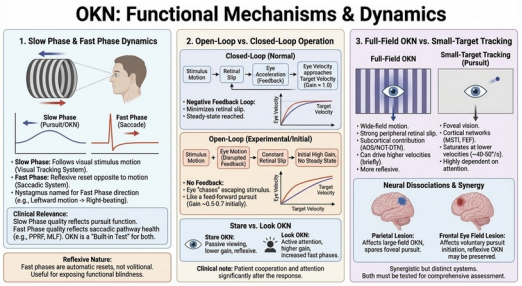
Optokinetic Nystagmus (OKN) — Clinical Cheat Sheet

OVERVIEW & DEFINITIONS



Definition: Reflexive nystagmus elicited by full-field moving visual stimulus, consisting of slow-phase tracking in the direction of stimulus motion and catch-up fast-phase saccades in the opposite direction.

Purpose: Assess brainstem and cortical integration of visual motion processing. Sensitive to CNS lesions affecting gaze control, visual-vestibular interaction, and velocity storage mechanisms.

Clinical Value: Asymmetric OKN strongly suggests hemispheric lesion. Normal OKN with abnormal VOR = peripheral vestibular disease. OKN deficit + abnormal pursuit = central pathology.

Neural Basis: Dual pathway — subcortical (brainstem vestibular nuclei sustain tracking) and cortical (V5/MT, MST provide voluntary enhancement). Interactions with the velocity storage mechanism in the vestibular nucleus.

NEURAL PATHWAYS & CIRCUITRY

Pathway	Key Structures	Function	Lesion Effect
Subcortical OKN	Brainstem vestibular nuclei, NOT	Sustain slow-phase tracking	Reduced gain, narrow velocity range
Cortical OKN	V5/MT, MST, DLPFC	Enhance gain, voluntary control	Directional asymmetry, contralateral bias
Saccadic System	SC, PPRF, CN VI	Generate catch-up fast-phase	Slow or absent fast-phase saccades
Pursuit Network	Cortex → pontis → cerebellum	Smooth slow-phase component	Deficit mirrors pursuit if cerebellar
Velocity Storage	Vestibular nuclei, commissure	Prolong OKN after stimulus stops (OKAN)	Asymmetric OKAN indicates vestibular imbalance

CLINICAL ASSESSMENT PROTOCOL

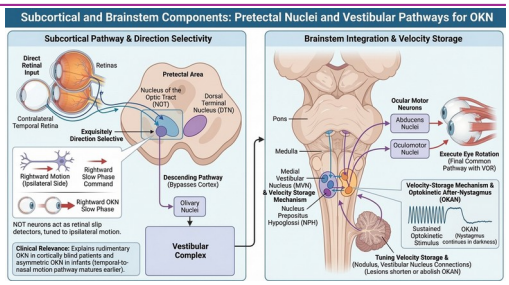
A. Equipment: Full-field rotating drum (40-60 rpm) or full-screen video display with optokinetic stripes/dots. Must fill >80% of visual field for valid test.

B. Setup: Patient seated 1 metre from stimulus, eyes level with centre, head fixed (chin rest), fully alert and attentive. Test in well-lit room.

C. Stimulus Protocol: Horizontal CW and CCW at 20°/sec, 40°/sec, 60°/sec. Vertical up and down at 20°/sec and 40°/sec. Each direction for 30-60 seconds.

D. Recording: Measure slow-phase gain (eye velocity / stimulus velocity), fast-phase frequency, directional asymmetry index, and OKN suppression ability.

OKN INTERPRETATION GUIDE



Parameter	Normal	Abnormal Finding	Clinical Significance
OKN Gain (slow-phase)	>0.80 at 20-40°/sec	<0.40	Severe brainstem or cortical dysfunction
Directional Asymmetry	<20% L-R difference	>30% difference	Ipsilateral hemispheric lesion likely
Velocity Range	Normal at 10-60°/sec	Reduced across all velocities	Subcortical: flat; cortical: velocity-dependent
OKAN Duration	15-30 sec post-stimulus	<5 sec or absent	Vestibular velocity storage dysfunction
Fast-Phase Frequency	2-4 per second	<1 per second	Brainstem saccade generator impairment

ASYMMETRIC OKN PATTERNS & LOCALISATION

Pattern	Description	Lesion Location	Differential Diagnosis
Unilateral cortical	Reduced OKN toward lesion side	Contralateral parietal (MT/MST)	Stroke, tumor, MS plaque
Bilateral cortical	Globally reduced OKN all directions	Bilateral cortex or subcortical	Progressive degenerative disease
Brainstem	Reduced gain + poor fast-phase	Pons (PPRF), medulla	Brainstem stroke, demyelination
Cerebellar	Mirrors pursuit deficit pattern	Flocculus, vermis, fastigial	Cerebellar ataxia, degeneration
Peripheral vestibular	Asymmetric OKAN only (OKN normal)	Unilateral vestibular loss	Vestibular neuritis, Meniere disease

OKN VS VOR VS PURSUIT: DIFFERENTIAL PATTERNS

OKN Normal + VOR Abnormal: Peripheral vestibular disease (vestibular neuritis, BPPV, Meniere). Central pathways intact. Expected pattern for acute unilateral loss.

OKN Abnormal + Pursuit Abnormal: Central pathology — cortical (MT/MST) or cerebellar. Shared neural pathways affected. Both rely on smooth eye movement generation.

OKN Asymmetric + Pursuit Normal: Subcortical lesion — brainstem vestibular nuclei or velocity storage. Pursuit uses different cortical input than subcortical OKN.

All Three Abnormal: Brainstem lesion affecting common final pathway. Check saccades — if also impaired, consider diffuse brainstem disease or medication toxicity.

Testing Pearls: OKN is less affected by attention/fatigue than pursuit. Useful in patients unable to cooperate with pursuit testing (children, dementia, inattention).