | | Rapid plasma reagin, Fluorescent treponemal antibody absorption assay | Syphilis (congenital) |
| | | Serology Ricketssia antigen, VZV antigen, Chikungunya, Parvovirus IgM/IgG | RMSF , Varicella, Chikungunya<br>PPGSS |
| | | Proalbumin, Albumin, ESR | Kawasaki |
| | Blood culture | Aerobe and anaerobe tube | Meningococcal septicemia, Rat bite fever |
| | Nasopharyngeal aspirate | Viral and bacterial PCR | Mycoplasma pneumoniae infection, SARS-Cov-2 infection, Enterovirus infection, RSV, Human Parechovirus 3, Hand foot mouth disease, PPGSS |
| | Imaging | Cardiac ultrasonography | Kawasaki disease |
| | | Chest X-ray | Mycoplasma pneumoniae |
| | Anatomopathological | Bone marrow biopsy | Lymphoproliferative disease |
| Palmar | Laboratory | Complete blood count | Infectious |
| | | Ferritin, Iron | Hemochromatosis |
| | | (Fasting) glucose, HbA1C | Diabetes mellitus |
| | | TSH, (T4, T3) | Thyrotoxicosis, Graves |
| | | Bilirubin (total + direct), Alkaline phosphatase, GGT | Cholestasis |
| | | Ceruloplasmin, Cu, MRI | Wilson disease |
| | | ANA, anti-Sm, anti-DNA, anti-ENA (anti-SSA, anti-SSB), anti-RNP | Systemic lupus erythematosus |
| | | Anti-human t-lymphotropic virus-1 IgM, IgG | Juvenile Human T-lymphotropic Virus-1 associated myelopathy |
| | | Serology: Hepatitis C, Hepatitis B, Epstein-Barr Virus, Rickettsia Ag, SARS-Cov-2 | Hepatitis, Epstein-Barr virus infection, RMSF, PPGSS, Erythema infectiosum, SARS-Cov-2 infection |
| | Blood culture | Aerobe and anaerobe tube | Toxic shock syndrome |
| | Imaging | Abdominal ultrasonography | Lymphoproliferative disease, Liver cirrhosis |
| | | CT chest, abdomen, pelvis | Neoplasia |
| | | MRI brain | Neoplasia, Hemochromatosis |

*CRP (C-reactive protein), AST (Aspartate aminotransferase), ALT (Alanine aminotransferase), GGT (Gamma-glutamyl transferase, APTT (Activated partial thromboplastin time), PT (Prothrombin time), RF (Rheumatoid factor), ANA (Anti-nuclear antibodies), anti-CCP (Anti-cyclic citrullinated peptide), anti-SSA (Anti-Sjögren syndrome related antigen A), anti-SSB (Anti-Sjögren syndrome related antigen B), HLA-B27 (Human Leucocyte Antigen), VZV (Varicella zoster virus), RMSF (Rocky Mountain Spotted Fever), PPGSS (Papular-pruritic gloves and socks syndrome), ESR (Erythrocyte sedimentation rate), RSV (Respiratory syncytial virus), HbA1C (Hemoglobin A1C), TSH (Thyroid stimulating hormone), Cu (Copper), MRI (Magnetic resonance imaging), ANA (Antinuclear antigen), anti-Sm (Smith antibody, specific marker for systemic lupus erythematosus), anti-ENA (Extractable nuclear antigen antibody), anti-RNP (Ribonucleoprotein antibody).*

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