THE DIFFERENTIAL DIAGNOSIS OF MULTIPLE SCLEROSIS

Neil Scolding

In most cases, the diagnosis of multiple sclerosis (MS) presents few difficulties. Clinical evidence of lesions disseminated in time and space, backed up by magnetic resonance imaging (MRI) and/or spinal fluid changes, commonly leave neither room nor reason for doubt. Occasionally, however, a rogue erythrocyte sedimentation rate (ESR), an atypical (or normal) MRI scan, or an unexpected symptom or sign—fever, rash, headache, fits, etc (table 1)—give rise to doubt.

The absence of diagnostic tests means that uncertainty can be extremely difficult to resolve. MRI, spinal fluid examination, and evoked potential recordings are sensitive tests for MS but do not have comparable specificity. The range of disorders that can mimic MS is vast; as the prototypical inflammatory demyelinating disorder, it may be confused with both unrelated demyelinating diseases (metabolic or inherited) and unrelated inflammatory disease; additionally, diseases which are directly related to MS must also be considered. To offer a systematic account of all would be unrealistic, and not a little unreadable. Therefore, only a few comments relating to salient clinical features or discriminating investigations will be mentioned.

SYNDROMES RELATED TO MULTIPLE SCLEROSIS

Syndromes of non-disseminated demyelination

A number of disorders are clearly related to MS, while nevertheless remaining distinct. Some, such as optic neuritis, appear pathologically identical, but are disseminated in neither time nor space. Whether they herald MS is plainly of huge importance to patients, who are now sufficiently informed to know of and fear this possibility. There is here a lacune in the neurological lexicon. It would be helpful to call upon a collective term for acute monophasic and monofocal syndromes that are seen in MS—idiopathic optic neuritis, sensory myelitis, and many others (after including, one suspects, episodes dismissed as labyrinthitis, trigeminal neuralgia, and Bell’s palsy—but which do not develop into MS. “Benign focal inflammatory demyelination” would serve (table 2).

Other syndromes, such as acute transverse myelitis, show distinctive pathological features and represent (often clinically recognisable) separate disorders.

Optic neuritis

The clinical syndrome of optic neuritis (a) is not always a manifestation of idiopathic inflammatory demyelination; and (b), even when it is, does not necessarily presage MS itself. Identifiable primary causes include Leber’s hereditary optic neuropathy (LHON), typically causing bilateral simultaneous or rapidly sequential optic neuritis (unusual in MS, and a feature which should prompt a more intense search for primary causes), which is very severe (and usually permanent) in young men. LHON may be spotted by careful fundoscopy (preferably using a slit lamp), showing tortuous vessels with capillary dilatation and telangiectasia, without increase in vascular permeability apparent on fluorescein angiography, contrasting with optic neuritis. These changes are not invariably, and mitochondrial DNA analysis is the proper route of diagnostic confirmation.

The differential diagnosis also includes:

- toxins (most notoriously tobacco amblyopia and methanol)
- vitamin B-12 deficiency
- other inflammatory disorders (particularly sarcoidosis, vasculitis, and lupus; see below)
- infections (uncommon)
- ischaemia (less uncommon), usually revealing itself by a typically vascular more abrupt onset, an absence of pain, and a horizontal altitudinal field defect
- optic nerve, chiasmal or other local tumours—these may be intrinsic (classically gliomata) or optic nerve sheath meningioma, the latter suggested by the presence of optociliary shunt vessels, or extrinsic (pituitary and craniopharyngioma).
Transverse myelitis

“Idiopathic” transverse myelitis usually exhibits a rather different clinical phenotype to the spinal cord relapse of MS. In approximately 80% of cases, the thoracic cord is affected, and as the name suggests, the usual clinical picture suggests involvement of the whole transverse extent of the spinal cord. The usual picture is therefore one of rapidly progressing paralysis, sensory loss, and incontinence, often with back pain; fever and meningism may be present. Objectively, the flaccid paraparetic or paraplegic picture of spinal shock with useless bladder and/or bowel sphincters is found, often with a sensory level accompanied by a band of hypesthesia, allodynia or hyperpathia. In MS, partial cord lesions are much more typical—pure sensory disturbance in both legs, allodynia or hyperpathia. In MS, partial cord lesions are much more typical—pure sensory disturbance in both legs, allodynia or hyperpathia. In late cases, imaging, indicated spinal block from a dissociation with greatly increased protein concentrations) were common. Spinal fluid changes (cyto-albuminic dissociation with greatly increased protein concentrations) and, in later cases, imaging, indicated spinal block from a very swollen cord. A number of reports followed describing patients with similarities but often more reactive cerebrospinal fluid (CSF), and the clinical picture has been left rather confused (whether the disorder is primarily inflammatory or not varies with different authorities). Most neuropathologists, perhaps faithful to its originators, retain the eponym for a disorder characterised by a severe necrotic process, of putative veno-occlusive cause, affecting grey and white matter, often with thrombin deposition thickening blood vessel walls.

Diffuse or disseminated syndromes

Acute disseminated encephalomyelitis

ADEM (table 2) occurs predominantly, though by no means exclusively, in childhood—perhaps this is because the most common viral precipitants of post-infectious encephalomyelitis are the childhood exanthemata. ADEM also occurs as post-vaccination encephalomyelitis, but in proportion of cases, no antecedent immunological challenge is identifiable. Typically, between days and 2–3 weeks following a self limiting illness, there emerges a prodrome of fever, myalgia, and malaise, lasting a few days. Subsequently, acutely evolving neurological features occur whose nature indicates severe simultaneous or rapidly sequential multifocal CNS disease. Focal brainstem and/or hemisphere signs,

Table 1 Features which might lead to doubt concerning a diagnosis of multiple sclerosis

<table>
<thead>
<tr>
<th>Systemic features</th>
<th>Neurological features</th>
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<tbody>
<tr>
<td>Family history</td>
<td>Persistent headache, fits, encephalopathy</td>
</tr>
<tr>
<td>Fever /night sweats, weight loss, arthropathy, rash, ulcers, dry mouth and eyes, ocular disease</td>
<td>Meninigism, movement disorders, stroke-like events, peripheral neuropathy</td>
</tr>
<tr>
<td>Investigations</td>
<td>Absent oligoclonal bands or persistent CSF pleocytosis</td>
</tr>
<tr>
<td>Raised ESR and/or CRP, serology; abnormal chest x ray.</td>
<td>Normal MRI or pronounced meningeal enhancement</td>
</tr>
</tbody>
</table>

Table 2 Inflammatory demyelinating diseases

<table>
<thead>
<tr>
<th>Benign focal inflammatory demyelination (BFID)</th>
<th>Optic neuritis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial cord syndromes, etc</td>
<td>Transverse myelitis</td>
</tr>
<tr>
<td>Non-benign, non-disseminated syndromes</td>
<td>Devic’s disease</td>
</tr>
<tr>
<td>Transverse myelitis</td>
<td>Disseminated diseases</td>
</tr>
<tr>
<td>Acute disseminated encephalomyelitis</td>
<td>Acute haemorrhagic encephalomyelitis</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>Multiple sclerosis</td>
</tr>
<tr>
<td>Relapsing-remitting (Charcot-type) multiple sclerosis</td>
<td>Primary progressive multiple sclerosis</td>
</tr>
<tr>
<td>Marburg disease</td>
<td>Schilder’s disease</td>
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<tr>
<td>(Baló’s disease)</td>
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</tbody>
</table>

Unfortunately, all of the features shown in italics can, if sometimes rarely, occur in multiple sclerosis!

CRP, C reactive protein; CSF, cerebrospinal fluid; ESR, erythrocyte sedimentation rate; MRI, magnetic resonance imaging.

There are no useful clinical clues indicating whether or not optic neuritis in any one individual heralds MS. MRI scanning serves multiple functions: directly to disclose optic neuritis; to help exclude many of the above alternatives; to help prognosticate—long and/or intracanalicular lesions are associated with poorer visual recovery; and to help predict the future risk of MS. Multifocal white matter lesions are seen at presentation in 50–70% of cases. Their presence indicates a risk of 82% in five years, while a normal brain MRI carries a predictive risk of between 6–24% at five years.

Devic’s disease or neuromyelitis optica

Devic’s syndrome—acute or subacute optic neuritis associated with myelitis—occurs in at least three separate contexts. It may be seen in MS, if the burden of disease happens to fall asymmetrically upon the spinal cord and optic nerves. In this situation, conventionally disseminated lesions are apparent elsewhere in the central nervous system (CNS), disclosed by MRI. Secondly, other inflammatory disorders may cause a similar clinical picture, notoriously SLE, but also vasculitic syndromes, sarcoidosis, and Behçet’s disease. Usually, but not invariably, systemic or serological manifestations are apparent. There is, in addition, a group of patients with no clinical or paraclinical evidence of disease elsewhere in the CNS, and in whom other systemic or vasculitic disorders have been excluded. The diagnostic label of Devic’s disease should be reserved for these; they show a unique clinical and pathological phenotype clearly separable from MS. Oligoclonal bands are usually absent, and cranial MRI is normal; the pathological process is closer to that of transverse myelitis or ADEM.

Foix-Alajouanine syndrome

In 1926, Foix and Alajouanine described subacute necrotic myelitis, an illness predominantly affecting adult males, characterised by a spastic paralysis, sensory loss, and incontinence progressing over 2–3 months; a flaccid, areflexic, amyotrophic phase ensued. Signs of systemic illness, with fever, meningism, and often severe local pain, were common. Spinal fluid changes (cyto-albumin dissociation with greatly increased protein concentrations) and, in later cases, imaging, indicated spinal block from a very swollen cord. A number of reports followed describing patients with similarities but often more reactive cerebrospinal fluid (CSF), and the clinical picture has been left rather confused (whether the disorder is primarily inflammatory or not varies with different authorities). Most neuropathologists, perhaps faithful to its originators, retain the eponym for a disorder characterised by a severe necrotic process, of putative veno-occlusive cause, affecting grey and white matter, often with thrombin deposition thickening blood vessel walls.
variants of MS. Were described which are now considered clinicopathological. Apparent variants of multiple sclerosis associated with varicella (and a good prognosis).

Less focally, there may occur an encephalopathy (which may progress to coma), meningo, and seizures; these, the bilateral nature of optic neuritis, and the multifocal nature of the disorder (acute episodes in MS are usually symptomatically single sited) all suggest ADEM rather than MS. Uncommonly, ADEM can relapse persistently, rendering the distinction from MS very difficult indeed, though so-called MDEM (multiphasic disseminated encephalomyelitis) probably represents a distinct disorder. The spinal fluid, often cellular, usually contains no oligogolical bands. Multifocal MRI lesions are observed, but are often more extensive and symmetrical in the white matter and occasionally in the basal ganglia, than in MS. Gadolinium enhancement can also help to distinguish the disorders—a mixture of enhancing and non-enhancing lesions implies the temporal dissemination of MS.

Although spontaneous recovery is the rule, a fatal outcome is seen in approximately 10–20%.

Acute haemorrhagic leukencephalomyelitis, or Weston-Hurst disease is a rare, more severe, and commonly fatal hyperacute form of ADEM. The course is more rapid, with pronounced systemic features; seizures are frequent and sometimes occurring after one or two isolated demyelinating events. The spinal fluid, often cellular, usually contains no oligogolical bands. Multifocal MRI lesions are observed, but are often more extensive and symmetrical in the white matter and occasionally in the basal ganglia, than in MS. Gadolinium enhancement can also help to distinguish the disorders—a mixture of enhancing and non-enhancing lesions implies the temporal dissemination of MS.

Infectious diseases

HTLV-1 related myelopathy is mentioned below. Lyme disease can cause a phenotype very similar to MS. The more common acute picture of meningeal (or meningoencephalitis), facial palsy, and/or painful radiculopathy presents few problems. However, in so-called tertiary Lyme disease, progressive syndromes including spastic paraparesis, cerebellar ataxia, and recurrent cranial neuropathies can cause diagnostic confusion. MRI may show multifocal white matter lesions, and the CSF can contain oligogolical bands though the cell count is usually persistently high. A history of the characteristic skin rash several years earlier will not be mentioned unless directly queried (and occasionally not even then). Serological tests on both blood and CSF are therefore important; polymerase chain reaction (PCR) also now plays a role. Neurosyphils, while increasing in frequency, still earns mention mostly through historic respect; it is rarely confused with MS, particularly in the MRI era. Headache and fits are common, and pupillary abnormalities characteristic. Syphilitic optic neuritis is usually painless.

Unrelated inflammatory disorders

Neurological disturbance reflecting involvement of the nervous system in many systemic inflammatory diseases (table 3) can mimic MS.

<table>
<thead>
<tr>
<th>Site</th>
<th>Primary disease</th>
<th>Secondary disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain (and spinal cord)</td>
<td>Multiple sclerosis, inflammatory myelitis, stiff man syndrome, Guillain-Barré syndrome + variants, CIDP, MMN</td>
<td>Vasculitides, lupus, other connective tissue diseases, anticytokinin syndromes, Behçet's, sarcoid, paraneoplasia, organ specific autoimmune disease (coeliac disease, Hashimoto's disease, etc)</td>
</tr>
<tr>
<td>Spinal cord</td>
<td>Myasthenia gravis, Lambert Eaton myasthenic syndrome, Polymyositis, dermatomyositis, inclusion body myositis</td>
<td></td>
</tr>
<tr>
<td>Peripheral nerve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuromuscular junction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle</td>
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</tr>
</tbody>
</table>

CIDP, chronic inflammatory demyelinating polyradiculoneuropathy; MMN, multifocal motor neuropathy.

Apparent variants of multiple sclerosis

During the early part of this century, a number of disorders were described which are now considered clinicopathological variants of MS.

Marburg disease essentially represents MS with a strikingly aggressive or malignant course, often rapidly fatal, sometimes occurring after one or two isolated demyelinating events. Retention of the term is useful on clinical grounds.

Schilder’s diffuse sclerosis is more complex. Dr Schilder certainly found it difficult to recognise, his second report describing two patients who had other diseases. However, there is a syndrome distinct from, but related to MS, usually of childhood onset, whose progressive course is punctuated by occasional periods of accelerated disease activity. Widespread, confluent or diffuse demyelination involving the cerebrum, cerebellum, and brainstem, with pronounced axon loss and often cavitation, are characteristic features. The neurological manifestations include those seen in MS, although dementia and other mainly cortical features are more prominent, including hemiplegia, cortical blindness and deafness. Inherited leucodystrophies (see below) must be excluded.

Baló’s concentric sclerosis is characterised pathologically by alternating concentric rings of demyelination and apparently normal myelin—occasionally strikingly seen on MRI. Episodes of repeated inflammatory demyelination at the same site, with intervening periods of myelin repair, probably explain this architecture. No particular clinical phenotype is commonly associated.

Inherited disorders which may be confused with multiple sclerosis

Adrenoleucodystrophy and metachromatic leucodystrophy may both cause a picture resembling progressive MS. Slowly progressive disease is the rule, but remitting illness is recognised. A family history, abdominal symptoms, skin pigmentation or other Addisonian features, and absent oligoclonal bands should stimulate a search for very long chain fatty acids and/or leucocyte enzyme abnormalities; additionally, MRI in leucodystrophies usually has partial specificity. Female carriers of the adrenoleucodystrophy gene can manifest. Electrophysiological evidence of a peripheral neuropathy also helps point to these disorders when confusion arises.

Mitochondrial disease can also cause a relapsing–remitting multifocal neurological picture. Useful distinguishing clinical features are found, and oligogolical bands are mostly absent. Leber’s disease (see above) is usually readily distinguished from MS. However, an interesting variant has emerged in recent years. Females present with disease consistent with MS but with a particular burden on the optic nerves; CSF oligogolical bands and cranial MRI changes suggest MS, but genetic tests reveal the presence of Leber’s mitochondrial mutations.
Neurology in Practice

Table 4 Classification of vasculitis

<table>
<thead>
<tr>
<th>Dominant vessel involved</th>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large arteries</td>
<td>Giant cell arteritis, Takayasu’s arteritis</td>
<td>Aortitis with rheumatoid disease; infection (e.g. syphilis)</td>
</tr>
<tr>
<td>Medium arteries</td>
<td>Classical polyarteritis nodosa, Kawasaki disease</td>
<td>Infection (e.g. hepatitis B)</td>
</tr>
<tr>
<td>Small vessels and medium arteries</td>
<td>Wegener’s granulomatosis, Churg-Strauss syndrome, microscopic polyangiitis, idiopathic CNS angitis</td>
<td>Vasculitis in rheumatoid disease, SLE, Sjögren’s syndrome, drugs, infection (e.g. HIV)</td>
</tr>
<tr>
<td>Small vessels</td>
<td>Henoch-Schönlein purpura, essential cryoglobulinaemia, cutaneous leukocytoclastic vasculitis</td>
<td>Drugs (e.g. sulfonamides, etc.), infection (e.g. hepatitis C)</td>
</tr>
</tbody>
</table>

CNS, central nervous system; SLE, systemic lupus erythematosus.

Cerebral vasculitis

Vasculitis is a histopathological description, not a diagnosis or disease (table 4). In both isolated CNS vasculitis and CNS involvement in systemic vasculitis three broad clinical phenotypes are proposed. That specifically resembling MS (“MS plus”) exhibits a relapsing–remitting course, with features such as optic neuropathy and brain stem episodes. However, additional features less common in MS also occur—seizures, severe persisting headaches (said to occur in 80% of patients or more), encephalopathic episodes, or hemispheric stroke-like events. Systemic features may also be present (often revealed only on direct inquiry) even in so-called isolated CNS vasculitis—fever and night sweats, skin or eye changes, oligoarthropathy—also contrasting with MS. The other two clinical patterns are (1) acute or subacute features such as optic neuropathy and brain stem episodes. However, additional features less common in MS also occur—seizures, severe persisting headaches (said to occur in 80% of patients or more), encephalopathic episodes, or hemispheric stroke-like events. Systemic features may also be present (often revealed only on direct inquiry) even in so-called isolated CNS vasculitis—fever and night sweats, skin or eye changes, oligoarthropathy—also contrasting with MS. The other two clinical patterns are (1) acute or subacute features such as optic neuropathy and brain stem episodes. However, additional features less common in MS also occur—seizures, severe persisting headaches (said to occur in 80% of patients or more), encephalopathic episodes, or hemispheric stroke-like events. Systemic features may also be present (often revealed only on direct inquiry) even in so-called isolated CNS vasculitis—fever and night sweats, skin or eye changes, oligoarthropathy—also contrasting with MS. The other two clinical patterns are (1) acute or subacute features such as optic neuropathy and brain stem episodes. However, additional features less common in MS also occur—seizures, severe persisting headaches (said to occur in 80% of patients or more), encephalopathic episodes, or hemispheric stroke-like events. Systemic features may also be present (often revealed only on direct inquiry) even in so-called isolated CNS vasculitis—fever and night sweats, skin or eye changes, oligoarthropathy—also contrasting with MS. The other two clinical patterns are (1) acute or subacute

Systemic lupus erythematosus

Neurological involvement in SLE is seen in 50% of cases, but neurological presentation is found in perhaps only 3%—as with vasculitis, neurological disease in the setting of known lupus presents less of a problem. It is uncommon therefore for lupus and MS to be confused diagnostically. This said, the historic concept of so-called lupoid sclerosis—MS-like neurological features in the context of established lupus—needs to be mentioned in order to be dismissed. Pathological studies indicate that primary demyelination is not seen in CNS lupus, helping to emphasise the separateness of these disorders. The simple co-existence of lupus and MS, neither being excessively rare, may have contributed to this confusion, as has the over-interpretation of antinuclear antibody (ANA) serology (see below). The term should not be retained.

Direct inquiry and focused systemic examination to disclose fever, malaise, skin changes (classically, the malar butterfly rash and/or photosensitivity), and arthritis will help. Revised SLE diagnostic criteria, with an estimated specificity and sensitivity of 96%, have been widely accepted, particularly for research and therapeutic trial purposes (see adjacent box). Importantly, most authorities suggest that only ANA titres over 1:160 are diagnostically relevant. In common with vasculitis, a wide variety of CNS complications can occur in SLE, some very similar to those in MS, others pointing away from this diagnosis. CNS lupus very rarely has an underlying vasculitic pathology, and the term lupus vasculitis also should be discarded.

Ataxia, brain stem abnormalities, and cranial neuropathies may resemble MS, but more particularly associated with lupus are optic neuropathy and transverse myelopathy. The former is often painless, subacute, and progressive, and commonly very severe; the latter usually resembles idiopathic transverse myelitis more than spinal relapses of MS. Headache is common in lupus (including that of dural sinus thrombosis). Other features for which SLE is more noted for than MS include seizures, psychiatric and cognitive disturbances, episodes of encephalopathy, and movement disorders (especially chorea). Peripheral neuropathy can also occur. Stroke, particularly a feature of the antiphospholipid syndrome, rarely causes diagnostic confusion with MS.

A persistently raised ESR should not be ignored. Serological changes apart (table 5), investigation may reveal a raised CSF protein concentration and a neutrophil or
Sarcoidosis affects the nervous system in approximately 5% of patients. Optic nerve disease is particularly associated; a chronic progressive course and persistent steroid sensitivity commonly (but not invariably) point away from MS. Other cranial neuropathies (especially involving the facial nerve), and brain stem and spinal cord disease, may variably resemble MS. Cognitive and neuropsychiatric abnormalities, and peripheral involvement (nerve and muscle) help point away from MS.

The chest x-ray is abnormal in between a third and a half of patients; subclinical thoracic disease is said to be present in most cases of extrathoracic sarcoidosis. Searching for anterior and/or posterior segment inflammation using slit lamp examination and fluorescein angiography can be valuable. Serum and CSF angiotensin converting enzyme concentrations may be raised; the CSF may reveal increases in protein or cell count in 80% of cases. Oligoclonal bands may be present, though as with other non-MS pathologies, their presence varies when serially assessed. Whole body gallium scanning can disclose asymptomatic foci of systemic disease. Cranial MRI may show multiple white matter lesions and/or, in about a third of patients, meningeal enhancement. The diagnosis is confirmed where possible by biopsy, either of cerebral or meningeal tissue, or of lung or conjunctiva where appropriate.

**Behçet’s disease**

Behçet’s disease is a chronic relapsing multisystem inflammatory disorder. Formal diagnostic criteria propose that recurrent oral ulceration (at least three times in one year) is an absolute criterion; any two of (1) recurrent genital ulceration, (2) uveitis or retinal vasculitis, (3) skin lesions, including erythema nodosum, or acniform nodules, pseudofolliculitis or papulopustular lesions, or (4) a positive pathergy test (read at 24–48 hours) are also required to confirm the diagnosis. These again help to emphasise the importance of a careful directed history and examination in revealing crucial features which patients might not think of sufficient interest to the neurologist to mention.

If benign headache is excluded, approximately 5% of patients develop neurological complications. Features suggesting Behçet’s disease include cerebral venous sinus thrombosis, sterile meningoencephalitis, encephalopathy, and psychiatric and progressive cognitive manifestations. MRI abnormalities are non-specific, though posterior fossa and brainstem involvement is said to be typical. Oligoclonal bands are uncommon.

**Whipple’s disease**

Whipple’s disease, caused by *Tropheryma whippelii*, is characterised by arthropathy, respiratory symptoms, anaemia, fever, erythema nodosum, and severe wasting, in addition to steatorrhoea and abdominal distension. Ten per cent of patients have neurological involvement; 5% present in this way. A wide variety of features is seen (see box); in only a small proportion might the onset resemble that of a first inflammatory demyelinating episode.

**Neurological features of Whipple’s disease (in approximate order of frequency)**

- Cognitive changes, dementia and/or psychiatric disease
- Supranuclear gaze palsy
- Pyramidal signs
- Hypothalamic features: somnolence, polydipsia, increased appetite, hypogonadism
- Myoclonus: oculo-masticatory myorhythmia
- Cranial neuropathies
- Fits
- Eye disease: keratitis, uveitis, papilloedema, ptosis
- Ataxia

Imaging may be normal, or reveal non-specific abnormalities; the same may be said of the CSF. One third of CSF samples may reveal pathognomonic period acid–Schiff (PAS) positive bacilli; repeat spinal fluid examination increases this yield. Approximately 30% of cases have a non-informative small bowel biopsy though electron microscopy will increase sensitivity. Lymph node biopsy can also be useful. PCR analysis of blood, lymph node, spinal fluid, small bowel tissue or brain is increasingly used.
Neurological disease may be reversible if treated promptly (with tetracyclines, penicillin or, more commonly, co-trimoxazole), or rapidly fatal if not.

**Vascular disease**

Arteriovenous malformations enjoyed a certain notoriety as a confounding cause of a relapsing remitting single sited syndrome, but because of the availability of MRI they no longer command such diagnostic respect. Subacute bacterial endocarditis (SBE) and atrial myxoma can rarely cause a more challenging picture as a consequence of multifocal embolic infarction, but the context is usually distractingly obvious. Cerebral autosomal dominant arteriopathy with subcortical and leukoencephalopathy (CADASIL) can mislead, but the family history, cognitive features, usually distinctive MRI changes, and absence of oligoclonal bands should alert the tolerably wary.

**Malignancy**

Paraneoplastic leucocytoclastic vasculitis (which is rarely neurological) may complicate a variety of cancers, and CNS angitis associated with Hodgkin’s disease is reported. Lymphomatoid granulomatosis is a rare T lymphoma centred on the vascular wall, while neoplastic or malignant angioendotheliosis, also rare, is a B cell lymphoma, where the neoplastic process is intraluminal. As with other CNS vasculopathies, all can cause a picture resembling MS. Systemic features—low grade or undulating fever, weight loss, pruritus—should raise suspicions. Other paraneoplastic disorders rarely permit serious confusion with MS, though cancer related retinopathy can superficially resemble optic neuritis.

A number of CNS malignancies carry reputations as great mimics of MS, but these almost invariably have failed to survive the widespread availability of MRI. Meningiomas can cause relapsing (unifocal) disease—most notoriously in pregnancy, as a presumed consequence of the oestrogen receptors they express. Gliomata, especially in the brainstem, can also show this course. Epidermoid cysts of the IVth ventricle may trap the unwary. Most neurologists have a healthy respect for pathology at the foramen magnum and the diagnostic problems that it can pose. For example, clinical features of Chiari malformations, among other symptoms, include Lhermitte’s sign and trigeminal neuralgia. None, however, easily evade the MR scanner. One of the few primary CNS malignancies that can is the multifocal glioma. The author has seen a 24 year old female patient with three different neurological episodes, two apparently steroid responsive, with biopsy ultimately revealing this diagnosis (fig 1).

**Primary progressive MS**

Primary progressive MS poses a different set of problems. The clinical picture is not especially characteristic, and alternative diagnoses are thus generally more actively sought. Most patients with a progressive paraparesis routinely undergo spinal cord MR imaging, which will exclude many (surgically relevant) causes; adding a cranial examination will help in some and confirm the diagnosis. Both cerebral and spinal appearances of B-12 deficiency can resemble those of MS (and the ankle jerks are not always absent in early deficiency, though glossitis usually is), so that checking B-12 concentrations is mandatory. HTLV related myelopathy can likewise cause similar brain and spine MR changes, and in this instance CSF oligoclonal bands are present: HTLV serology is therefore also recommended.

The above systemic inflammatory diseases should be actively sought. Most can present with progressive paraparesis or ataxia. Hereditary diseases are not always conveniently flagged by a family history, absent ankle jerks and pes cavus; however, the cranial MRI and the presence or absence of oligoclonal bands usually makes the distinction straightforward. (Note that the visual evoked response (VER) can be abnormal in some of the spinocerebellar ataxias.) Genetic testing for these (including Friedrich’s ataxia) is available.

Key references

A recent review of a number of white matter syndromes, many of which can simulate multiple sclerosis.


A highly relevant account that remains valuably informative.


A barely tolerable account of clinical, diagnostic, and therapeutic aspects of inflammatory neurological diseases.


Far more than the atlas its title suggests, this is an outstanding book, beautifully summarising (and illustrating) the whole range of de- and dysmyelinating diseases.

SURFING FOR MULTIPLE SCLEROSIS

There are a very large number of sites relating to multiple sclerosis (MS) on the web. An unfiltered search generates thousands of these. Even a more selective search—for example, using the Google directory (at www.google.com)—identifies nearly 500 patient support sites. Among this melee that of the national MS society stands out. The MS society at www.mssociety.org.uk is easy to navigate, good for patients and carers, and has excellent links for everyone. The national MS society of USA at www.nmss.org contains valuable material for patients and professionals. There are useful lists of current trials, research, and updates on ongoing trials.

An excellent site for both professionals and patients is “The world of MS”, the web page of the Multiple Sclerosis International Federation at http://www.msif.org/default.htm. This has easy access to comprehensible information for patients and has useful links to all the international MS societies. There is an excellent search engine to allow you to find information for patients from a wide range of sources, including the national societies mentioned above. This is probably the site to bookmark as you can get everywhere you will want to go from here!

There are lots of other interesting sites, mostly for patients and their carers.

A nurse with MS established MS news, at www.msnews.org. Its mission statement stresses the problems of social isolation that patients encounter. This site also includes conference abstracts and useful links as well as lots on diets, all organised in a pleasingly haphazard way. The web site www.albany.net/~tjc is run by a patient with contributions from others. It is a very comprehensive web resource about MS. There are libraries of abstracts, sorted by topic, as well as a cross-referenced glossary of MS that is like a small textbook. There are also poems and personal accounts.

Patients may also find helpful the US National Institutes of Health site at http://ninds.nih.gov/health_and_medical/pubs/multiple_sclerosis.htm#whatis. This has sober and readable accounts of the major aspects of the disease which should answer most of the questions your patients may think of after they have left your consulting room. This would also be a good site to visit if you’ve been asked to give a talk about MS to medical students at short notice. Other accessible sites include: www.healthtalk.com, a US site which has some sensible interactive features, chat rooms, and interviews with patients and MS professionals; and www.understandingms.com which has some accessible web casts that will probably be of interest to some patients.

One site for professionals but not specifically related to MS is worth mentioning. The online Mendelian inheritance in man database (OMIM at http://www.ncbi.nlm.nih.gov/Omim/) is useful for all genetic information and a wealth of references on inherited myelin disorders.

Finally, www.mscare.org is a stylish but rather insubstantial US site that you will often be linked to, without quite realising why. Its on-line journal at www.mscare.com will cheer you up if you are despairing of ever publishing some MS related research.

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THE DIFFERENTIAL DIAGNOSIS OF MULTIPLE SCLEROSIS

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