Neuroimaging in dementia

Philip Scheltens
Alzheimer Center / dept Neurology
VU University Medical Center
Amsterdam

Disclosures

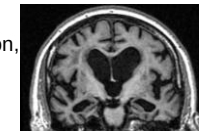
-The Alzheimer Centre has received funding from: AEGON, ZONMW, Alzheimer Nederland, Stichting VUmc Fonds, AHAF, ISOA, ISAO, Wyeth Nederland, Danone Research, KLM Royal Dutch Airlines, Heineken Nederland.

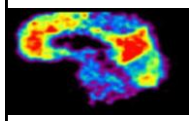
-Image Analysis research and clinical trials are carried out with: Danone Medical Nutrition, NeuroChem, Jansen Research Foundation, Novartis, Roche, Lundbeck and Servier, Wyeth, Medivation.

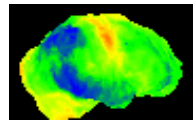
-Dr Scheltens receives no personal compensation from any of the above or others except the VUmc.

Neuroimaging

- Structural: CT/MRI
- Quantitative MR: spectroscopy, diffusion, perfusion, MTR
- Functional: PET/SPECT & fMRI
- Molecular imaging: e.g. amyloid







Special Article
CME
Neurology 2001;56:1143–1153

Practice parameter: Diagnosis of dementia (an evidence-based review)

Report of the Quality Standards Subcommittee of the American Academy of Neurology

D.S. Knopman, MD; S.T. DeKosky, MD; J.L. Cummings, MD; H. Chui, MD; J. Corey-Bloom, MD, PhD; N. Relkin, MD, PhD; G.W. Small, MD; B. Miller, MD; and J.C. Stevens, MD

EFNS TASK FORCE

Recommendations for the diagnosis and management of Alzheimer's disease and other disorders associated with dementia: EFNS guideline

Gunhild Waldemar, Bruno Dubois, Murat Emre, Jean Georges, Ian G. McKeith, Martin Rossor, Philip Scheltens, Peter Tariska, Bengt Winblad

AAN (2001)

Practice recommendations.

- Structural neuroimaging with either a noncontrast CT or MR scan in the routine initial evaluation of patients with dementia is appropriate (Guideline).
- Linear or volumetric MR or CT measurement strategies for the diagnosis of AD and are not recommended for routine use at this time (Guideline).
- For patients with suspected dementia, SPECT cannot be recommended for routine use in either initial or differential diagnosis as it has not demonstrated superiority to clinical criteria (Guideline).
- PET imaging is not recommended for routine use in the diagnostic evaluation of dementia at this time (Guideline).

EFNS (2005)

Recommendations:
Structural imaging should be used in the evaluation of every patient suspected of dementia: Non-contrast CT can be used to identify surgically treatable lesions and vascular disease (Level A).
To increase specificity, MRI (with a protocol including T1, T2 and FLAIR sequences) should be used (Level A).
SPECT and PET may be useful in those cases where diagnostic uncertainty remains after clinical and structural imaging work up, and should not be used as the only imaging measure (Level B).

European Journal of Neurology 2010, 17: 1236–1248
doi:10.1111/j.1468-1331.2010.03040.x

EFNS GUIDELINES/CME ARTICLE

EFNS guidelines for the diagnosis and management of Alzheimer's disease

J. Hort[a], J. T. O'Brien[b], G. Gainotti[c], T. Pirttila[d,†], B. O. Popescu[e], I. Rektorova[f], S. Sorbi[g] and P. Scheltens[h] on behalf of the EFNS Scientist Panel on Dementia

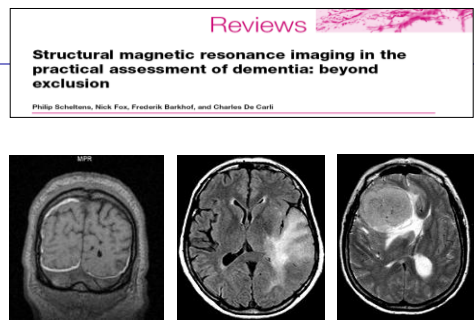
CT and MRI may be used to exclude treatable causes of dementia. Multislice CT and coronal MRI may be used to assess hippocampal atrophy to support a clinical diagnosis of AD (Level B). FDG PET and perfusion SPECT are useful adjuncts when diagnosis remains in doubt (level B). Dopaminergic SPECT is useful to differentiate AD from DLB (level A). Follow up with serial MRI is useful in a clinical setting to document disease progression (good practice point).

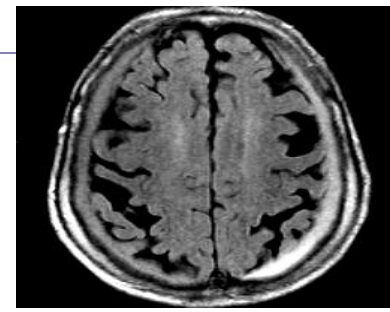
Changing roles of imaging

- From excluding treatable causes
  - Neoplasm, hydrocephalus, subdural
  - "Yield" – <1% to <5%?
- To making a positive diagnosis
  - moving from "dementia" to a specific diagnosis because
    - Patients and carers want to know
    - Prognostic value
    - Guide treatments and research

What to image and how

- Exclude structural causes (CT/MRI)
- Assess signal change on T2/PD MRI or FLAIR
- Assess pattern of atrophy (T1 – coronal)
  - Is there focal atrophy? FTD
  - Hipoocampal atrophy? AD
- Consider other imaging – PET etc





Dementia: differential diagnosis

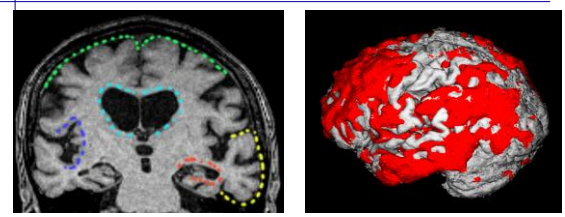
By prevalence

- Alzheimer's Disease
- Vascular Dementia
- Dementia With Lewy Bodies
- Frontotemporal Dementia

Characteristic features

- Prion Diseases
- Progressive Supranuclear Palsy
- HD; Leukodystrophies, SCAs, CADASIL …other

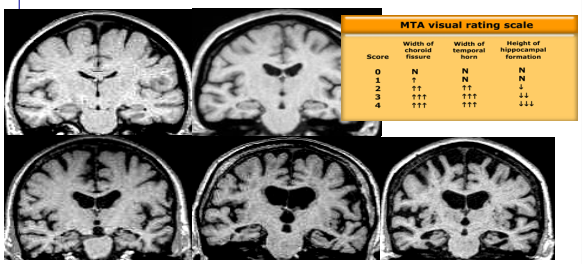
Imaging the 'fingerprint' of AD



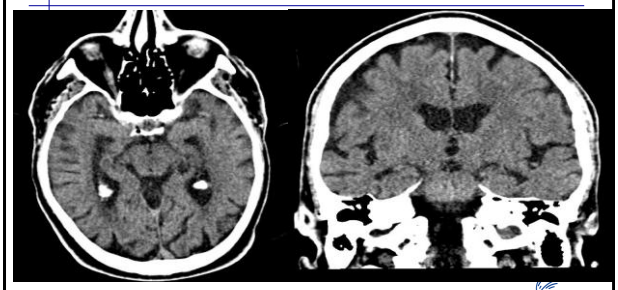
Visual inspection | VBM

Karas GB, Neuroimage 2003;18:895-907

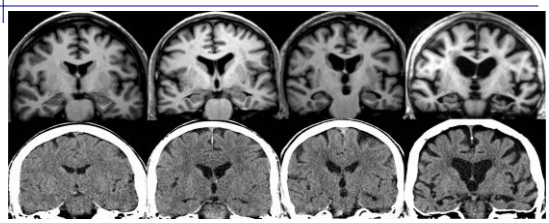
Medial temporal lobe atrophy



Also on (Multi slice) CT !



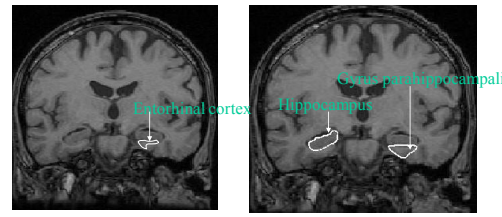
Multidetector CT in dementia



64 slices, 0.6 mm slice collimation, 5 sec acquisition time

Wattjes M, et al Radiology, 2009

Volumetry of MTA



Diagnostic value of MTA AD vs ND (n=107)

	MMSE	VOLUME	VISUAL
Sensitivity	76 (68-84)	78 (70-86)	90 (84-96)
Specificity	85 (78-92)	91 (86-96)	98 (100-96)
+LR		8.7	45

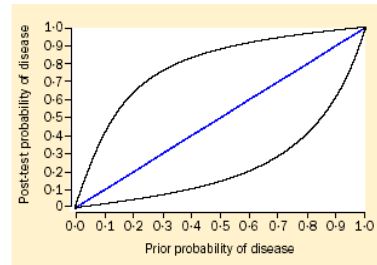
Wahlund et al. JNNP 2000;69:630-635

Diagnostic value of MTA in AD

Reviews

Structural magnetic resonance imaging in the practical assessment of dementia: beyond exclusion

all studies:
sens 85%
spec 88%



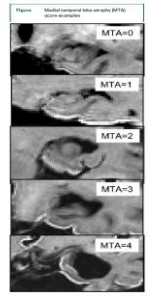
The significance of medial temporal lobe atrophy

A postmortem MRI study in the very old

Table 2 Number of subjects in each medial temporal lobe atrophy (MTA) score by primary pathology

Hippocampal pathology	N (%)	Most severe MTA score 0	1	2	3	4
No significant pathology*	47 (36)	3	25	16	2	1
AD Alone	23 (17)		0	4	98	2
With AgD	4 (3)	0	2	1	1	0
With HS	2 (2)	0	0	1	0	1
With L-rP	10 (14)	0	2	5	0	3
With L-rP and HS	1 (1)	0	0	0	0	1
AgD Alone	13 (10)	0	4	5	2	2
With L-rP	4 (3)	0	2	1	1	0
With L-rP DLB	1 (1)	0	0	0	1	0
With HS	2 (2)	0	0	0	1	1
L-rP Alone	8 (6)	0	3	3	2	0
With HS	1 (1)	0	0	0	0	1
HS Alone	4 (3)		0	1	0	21
HS With other	1 (1)	0	0	0	1	0
Other alone*	3 (2)	0	1	0	2	0

*No significant pathology consists of the normal aging and borderline groups, i.e., individuals who do not meet the neuropathologic criteria for AD or other primary hippocampal pathology in this study.
*Other primary neurodegenerative pathology.
AD = Alzheimer disease; AgD = argyrophilic grain disease; HS = hippocampal sclerosis; L-rP = Lewy-related pathology; DLB = Dementia with Lewy bodies; Other = other tauopathy.



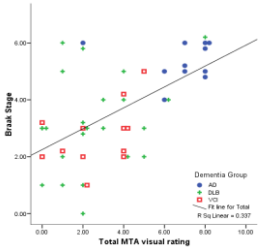
doi:10.1093/brain/awn298 Brain 2009: 132; 195–203 | 195

BRAIN
A JOURNAL OF NEUROLOGY

Medial temporal lobe atrophy on MRI differentiates Alzheimer's disease from dementia with Lewy bodies and vascular cognitive impairment: a prospective study with pathological verification of diagnosis

E. J. Burton,[1] R. Barber,[1] E. B. Mukaetova-Ladinska,[1,2] J. Robson,[1,2] R. H. Perry,[1,3,4] E. Jaros,[1,3,4,5] R. N. Kalaria[1,6] and J. T. O'Brien[1]

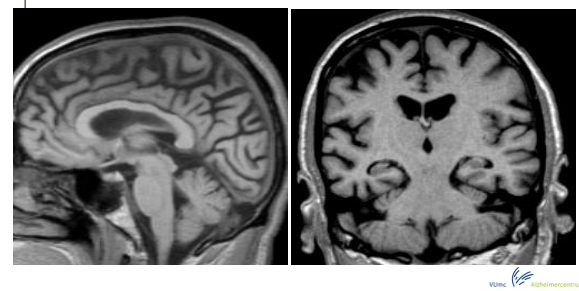
Hippocampal atrophy and neuropathology



- MTA on MRI had robust power for distinguishing 11 AD from 23 DLB and 12 VCI in pathologically confirmed cases
- Sensitivity = 91%
- Specificity = 94%

Burton et al, Brain 2009

Presenile AD



Precuneus atrophy in early-onset Alzheimer's disease: a morphometric structural MRI study

Giorgos Karas · Philip Scheltens · Serge Rombouts · Ronald van Schijndel · Martin Klein · Bethany Jones · Wiesje van der Flier · Hugo Vrenken · Frederik Barkhof

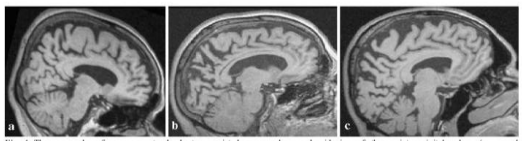
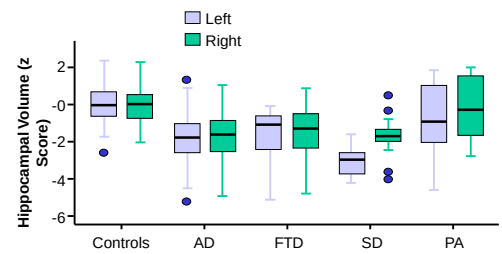


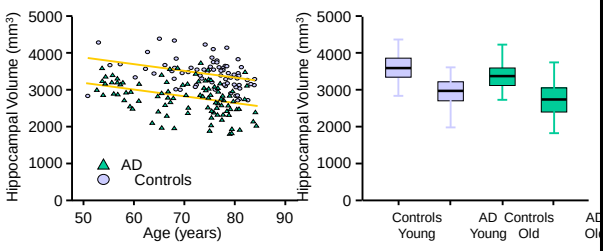
Fig. 4 Three examples of precuneus atrophy best appreciated on multiplanar reformatted images in the sagittal plane. In an atrophic precuneus there is widening of the marginal ramus of the cingulate sulcus and widening of the parietooccipital sulcus (a normal precuneus, b and c atrophic precuneus)

Hippocampal Atrophy on MRI in Frontotemporal Lobar Degeneration and Alzheimer's Disease



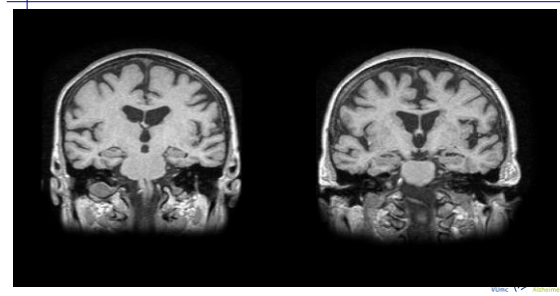
Van de Pol et al. *J Neurol Neurosurg Psychiatry*. 2006;77:439-442 (B).

Hippocampal Atrophy in Alzheimer's Disease: Age Matters

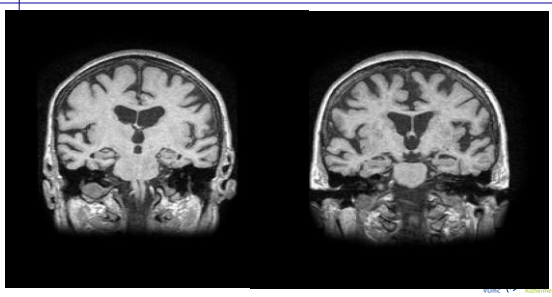


Van de Pol, Neurology 2008

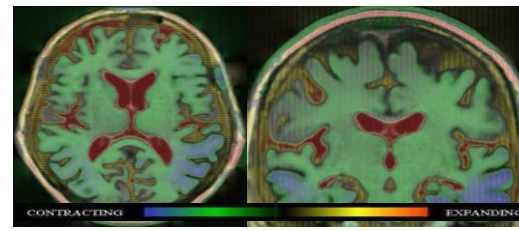
MCI - baseline



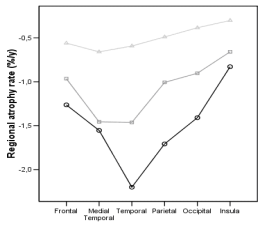
MCI – 2 year later



FLUID – non-linear registration



FLUID – regional pattern of atrophy

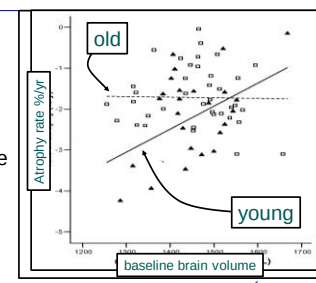


- controls - 0.5%/yr
  - no spatial predeliction
- MCI accelerating atrophy
  - (medial) temporal
- AD accelerating atrophy
  - temporoparietal

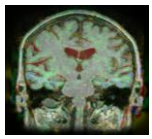
Fast progressors?

Fast progressors = high rate of atrophy

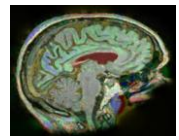
•Young onset patients
Especially if also:
small baseline brain volume
but spared hippocampus
•Genotype
→APOE e4 negative



Fast progressors?



Typical slow progressor
Old (74 years)
APOE e4 positive
Predominantly temporal



Typical fast progressor
Young (53 years)
APOE e4 negative
Spared hippocampus
(note posterior atrophy!)

Medial temporal lobe atrophy on MRI predicts dementia in patients with mild cognitive impairment

Esther S.C. Korf, MD; Lars-Olof Wahlund, MD, PhD; Pieter Jelle Visser, MD, PhD; and Philip Scheltens, MD, PhD

July (1 of 2) 2004 NEUROLOGY 63

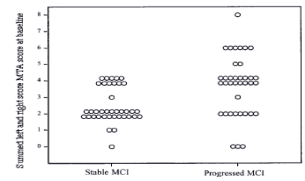


Figure 2. Medial temporal lobe atrophy (MTA) distribution in stable mild cognitive impairment (MCI) and progressive MCI. On the y axis, the summed left and right MTA score is displayed in the two groups.

Medial temporal lobe atrophy on MRI predicts dementia in patients with mild cognitive impairment

Esther S.C. Korf, MD; Lars-Olof Wahlund, MD, PhD; Pieter Jelle Visser, MD, PhD; and Philip Scheltens, MD, PhD

July (1 of 2) 2004 NEUROLOGY 63

Table 3 Cox regression: univariate analysis

Parameter	Hazard ratio (95% CI)
MTA summed score	1.48 (1.19–1.84)†
MTA dichotomized score	3.05 (1.47–6.41)†
Age	1.04 (1.00–1.07)
Female gender	1.30 (0.64–2.64)
Education	0.93 (0.82–1.06)
MMSE	0.94 (0.87–1.02)
CDR Sum of Boxes	1.35 (1.03–1.78)‡
Verbal Delayed Recall	1.69 (0.89–3.21)
Hypertension	0.62 (0.27–1.42)
Depression	0.76 (0.28–1.52)
APOE ε4 genotype	1.85 (0.91–3.77)
WMHs	1.01 (0.94–1.08)

Cox regression with follow-up as time variable and outcome (decline to dementia) as status variable.

* $p < 0.001$.
† $p = 0.003$.
‡ $p < 0.05$.

MTA = medial temporal lobe atrophy; MMSE = Mini-Mental State Examination; CDR = Clinical Dementia Rating Scale; WMH = white matter hyperintensity.

ORIGINAL CONTRIBUTION

Qualitative Estimates of Medial Temporal Atrophy as a Predictor of Progression From Mild Cognitive Impairment to Dementia

Charles DeCarli, MD; Giovanni B. Frisoni, MD; Christopher M. Clark, MD; Danielle Harvey, PhD; Michael Grundman, MD, MPH; Ronald C. Petersen, MD, PhD; Leon J. Thal, MD; Sheila Jin, MD, MPH; Clifford R. Jack, Jr, MD; Philip Scheltens, MD, PhD; for the Alzheimer's Disease Cooperative Study Group

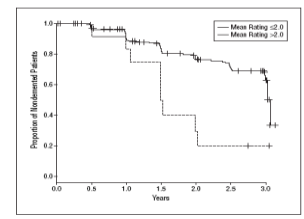
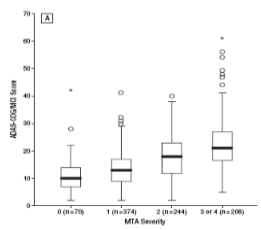


Figure 4. Kaplan-Meier curves for participants with medial temporal atrophy ratings of 2.0 or less compared with those with ratings greater than 2.0.

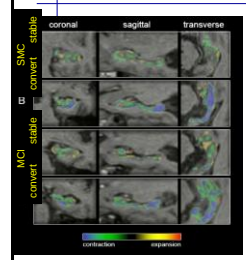
ORIGINAL CONTRIBUTION

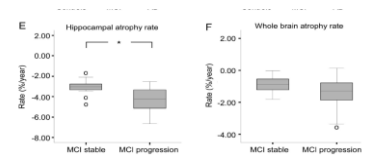
Magnetic Resonance Imaging Predictors of Cognition in Mild Cognitive Impairment

Laura A. van de Pol, MD; Esther S. C. Korf, MD; Wiesje M. van der Flier, PhD; H. Robert Brashear, MD; Nick C. Fox, MD, FRCP; Frederik Barkhof, MD, PhD; Philip Scheltens, MD, PhD



Longitudinal MRI – hippocampus is best!





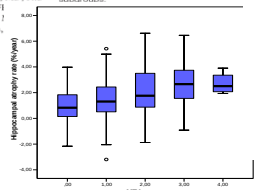
Henneman et al., Neurology 2009

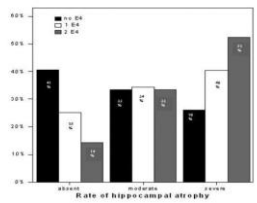
Baseline predictors of rates of hippocampal atrophy in mild cognitive impairment

L.A. van de Pol, MD, PhD
W.M. van der Flier, PhD
E.S.C. Korf, MD, PhD
N.C. Fox, FI
F. Barkhof, I
P. Scheltens,

ABSTRACT

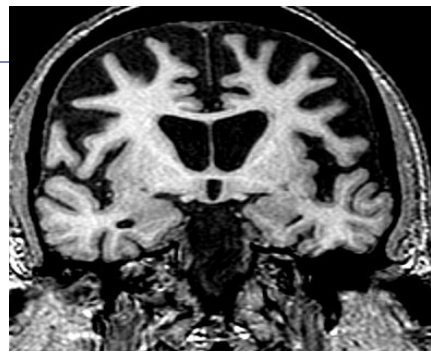
Objective: A large cohort of subjects with r
tertiles based on hippocampal atrophy ra
compared baseline clinical, neuropsycholo
subaroups.

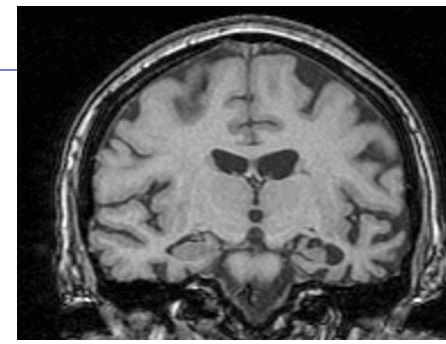


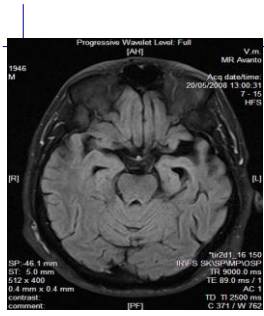


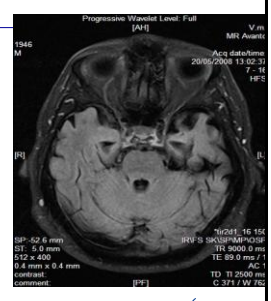
Other brain lesions

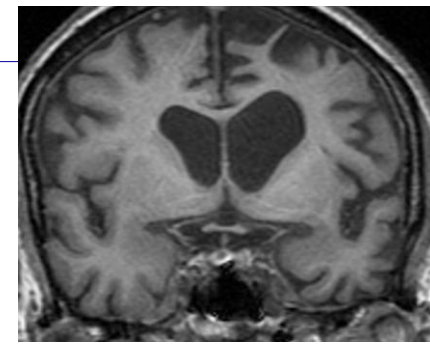
- Lobar atrophy
- Vascular changes
- -(lacunar) infarcts
- -white matter changes
- -microbleeds

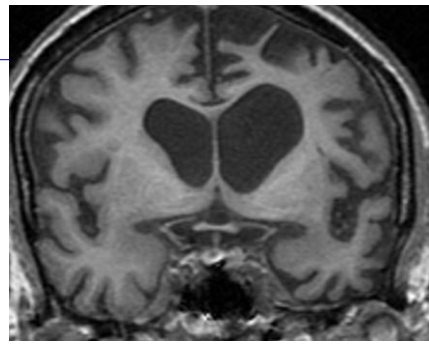








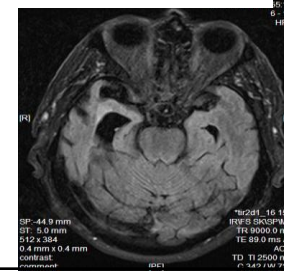




BRAIN
A JOURNAL OF NEUROLOGY

The clinical profile of right temporal lobe atrophy

Dennis Chan,[1] Valerie Anderson,[1] Yolande Pijnenburg,[2] Jennifer Whitwell,[1] Jo Barnes,[1] Rachael Scahill,[1] John M. Stevens,[3] Frederik Barkhof,[4] Philip Scheltens,[2] Martin N. Rossor[1,4] and Nick C. Fox[1]



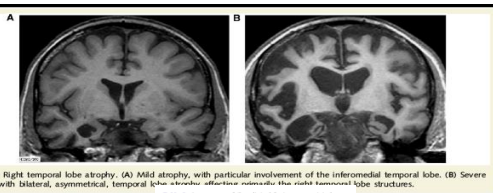
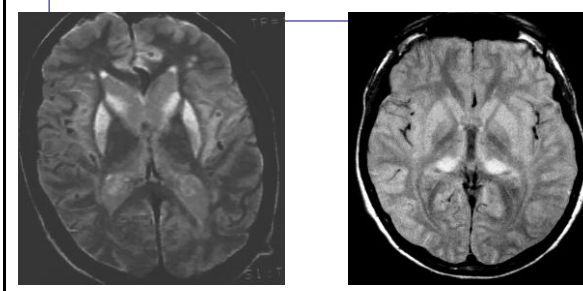


Figure 1 Right temporal lobe atrophy. (A) Mild atrophy, with particular involvement of the inferomedial temporal lobe. (B) Severe atrophy, with bilateral, asymmetrical, temporal lobe atrophy affecting primarily the right temporal lobe structures.

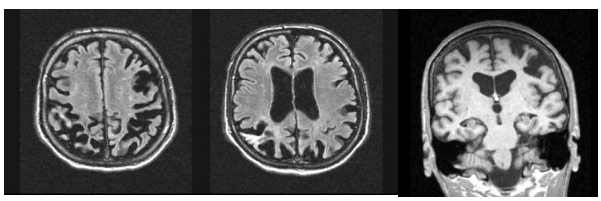
Table 2 A summary of the clinical features associated with the RTLA and semantic dementia patient group

	RTLA (percent affected)	SD (percent affected)
Cognitive functions		
Episodic memory	90	90
Topographical disorientation	70	10
Prosopagnosia	60	10
Problems with naming	95	100
Problems with calculation	5	10
Problems with spelling	10	0
Behaviour		
Apathy	35	20
Disinhibition	65	30
Obsessional behaviour	50	40
Behavioural rigidity	95	80
Loss of insight	85	70
Loss of empathy	25	20
Aggression	40	30
Personality		
Hyper religiosity	15	0
Hyper sexuality	10	10
Decline in personal care	90	60
Mood		
Depression	45	30
Manic/elation disorder	10	0
Eating habits		
Over-eating	20	30
Altered food preference	40	40
Other		
Visual hallucinations	10	0
Abnormal perception of sensory stimuli	15	0

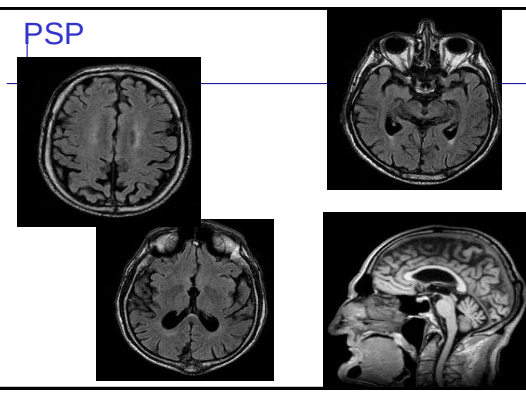
CJD: sporadic and variant



CBD

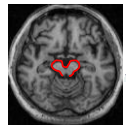


PSP



PSP: established imaging features

Midbrain
- reduced size,
- Mice
- Hummingbirds
- Penguins
- Morning glory

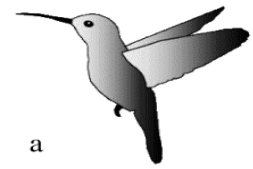


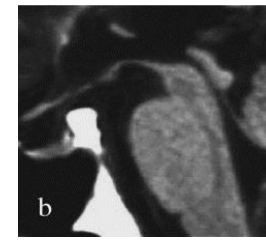
SCP

Third ventricle
- enlarged relative to lateral ventricles

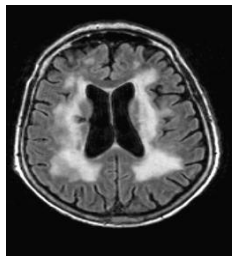
Frontal atrophy

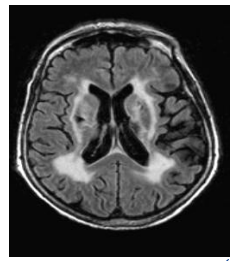
PSP - humming bird sign





And now for the White matter….



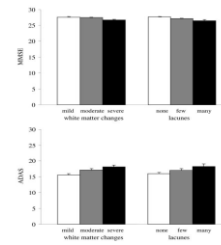


9734095

Small Vessel Disease and General Cognitive Function in Nondisabled Elderly

The LADIS Study

Wiesje M. van der Flier, PhD; Elizabeth C.W. van Straaten, MD; Frederik Barkhof, MD, PhD; Ana Verdelho, MD; Sofia Madureira, PsyP; Leonardo Pantoni, MD, PhD; Domenico Inzitari, MD; Timo Erkinjuntti, MD, PhD; Militta Crisby, MD, PhD; Gunhild Waldemar, MD, DMSc; Reinhold Schmidt, MD; Franz Fazekas, MD; Philip Scheltens, MD, PhD; on behalf of the LADIS Study Group



Progression of Mild Cognitive Impairment to Dementia

Contribution of Cerebrovascular Disease Compared With Medial Temporal Lobe Atrophy

Salka S. Staekenborg, MD; Esther L.G.E. Koedam, MD; Wouter J.P. Henneman, MD; Pauline Stokman; Frederik Barkhof, MD, PhD; Philip Scheltens, MD, PhD; Wiesje M. van der Flier, PhD

Table 3. Cox Regression Analysis

	AD		Non-Alzheimer Dementia	
	Model 1	Model 2	Model 1	Model 2
MTA	2.9 (1.7–5.0)	2.9 (1.7–5.3)	2.9 (1.1–7.9)	2.5 (0.8–7.2)
GCA	1.6 (0.8–3.1)	1.4 (0.7–2.7)	2.4 (0.8–7.0)	2.2 (0.7–7.0)
PVHs	1.3 (0.7–2.2)	1.1 (0.7–2.0)	7.3 (1.7–32.4)	6.5 (1.4–29.8)
DWMHs	1.4 (0.8–2.4)	1.3 (0.8–2.3)	5.7 (1.3–25.5)	5.7 (1.2–26.7)
Total WMHs	1.3 (0.8–2.2)	1.2 (0.7–2.2)	6.0 (1.3–26.8)	5.8 (1.2–26.6)
Lacunes	1.2 (0.6–2.4)	1.1 (0.5–2.2)	2.3 (0.8–6.8)	2.1 (0.7–6.4)
Lacunes basal ganglia	1.4 (0.7–3.0)	1.2 (0.6–2.6)	2.7 (0.9–8.1)	2.4 (0.8–7.5)
Microbleeds	0.7 (0.3–2.0)	0.8 (0.2–2.2)	2.5 (0.9–7.2)	2.6 (0.9–7.5)
Infarcts	0.8 (0.3–2.6)	1.1 (0.3–3.8)	0.8 (0.1–6.6)	1.4 (0.2–12.1)

MTA indicates medial temporal lobe atrophy; GCA, global cortical atrophy. Data are presented as HR (95% CI). Cox regression analysis compared progression to AD and non-Alzheimer dementia with nonconverters. The first model was unadjusted; the second model was adjusted for age and sex.

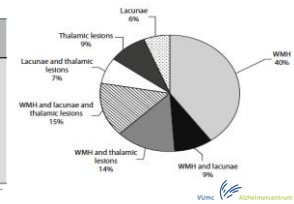
Small vessel versus large vessel vascular dementia

Risk factors and MRI findings

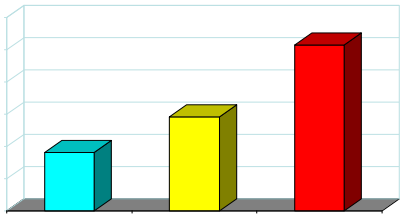
Salka S. Staekenborg
Elisabeth C. W. van Straaten
Wiesje M. van der Flier
Roger Lane
Frederik Barkhof
Philip Scheltens

Table 2 Characteristics

	Small vessel disease	Large vessel disease	Small & large vessel disease	
Number of patients	522	126	58	
Demographics				
Age (years)	73 (8)	71 (8)[a]	72 (8)	p < 0.05
Sex n (% men)	314 (60 %)	84 (67 %)	42 (72 %)	ns
Education (years)	9.0 (4.0)	10.7 (3.7)[a]	9.4 (3.8)	p < 0.001
MMSE	19.2 (3.8)	18.6 (4.1)	17.5 (4.0)[a]	p < 0.01
MRI				
ARWMC[1]	16.5 (4.9)	6.5 (4.3)[a,c]	13.6 (5.5)[a]	p < 0.001
Cortical atrophy	1.5 (0.8)	1.2 (0.8)[a]	1.4 (0.8)	p < 0.001
MTA[2]	1.7 (0.9)	1.4 (1.1)[a]	1.7 (0.9)	p = 0.001



ARWMC predicts disability

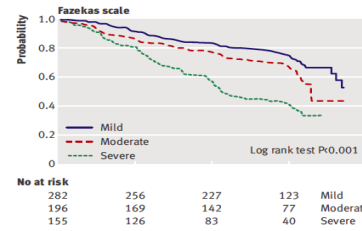


Change on IADL scale (> 1 item) at 1 yr by ARWMC grade

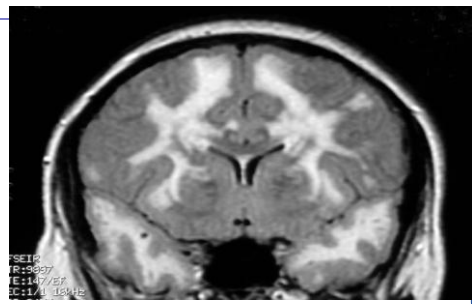
BMJ

Changes in white matter as determinant of global functional decline in older independent outpatients: three year follow-up of LADIS (leukoaraiosis and disability) study cohort

Domenico Inzitari, Giovanni Pracucci, Anna Poggesi, Giovanna Carlucci, Frederik Barkhof, Hugues Chabriat, Timo Erkinjuntti, Franz Fazekas, José M Ferro, Michael Hennerici, Peter Langhorne, John O'Brien, Philip Scheltens, Marieke C Visser, Lars-Olof Wahlund, Gunhild Waldemar, Anders Wallin, Leonardo Pantoni and on behalf of the LADIS Study Group



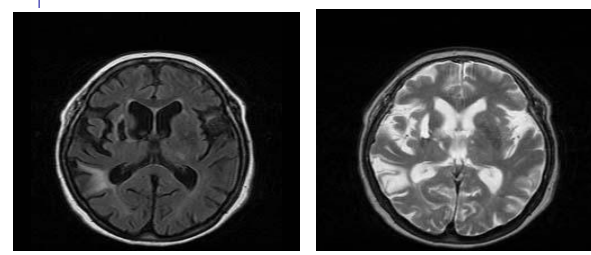
CADASIL

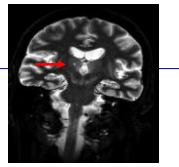


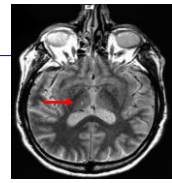
Thalamic Lesions in Vascular Dementia
Low Sensitivity of Fluid-Attenuated Inversion Recovery (FLAIR) Imaging

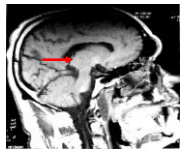
António J. Bastos Leite, MD; Elisabeth C.W. van Straaten, MD; Philip Scheltens, MD, PhD; Geert Lycklama, MD, PhD; Frederik Barkhof, MD, PhD

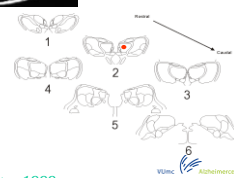
(*Stroke*. 2004;35:415-419.)











Van Der Werf et al. J Neurol Neurosurg Psychiatry 1999

Microbleeds

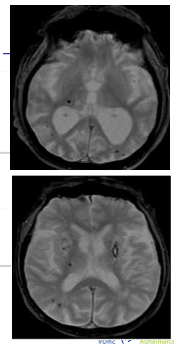
- Mini bleedings small vessels
- Small dot-like lesions with low signal intensity
- Visible on T2*-weighted MRI

- Prevalence general population: 3%-6%
- Far higher percentages in stroke

Memory clinic population?
Especially Alzheimer's disease?

Prevalence and severity of microbleeds in a memory clinic setting

C. Cordonnier, MD; W.M. van der Flier, PhD; J.D. Sluimer, MD; D. Leys, MD, PhD; F. Barkhof, MD, PhD; and P. Scheltens, MD, PhD



- 772 patients Alzheimer Centre Vumc
- Microbleeds counted

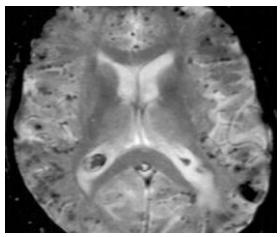
- 17% ≥ 1 microbleed
- → prevalence ~ diagnosis

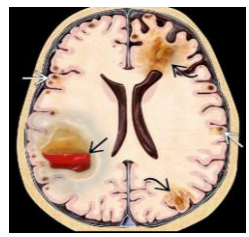
Table 1 Demographic data, MMSE score, and MB prevalence in overall population and among patients with and without MBs according to diagnostic groups

	Subjective complaints, n = 184	MCI, n = 90	AD, n = 223	VaD, n = 31	Other types of dementia, n = 94	Other disorders, n = 150
Age, mean ± SD; y	61 ± 12	71 ± 8	70 ± 9	71 ± 9	66 ± 10	62±11
Men, n (%)	100 (54)	47 (52)	89 (40)	16 (56)	59 (63)	96 (64)
MMSE, mean ± SD	28 ± 2	26 ± 2	20 ± 6	22 ± 6	23 ± 5	27 ± 4
Arterial hypertension, n (%)	60 (33)	25 (28)	76 (34)	12 (40)	33 (36)	41 (27)
Prevalence of MBs, n (%)	18 (10)	18 (20)	41 (18)	20 (65)	9 (10)	21 (14)
Odds ratio (95% CI)	1.0 (ref.)	2.3 (1.1–4.7)	2.1 (1.2–3.8)	15.9 (6.6–38.7)	1.0 (0.4–2.3)	1.6 (0.8–3.1)

MB = microbleed; MCI = mild cognitive impairment; AD = Alzheimer disease; VaD = vascular dementia; MMSE = Mini-Mental State Examination.

Microbleeds in CAA



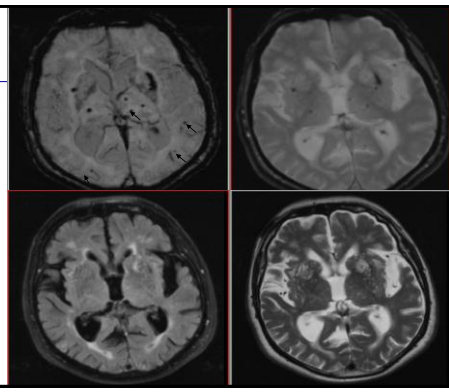


Prevalence and risk factors of cerebral microbleeds

The Rotterdam Scan Study

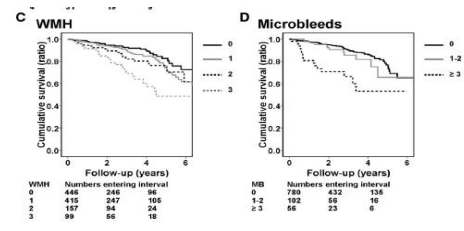
Table 2 Age-specific prevalence of cerebral microbleeds

Age range	No. of persons	Cerebral microbleeds, % (n)	Multiple cerebral microbleeds, % (n)
60–69 y	670	17.8 (119)	5.4 (36)
70–79 y	272	31.3 (85)	16.5 (45)
80–97 y	120	38.3 (46)	23.3 (28)



MRI Biomarkers of Vascular Damage and Atrophy Predicting Mortality in a Memory Clinic Population

Wouter J.P. Henneman, MD; Jasper D. Sluimer, MD; Charlotte Cordonnier, MD; Merel M.E. Baak; Philip Scheltens, PhD; Frederik Barkhof, PhD; Wiesje M. van der Flier, PhD



Neurol Sci (2005) 26:367–369
DOI 10.1007/s10072-005-0493-7

LETTER

P.J. Modrego · J. Mojonero · M. Serrano · N. Fayed

Fahr's syndrome presenting with pure and progressive presenile dementia

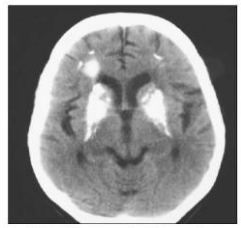
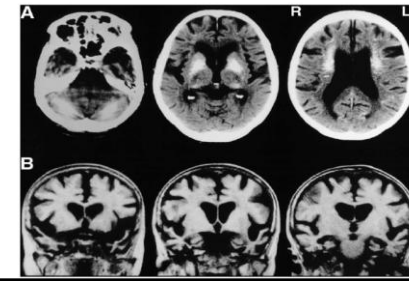


Fig. 3 Brain CT slice with extensive calcifications in basal ganglia and frontal white matter

Short communication

Neuroradiologic and clinical abnormalities in dementia of diffuse neurofibrillary tangles with calcification (Kosaka–Shibayama disease)

Yasuhiro Ito[a,b,c,*], Takashi Kato[a], Tomomi Suzuki[d], Yuki Yokokawa[a], Ikuko Aiba[a], Yutaka Arahata[b], Eiichi Ito[a], Kengo Ito[a], Takeshi Yasuda[a], Gen Sobue[b]



NPH

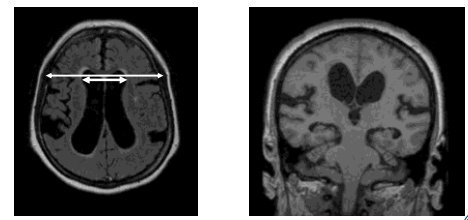
Trias: dementia, gait disorder, urine incontinence
- Executive dysfunction

Not a disease; a syndrome

CT/MRI: enlarged ventricles

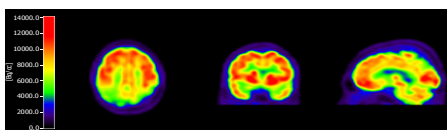
Good shunt respons (sens 91%, spec 50%):
- Gait >> cognition
- Frontalhorn index > 0.40
- None/mild white matter changes a.o. cortical atrophy
- External drainage not a good predictor

NPH : shunt response (?)

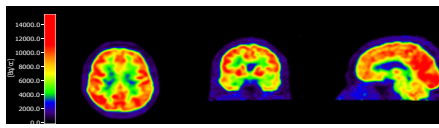


0.38

FDG-Glucose metabolism



ALZHEIMER



CONTROL

FDG PET

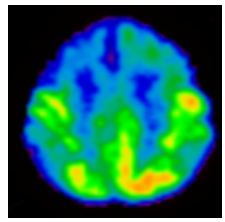
-sensitivity of 93% (191/206) and specificity of 76% (59/78)

-in pathologically verified cases sensitivity was 94% and specificities of 73% (AD) and 78% (other dementias);

-a negative PET scan indicates no progression in a 3 year follow-up

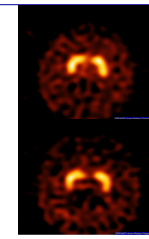
Silverman DH, Small GW, Chang CY, et al. Positron emission tomography in evaluation of dementia: Regional brain metabolism and long-term outcome. Journal of the American Medical Association 2001;286:2120-2127

FDG-PET

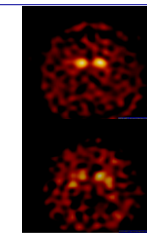


DAT-scan (Dopaminergic transporter)

CON



PD



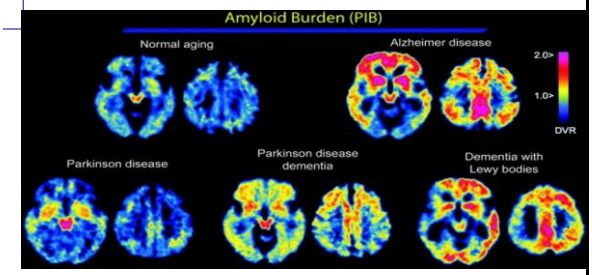
AD

DLB

O'Brien et al, Arch Neurol, 2004

DLB v AD: Sens 88%, Spec 85%

Molecular imaging - PIB



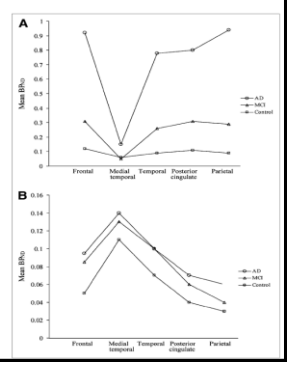
Gomberts et al, 2008

Journal of Nuclear Medicine, published on January 21, 2009 as doi:10.2967/jnumed.108.056499

Detection of Alzheimer Pathology In Vivo Using Both ^{11}C-PIB and ^{18}F-FDDNP PET

Nelleke Tolboom[1,2], Maqsood Yaqub[1], Wiesje M. van der Flier[1], Ronald Boellaard[1], Gert Luurtsema[1], Albert D. Windhorst[1], Frederik Barkhof[3], Philip Scheltens[2], Adriaan A. Lammertsma[1], and Bart N.M. van Berckel[1]

[1]Department of Nuclear Medicine and PET Research, VU University Medical Centre, Amsterdam, The Netherlands; [2]Department of Neurology and Alzheimer Centre, VU University Medical Centre, Amsterdam, The Netherlands; and [3]Department of Radiology, VU University Medical Centre, Amsterdam, The Netherlands



Journal of Nuclear Medicine, published on January 21, 2009 as doi:10.2967/jnumed.108.056499

Detection of Alzheimer Pathology In Vivo Using Both ^{11}C-PIB and ^{18}F-FDDNP PET

Nelleke Tolboom[1,2], Maqsood Yaqub[1], Wiesje M. van der Flier[1], Ronald Boellaard[1], Gert Luurtsema[1], Albert D. Windhorst[1], Frederik Barkhof[3], Philip Scheltens[2], Adriaan A. Lammertsma[1], and Bart N.M. van Berckel[1]

[1]Department of Nuclear Medicine and PET Research, VU University Medical Centre, Amsterdam, The Netherlands; [2]Department of Neurology and Alzheimer Centre, VU University Medical Centre, Amsterdam, The Netherlands; and [3]Department of Radiology, VU University Medical Centre, Amsterdam, The Netherlands

Position Paper

Research criteria for the diagnosis of Alzheimer's disease: revising the NINCDS-ADRDA criteria

Bruno Dubois, Howard Feldman, Claudia Jacova, Steven DeKosky, Pascale Barberger-Gateau, Jeffrey Cummings, André Delacourte, Douglas Galasko, Serge Gauthier, Gregory Jicha, Kenichi Meguro, John O'Brien, Florence Pasquier, Philippe Robert, Martin Rossor, Steven Salloway, Yaakov Stern, Perry J Visser, Philip Scheltens

Panel 2: Diagnostic criteria for AD

Probable AD: A plus one or more supportive features B, C, D, or E

Core diagnostic criteria

A. Presence of an early and significant episodic memory impairment that includes the following features:

1. Gradual and progressive change in memory function reported by patients or informants over more than 6 months
2. Objective evidence of significantly impaired episodic memory on testing: this generally consists of recall deficit that does not improve significantly or does not normalise with cueing or recognition testing and after effective encoding of information has been previously controlled
3. The episodic memory impairment can be isolated or associated with other cognitive changes at the onset of AD or as AD advances

Supportive features

B. Presence of medial temporal lobe atrophy
- Volume loss of hippocampi, entorhinal cortex, amygdala evidenced on MRI with qualitative ratings using visual scoring (referenced to well characterised population with age norms) or quantitative volumetry of regions of interest (referenced to well characterised population with age norms)

C. Abnormal cerebrospinal fluid biomarker
- Low amyloid β_{1-42} concentrations, increased total tau concentrations, or increased phospho-tau concentrations, or combinations of the three
- Other well validated markers to be discovered in the future

D. Specific pattern on functional neuroimaging with PET
- Reduced glucose metabolism in bilateral temporal parietal regions
- Other well validated ligands, including those that foreseeably will emerge such as Pittsburg compound B or FDDNP

E. Proven AD autosomal dominant mutation within the immediate family

Conclusions

-Neuroimaging is part of the diagnostic process

-Medial temporal lobe atrophy on MRI helps identifying AD and absence rules against it

-MRI helps identifying other contributing factors that may be amenable to treatment

-

-PET and SPECT is useful especially in cases where diagnostic doubt exists