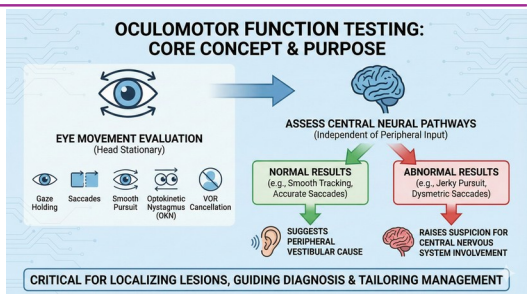
Oculomotor Function Test — Clinical Cheat Sheet

OVERVIEW & COMPREHENSIVE ASSESSMENT



Purpose: Comprehensive assessment of all eye movement subsystems (saccades, pursuit, vergence, OKN, VOR) as an integrated battery. The oculomotor function test provides a systematic approach to oculomotor evaluation.

Clinical Relevance: Identifies brainstem, cerebellar, and peripheral pathology through pattern recognition across subsystems. Essential for vertigo differential diagnosis and pre-operative vestibular assessment.

Sensitivity: Multi-subsystem testing detects early/mild disease and reveals pathology when individual clinical examination appears normal. Subclinical abnormalities are common in early neurodegeneration.

Integration Principle: No single oculomotor test is diagnostic in isolation. Pattern of abnormalities across subsystems provides localisation specificity far exceeding any individual test.

OCULOMOTOR SUBSYSTEMS MATRIX

Subsystem	Function	Neural Pathway	Localisation Value
Saccades	Rapid eye shifts (150-600°/sec)	FEF → SC → PPRF → CN VI	Brainstem, basal ganglia, cortex
Smooth Pursuit	Track slow target (<30°/sec)	V5/MT → pontis → cerebellum → brainstem	Cortex, cerebellum, brainstem
OKN	Track full-field visual motion	Brainstem ↔ cortex (bidirectional)	Brainstem, cortex (MT/MST)
VOR	Compensatory reflex to head motion	Vestibular → nucleus → CN III/IV/VI	Peripheral vestibule, brainstem
Vergence	Converge/diverge for depth	CN III nucleus, medial rectus	CN III, midbrain, neuromuscular

STANDARD TESTING BATTERY PROTOCOL

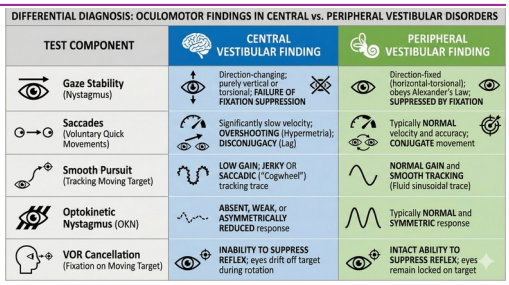
A. Saccades: Random step paradigm: 5°, 10°, 20°, 30° amplitudes. Measure latency (normal 100-200 ms), peak velocity (normal 400-600°/sec), and gain (normal 0.95-1.05).

B. Smooth Pursuit: Sinusoidal target at 0.2, 0.5, and 1.0 Hz. Measure gain (normal >0.85), latency, saccadic intrusions, and directional asymmetry at each frequency.

C. OKN: Full-field rotating stimulus at 20°/sec and 40°/sec in both directions. Measure slow-phase gain, fast-phase frequency, and asymmetry index.

D. VOR: vHIT for all 6 canals (gain, catch-up saccades). Calorics for canal paresis. Rotational chair if available for mid-frequency assessment.

COMPREHENSIVE INTERPRETATION MATRIX



Subsystem	Normal	Abnormal Threshold	Localisation Hint
Saccade Velocity	>400°/sec	<350°/sec	PPRF, CN VI nucleus; myasthenia gravis
Saccade Gain	0.95-1.05	<0.85 or >1.15	Hypometric: brainstem; hypermetric: cerebellum
Pursuit Gain (0.5 Hz)	>0.85	<0.70	Cortex (MT/MST), cerebellum, brainstem
OKN Gain	>0.80	<0.65	Brainstem (subcortical) or cortical (MT/MST)
VOR Gain (vHIT)	>0.80	<0.65	Peripheral semicircular canal vestibular loss
VORS Gain	<0.50	>0.60	Cerebellar flocculus, cortical oculomotor areas

PATTERN RECOGNITION: MULTI-SUBSYSTEM DEFICITS

Pattern	Saccades	Pursuit	VOR	Localisation
Peripheral vestibular	Normal	Normal	Abnormal (ipsilesional)	Vestibular end organ or nerve
Cerebellar	Dysmetric	Reduced	Normal or low	Cerebellum (flocculus, vermis)
Brainstem	Slow/absent	Reduced	May be abnormal	Pons (PPRF), medulla, midbrain
Cortical	Normal velocity, abnormal latency	Reduced	Normal	Frontal/parietal cortex (FEF, MT/MST)
Degenerative	Progressive slowing	Progressive loss	Variable	PSP, MSA, spinocerebellar ataxia

CLINICAL DECISION-MAKING & INTERPRETATION

Central vs Peripheral: If saccades and pursuit are abnormal with normal VOR → central (cerebellar/brainstem). If VOR abnormal with normal saccades and pursuit → peripheral vestibular.

Isolated Pursuit Deficit: Most sensitive but least specific finding. Exclude medications, fatigue, inattention first. If persistent, suggests cortical or early cerebellar disease.

All Subsystems Abnormal: Suggests brainstem disease (common final pathway) or systemic (medication toxicity, metabolic). Check medication list and metabolic panel.

Age-Related Changes: Pursuit gain, saccade latency, and VOR gain all deteriorate with age. Always use age-matched normative data. Do not over-interpret borderline findings in elderly patients.

Serial Testing Value: Baseline oculomotor battery establishes reference for monitoring progressive disease. Quantitative changes over time correlate with disease progression in neurodegenerative conditions.