

Contents

1	How to Use This Book?	1
1.1	General Background	1
1.2	Main Classification System	2
1.3	A Route-Map or Classification Tree	2
2	Dementia: Clinical Background	5
2.1	What Is Dementia?	5
2.2	Prevalence and Incidence	5
2.2.1	Prevalence	5
2.2.2	Incidence	6
2.3	Nosological Approach	7
2.3.1	Genetic/Protein Classification	8
2.3.2	Clinical and Pathological Uncertainty	8
2.4	Differential Diagnosis	9
2.4.1	Diagnostic Evaluation	10
2.5	Multidisciplinary Integration	11
	Suggested Reading	11
3	The Toolbox	13
3.1	Introduction: Choosing the Right Tools	13
3.2	Structural Imaging	14
3.2.1	Data Acquisition	14
3.3	Feature Extraction	21
3.3.1	Introduction: Structured Reporting	21
3.3.2	Visual Rating	22
3.3.3	Linear Measurements for MRI and/or CT	28
3.3.4	Quantitative Techniques (contribution by Giorgos Karas)	28
3.4	Advanced MR Techniques	32
3.4.1	Diffusion Tensor Imaging (DTI)	32
3.4.2	MR Perfusion Imaging	33
3.4.3	MR Spectroscopy	33
3.4.4	Brain Activation – Functional MRI (fMRI)	34
3.5	SPECT and PET (contribution by Bart van Berckel)	36
3.5.1	Data Acquisition – Introduction	36
3.5.2	SPECT Technique and Tracer Generation	36
3.5.3	PET Technique and Scanners	37
3.5.4	Feature Extraction	38
	Suggested Reading	41

4	Normal Ageing	43
4.1	Introduction – Don't Worry, It is Normal?	43
4.1.1	Successful Ageing Versus Usual Ageing	43
4.2	Brain Volume Loss	44
4.2.1	Global Brain Atrophy	44
4.2.2	Medial Temporal Lobe Atrophy Versus Hippocampal Cavities	46
4.3	Enlarged Perivascular (Virchow–Robin) Spaces and Lacunes	48
4.3.1	Microbleeds	48
4.4	Age-Related White Matter Hyperintensities	49
4.5	Iron Accumulation	51
4.6	Age-Related Changes in 'Normal Appearing' Brain Tissue	52
4.6.1	Metabolic and Microstructural Changes	52
4.6.2	Functional Changes in Normal Ageing	55
4.7	Is It Normal or Not?	55
	Suggested Reading	57
5	Primary Grey Matter Loss	59
5.1	Introduction: Primarily Grey Matter Loss	59
5.2	Alzheimer's Disease	60
5.2.1	History	60
5.2.2	Histopathology	60
5.2.3	Genetics	62
5.2.4	Clinical Presentation	63
5.2.5	Differential Diagnosis of AD	65
5.2.6	Neuroimaging Strategy and Findings in AD	65
5.2.7	Recommendations for Further Imaging	72
5.3	Frontotemporal Lobar Degeneration (Jonathan D. Rohrer)	75
5.3.1	Introduction and Synonyms	75
5.3.2	History and Nosology	76
5.3.3	Epidemiology, Aetiology and Genetics	77
5.3.4	Histopathology	77
5.3.5	Clinical Features and Imaging Strategy	79
5.3.6	Differential Diagnosis, Imaging Follow-up (Including PET/SPECT), Other Tests (CSF/EEG)	89
5.4	Dementia with Parkinsonism	89
5.4.1	Introduction: Neurodegeneration, Parkinsonism and Dementia	89
5.4.2	Dementia with Lewy bodies and Parkinson's Disease Dementia (John O'Brien and Michael Firbank)	94
5.4.3	Progressive Supranuclear Palsy (PSP) (Dominic Paviour)	100
5.4.4	Multiple System Atrophy (MSA) (Dominic Paviour)	103
5.4.5	Cortico-Basal Degeneration (CBD) and Other FTLD Tauopathies (Dominic Paviour)	108
5.5	Dementia in 'Other' Movement Disorders	110
5.5.1	Introduction	110
5.5.2	Huntington's Disease (Ed Wild, Nicola Hobbs and Susie Henley)	111

5.5.3	Metal Metabolism Disorders.	115
5.5.4	Dentatorubral-Pallidoluysian Atrophy	117
5.6	Prion-Linked Dementias.	119
5.6.1	Introduction – History, Nosology and Transmission	119
5.6.2	Biochemistry, Genetics and Histopathology.	120
5.6.3	Creutzfeldt–Jakob Disease	121
5.6.4	Gerstmann–Sträussler–Scheinker (GSS) Syndrome.	128
5.6.5	Fatal Familial Insomnia (FFI).	128
5.7	Recreational Drugs and Alcohol.	129
5.7.1	Introduction.	129
5.7.2	Alcohol-Induced Dementia.	130
5.7.3	Marchiafava–Bignami Disease	130
5.7.4	Cannabis, Ecstasy and Cocaine.	132
5.7.5	Nicotine.	132
	Suggested Reading.	133
6	Vascular Dementia.	137
6.1	Introduction.	137
6.2	History and Nosology.	138
6.2.1	Binswanger’s Disease, ‘État lacunaire’, Multi-infarct Dementia, Strategic Infarct Dementia – Current Concepts.	138
6.2.2	Current Diagnostic Criteria and Limitations.	139
6.2.3	Towards More Homogeneous Criteria	140
6.3	Large Vessel Vascular Dementia.	140
6.3.1	Aetiology, Pathology and Genetics.	140
6.3.2	Clinical Presentation, Epidemiology and Treatment	142
6.3.3	Neuroimaging Strategy and Key Findings in Large Vessel VaD	142
6.3.4	Differential Diagnosis.	143
6.4	Small Vessel Vascular Dementia.	144
6.4.1	Age-Related White Matter Changes, Lacunes, ‘État criblé’ – What Is Abnormal for Age?	144
6.4.2	Subcortical Ischaemic Vascular Dementia	145
6.4.3	Specific Types of Microangiopathy	149
6.5	Vasculitis.	159
6.5.1	Primary CNS Vasculitis	159
6.5.2	Secondary CNS Involvement	160
6.5.3	Systemic Lupus Erythematosus (SLE).	160
6.5.4	Susac’s Syndrome.	160
6.6	Systemic Hypoxia.	164
6.6.1	Anaemia	164
6.6.2	Transient Global Amnesia	165
6.7	Mixed Dementia and Interrelationship of Vascular Pathology and Alzheimer’s Disease (Wiesje van der Flier)	167
6.7.1	Introduction.	167
6.7.2	The Contribution of Cerebrovascular Pathology to Alzheimer’s Disease	167
6.7.3	The Contribution of Neurodegenerative Pathology to VaD	168

6.7.4	How Do Neurodegenerative and Cerebrovascular Changes Interact?	171
6.7.5	Shifting Paradigms	173
	Suggestions for Further Reading	175
7	Disorders Mainly Affecting White Matter	177
7.1	Introduction – Focus on White Matter Involvement	177
7.2	Infections	178
7.2.1	Introduction	178
7.2.2	Viral Infections Leading to Dementia	178
7.2.3	Bacterial Infections: Whipple's Disease	182
7.2.4	Spirochetal Infections and Dementia	182
7.3	Inflammatory Disorders	185
7.3.1	Introduction	185
7.3.2	Multiple Sclerosis and ADEM	185
7.3.3	Neurosarcoidosis	188
7.3.4	Coeliac Disease	190
7.4	Inborn Errors of Metabolism	192
7.4.1	Introduction	192
7.4.2	Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS)	193
7.4.3	Mitochondrial Dementia	194
7.4.4	Diffuse Neurofibrillary Tangles with Calcification (DNCT)	197
7.4.5	Cerebrotendinous Xanthomatosis (CTX)	198
7.4.6	Adult Polyglucosan Body Disease (APBD) (Contribution by Bert-Jan Kerklaan)	200
7.4.7	Neuroaxonal Leukodystrophy (NAL)	202
7.4.8	Late-Onset Metachromatic Leukodystrophy	204
7.4.9	Adrenomyeloneuropathy (AMN)	206
7.4.10	Vanishing White Matter Disease (VWM)	207
7.4.11	Globoid Cell Leukodystrophy (Krabbe's Disease)	210
7.5	Toxic Leukoencephalopathy and Dementia (Mike P. Wattjes)	210
7.5.1	Introduction and Classification	210
7.5.2	Vitamin B Deficiencies	212
7.5.3	Chronic Kidney Disease and Dialysis	215
7.5.4	Carbon Monoxide Poisoning	218
7.5.5	Delayed Post-hypoxic Demyelination	220
7.5.6	Organic Solvent Inhalation	221
7.5.7	Heroin Vapour Inhalation	224
7.6	Cognitive Dysfunction Associated with Cancer Therapy (Mike P. Wattjes)	225
7.7	Trauma	233
7.7.1	Dementia Associated with Traumatic Brain Injury (Mike P. Wattjes)	233
7.7.2	Dementia Pugilistica	238
	Suggested Reading	239

8	Dementias with Associated ‘Brain Swelling’	243
8.1	Introduction	243
8.2	Giant Virchow–Robin Spaces (VRS)	243
8.3	Infections	244
8.3.1	Herpes Simplex Encephalitis	244
8.3.2	Progressive Multifocal Leukoencephalopathy (PML)	247
8.4	Neoplastic Disease and Radiation Necrosis	250
8.4.1	Eloquent Areas and Common Tumours	250
8.4.2	Gliomatosis Cerebri Diffusa	251
8.4.3	Intravascular Lymphomatosis	254
8.4.4	Radiation Necrosis	254
8.5	Autoimmune Limbic Encephalitis (Jonathan Schott)	257
8.5.1	History and Nosology	257
8.5.2	Clinical Presentation, Pathology and Differential Diagnosis	257
8.5.3	Paraneoplastic Limbic Encephalitis	257
8.5.4	Non-neoplastic Autoimmune Encephalitis	259
8.6	Normal Pressure Hydrocephalus (NPH)	261
8.6.1	History and Nosology	261
8.6.2	Clinical Presentation	261
8.6.3	Neuropathology and Aetiological Considerations	261
8.6.4	Neuroimaging Strategy and Findings	263
8.6.5	Differential Diagnosis	263
8.6.6	Shunt Response	263
8.7	Arteriovenous Malformations (AVM) and Dural Arteriovenous Fistula (dAVF)	265
8.8	Reversible Posterior Leukoencephalopathy (RPLS)	266
8.9	Amyloid-Targeted Therapy	267
	Suggested Reading	268
	Index	269