Granulomatosis with Polyangiitis (GPA) Characteristics

Granulomatosis with polyangiitis, formerly Wegener's granulomatosis, is a small and medium vessel necrotizing vasculitis that typically affects the nose, lungs, and kidneys. It is characterized by granulomatous inflammation against a nonspecific inflammatory background thought to be caused by the presence of C-ANCA or cytoplasmic anti-neutrophil cytoplasmic antibodies. These antibodies react with proteinase 3, an enzyme within neutrophil granulocytes. The lungs and upper airways are classically involved and can cause chronic sinusitis, otitis media, perforation of the nasal septum, and saddle nose deformity. Individuals also commonly complain of cough and hemoptysis. The kidneys are also classically involved and can cause glomerulonephritis with hematuria. Cyclophosphamide and corticosteroids can be used as immune suppressants in the treatment of granulomatosis with polyangiitis.



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Pathophysiology

Small Vessel Vasculitis
Small Vessels-on-fire
Vasculitis is a general term for inflammation of the blood vessel walls. Clinical features of various vasculitides largely depend on the vascular beds affected. Granulomatosis with polyangiitis is a small and medium vessel vasculitis that typically affects the nose, lungs, and kidneys.

Necrotizing
Necrosis-crow
Granulomatosis with polyangiitis is commonly described as a necrotizing vasculitis due to necrosis of the vessels it affects. It is also characterized by necrotizing granulomas and focal necrotizing renal disease.

Lungs and Upper Airway
Lungs
The lungs and upper airways are classically involved with granulomatosis with polyangiitis and can present with chronic sinusitis, ulcerative lesions of the nose and palate, and nodules and cavities in the lungs.

Crescentic Glomerulonephritis
Crescent on Glowing-mare
The kidneys are classically involved in granulomatosis with polyangiitis and can exhibit a spectrum of diseases, including focal necrosis of glomeruli to diffuse necrosis and parietal cell proliferation to form crescents seen in crescentic glomerulonephritis.

DIAGNOSTICS

c-ANCA
C Anchor
In the diagnosis of Granulomatosis with Polyangiitis (GPA), both c-ANCA (cytoplasmic antineutrophil cytoplasmic antibody) and PR3-ANCA (proteinase 3-antineutrophil cytoplasmic antibody) play a crucial role. These terms are often used interchangeably, with c-ANCA denoting a characteristic cytoplasmic staining pattern seen in laboratory tests, primarily resulting from antibodies targeting the proteinase 3 (PR3) enzyme. Detection of elevated levels of c-ANCA or PR3-ANCA in blood tests is strongly associated with GPA. The presence of these antibodies, in conjunction with clinical symptoms, imaging studies, and other laboratory findings, aids in confirming the diagnosis of GPA and guides healthcare professionals in developing an appropriate treatment plan for this autoimmune vasculitis.

X-ray
X-Ray
X-rays are not typically used as a primary diagnostic tool for Granulomatosis with Polyangiitis (GPA), as GPA primarily affects small- to medium-sized blood vessels and often involves organs such as the lungs and kidneys. However, imaging studies such as chest X-rays or computed tomography (CT) scans may be employed to assess the extent of organ involvement and detect characteristic findings such as pulmonary nodules or cavities. These imaging modalities are valuable for evaluating the respiratory system and identifying complications related to GPA. The diagnosis of GPA is generally based on a combination of clinical symptoms, laboratory tests, and imaging studies rather than relying solely on X-rays.

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Multiple Nodules in Lungs

Multiple Knobs in Lungs

In Granulomatosis with Polyangiitis (GPA), multiple nodules can be observed on chest X-rays due to the disease's impact on the respiratory system. GPA often involves inflammation of blood vessels in the lungs, leading to the formation of nodules or small masses of tissue. These nodules can be detected on X-rays and are indicative of pulmonary involvement. Additionally, the nodules may cavitate, forming hollow spaces within them. The presence of multiple nodules, especially when combined with clinical symptoms, such as cough, shortness of breath, and systemic features, contributes to the diagnosis of GPA. Further imaging studies, such as computed tomography (CT) scans, may provide more detailed information about the size, distribution, and characteristics of these nodules, aiding in the comprehensive assessment of the disease.

Treatment

Cyclophosphamide

Cyclops-phosphate-P

Cyclophosphamide is a nitrogen mustard alkylating agent that can be used to treat various types of cancer and some autoimmune disorders, including granulomatosis with polyangiitis. Hemorrhagic cystitis is a common complication of drug use that can be prevented with mesna and adequate fluid intake.

Corticosteroids

Quarter-on-steroids

Corticosteroids are commonly used in the treatment of granulomatosis with polyangiitis due to immunosuppressive effects.

Rituximab

Red-tux-mob

Rituximab is a medication that belongs to a class of drugs known as monoclonal antibodies. It has been used in the treatment of various autoimmune diseases, including Granulomatosis with Polyangiitis (GPA). Rituximab works by targeting a protein called CD20, which is present on the surface of B cells. By binding to CD20, Rituximab helps to destroy or deplete B cells. This effect is achieved through a combination of antibody-dependent cellular cytotoxicity, complement-dependent cytotoxicity, and direct induction of apoptosis (programmed cell death) in B cells.

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