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Managing an Atypical Case of Pediatric Cutaneous Polyarteritis Nodosa: Clinical Perspectives Managing Rare Presentation of Cutaneous Polyarteritis Nodosa in Pediatric Patient: Insight from a Case Study

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Abstract

Cutaneous polyarteritis nodosa is a rare form of necrotizing vasculitis affecting small and medium-sized arteries, characterized by localized inflammation and ischemia without systemic organ involvement. This case report highlights a 7-year-old girl who presented with severe cutaneous manifestations, including digital necrosis and livedo reticularis, accompanied by arthralgia and myalgia. Laboratory findings revealed elevated inflammatory markers and a high anti-streptolysin O titer, indicating a possible post-streptococcal etiology. Angiographic evidence confirmed arterial occlusion in the left hand. The patient was treated with high-dose intravenous methylprednisolone, anticoagulation, and long-term methotrexate, resulting in symptom resolution and sustained remission over one year. This case emphasized the importance of prompt recognition, diagnosis, and multidisciplinary management of cutaneous polyarteritis nodosa to prevent and improve outcomes.

1. Introduction

Polyarteritis nodosa (PAN) is a rare inflammatory disease characterized by a necrotizing vasculitis affecting medium and/or small-sized vessels [1, 2]. In the general population, the prevalence rate of PAN is 30.7 per 100,000, while the incidence and prevalence of childhood PAN are still unclear, perhaps because of the rarity of the condition and the lack of reported cases. A study in southern Sweden showed that the incidence of childhood PAN was 0.7 per million children [3]. Epidemiologic study showed that childhood PAN occurs with a similar frequency in both sexes, with peak age ranges between 9 and 11 years [4].

The etiology of PAN is still unclear. It is hypothesized due to underlying autoimmune dysregulation and immune complex-mediated inflammation. It has also been associated with various antecedent infections, such as group A Streptococcus, and due to medications such as minocycline [1]. Although systemic manifestations and any organ system may be involved, PAN can manifest with cutaneous features only with no systemic involvement, called cutaneous PAN [4]. Cutaneous manifestations commonly found in cutaneous PAN vary from mild to severe symptoms, such as skin nodules, livedo reticularis, Raynaud's phenomenon, to skin ulceration and digital necrosis [4].

Cutaneous PAN usually has a milder clinical course compared with systemic PAN. However, sometimes the manifestation of cutaneous PAN can be presented with severe cutaneous manifestations such as tissue necrosis and affect quality of life, requiring early diagnosis and

Table 1. Laboratory examination results.

Laboratory examination	
Hemoglobin	11.8 g/dl
Hematocrit	37.1 %
Erythrocyte	4.52 million/mm
Leukocyte	15.7 K/mm^3
Platelets	593 K/mm^3
AST/ALT	24/33 IU/dl
BUN	23 mg/dl
Creatinine	0.92 mg/dl
Albumin	4,1 g/dl
ESR	80 mm/hour
CRP	203.5 mg/L
ASTO	400 U
C3	102 mg/dl
C4	88 mg/dl
ANA	negative
Anti-dsDNA	<10 IU/l
Urinalysis	Erythrocyte negative
	Leukocyte negative
	Protein negative
	Ketones negative

ANA, antinuclear antibody; ALT, alanine transaminase; AST, aspartate transaminase; BUN, blood urea nitrogen; dsDNA, double-stranded DNA; CRP, c-reactive protein; ESR, erythrocyte sedimentation rate;

more aggressive treatment [1]. In this case report, we will present the case of children diagnosed as cutaneous PAN with severe cutaneous manifestations such as digital necrotizing vasculitis with arthralgias and myalgias.

2. Cases

A 7-year-old Asian girl presented to the outpatient clinic with 14 14-day history of arthralgias and myalgias all over her body. She also felt pain in her fourth finger of her left hand for the last 7 days before her visit to our hospital. Her fourth finger looked pale at first, and it turned blue over time. She noticed a netlike pattern of reddish-blue skin discoloration at her right plantar pedis. No skin nodules were noticed in the patient.

There was no significant history or family history. She is developmentally appropriate for her age and has been fully immunized according to the national immunization schedule. Physical examination revealed cyanosis at her fourth finger of the left hand with decreased oxygen saturation to 67% and livedo reticularis at her right plantar pedis. The rest of her examination was normal. Extensive laboratory workup included complete blood count, inflammatory markers, liver and renal function, coagulation studies, urinalysis, and complement. Laboratory workup showed there was leukocytosis 15,700/mm, thrombocytosis 593,000/mm, increased erythrocyte sedimentation rate (ESR) 80 mm/hour, C-reactive protein (CRP) 203.5, and anti-streptolysin O (ASTO) 400. The rest of the laboratory results showed no abnormalities, including urinalysis. Laboratory examination can be seen in Table 1. MSCT angiography of the left arm showed occlusion of the artery at the level of the distal left ulnar and carpal region, the palmar digital artery was not filled, and the deep palmar arch was not filled with contrast due to thrombus. Histopathological findings of the area of livedo reticularis of the right plantaris pedis showed no evidence of necrotizing vasculitis in medium or small-sized arteries. Echocardiography shows no valvular abnormalities.

She was injected with a single dose of intramuscular benzathine penicillin G for Group A Streptococcus eradication and started on a course of high-dose intravenous methylprednisolone 10-30 mg/kg/day for three consecutive days and anticoagulant therapy (heparinization protocol) due to severe cutaneous manifestations. On the seventh day of the heparinization protocol, the oxygen saturation at her fourth finger of the left hand was gradually increased to 99%, and livedo reticularis at her right plantar pedis was dismissed. She was then prescribed oral methotrexate 10-15 mg/m^2/week as an immunosuppressant for 1 year, symptom-free, then tapered. She responded well to this regimen and had no active lesions at 1-year follow-up.

3. Discussions

Cutaneous polyarteritis nodosa (CPAN) is a necrotizing inflammatory vasculitis affecting small to medium-sized arteries and skin, muscles, and joints. Unlike systemic PAN, it doesn't involve any visceral organ and has no systemic involvement (except for myalgia, arthralgia, and non-erosive arthritis) [1, 4]. In the early course of the disease, it often shows non-specific signs and symptoms such as myalgia, arthritis, malaise, and fever, then followed by symptoms that indicate inflammation of the target blood vessel walls [2].

The presented case highlights the importance of early recognition and appropriate management of CPAN, particularly when severe cutaneous manifestations such as digital necrosis are present. Although CPAN generally has a milder course compared to systemic PAN, the potential for severe localized ischemia, as seen in this case, emphasized the need for prompt intervention to prevent long-term sequelae.

The primary diagnosis of CPAN was established based on European League Against Rheumatism/Pediatric Rheumatology International Trials Organization/ Pediatric Rheumatology European Society (EULAR/PRINTO/PRES) 2008 classification criteria for PAN, that is, histopathology (necrotising vasculitis in medium or small-sized arteries) or angiographic abnormalities

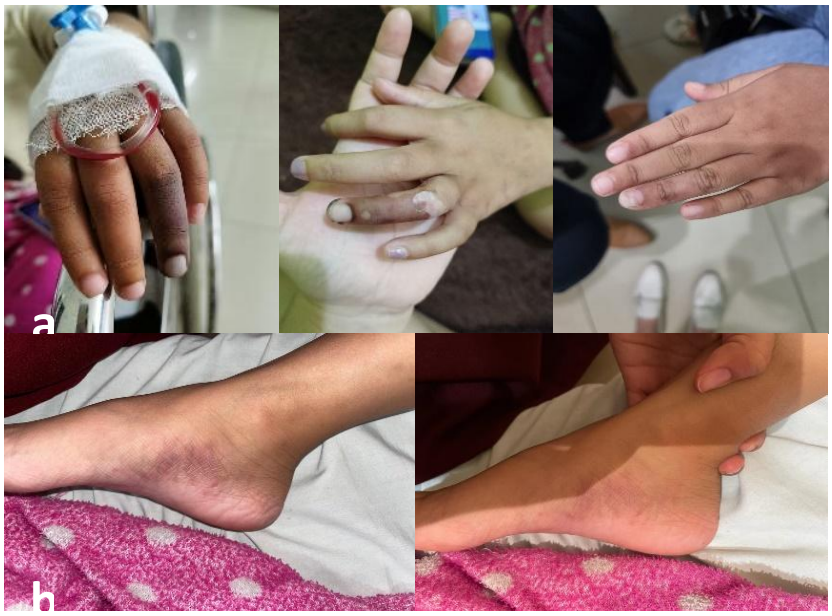

Figure 1. Patient's clinical manifestation progression from the onset of symptoms to the completion of treatment: a) digital infarction; b) livedo reticularis.

(aneurysm, stenosis, or occlusion of a medium or small-sized artery, not due to fibromuscular dysplasia, or other non-inflammatory causes) as mandatory criteria plus one of the five criteria, such as skin involvement, myalgia/muscle tenderness, hypertension, peripheral neuropathy, and renal involvement [5].

The diagnosis of CPAN in this patient was based on clinical manifestation criteria that consisted of MSCT angiography showing occlusion of the artery at the level of the distal left ulnar and carpal region, plus there was skin involvement (livedo reticularis, skin infarction) and muscle tenderness. The absence of systemic organ involvement further supports the diagnosis of CPAN rather than systemic PAN [5, 6]. Although the histopathological findings from the skin biopsy of the area of livedo reticularis did not reveal necrotizing vasculitis, this may be attributed to sampling from an area where active inflammation had already resolved, a known limitation in the diagnostic process for vasculitis.

The elevated inflammatory markers, including ESR, CRP, and leukocytosis, in this patient reflect CPAN's underlying inflammatory process characteristic. The high ASTO titer suggests a possible post-streptococcal etiology, which has been reported and is consistent with the findings in Yamamoto et al. in 2013, highlighting the role of *Group A Streptococcus* infection in triggering CPAN [6, 7]. Streptococcal infection is hypothesized to trigger an immune-mediated inflammatory response, leading to vascular damage in genetically predisposed individuals. This finding emphasized the importance of screening for potential infectious triggers in patients, as it may guide adjunctive treatment strategies.

The management in this case was tailored to address the severity of the cutaneous manifestations and the underlying inflammatory process. The use of high-dose intravenous methylprednisolone effectively reduced the acute inflammatory response. At the same time, initiating anticoagulation with heparin played a critical role in improving perfusion to the affected digit [2, 8]. Early recognition and aggressive treatment of digital ischemia are crucial to prevent progression to irreversible tissue damage or amputation. The clinical progression of cutaneous manifestations of CPAN in this patient can be seen in Figure 1.

Long-term immunosuppressive therapy with methotrexate was initiated to maintain remission and prevent disease recurrence. Methotrexate is considered a safe and effective treatment option for CPAN, particularly in children, as it offers both anti-inflammatory and immunosuppressive effects [2, 8, 9]. This approach achieved sustained remission in the patient, with no active lesions observed at the 1-year follow-up. The resolution of livedo reticularis and restoration of oxygen saturation in the affected finger during treatment demonstrate the effectiveness of the chosen therapeutic regimen. This case highlights the potential for favorable outcomes in pediatric CPAN when providing timely and comprehensive treatment.

In cases where conventional therapies fail, TNF-α inhibitors such as infliximab, as reported by Do et al. in 2019, can provide significant clinical improvement [1].

While this patient responded well to high-dose corticosteroids, anticoagulation, and methotrexate, refractory cases of CPAN may benefit from biological therapies targeting specific inflammatory pathways. TNF-α inhibitors could be considered for patients unresponsive to standard treatment.

The rarity of CPAN in children poses a challenge in establishing standardized treatment protocols, and much of the current understanding is extrapolated from adult studies and limited pediatric case reports. Further research and case series are needed to better understand pediatric CPAN pathophysiology, optimal treatment strategies, and long-term outcomes.

4. Conclusions

This case emphasizes the need for a high index of suspicion for CPAN in children presenting with localized ischemic symptoms and systemic inflammatory markers. Prompt diagnosis using clinical and angiographic criteria, coupled with aggressive management of inflammation and ischemia, is essential to improve outcomes and prevent complications. Early recognition and appropriate intervention, including immunosuppressive therapy and anticoagulation, are critical to mitigating disease progression and preventing long-term sequelae. This case also underscores the value of a multidisciplinary approach to managing rare pediatric vasculitis to optimize patient outcomes.

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