



Diagnostic utility of automated assessment of FDG-PET to optimize the diagnostic work-up of patients with dementing neurodegenerative disorders

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Objective → Assess evidence on the utility of semi-automated assessment of FDG-PET to improve current diagnostic work-up based on visual reading for patients with dementing neuro-degenerative disorders.

Methods

- **P:** patients with dementing neurodegenerative disorders I: automated assessment of FDG-PET C: visual reading taken alone **O:** optimize the diagnostic work-up **Evidence assessment**: study design, gold/reference standard, risk of bias, imprecision, applicability, effect size and inconsistency, indirectness. Critical outcomes: incremental value indices, sensitivity, specificity, accuracy, area under the curve, positive/negative predictive value, likelihood ratio positive/negative.
 - **Delphi** voting procedure based on evidence and panelists' expertise.



Results

PICO 21											
Critical outcomes	N. of papers	Sample size	Gold/reference standard	Risk of bias	Index test imprecision	Applicability	FDG-PET assessment	Effect range (CI)	Effect assessment	Effect inconsistency	Outcome quality
Incremental value indices	3	156 Patients 157 HC	2 Diagnosis at follow-up 1 Clinical diagnosis	Serious	Serious	Not serious	Visual + Semi-quantitative (1 SPM-Maps, 2 3D-SSP)	<u>Study 1</u> (Visual vs SPM-Maps). - Level of confidence 2.07 vs 2.4, <i>p</i> =0.003. <u>Study 2</u> (Visual vs 3D-SSP). - Sensitivity: 83% (Cl: 66-94%) vs 82% (Cl: 62-92%), <i>p</i> =1.0. - Specificity: 41% (Cl: 20-61%) vs 75% (Cl: 52-90%), <i>p</i> <0.01. - AUC: 72% (Cl: 55-83%) vs 88% (Cl: 76-95%), <i>p</i> =0.017. - Mean increase in confidence rating = 0.7 (Cl: 0.01-1.3), <i>p</i> =0.048. <u>Study 3</u> (Visual vs 3D-SSP). - AUC: 94% (SD 0.03) vs 0.99 (SD 0.01), <i>p</i> = 0.043.			1011
									VIODERALE	NA	LOW
Sensitivity	6	479 Patients 126 HC	1 Pathology 1 Biomarker-based diagnosis 2 Diagnosis at follow-up 2 Clinical diagnosis	Not serious	Serious	Not serious	Visual	59% (range: 43-71%) - 89.6% (Cl 80-95%)	MODERATE	Serious	MODERATE
							Semi-quantitative (2 ROI, 2 3D-SSP, 1 SPM, 1 PALZ)	62.3% (CI 50-73%) – 96% (CI NA)	MODERATE	Serious	MODERATE
Specificity	6	479 Patients 126 HC	1 Pathology 1 Biomarker-based diagnosis 2 Diagnosis at follow-up 2 Clinical diagnosis	Not serious	Serious	Not serious	Visual	50% (CI NA) – 96% (range: 92-100%)	HIGH	Very serious	LOW
							Semi-quantitative (2 ROI, 2 3D-SSP, 1 SPM, 1 PALZ)	84% (CI NA) – 99% (SD 0.02)	HIGH	Not serious	HIGH
Accuracy	7	459 Patients 237 HC	1 Pathology 1 Biomarker-based diagnosis 2 Diagnosis at follow-up 3 Clinical diagnosis	Serious	Not serious	Not serious	Visual	64.8% (CI: 51-77%) - 89.2% (CI: 84-93%)	MODERATE	Serious	MODERATE
							Semi-quantitative (3 ROI, 3 3D-SSP, 1 PALZ)	70% (CI: 53-84%) – 97.5% (CI: 91-100%)	HIGH	Serious	MODERATE
AUC	3	155 Patients 142 HC	1 Diagnosis at follow-up 2 Clinical diagnosis	Serious	Serious	Not serious	Visual	50% (CINA) 87.8 (CINA)	MODERATE	Serious	LOW
							Semi-quantitative (1 ROI, 1 SPM, 1 3D-SSP)	67 (CI NA) 96.7 (CI NA)	HIGH	Serious	LOW
PPV	3	294 Patients 167 HC	1 Pathology 1 Biomarker-based diagnosis 1 Diagnosis at follow-up	Not serious	Serious	Not serious	Visual	68% (range: 50-88%) – 87.5% (CINA)	нідн	Not serious	MODERATE
							Semi-quantitative (1 ROI, 1 3D-SSP, 1 PALZ)	84.2% (CI: 72–92%) – 98% (CI: 88–100%)	HIGH	Not serious	MODERATE
NPV	3	294 Patients 167 HC	1 Pathology 1 Biomarker-based diagnosis 1 Diagnosis at follow-up	Not serious	Serious	Not serious	Visual	72% (CI NA) – 92.4% (CI: 85-96%)	HIGH	Serious	MODERATE
							Semi-quantitative (1 ROI, 1 3D-SSP, 1 PALZ)	71% (CI: 58-93%) – 89% (range: 85-92%)	VODERATE	Not serious	MODERATE
LR+	4	382 Patients 279 HC	1 Pathology 1 Biomarker-based diagnosis 2 Diagnosis at follow-up	Not serious	Serious	Serious	Visual	1.55 (CI NA) – 14.8 (CI: 10.7-∞)	MODERATE	Serious	LOW
							Semi-quantitative (1 ROI, 1 SPM, 1 3D-SSP, 1 PALZ)	6.08 (CI NA) – 36.5 (CI: 21.3-∞)	HIGH	Very serious	LOW
LR-		382 Patients 279 HC	1 Pathology 1 Biomarker-based diagnosis 2 Diagnosis at follow-up	Not serious	Serious	Serious	Visual	0.12 (CI: 0.06-0.23) - 0.45 (CI NA)	MODERATE	Serious	LOW
	4						Semi-quantitative (1 ROI, 1 SPM, 1 3D-SSP, 1 PALZ)	0.03 (CI: 0.0-0.5) - 0.41 (CI: 0.31-0.55)	MODERATE	Very serious	LOW

Conclusions

Low-to-moderate quality of evidence Important effect inconsistency

Delphi recommendation FOR clinical use

Delphi panelists: Flavio Nobili, Zuzana Walker, Femke Bouwman, Alexander Drzezga, Peter Nestor, Javier Arbizu, Massimo Filippi.

- It can help non-experienced readers (3 panelists)
- It can help (assist) even experience readers, increasing confidence and specificity (2 panelists)
- Good reliability and good evidence (2 panelists)
- Helpful in clinical practice (1 panelist)