Definition

- **Epidemiology**
  Prevalence of 3:100 000 • First presenting symptom of demyelinating disease in 12–30% of cases • Approximately 50% incidence of bilateral visual impairment.
- **Etiology, pathophysiology, pathogenesis**
  Acute inflammation of the optic nerve (CN II) • Autoimmune diseases (e.g., systemic lupus erythematosus, disseminated encephalomyelitis) • Parainfectious or viral etiology (e.g., cytomegalovirus, rubella, mumps, herpes, toxoplasmosis) • Radiation-induced (exposure of approximately 10 Gy or more).

Imaging Signs

- **Modality of choice**
  Gadolinium-enhanced MRI.
- **CT findings**
  CT often shows no abnormalities • Possible thickening of the optic nerve • Nerve may enhance after contrast administration.
- **MRI findings**
  Intraorbital and intracanalicular thickening of the optic nerve • Mixed punctate and streaky enhancement after gadolinium administration (especially of the intracanalicular nerve) • Increased T2-weighted signal intensity • Sequences with combined fat and water suppression (SPIR FLAIR) are more sensitive for detecting optic nerve lesions.
- **Pathognomonic findings**
  Thickened optic nerve showing enhancement after gadolinium administration on T1-weighted fat-suppressed imaging.

Clinical Aspects

- **Typical presentation**
  Viral: Visual deterioration 10–14 days after underlying disease • Central scotoma • Afferent pupillary defect.
- **Treatment options**
  Steroid therapy • Interferon is given for disseminated encephalomyelitis.
- **Course and prognosis**
  Unilateral optic neuritis has a good prognosis with cortisone therapy • Visual impairment persists in up to 15% of cases, depending on the underlying disease • Recurrence rate approximately 20%.
- **What does the clinician want to know?**
  Diagnosis • Intracerebral foci • Exclusion of a mass.

Moedder et al., Direct Diagnosis in Radiology. Head and Neck Imaging
(ISBN 9783131440815), © 2008 Georg Thieme Verlag KG

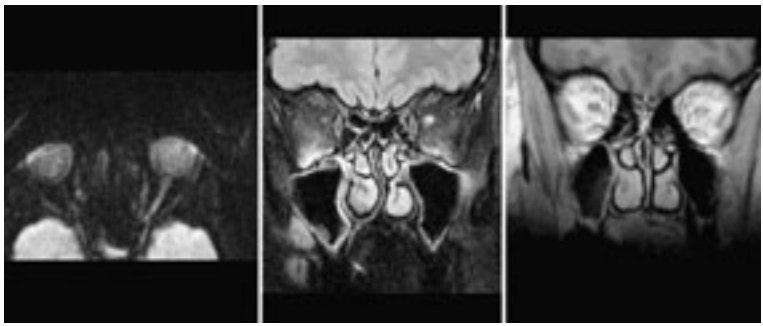

Fig. 3.6 Left-sided optic neuritis as an initial manifestation of multiple sclerosis. Axial diffusion-weighted image (left) and coronal T2-weighted MR image (center) with fat and water suppression (SPIR FLAIR) show increased signal intensity of the optic nerve. Post-contrast coronal T1-weighted image (right) shows marked enhancement.

Differential Diagnosis

Mass (e.g., optic glioma, meningioma)	– Circumscribed optic nerve expansion or mass, enhancing after contrast injection
Orbital pseudotumor	– Pain – May involve all orbital structures
Radiation neuropathy	– Rare – Prior history of radiotherapy

Tips and Pitfalls

Cerebral imaging should be done to exclude a demyelinating disease.

Selected References

Hickman SJ. Optic nerve imaging in multiple sclerosis. J Neuroimaging 2007; 17(S1): 42S–45S

Jackson A et al. Combined fat- and water-suppressed MR imaging of orbital tumors. AJNR Am J Neuroradiol 1999; 20(10): 1963–1969

Müller-Forell W et al. Entzündliche Orbitaerkrankungen. Teil 2: Bulbus, Extrakonalraum, Glandula lacrimalis, Nervus opticus. Radiologe 2003; 43(5): 400–418

Rocca MA et al. Imaging the optic nerve in multiple sclerosis. Mult Scler 2005; 11: 537–541