

# Nervous system dysfunction in Henoch–Schönlein syndrome: systematic review of the literature

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**Objective.** CNS or peripheral nervous system dysfunction sometimes occurs in Henoch–Schönlein patients.

**Methods.** We review all Henoch–Schönlein cases published after 1969 with CNS dysfunction without severe hypertension and neuroimaging studies ( $n=35$ ), cranial or peripheral neuropathy ( $n=15$ ), both CNS and peripheral nervous system dysfunction without severe hypertension ( $n=2$ ) or nervous system dysfunction with severe hypertension ( $n=2$ ). Forty-four of the 54 patients were <20 years of age.

**Results.** In patients with CNS dysfunction without or with severe hypertension the following presentations were observed in decreasing order of frequency: altered level of consciousness, convulsions, focal neurological deficits, visual abnormalities and verbal disability. Imaging studies disclosed the following lesions: vascular lesions almost always involving two or more vessels, intracerebral haemorrhage, posterior subcortical oedema, diffuse brain oedema and thrombosis of the superior sagittal sinus. Following lesions were noted in the subjects with cranial or peripheral neuropathy without severe hypertension: peroneal neuropathy, peripheral facial palsy, Guillain–Barré syndrome, brachial plexopathy, posterior tibial nerve neuropathy, femoral neuropathy, ulnar neuropathy and mononeuritis multiplex. Persisting signs of either CNS ( $n=9$ ) or peripheral ( $n=1$ ) nervous system dysfunction were sometimes reported.

**Conclusions.** In Henoch–Schönlein syndrome, signs of nervous system dysfunction are uncommon but clinically relevant. This review helps clinicians managing Henoch–Schönlein syndrome with nervous system dysfunction.

**KEY WORDS:** Vasculitis, Henoch–Schönlein syndrome, Stroke, Posterior reversible encephalopathy syndrome, Peripheral neuropathy.

## Introduction

The characteristic clinical features of Henoch–Schönlein syndrome, the most common vasculitis disorder of childhood, include palpable purpura concentrated in dependent areas, arthralgia or arthritis, abdominal pain and glomerulonephritis [1, 2].

Headache is rather common in this small vessel vasculitis [1, 2]. More rarely, Henoch–Schönlein patients present with signs of either CNS or peripheral nervous system dysfunction. Reports available until the mid-seventies that deal with nervous system involvement in Henoch–Schönlein syndrome were aggregated by French authors in two reviews [3, 4]. Since imaging is currently integral to the diagnostic assessment of vasculitides affecting the CNS [5], we performed an extensive review of the literature dealing with nervous system dysfunction in Henoch–Schönlein syndrome. We included the patients with signs of CNS dysfunction, neuroimaging studies and those with cranial or peripheral neuropathy.

## Materials and methods

Between November 2008 and April 2009, we performed a thorough computer-based search of the terms anaphylactoid purpura, Henoch, Henoch–Schönlein, Schönlein, Schönlein–Henoch, nervous system, vasculitis and angitis in the US National Library of Medicine database and in the web-based search engine Google. Articles published after 1969 as full-length articles or letters in peer-reviewed scientific literature were considered. Pertinent secondary references were also reviewed. Reports published in languages other than English, French, German, Italian or Spanish were not included.

Using the above-mentioned research technique, we were able to accumulate 37 cases of Henoch–Schönlein syndrome with signs of CNS dysfunction without severe arterial hypertension and CT or MRI of the brain [6–42], which were published between 1983 and 2009. Henoch–Schönlein patients with headache but without any abnormal neurological signs were not included.

In two of the aforementioned 37 cases [12, 41], a concurrent involvement of the peripheral nervous system was noted. In 15 further cases of Henoch–Schönlein syndrome, which were reported between 1970 and 2009, a cranial or peripheral neuropathy without severe hypertension and without any CNS dysfunction was noted [9, 43–56].

Severe arterial hypertension, which is common in Henoch–Schönlein glomerulonephritis, may cause widespread brain abnormalities or peripheral facial palsy [57, 58]. As a consequence, two Henoch–Schönlein children with blood pressure  $\geq$  (99th percentile + 5 mm Hg), signs of nervous system dysfunction and MRI were analysed separately [59, 60].

The diagnosis of Henoch–Schönlein syndrome was based on the classical palpable purpuric rash in the presence of at least one of the following [61]: diffuse abdominal pain, arthritis or arthralgia or a pathological urinalysis. A biopsy showing predominant IgA deposition was performed in 31 (57%) of the 54 patients (7, 9, 10, 12, 14–16, 19, 20, 22, 23, 25, 26, 28, 29, 31, 32, 35, 37–39, 43–47, 50, 51, 53, 61 and 62): skin biopsy ( $n=15$ ), renal biopsy ( $n=11$ ), both skin and renal biopsy ( $n=5$ ). Testing for IgG ANCA was negative in 14 patients with this examination (6, 8, 12, 19, 20, 25, 29, 32, 35, 43, 45, 51, 53, 54).

Of the 54 patients, 32 were male and 21 were female subjects (information unavailable [52] in one case), ranging in age between 3 and 68 years. Forty-four (81%) of the patients were <20 years of age (Fig. 1). They had been reported from the following continents: 24 from Europe (France,  $n=3$ ; Germany,  $n=2$ ; Italy,  $n=6$ ; Portugal,  $n=1$ ; Romania,  $n=1$ ; Spain,  $n=2$ ; Switzerland,  $n=1$ ; Turkey,  $n=6$ ; and UK,  $n=2$ ), 18 from Asia (India,  $n=2$ ; Iran  $n=1$ ; Japan,  $n=6$ ; Korea,  $n=4$ ; Saudi Arabia,  $n=1$ ; Taiwan,  $n=3$ ; and Thailand,  $n=1$ ), 10 from North America (Canada,  $n=2$  and USA,  $n=8$ ) and each 1 from Africa (Morocco) and Australia. The case of a patient with a peripheral neuropathy,

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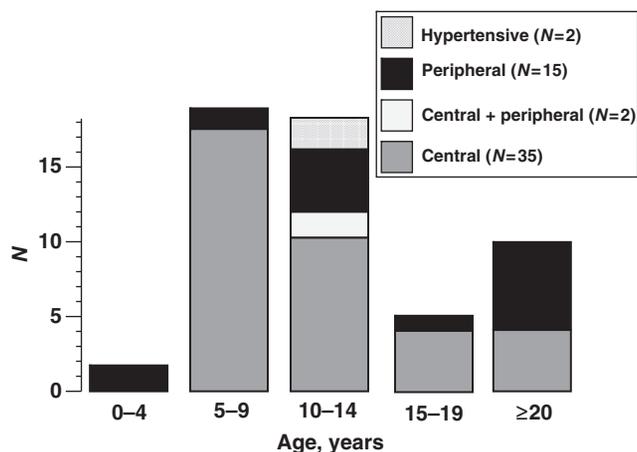


FIG. 1. Age distribution in 54 Henoch-Schönlein patients (32 male and 21 female subjects; information unavailable in one case) with nervous system dysfunction.

complicating Henoch-Schönlein syndrome reported within a case series of patients affected by vasculitic peripheral neuropathy, was not included due to scanty data available [62].

## Results

### *CNS dysfunction without severe hypertension*

In 31 (84%) of the 37 patients with CNS dysfunction without severe hypertension, the corresponding signs appeared in subjects concomitantly presenting the distinctive rash of Henoch-Schönlein syndrome. The diagnosis was more tricky in the remaining six cases (16%), considering that four patients developed the rash from 10 h until 8 days [9, 11, 21, 40] after onset of CNS symptoms. Furthermore, in two cases [27, 34], CNS dysfunction developed in subjects with past history of Henoch-Schönlein syndrome but without any cutaneous, articular or renal signs since 5, respectively, 9 years. Apart from headache, following neurological presentations were observed (Table 1): altered level of consciousness, convulsions, visual abnormalities and verbal disability. Imaging (MRI in 17 and CT alone in the remaining 19 patients) was normal in five patients (14%); three patients with MRI and two with CT). Following anomalies were disclosed in the remaining 32 (86%) patients: ischaemic vascular lesions almost always involving two or more vessels, intracerebral haemorrhages, diffuse (mainly posterior) brain oedema [21, 42] or thrombosis of the superior sagittal sinus (Table 2 and Fig. 2).

A secondary deficiency of clotting factor XIII was disclosed in three patients [24, 27, 29] and vitamin K-dependent factors in one [16] (with concurrent intestinal involvement). Testing for aPL antibodies was strongly positive in the patient with thrombosis of the superior sagittal sinus [6], and in a patient with an extensive infarction involving lenticular nucleus, caudate nucleus and periopercular region [37], but was never performed in the remaining patients with CNS dysfunction.

A large haemorrhage was drained surgically in three patients [7, 16, 34]. A 14-year-old boy with a strongly reduced activity of the clotting factor XIII and a large haemorrhage penetrating the left ventricle died in spite of emergency neurosurgery [29]. The management was conservative in the remaining patients: parenteral steroids were used in almost all patients ( $n=32$ ; 86%), sometimes ( $n=6$ ; 17%) in association with cyclophosphamide ( $n=2$ ; 6%) [25, 32], AZA ( $n=1$ ; 3%) [26], plasmapheresis ( $n=2$ ; 5%) [18, 39] or intravenous immune globulin ( $n=1$ ; 3%) [35]. Clotting factor XIII was administered in two patients with a reduced activity of this factor [24, 27]. Heparin, and, subsequently,

TABLE 1. Clinical presentation in 54 Henoch-Schönlein patients (32 male and 21 female subjects; information unavailable in one case) with neurological involvement

Characteristics	<i>n</i> (%)
<b>CNS dysfunction without severe hypertension</b>	
Altered level of consciousness	
Glasgow coma scale 10-12	10 (19)
Glasgow coma scale $\leq 9$	19 (35)
Convulsions	
Partial	4 (7)
Generalized	18 (33)
Focal neurological deficits	14 (26)
Visual abnormalities	12 (22)
Verbal disability	
Mild	2 (4)
Severe	3 (6)
<b>Nervous system dysfunction with severe hypertension</b>	
Glasgow coma scale $\leq 9$	2 (4)
Generalized convulsions	2 (4)
Visual abnormalities	1 (2)
<b>Cranial or peripheral neuropathy without severe hypertension</b>	
Peripheral facial palsy	3 (6)
Guillain-Barré syndrome	3 (6)
Brachial plexopathy	3 (6)
Peroneal neuropathy <sup>a</sup>	4 (7)
Posterior tibial nerve neuropathy	1 (2)
Femoral neuropathy	1 (2)
Ulnar neuropathy (bilateral)	1 (2)
Mononeuritis multiplex <sup>b</sup>	1 (2)

<sup>a</sup>Bilateral in one case (testing for aPL antibodies was performed in one patient and found to be normal [52]). <sup>b</sup>Median, superficial peroneal and medial plantar nerve.

TABLE 2. Cerebral lesions detected by neuroimaging in 37 Henoch-Schönlein patients with CNS dysfunction but without severe arterial hypertension

	<i>n</i> (%)
Normal neuroimaging	5 (14)
<b>Ischaemic lesion</b>	
One-vessel disease	1 <sup>a</sup> (3)
Two or more vessels disease	16 (43)
Intracerebral haemorrhage	11 (30)
Two or more vessels disease and haemorrhage	1 (3)
Diffuse brain oedema	2 (5)
Sagittal sinus thrombosis	1 (3)

<sup>a</sup>Middle cerebral artery [36].

warfarin were used in the patient with thrombosis of the superior sagittal sinus and positive testing for aPL antibodies [6].

Minor sequelae at follow-up, which was sometimes rather short ( $\leq 3$  months), were observed in eight patients (13, 16, 21, 24, 25, 36, 37, 41): visual field defects ( $n=3$ ), verbal disabilities ( $n=2$ ), focal neurological deficits ( $n=2$ ) and partial epilepsy ( $n=1$ ).

### *Nervous system dysfunction with severe hypertension*

In two children [59, 60] with Henoch-Schönlein glomerulonephritis and severe arterial hypertension, who presented with headache, decreased level of consciousness, visual changes and convulsions, MRI disclosed a mainly posterior subcortical oedema. In both patients, control of hypertension was followed by a full remission of the CNS dysfunction.

### *Cranial or peripheral nervous system dysfunction without severe hypertension*

Signs of peripheral nervous system dysfunction appeared in 17 subjects concomitantly presenting the distinctive rash of Henoch-Schönlein syndrome. The lesions, which appear in Table 1, included polyneuropathy, mononeuropathy or mononeuropathy multiplex. A secondary deficiency of the clotting

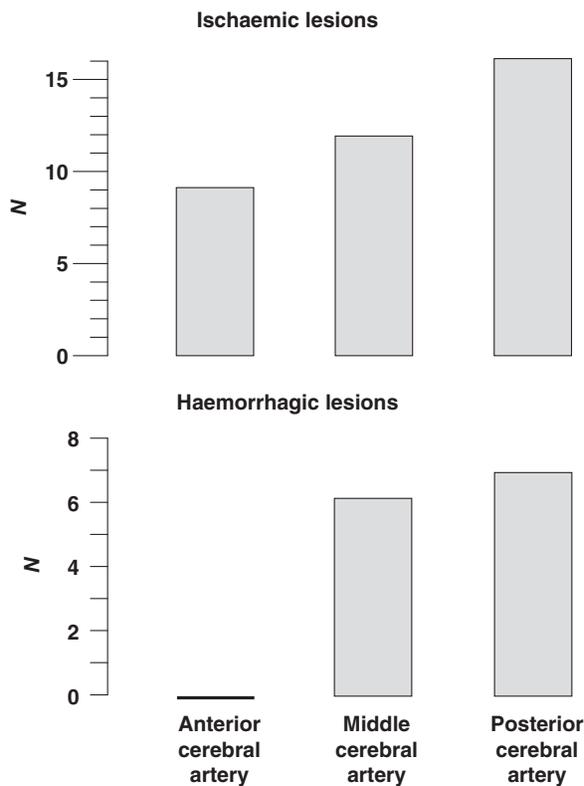


FIG. 2. Ischaemic or haemorrhagic vascular lesions detected by neuroimaging in 29 patients with Henoch-Schönlein syndrome and CNS dysfunction, but without severe arterial hypertension.

factor XIII occurred in one patient [53]. The management was expectative in all cases with the exception of intravenous immune globulin, which was prescribed in each one patient with Guillain-Barré syndrome [51] and brachial plexopathy [41]. A persisting nervous dysfunction was noted in an 11-year-old boy with brachial neuropathy [41].

#### Renal disease and uncommon features

Nephrotic-range proteinuria, a marker of rather severe kidney disease, was noted in 29 (54%) of the 54 patients with nervous system dysfunction (Table 3). Further uncommon features (Table 3), including severe gastroduodenal involvement ( $n=2$ ), gastric and colonic ulcers ( $n=1$ ), abdominal wall haematoma ( $n=1$ ), retroperitoneal haematoma ( $n=1$ ), pulmonary oedema associated with retinal artery occlusion ( $n=1$ ), pericardial tamponade ( $n=1$ ), pericardial tamponade associated with necrosis of the small intestine ( $n=1$ ) and myocarditis ( $n=1$ ), were noted in 9 (17%) of the 54 patients.

#### Discussion

Although the long-term prognosis of Henoch-Schönlein syndrome is almost entirely attributable to the kidney disease [1, 2], some rare extrarenal features may produce substantial morbidity and mortality. The present review indicates that in Henoch-Schönlein syndrome, a clinically relevant neurological disease is very rare and mostly affects subjects with either a rather severe kidney disease or uncommon features. However, in two case series [52, 63], including 39 unselected children affected by Henoch-Schönlein syndrome with normal neurological examination and blood pressure, headache was reported in 11 (28%) of them. More importantly, transient electroencephalographic

TABLE 3. Severe kidney disease and uncommon features in 32 (59%) of the 54 Henoch-Schönlein patients with nervous system dysfunction

	Nephrotic-range proteinuria	Uncommon features	Total <sup>a</sup>
CNS dysfunction	19	7	20
Peripheral nervous system dysfunction	8	2	10
CNS and peripheral nervous system dysfunction	2	0	2

<sup>a</sup>Either nephrotic-range proteinuria or uncommon features.

abnormalities including focal or generalized slow wave activity, sharp waves, focal attenuation of the voltage activity and sometimes also paroxysmal activity occurred in 21 (55%) of the 39 cases, indicating that in Henoch-Schönlein syndrome mild cerebral involvement is the rule rather than the exception. Similarly, clinically relevant pulmonary disease is exceptional in this vasculitis. Nonetheless, the lung transfer for carbon monoxide is altered in most Henoch-Schönlein children [64].

#### CNS dysfunction without severe hypertension

Like in other cerebral vasculitides, in Henoch-Schönlein patients with cerebral involvement, neuroimaging characteristically discloses ischaemic lesions secondary to vessel wall proliferation with resultant luminal obliteration (or thrombotic occlusion) or haemorrhages with or without secondary ischaemia to vessel wall proliferation with rupture of necrotic walls [65-67].

#### Nervous system dysfunction with severe hypertension

Altered level of consciousness, visual changes, convulsions and MRI studies disclosing a mainly posterior subcortical oedema, currently designated as reversible posterior leucoencephalopathy syndrome, characterize hypertensive encephalopathy [68, 69]. The present experience confirms that posterior leucoencephalopathy sometimes occurs also in normotensive (or slightly hypertensive) patients with cerebral vasculitis [68, 69].

Lower motor neuron facial palsy sometimes occurs in children with severe arterial hypertension [59, 60]. As a consequence, in Henoch-Schönlein syndrome peripheral facial palsy may result not only from a vasculitic neuropathy (see below) but also from severe hypertension. However, peripheral facial palsy has so far never been associated with severe hypertension in Henoch-Schönlein syndrome.

#### Cranial or peripheral nervous system dysfunction without severe hypertension

Vasculitides may cause inflammation in the walls of the vasa nervorum and induce critical ischaemia to nerves. However, sometimes lesions may result from compression by haematoma or localized oedema [58].

In Churg-Strauss syndrome, WG and microscopic polyangiitis, the most common vasculitides that affect the peripheral nervous system, the corresponding clinical patterns are mononeuritis multiplex, polyneuropathy, radiculopathy and neural plexopathy [55]. In Henoch-Schönlein patients with peripheral or cranial neuropathy, facial palsy, Guillain-Barré syndrome, brachial plexopathy, peroneal neuropathy, posterior tibial nerve neuropathy, femoral neuropathy and mononeuritis multiplex were observed.

#### Diagnostic work up

Generally, there is little diagnostic doubt in a subject with acute CNS or peripheral nervous system dysfunction concurrently

TABLE 4. Conditions that deserve consideration in patients with suspected neurological manifestations of Henoch-Schönlein syndrome

	CNS	Peripheral or cranial nervous system
Arterial hypertension (severe)	++	+
Vasculitides		
IgG-ANCA positive <sup>a</sup>	++	++
Primary CNS vasculitis	++	-
Behçet disease	+	-
Takayasu disease	(+) <sup>b</sup>	-
Kawasaki disease	(+)	-
Polyarteritis nodosa	++	++
SLE	++	+
SSc	+	+
juvenile idiopathic arthritis and AS	(+)	++
Sarcoidosis	++	+
Familial mediterranean fever	-	(+)
CINCA syndrome	++	(+)
Infections		
Non-opportunistic		
Syphilis	++	-
Borreliosis	++	+
Cat-scratch disease	+	-
Tuberculosis	+	(+)
Varicella zoster virus infection	+	++
Cytomegalovirus infection	++	+
HAV and HBV	+	+
Opportunistic	++	-
Adverse effects of drugs		
NSAIDs, salicylates	++	-
Steroids	++	-
Cyclophosphamide	+	-
MTX	+	-
Cyclosporin	++	+
IFN	+	+
TNF inhibitors	+	-
Thalidomide	-	+

<sup>a</sup>WG, microscopic polyangiitis and Churg-Strauss syndrome. <sup>b</sup>Ischaemic stroke.

affected with the characteristic rash of Henoch-Schönlein syndrome. It is worthy of mention, however, that in cerebral Henoch-Schönlein syndrome CNS vasculitis sometimes precedes or follows the rash. On the other side, clinicians must remember that severe arterial hypertension and vasculitides associated with IgG ANCA, primary central nervous system vasculitis, Behçet disease, Takayasu disease, Kawasaki disease, polyarteritis nodosa or cryoglobulinaemic vasculitis [59, 60, 70-77] are possible causes of both peripheral vasculitic neuropathy or CNS vasculitis, whose presentation may often mimic or overlap with Henoch-Schönlein syndrome (Table 4). SLE, SSc, AS, juvenile idiopathic arthritis, anti-phospholipid syndrome, sarcoidosis, familial Mediterranean fever, CINCA syndrome (i.e. chronic infantile, neurological, cutaneous and articular syndrome) and a number of both non-opportunistic and opportunistic infections may also mimic cerebral vasculitis [72, 78-81]. Furthermore, CNS or peripheral nervous system adverse effects have been sometimes linked with drugs used in the management of the aforementioned conditions [72].

In patients with suspected CNS or peripheral nervous system Henoch-Schönlein syndrome, history and clinical presentation are strongly variable. As a consequence, a strictly standardized diagnostic work up is not advised. Nonetheless, considering that 'non-Henoch-Schönlein vasculitides' affect the nervous system more frequently than Henoch-Schönlein syndrome, we urge testing for aPL, ANA and IgG ANCA in all cases. Furthermore, considering the possible confusion with other vasculitides and the role of IgA tissue deposits in Henoch-Schönlein syndrome, the detection of IgA in tissue-like skin or kidney appears imperative in most cases. Neuroimaging is crucial to the diagnostic assessment of suspected cerebral vasculitides: although catheter angiography remains the gold standard, in clinical practice MRI is usually the study of choice [5, 66].

## Management

Controlled trials with significant and homogeneous case numbers are not feasible with very rare and heterogeneous diseases such as nervous system dysfunction in Henoch-Schönlein syndrome [82]. With these limitations in mind, the data of the present review prompt us to suggest the following management.

**CNS.** Like in adults with stroke, the initial management of patients with suspected cerebral Henoch-Schönlein syndrome includes control of arterial hypertension, seizures and repair of disordered hemostasis [83, 84]. In patients with intracerebral haemorrhage, the indications for surgery are controversial and vary with the site and the size of the bleed. Like in severe Henoch-Schönlein glomerulonephritis [85, 86], combined therapy with corticoids and cyclophosphamide is appropriate in a patient with relevant ischaemic cerebral lesions and Henoch-Schönlein syndrome. Anti-coagulation is advised in patients with secondary anti-phospholipid syndrome [79].

**Peripheral or cranial nervous system.** Corticoids and cyclophosphamide are not advised for Henoch-Schönlein patients with a peripheral or a cranial neuropathy, considering that these conditions mostly tend to full spontaneous recovery. In Henoch-Schönlein purpura complicated by Guillain-Barré syndrome, management with intravenous immune globulin (or plasma exchange) is, like in the classical form of this polyneuropathy, recommended [87].

In conclusion, the present systematic review helps clinicians in the management of Henoch-Schönlein patients with signs of nervous system dysfunction.

## Rheumatology key messages

- In Henoch-Schönlein syndrome, relevant neurological disease is rare but produces substantial morbidity and mortality.
- CNS dysfunction results from a vascular obstruction, from an intracerebral haemorrhage or from severe hypertension.
- Peripheral nervous system dysfunction presents as polyneuropathy, mononeuropathy or mononeuropathy multiplex.

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