

Systemic vasculitis

Vasculitis is a heterogeneous group of diseases that are caused by inflammation of the vascular (mostly arterial) wall - angiitis. Histology, X-ray, is essential for diagnosis. According to the size of the affected vessel, we distinguish vasculitis into:

- **aortitis** - aorta inflammation,
- **arteritis** - inflammation of the middle and small arteries.
- **arteriolitis** - inflammation of arterioles,
- **vasculitis** - inflammation of arterioles, capillaries and venules,
- **phlebitis** - inflammation of veins.

The result of vasculitis is **weakening of the vascular wall** (in some cases it arches as microaneurysms) with **rupture and bleeding** (petechiae to purpura - disorders of primary hemostasis), as well as thrombosis associated with inflammation of the intima, or obliteration of the lumen in the repair of inflammation leading to ischemia.

Pathogenesis

1. **Unclear etiopathogenesis (primary vasculitis)**, mostly *autoimmune diseases*, may be one of the following mechanisms:
 - immunocomplexes and the inflammatory response triggered by them (immunopathological reaction type III.);
 - immunopathological reaction type IV.;
 - Autoantibodies against lysosomal enzymes of neutrophils (ANCA - Anti Neutrophil Cytoplasmic Antibodies) - they stimulate neutrophils to produce oxygen radicals and to secrete lysosomal enzymes that lead to damage of the surrounding tissue - the so-called **pauciimmune type of reaction** (without immunocomplexes).
2. **Transition from the surroundings** (phlegmona, tuberculosis), septic embolus at central pyemia - **secondary vasculitis**.

Distribution of arterial inflammation

Inflammation of arteries

allergic vasculitis	
polyarteritis nodosa and related diseases	Polyarteritis nodosa, Kawasaki disease, Wegener's granulomatosis, Churg-Strauss syndrome
granulomatous (giant cell) inflammation	Temporal arteritis, Takayasu's disease
others	Bürger's disease (thrombangiitis obliterans), Aortitis luetica

Allergic vasculitis

Allergic vasculitis is an immune-related systemic inflammation of small blood vessels (arterioles, capillaries, venules) mainly in the skin, but also in other organs (brain, kidneys, GIT, lungs). These include vasculitis in:

- **systemic connective tissue diseases** (systemic lupus erythematosus, rheumatoid arthritis etc.);
- **allergic reactions**; to bacterial and viral antigens and to certain drugs (antibiotics...)
- **Henoch-Schönlein purpura** - usually affects children and adolescents after an upper respiratory tract infection, affects the skin, kidneys, GIT, joints.

Pathogenesis

Immunocomplexes are deposited in the vessel wall and activate the complement. The chemotactic components of the complement (C3a, C5a) attract neutrophils, which release lysosomal enzymes. These enzymes subsequently cause necrosis of the vessel wall.

Microscopy

Fibrinoid necrosis of vessel walls with neutrophil infiltration, breakdown of their nuclei (karyorrhexis = *leukocytoclasia*) to form a chromatin powder in the lumen of the thrombosed vessel. All lesions are at the same stage of development, ie the same age, unlike *polyarteritis nodosa*.



Manifestations of vasculitis on the skin

🔍 For more information see *Henoch-Schönlein purpura*.

Polyarteritis nodosa (PAN)

It is an inflammation affecting **all layers of the vessel wall** (therefore polyarteritis) and aneurysms (therefore nodosa) form segmentally. It was formerly referred to as **periarteritis** because the inflammatory infiltrate extends far into the area around the blood vessel.

Pathogenesis

The disease results from the formation of **immunocomplexes** that bind to the small and medium arteries. Hepatitis B virus is very often the causative antigen. Immunocomplexes then "attack" the arteries of all tissues, especially the kidneys, GIT, heart, skeletal muscles, but omit the lungs. The disease occurs in attacks, so we find damage of the blood vessels of various ages. Complications of this disease include the formation of aneurysms as well as thrombosis, which can cause a heart attack.

Microscopy

Transmural fibrinoid necrosis is seen, first with polymorphocellular infiltrate (neutrophils), and in later stages with round cell infiltrate (mononuclear cells). The infiltrate intervenes *periadventitically*. Inflammation heals with the help of connective tissue and often **obliterates the lumen of the vessel**.

 For more information see *Polyarteritis nodosa*.

Kawasaki disease

Pediatric PAN - mainly affects children under one year of age, in addition to vascular disease it is characterized by skin rashes, conjunctivitis, oral mucosa inflammation, and enlargement of lymph nodes (mainly cervical) - mucocutaneous and nodular syndrome, that is not very severe, heals spontaneously, but there is a risk of coronary artery aneurysms (rupture) or thrombosis (heart attack).

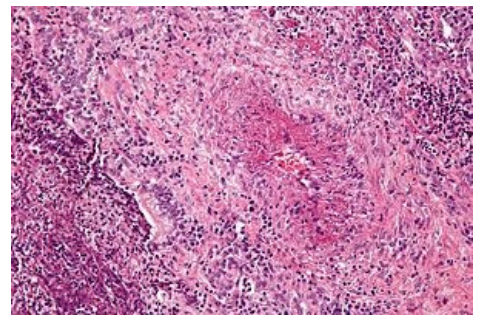
 For more information see *Kawasaki disease*.

Wegener's granulomatosis

Wegener's granulomatosis, more recently called **granulomatosis with polyangiitis**, is probably an autoimmune vasculitis (95% of patients had ANCA in their serum), and it is characterized by a triad:

- PAN-type necrotizing vasculitis, mainly affecting small blood vessels in the lungs;
- necrotizing granuloma in the upper respiratory tract;
- necrotizing glomerulonephritis (focal-segmental, sickle-shaped).

 For more information see *Wegener's granulomatosis*.



Wegener's granulomatosis - lungs

Churg-Strauss syndrome

Eosinophilic granulomatosis with polyangiitis (EGPA, **Churg-Strauss syndrome**) is a combination of necrotizing vasculitis that affects small to medium-sized blood vessels. Eosinophilic granulomatosis, which mainly affects the respiratory tract, is very similar to Wegener's granulomatosis. The disease is associated with eosinophilia and bronchial asthma and in 30-40% of cases, and with the production of ANCA antibodies.^[1]

 For more information see *Churg-Strauss syndrome*.

Temporal arteritis (Horton's giant cell arteritis)

Segmental granulomatous inflammation of the upper and middle arteries mainly branches of the external carotid artery and internal temporal artery, orbital arteries (can lead to blindness), cerebral arteries (can lead to encephalomyelitis). It mainly affects older women and it is sometimes associated with polymyalgia rheumatica.

Macroscopically

Reddening in the temporal area, palpable pain, and arteries may change to become stiff and fibrous.

Microscopically

At the beginning there is lymphoplasmocytic infiltration. Later formation of granulomas occurs in the medium, along with disintegration of the internal elastic membrane along and phagocytosis of its fragments by huge multinucleated cells. Also lumen thrombosis. Chronic stage corresponds to repair - fibrosis of all wall layers and organization of the thrombus leads to obliteration of the lumen and transformation of the vessel into a fibrous band.

 For more information see *Giant cell arteritis*.

Takayasu's disease

Chronic idiopathic granulomatous aortitis, it affects the receding large arteries (pulseless HK disease, vision disorders, neurological disorders), sometimes the lungs. It mainly affects young women in Japan.

Macroscopically

Thickening of the wall can be seen. Other observations may vary from wrinkles and sclerosis of the intima to occlusion of the lumen.

Microscopically

Lymphoplasmocytic and granulomatous inflammation of all layers of the wall, destruction of the elastic, scarring of the media, fibroproduction in the intima and adventitia, and also often thrombosis.

 For more information see *Takayasu's disease*.

Bürger's disease(thrombangiitis obliterans)

Chronic inflammatory disease of the arteries and (deep) veins, especially in the lower limbs (a.tibialis). In the upper limb a.radialis is the most affected vessel. It affects younger smokers.

It starts as arteritis with thrombosis, the inflammation then passes to neighboring veins (including superficial veins - phlebitis migrans) and nerves. The inflammation is repaired and by organization of the thrombus, the whole nerve-vascular bundle is built into the fibrous band. The clinical symptoms are given by the occlusion of the artery - Raynaud's phenomenon (often the first symptom of the disease), claudication, gangrene.

 For more information see *Bürger's disease*.

Others

Other significant vasculitis are:

- Microscopic polyangiitis.
- Essential cryoglobulinemia.



Bürger's disease

Links

Related links

- Autoimmune diseases
- Systemic vasculitis / case report

External sources

- Vaskulitidy – video na youtube.com (<https://www.youtube.com/watch?v=fKXHxcV6eLU>)

Source

- PASTOR, Jan. *Langenbeck's medical web page* [online]. [cit. 3.11.2010]. <<http://langenbeck.webs.com>>.

Reference

1. MAHR, Alfred – MOOSIG, Frank – NEUMANN, Thomas. Eosinophilic granulomatosis with polyangiitis (Churg-Strauss): evolutions in classification, etiopathogenesis, assessment and management. *Curr Opin Rheumatol* [online]. 2014, y. 1, p. 16-23, Available from <<https://www.ncbi.nlm.nih.gov/pubmed/24257370>>. ISSN 1040-8711 (print), 1531-6963.

Bibliography

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