NEUROIMAGING DIAGNOSIS IN NEURODEGENERATIVE DISEASES

INTRODUCTION

Despite the fact that extensive progress in neuroimaging
techniques of the brain has been made, there is no specific pattern of pathological changes in any type of dementia.

PARKINSON'S DISEASE

a degenerative and progressive disorder of the central nervous system

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Motor

-tremor(resting)

-muscle rigidity

-postural instability with problems with coordination

-slowness of

Non-motor

-high-level cognitive dysfunction

-psychiatric and emotional changes

-depression

-difficulty in swallowing and speaking

NEUROIMAGING

-Cranial computed tomography (cranial CT)

-Magnetic resonance imaging (MRI)

-Positron emission tomography (PET)

POSITRON EMISSION TOMOGRAPHY (PET)

-the highest sensitivity
-changes in regional cerebral blood flow glucose, oxygen, dopa metabolism, and brain receptor binding
-to detect femtomolar levels of positron-emitting radioisotopes at a spatial resolution of 3–5 mm and corrects for scatter

Single photon emission tomography (SPECT)
-lower sensitivity

IMAGING

detecting changes in brain structure (structural imaging)

examining regional changes in brain metabolism and receptor binding associated with disorder

Functional neuroimaging of nigrostriatal dopaminergic pathways is an important method for the evaluation the dopaminergic terminals in the striatum. For evaluating of the dopaminergic terminals we use radiligands with both PET and SPECT.

- *DOPA Decarboxylase (DDC):* The activity of DDC can be measured with 6-[18F]-L-dopa PET and it can be used as a means of measurement of neuronal loss
- *Presynaptic dopamine active transporter (DAT)*: DAT is an integral membrane protein that clears dopamine after its release in the synaptic cleft, thus terminating the signal of the neurotransmitter
- *Vesicular monoamine transporter (VMAT2) :* VMAT2 is an integral membrane protein transporting monoamines — particularly neurotransmitters like dopamine, histamine, serotonin, and noradrenalin—into synaptic vesicles.
  It can be examined with 11C-dihydrotetrabenazine-PET [11, 20]