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ORIGINAL ARTICLE

Kawasaki disease and Henoch–Schönlein purpura – 10 years' experience of childhood vasculitis at a university hospital in Taiwan

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Background/Purpose: To investigate the clinical manifestations, disease activity and prognosis in different types of vasculitis.
Methods: The charts of pediatric patients with vasculitis diagnosed from December 1997 to December 2007 were retrospectively reviewed. The first clinical manifestations and laboratory results were recorded at the time of diagnosis, and outcome evaluations with history of flare-ups were analyzed.
Results: A total of 508 vasculitis patients were included in this study, of whom 124 had Henoch–Schönlein purpura (HSP), and 351 had Kawasaki disease (KD). Hematuria was observed in 79% of recurrent HSP patients at the time of diagnosis, and was associated with an increased risk of relapse ($p = 0.000$). In Kawasaki disease, the clinical symptoms with erythematous changes in Bacille Calmette-Guérin scars and coronary artery dilatation were more prominent in patients younger than 1 year old, and lymphadenopathy was more common in patients older than 1 year old ($p = 0.001$). The risk of coronary dilatation was significant in the patients with an initial presentation of thrombocytosis, and greater in patients younger than 1 year old ($p = 0.027$). Thrombocytopenia was more prominent in vasculitis-associated autoimmune diseases. Marked lymphocytosis with increased C-reactive protein levels was significantly noted in urticarial vasculitis patients compared with HSP patients in multivariate logistic regression analysis.

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Conclusion: Vasculitis disease activity and prognosis were associated with initial laboratory results and clinical manifestations. Further large-scale clinical trials are warranted to validate these findings.

Introduction

Vasculitis in childhood is a result of causes ranging from idiopathic conditions with primary vessel inflammation to syndromes after exposure to recognized antigenic triggers such as infectious agents and drugs causing hypersensitivity reactions. Vasculitis is also a component of many autoimmune diseases.

Childhood vasculitides are complex, multisystemic diseases,,and include many different types of disease. Vasculitis is generally classified as primary, secondary or incidental. It is an inflammatory process mediating destruction of the vessel walls by unknown causes, leading to hemorrhage, ischemia and/or infarction.[1,2] Primary vasculitis syndromes include systemic and cutaneous variants, such as idiopathic cutaneous leukocytoclastic vasculitis, Henoch—Schönlein purpura (HSP), Wegener's granulomatosis (WG), and Churg—Strauss syndrome (CSS). Secondary vasculitis syndromes include vasculitis associated with autoimmune diseases, infections, drug eruptions, malignancies and others involved in small-vessel vasculitides. Incidental vasculitis represents a localized histological finding that is the consequence of another pathology, such as traumatic ulceration or diffuse neutrophilic infiltration[1,2] (Table 1).

Takayasu arteritis (TA) is the third-most common form of childhood vasculitis worldwide after HSP and Kawasaki disease, with a 2.5:1 female:male ratio. About one-third of cases have an onset before 20 years of age, and symptoms usually appear after 10 years of age, although children as young as 8 months have been affected.

Kawasaki disease (KD) is an acute febrile vasculitis of childhood. Approximately 20% of untreated patients develop coronary artery abnormalities. The cause of the illness remains unknown, but epidemiological and clinical features strongly support an infectious origin. The illness occurs predominantly in young children, and 80% of patients are less than 5 years of age. Kawasaki disease causes severe vasculitis of all blood vessels, but predominantly affects the medium-sized arteries. Prolonged fever is prognostic for the development of coronary artery disease, and perineal desquamation has also been noted in the acute phase.

Henöch-Schonlein purpura (HSP), also known as anaphylactoid purpura, is a common vasculitis of small vessels with cutaneous and systemic complications. It is the most common cause of nonthrombocytopenic purpura in children. The etiology is unknown, but HSP often follows an upper respiratory tract infection. HSP occurs more frequently in children, with most cases occurring between 2 and 8 years of age, and most frequently in the winter months. The overall incidence is estimated to be 14/100,000population, and males are affected twice as frequently as females. Arthritis, present in more than two-thirds of children with HSP, is usually localized to the knees and ankles, and appears to be concomitant with edema. Edema and damage to the vasculature of the gastrointestinal tract may also lead to intermittent abdominal pain that is often colicky in nature. Renal involvement occurs in 25—50% of children and manifests with hematuria, proteinuria, or both. The major complications of HSP are renal involvement, including nephrotic syndrome, and bowel perforation. One population-based study indicated that 4% of patients with HSP develop persistent renal disease and less than 0.1% develop serious renal disease.

Wegener's granulomatosis (WG) is a necrotizing granulomatous small-vessel vasculitis that occurs at all ages and often involves the upper airways, lower respiratory tract and kidneys. Although most cases occur in adults, children can develop WG with a mean age at diagnosis of 6 years, but it may present as early as 2 weeks of age. There is a female predominance of 3:1.

Churg—Strauss syndrome is a vasculitis that can cause chronic sinus lesions. Diagnostic criteria include a history of asthma, circulating eosinophilia and an eosinophilic cutaneous vasculitis that often involves lymphadenopathy.

There is little information showing an association of disease activity and prognosis with initial laboratory results and clinical symptoms. In this study, we aimed to investigate this possible association and find factors at the time of diagnosis that were predictive of relapse, and differentiate their prognostic relevance on the basis of the type of childhood vasculitis.

Methods

Patients

We retrospectively reviewed the charts of vasculitis patients (onset age $<$18 years) who were admitted to the Pediatric Rheumatology Ward of the National Taiwan University Hospital, a tertiary referral center, from December 1997 to December 2007, and who satisfied the 1990 American College of Rheumatology (ACR) criteria based predominately on clinical findings and/or the Chapel Hill Consensus conference (CHCC),[3] which is based on pathologic criteria for vasculitis. Urticaria vasculitis patients were diagnosed by skin biopsy results, and the diagnosis of infection associated vasculitis was dependent on pathogen culture results or serologic reports. All patients were ethnic Chinese. The demographics, clinical features, diagnostic evaluations and outcomes of the patients were recorded. Patients were excluded from the

Table 1 Classification of vasculitis

Class	Name	Pathophysiology	Characteristics	Associated disease
Large-vessel vasculitis	Giant cell arteritis	Granulomatous inflammation	Most common over 50 years old	Associated with polymyalgia rheumatica
	Takayasu arteritis	Granulomatous inflammation	Third-most common form of childhood vasculitis Pulseless disease	Associated with connective tissue, autoimmune, endocrine
Medium-vessel vasculitis	Kawasaki disease	Vasculitis of coronary arteries, aorta and veins may be involved	Occurs usually in children Potential aneurysm formation *The clinical features* of fever persisting for at least 5 days and plus the presence of at least four principal features: exanthem, conjunctival injection without exudate, changes in extremities (erythema or edema), changes in lip and oral cavity, and cervical lymphadenopathy($>$ 1.5 cm diameter), usually unilateral	Associated with mucocutaneous lymph node syndrome
	Rheumatoid vasculitis		Distal, symmetric polyneuropathy Occurs in patients who have longstanding rheumatoid arthritis	
	Angiitis of central nervous system		Repeat angiogram after 4—6 weeks	Evident on MRI/histopathology
Small-vessel vasculitis	Henoch-Schönlein purpura	Necrotizing inflammation, IgA-dominant immune deposits	Most common vasculitis in children Involves skin, gut, and glomeruli Palpable purpura	Associated with arthralgias or arthritis
	Hypersensitivity vasculitis (urticaria vasculitis)	Necrotizing inflammation Leukocytoclastic Small- to medium-vessel	Involves skin, joints 40% of these patients have angioedema which tends to be painful or burn	Associated with connective tissue diseases, autoimmune disorders, viral hepatitis, or as a paraneoplastic syndrome
	Wegener's granulomatosis	Granulomatous inflammation	Equal in men and women	Necrotizing glomerulonephritis common
		Necrotizing inflammation	Occurs in any age, but most cases occur in adults Strawberry gums are a classic sign	cANCA positive
	Churg—Strauss syndrome	Granulomatous or necrotizing inflammation (or both)	Upper respiratory tract, lungs, heart, peripheral nerves Asthma history	pANCA positive

ANCA = antineutrophil cytoplasmic antibody; IgA = immunoglobulin A; MRI = magnetic resonance imaging.

Table 2 Types of unspecific vasculitis

Case	Type	Age (y)/ gender	Clinical presentation	WBC (/μL)	Platelets ($\times 10^3$/μL)	Neutrophils (/μL)	Lymphocytes (/μL)	CRP (mg/dL)	ANA	C3/C4 (mg/dL)	Others
I	CSS	14/M	Asthma, sinusitis Pleural effusion Mononeuritis multiplex	8740	272	7307	1101	5.82	1:160	164/38	Eos: 25.5% IgE: 1822
II	HD	4/F	Fever Purpura Rash Medication at disease onset	2860	32	744	829	4.33	1:40	107/21	Biopsy: granulocytes in a perivascular location Eos: 23%
III	DIV	6/F	Purpura Arthralgia ALL under MTX control**	3040	269	1003	1368	3.97	N/A	N/A	N/A
IV	DIV	16/F	Purpura Arthralgia	7220	226	4282	2137	3.67	1:40	N/A	N/A
V	LV	11/F	Chronic, recurrent ulcers over bilateral lower extremities	4820	301	2612	1711	0.05	1:40	124/24	Biopsy: intraluminal thrombosis
VI	LV	14/F	Progressive erythematous change and ulceration over bilateral leg Purpura	7790	169	2392	4417	0.03	1:40	N/A	Biopsy: intraluminal thrombosis
VII	TA	6/M	Dyspnea Orthopnea Upper extremities weakness Subclavian steal phenomenon	16,700	293	13,410	1987	5.54	N/A	N/A	Arteriogram abnormality in descending arteries, left renal artery
VIII	VGI	10/F	Abdominal pain Weight loss	6720	260	3508	2822	0.07	1:40	133/19	Echo: normal
IX	VGI	9/M	Abdominal pain Duodenal ulcer Bloody stools	10,450	202	5998	3459	4.92	1:40	N/A	Echo: normal
X	UV	13/F	Purpura, arthritis	8740	272	7307	1101	5.82	1:2560	N/A	EBNA(+) RF:1:5120

(*continued on next page*)

Table 2 (*continued*)

Case	Type	Age (y)/ gender	Clinical presentation	WBC (/μL)	Platelets ($\times 10^3$/μL)	Neutrophils (/μL)	Lymphocytes (/μL)	CRP (mg/dL)	ANA	C3/C4 (mg/dL)	Others
XI	UV	10/F	Purpura, arthritis	8730	235	6600	1781	10.94	1:320	218/35	Biopsy: pandermal vascular damage with perivascular and periadenexa neutrophil infiltrate and nuclear debris
XII	UV	13/F	Purpura, ascending myalgia	4570	240	2253	2180	1.06	N/A	136/18	N/A

ALL = acute lymphoblastic leukemia; ANA =anti-nuclear antibodies; CRP = C-reactive protein; CSS = Churg–Strauss syndrome; DIV = drug-induced vasculitis; EBNA = Epstein–Barr virus nuclear antigen; Echo = echocardiography; Eos. = eosinophils; F = female; HD = hypersensitivity vasculitis; IgE = immunoglobulin E; LV = livedoid vasculitis; M = male; MTX = methotrexate; RF = rheumatoid factor; TA = Takayasu arteritis; UV = unspecific vasculitis; VGI = vasculitis of the gastrointestinal tract; WBC = white blood cells.

study if they were transferred from another hospital or clinic without a description of the initial presentation or laboratory results.

Diagnostic evaluation and follow-up

We recorded the diagnostic evaluation results at the time of vasculitis diagnosis and during vasculitis flares. A relapse was defined as the recurrence of clinical signs/symptoms or the occurrence of new symptoms after an initial remission, requiring the resumption of immunosuppressive therapy or an increased dose. Diagnostic evaluation included complete blood cell and differential cell counts, urinalysis, C-reactive protein (CRP), antinuclear antibody, anti-dsDNA antibody, serum C3 and C4 levels, erythrocyte sedimentation rate (ESR), antiphospholipid antibody (APA), and anticardiolipin antibody (ACA). APAs were assayed using an IMUCLONE aPL immunoglobulin (Ig) G enzyme-linked immunosorbent assay (ELISA) kit (American Diagnostica, Stamford CT., US) ACAs were assayed using AUTOZYME ACL anticardiolipin IgG and IgM sandwich immunoassays (Cambridge Life Sciences Ltd., Cambridgeshire, UK). Hematuria was defined as the excretion of more than ten red blood cells per high-power field in a centrifuged urine specimen and/or urine dipstick test OB $\geqq$ one plus.

We reviewed the clinical charts for any clinical or laboratory signs of remission or relapse at every visit and recorded the time from disease onset to diagnosis, and from diagnosis to first relapse.

Statistical analysis

Data with a normal distribution were expressed as the mean $\pm$ SD, and non-normally distributed data were expressed as the median (range). Between-group differences in categorical variables were examined using Fisher's exact test or the Chi-square test. For continuous data, a Student *t* test or analysis of variance (ANOVA) was employed. The Mann-Whitney U-test was used in non-normally distributed data. To investigate the prognostic significance of each demographic, clinical, and laboratory characteristic, we computed the relapse in the study population as a whole, using logistic regression analysis, with the time at risk starting from the time of the first remission in the case of the prognostic indicators of relapse (the outcome being the time to relapse after having censored the follow-up for the vasculitic process). Additionally, we performed the same tests after adjusting for the type of vasculitis. Statistical significance was defined as $p < 0.05$.

Multivariate analysis was performed to investigate the relationship between different types of vasculitis with adjustments for sex and age. We also verified whether the prognostic significance of each variable differed in relation to the type of vasculitis by applying the likelihood ratio test to the interaction term between each prognostic indicator and the variable indicating the type of vasculitis. The variables were entered by the enter variable selection method. Using a stepwise backward elimination procedure, we selected the variables that predicted the outcome with a *p* value less than 0.05 by the Wald test. No interaction term was included. All of the multiple regression models were refitted after inclusion of the type of vasculitis, which

Table 3 Distribution of the vasculitis patients

	HSP	CNS vasculitis	Urticaria vasculitis	VAAD	Infection vasculitis	Unspecific vasculitis
Cases	124	8	3	6	4	12
Age (y)	6.4 ± 3.2	8.6 ± 3.4	6.0 ± 4.6	9.3 ± 6.9	6.0 ± 5.6	10.5 ± 3.7
Gender						
Male	74 (59.7)	0	2 (66.7)	3 (50)	1 (25)	3 (25)
Female	50 (40.3)	8 (100)	1 (33.3)	3 (50)	3 (75)	9 (75)
Skin involvement	106 (85.5)	0	3 (100)	4 (66.7)	4 (100)	9 (75)
Kidney involvement						
Isolated urinary abnormalities	28 (22.6)	0	0	0	0	1 (8.3)
Impaired renal function	19 (15.3)	0	0	1 (16.7)	0	1 (8.3)

Categorical variables are shown as number (%) and continuous variables as mean values ± SD. Isolated urinary abnormalities were defined as the excretion of more than 10 red blood cells and/or white blood cells per high-power field in a centrifuged urine specimen and/or urine dipstick test OB/protein≧ one plus. Impaired renal function was defined as hematuria associated with at least two of the following: increased serum urea and creatinine levels, hypertension, and oliguria or massive proteinuria (>40 mg/m^2/h), hypoalbuminemia (<2.5 g/dL) and edema.
CNS = central nervous system; HSP = Henoch-Schönlein purpura; VAAD = vasculitis associated with autoimmune disease.

could potentially behave as a strong confounder in the relationship between each predictor and the outcome. All statistical analyses were computed using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).

Results

Distribution of vasculitis

According to the size of the predominant blood vessels involved, there were three types of vasculitis involved: (1) predominantly large-vessel vasculitides, including Takayasu arteritis and giant cell arteritis; (2) predominantly medium-vessel vasculitides, including classic polyarteritis nodosa, cutaneous polyarteritis nodosa, rheumatoid vasculitis, Kawasaki disease, and primary angiitis of the central nervous system; and (3) predominantly small-vessel vasculitides, which contained three subtypes: (a) immune-complex mediated, including cutaneous leukocytoclastic angiitis (hypersensitivity vasculitis), Henoch–Schönlein purpura and urticarial vasculitis; (b) antineutrophil cytoplasmic antibody (ANCA)-associated disorders, including Wegener's granulomatosis, microscopic polyangiitis, Churg–Strauss syndrome; and (c) miscellaneous small-vessel vasculitides, including connective tissue disorders, paraneoplastic diseases, infection, and inflammatory bowel disease.

Patient characteristics

A total of 508 vasculitis patients were included in this study: 351 (69%) with Kawasaki disease, 124 (24%) with HSP, eight (2%) with central nervous system (CNS) vasculitis, three (1%) with urticaria vasculitis, six (1%) with vasculitis associated with autoimmune disease (including three with systemic lupus erythematosus (SLE), two with juvenile rheumatoid arthritis (JRA), and one with juvenile dermatomyositis (JDM), four (1%) with infection vasculitis, and 12 (2%) with unspecific vasculitis (including two with drug-induced vasculitis, two with gastrointestinal vasculitis, one with Churg–Strauss syndrome, one with Takayasu disease, two with livedoid vasculitis, one with hypersensitivity vasculitis, and the remaining three with unspecific vasculitis) (Table 2). There were 212 (42%) female and 296 (58%) male patients. The mean ages at onset of different types of vasculitis are shown in Table 3. HSP occurred most

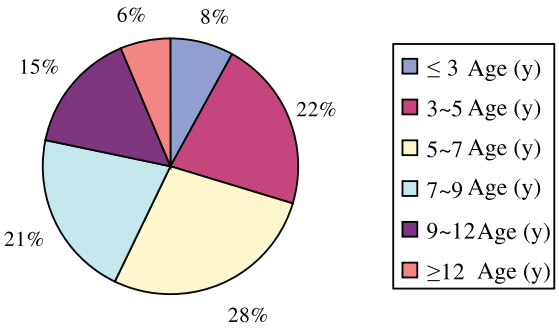

Figure 1. Demographics of Henoch-Schönlein purpura.

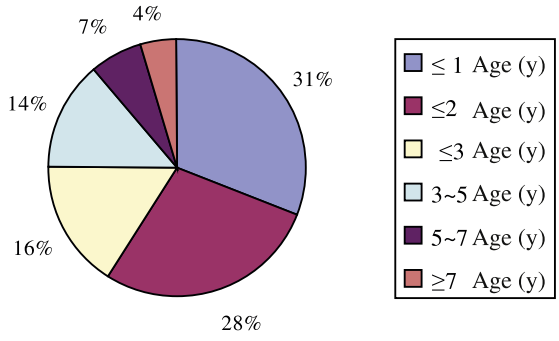

Figure 2. Demographics of Kawasaki disease.

Table 4 Different clinical features between patients less than 1 year old and older than 1 year old in Kawasaki disease

	≤1 year old	≥1 year old	Total	*p* value
Skin rash	86/109 (78.9)	196/242 (81.0)	282/351 (80.3)	NS
Conjunctivitis	92/109 (84.4)	197/242 (81.4)	289/351 (82.3)	NS
Lymphadenopathy	40/109 (36.7)	151/242 (62.4)	191/351 (54.4)	0.001
BCG scar erythema	50/109 (45.9)	39/242 (16.1)	89/351 (25.4)	< 0.001
Desquamation	55/109 (50.5)	98/242 (40.5)	153/351 (43.6)	NS
Oral symptoms	74/109 (68.2)	178/242 (73.6)	252/351 (71.8)	NS
Dilated CA	52/109 (47.7)	76/242 (31.4)	128/351 (36.5)	0.027
Pyuria	39/109 (35.8)	47/242 (19.4)	86/351 (24.5)	NS
GI symptoms	20/109 (18.3)	49/242 (20.2)	69/351 (19.7)	NS

Categorical variables are shown as number (%).
BCG = Bacille Calmette-Guérin; CA = coronary artery; GI = gastrointestinal; NS = nonsignificance.

frequently at a mean age of 5–7 years[10] (Fig. 1), and Kawasaki disease most frequently at a mean age of less than 2 years (Fig. 2). The most common type of vasculitis was HSP in outpatient clinics and most admissions were as a result of Kawasaki disease (69%). Interestingly all cases with CNS vasculitis were female. Renal involvement was more common in HSP patients compared with other types of vasculitis (Table 3). The male:female ratio found in our HSP group (1.00:0.72) was comparable to those of previous reports.[4] Skin rashes were seen as a first manifestation in 408/508 cases (80.3%). This finding was again comparable with earlier studies.[1,5,6] Gastrointestinal (GI) symptoms and signs preceded and/or were combined with the typical rash for a period of days in 49/124 (39.5%) of the patients. The most common complaint of GI involvement was abdominal pain, often associated with vomiting.[7,8] Joint involvement was noted in 31/124 (25%) of patients and characterized by warmth, tenderness and swelling of the joints, particularly the large joints (specifically the ankles and knees). Joint involvement left no permanent deformities.[9] Interestingly, we found that Bacille Calmette-Guérin (BCG) scar erythema and dilated coronary arteries were more significantly found in the patients aged less than 1 year who had Kawasaki disease, and lymphadenopathy was more prominent in the patients who were older than 1 year (Table 4). Thrombocytosis was more obvious in those who had coronary dilatation in Kawasaki disease (Table 5).

Prognostic factors for relapse

In terms of clinical features and laboratory indicators, joint involvement tended to relapse less frequently than the others, although the difference was not statistically significant ($p = 0.058$), whereas kidney disease was related to a higher risk ($p = 0.000$). Skin involvement (which was not observed in CNS vasculitis patients) appeared to have no effect on the prognosis of HSP ($p = 0.735$). Multiple regression analysis showed that renal involvement was an independent evaluation factor for relapse or disease activity in the HSP population. A decreased lymphocyte count and CRP level were prominent in HSP patients, especially compared with urticaria vasculitis. Thrombocytopenia was significant in vasculitis associated with autoimmune disease (VAAD) patients compared to HSP patients. Other laboratory data [white blood cells (WBC), neutrophils] were not significantly different between HSP and other types (Table 6). The hematuria group of HSP patients was more likely to experience recurrence than the non-hematuria group (Table 7). Kawasaki disease recurred in 1.5% of all cases, and occurred most frequently in the summer and least frequently in the winter. Huang et al[11] reported that coronary artery aneurysms occurred in 7.2% of all Kawasaki disease cases, and we found coronary artery dilatation in up to 36.5% of cases (128/351).

Discussion

The mechanism involved in the pathogenesis of vasculitis is still not well understood; however several lines of evidence suggest that immunological factors, including immune complexes might be implicated. In HSP patients, renal involvement, an important prognostic factor in long-term follow-up, is seen in only one-fifth of the patients.[12] Nephritis occurs in 15–50% of children with HSP,[12,13] and

Table 5 Association between laboratory results and coronary artery dilatation in Kawasaki disease

	With CAD	Without CAD	*p* value
White blood cells	17,046.58 ± 6593.65	12,661.35 ± 4937.18	NS
Platelets	436,530 ± 202,239	327,600 ± 115,683	0.002
Neutrophils	10,662.14 ± 5885.15	7701.12 ± 4052.31	NS
Lymphocytes	4527.14 ± 2629.79	3602.25 ± 2483.80	NS
C-reactive protein (mg/dL)	8.75 ± 5.20	6.35 ± 4.70	0.051

Categorical variables are shown as number (%) and continuous variables as mean values ± S.D.
CAD = coronary artery dilatation; NS = nonsignificance.

Table 6 Laboratory data for HSP, VAAD, CNS vasculitis, infection vasculitis and urticarial vasculitis

	HSP	VAAD	*p*	CNS vasculitis	*p*	Infection vasculitis	p	Urticaria vasculitis	*p*
White blood cells	12,006.13 ± 3538.64	10,220.00 ± 8391.40	NS	7045.00 ± 2962.71	NS	8949.50 ± 3342.89	NS	13,373.33 ± 10,834.73	NS
Platelets	355,630 ± 101,887	264,830 ± 125,888	0.037	279,750 ± 32,052	NS	380,750 ± 188,165	NS	433,000 ± 67,268	NS
Neutrophils	8303.72 ± 3548.92	6719.59 ± 6768.52	NS	3741.59 ± 1908.52	NS	6651.46 ± 3339.63	NS	4607.22 ± 1091.79	NS
Lymphocytes	2822.71 ± 1254.96	1864.15 ± 1148.12	NS	2627.85 ± 851.32	NS	1615.69 ± 402.90	NS	7740.88 ± 9445.74	0.030
C-reactive protein (mg/dL)	0.450 (0.00–14.33)	0.200 (0.04–6.52)	NS	0.185 (0.01–12.42)	NS	4.310 (1.06–12.00)	NS	6.480 (2.81–6.72)	0.010

p value shows the statistical data of the indicated vasculitis compared to HSP.
CNS = central nervous system; HSP = Henoch–Schönlein purpura; NS = nonsignificance; VAAD = vasculitis associated with autoimmune disease.

a substantial proportion of the patients show a delay of weeks or months in the onset of renal involvement. Fortunately, less than 1% of those with kidney involvement progress to end-stage renal disease.[10] Hematuria has been reported to be a common initial manifestation of renal disease, which is similar to our findings (28/124, 22.6%).[12] An increased recurrence rate in the HSP patients with early hematuria, as seen in our study, may easily trigger another episode, possibly because of immune complexes (IgA)[14]; however the role of complement activation is controversial. The etiology of HSP is unknown, but often follows an upper respiratory tract infection. Kidney disease in combination with the involvement of other systems such as cerebral and/or liver involvement is the most relevant predictor of a poor prognosis in primary small-vessel vasculitides.[15] Other clinical manifestations such as edema, gastrointestinal findings and recurrence rate in our study were similar to previous reports,[16] but joint manifestations were observed less frequently. There was a significant relationship between renal and joint manifestations in contrast to the findings of Mir et al.[17]

Of all patients presenting with chronic urticaria, less than 20% have urticarial vasculitis.[18] Urticarial vasculitis is a form of small- to medium-vessel vasculitis that presents with urticarial wheals. Up to 40% of these patients have angioedema, which persists for 24–72 hours and tends to be painful or with a burning sensation, lasting for several days, and healing with dyspigmentation or purpura. Systemic symptoms are not uncommon and diagnosis is usually made by histopathologic analysis.[18,19] In our study, we found an increase in CRP levels and lymphocyte predominance in most of the urticarial vasculitis patients.

About 22% of all cases of cutaneous vasculitis are associated with infection,[2] and it is likely that there is a common morphologic endpoint of several pathways, including immune complex formation, alternate pathways of complement activation, and endotoxin-mediated expression of vascular adhesion molecules.[1,19]

About 12% of cutaneous vasculitis cases are associated with an autoimmune disease, and an enhanced expression of vascular adhesion molecules attracting and activating neutrophils is suspected to play a role in the pathogenesis of VAAD.[20] Thrombocytopenia was more prominent among the VAAD patients in our study than any other group because of their underlying diseases.

In Kawasaki disease, there is little information showing the risk of coronary artery dilatation between different age groups. We found that the prevalence of coronary artery disease (CAD) in Kawasaki disease was more prominent in those patients who were younger than 1 year of age and had an initial laboratory result of thrombocytosis. So, the age group should be considered during treatment choice. The BCG scar erythematous change was considered in the clinical manifestation, and the relationship between BCG scar and genome type was discussed by Tsai et al,[21] but they did not discuss the relationship between BCG scar and age group.[21] Therefore, in this study we looked for factors that could affect the clinical presentation in different age groups.

In conclusion, this study showed that vasculitis disease activity and prognosis were associated with initial laboratory results and clinical manifestations at the first visit to our clinic, and may provide future outcome and treatment

Table 7 Relationship between recurrence and hematuria in Henoch–Schönlein purpura patients

	Recurrent[a]	Nonrecurrent	*p* value
Urine OB	15/20 (75%)	13/104 (13%)	<0.001
Stool OB	5/20 (25%)	22/104 (21%)	0.633
White blood cells	11,044.74 ± 4203.65	12,186.63 ± 3414.60	0.199
Platelets	336,470 ± 108,148	356,990 ± 99,010	0.414
Neutrophils	7915.18 ± 4095.09	8369.96 ± 3474.94	0.611
Lymphocytes	2365.66 ± 1059.80	2918.20 ± 1273.43	0.078
C-reactive protein	0.500 (0.00–10.01)	0.430 (0.00–14.33)	0.580
Arthralgia	1/20 (5%)	30/104 (29%)	0.052
Skin	18/20 (90%)	88/104 (85%)	0.735
Gastrointestinal symptoms	6/20 (30%)	43/104 (41%)	0.342

[a] Recurrence within 3 months from first remission.

considerations for patients with different kinds of vasculitis. As only a few cases of rare types of vasculitis were found in our investigation, further studies with larger numbers of patients are warranted to validate our findings.

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