International Case Reports Journal
Case Report (ISSN: 2770-9647)

Review of Approaches of Nuclear Medicine Images and Psychiatry

Sebastião David Santos-Filho[1*] and Roberto Levi Cavalcanti Jales[2,3]

[1]Doctor in Health Science, Universidade Federal do Rio Grande do Norte, UFRN, Natal, RN, and Brazil

[2]Doctor in Medicine, Universidade Federal do Rio de Janeiro, UFRJ, Rio de Janeiro, RJ, Brazil

[3]Clinica Nuclear de Natal, Tirol, Natal, RN, Brazil

1. Abstract

Nuclear imaging is used to diagnose or treat illnesses, those conditions have a multiple of consequences. It is important to note that few patients attending general medical settings who have a psychiatric disorder receive adequate treatment for it. The advent of cerebral single photon emission computed tomography made it possible. This work presents the use of nuclear medicine images in psychiatric diagnosis and in the following patient's psychiatric disturbs, helping the diagnosis and the early treatment of this diseases. Searched PubMed with the words: Nuclear medicine images or SPECT or Gamma camera images or brain images or radiopharmaceuticals or Technetium-99m or HMPAO and psychiatry. Articles as free full text, in meta-analysis, in systematic review, in the last 5 years, with research done in humans, written in English and founded in MEDLINE were searched. 223 articles were founded. 19 works selected having the object of this study. Nuclear medicine images are a tool to diagnose and following the brains disturb giving to the physicians a good matter to treat their patients. The psychiatric have a well-done work to do with this resource to treat and diagnostic his patients, following their evolution during the treatment with drugs or psychiatric way.

Keywords: Nuclear medicine; Diagnostic image; Psychiatry; Brain disturbs; PET; SPECT

Introduction

Nuclear medicine imaging is a method of producing images by detecting radiation from different parts of the body after a radioactive tracer is given to the patient.[1] The images are digitally generated on a computer and transferred to a nuclear medicine physician, who interprets the images to make a diagnosis.[2] Radioactive tracers or radiopharmaceuticals used in nuclear medicine are, in most cases, injected into a vein. For some studies, they may be given by oral *via*.[3] These tracers aren't dyes or medicines, and they have no side effects. The amount of radiation a patient receives in a typical nuclear medicine scan tends to be very low.

Nuclear imaging is used primarily to diagnose or treat illnesses.[4] Conditions diagnosed by nuclear medicine imaging include: blood disorders; thyroid disease, including hypothyroidism; heart disease; gallbladder disease; lung problems; bone problems, including infections or breaks; kidney disease, including infections, scars or blockages; cancer; and now psychiatric brain disturbs.

Citation: *Sebastião David Santos-Filho, Roberto Levi Cavalcanti Jales. Review of Approaches of Nuclear Medicine Images and Psychiatry. Int Case Rep Jour. 2022;2(8):1-18.*

Received Date: 12 September, 2022; **Accepted Date:** 26 October, 2022; **Published Date:** 06 November, 2022

[*]**Corresponding author:** Sebastião David Santos-Filho, Doctor in Health Science, Universidade Federal do Rio Grande do Norte, UFRN, Natal, RN, Brazil, Tel: 84996816796; E-mail: sdavidsfilho@gmail.com

Nuclear medicine imaging can also be used to treat conditions or to evaluate how treatment is working. One example of this is radioimmunotherapy, which combines radiation and immunotherapy to deliver radiation precisely to a targeted area.[5]

The main difference between nuclear medicine imaging and other radiologic test is that nuclear medicine imaging evaluates how organs function, whereas other imaging methods assess anatomy (how the organs look).[6] The advantage of assessing the function of an organ is that it helps physicians make a diagnosis and plan treatments for the part of the body being evaluated.

Some people might be alarmed when they hear the word "radioactive", but the tracers used aren't medicines and almost don't have side effects. In addition, the level of radiation in this kind of test tends to be very low. There is a very small chance that you might be allergic to the tracer. You should always make sure that your healthcare provider knows of any type of allergy you have. Nuclear medicine scans can provide important information that you can't get from other types of testing. These scans can be used instead of exploratory surgery to improve diagnosis and treatment quality. Often, illnesses can be discovered in their earliest stages.[7]

It is important to note that relatively few patients attending general medical settings who have a psychiatric disorder receive optimal or even adequate treatment for it. The obstacles of the effective management of psychiatric illness in medical patients may be considered.

Psychiatric diagnoses are frequently missed in medical patients.[8] There are a number of reasons for this: the patient may present with somatic complaints; the doctor may focus their attention on assessing or treating the patient's medical condition rather than on their symptoms; the patient may be too embarrassed to discuss their psychological symptoms or fear the stigma of a psychiatric diagnosis; the doctor may be inadequately trained to assess psychiatric disorder or may be unwilling to make a potentially stigmatizing diagnosis.

Two commonly held attitudes may prevent the physician actively treating the psychiatric disorder. First, they may regard it merely as a result of a medical condition and assume it does not require specific treatment preferring to assume the diagnosis only in a subjective way. Second, the physician may erroneously believe that psychiatric treatment would be ineffective in any case, and is therefore pointless. These attitudes are compounded by a lack of psychiatric training, expertise, time and facilities in the non-psychiatric parts of the healthcare system.[9]

Even when a psychiatric disorder has been diagnosed and treatment commenced, effective management may fail because the patient's symptoms and response to treatment are not monitored.[10-12] The patient may stop taking medication because of side-effects of because they believe it to be unhelpful, or they may not receive an adequate dose of medication for a sufficient time. Without regular monitoring, medication is not adjusted appropriately and referral to specialist psychiatric or psychological services is not made.

It is usual in psychiatric clinic arise diagnostic hypothesis for the same patient. The advent of cerebral single photon emission computed tomography made it possible the formation of Data Bank.[13] The Single-Photon Emission Computed Tomography (SPECT) when made cerebral images is known as cerebral perfusion scintigraphy, it is done with a drug that in minute fraction is extracted of blood to the interior of the neurons, through the haemato-encephalic barrier, still there for hours. The psychiatry is one the more needy medical specialities, in terms of complementary examinations, and the cerebral SPECT done with HMPAO could be used to help the clinician in doubt cases.[14]

With this point of view, we try to present in this work the use of nuclear medicine images in psychiatric diagnosis and in the following patient's psychiatric disturbs, helping the diagnosis and the early treatment of this diseases.

Methods

PubMed (www.pubmed.com) is a free resource supporting the search and retrieval of biomedical and life sciences literature with the aim of improving health-both globally and personally. The PubMed database contains more than 34 million citations and abstracts of biomedical literature. It does not include full text journal articles; however, links to the full text are often present when available from other sources.

We searched in PubMed with the words: Nuclear medicine images or SPECT or Gamma camera images or brain images or radiopharmaceuticals or Technetium-99m or HMPAO and psychiatry. Articles published as free full text, in Meta-Analysis, in Systematic Review, in the last 5 years, with research done in humans, written in English and founded in MEDLINE were searched. We founded 223 articles with this type of research. We selected 19 works that they were the object of this study.

Results

The articles searched in PubMed were showed in the Figure 1 with their prevalence in the last 5 years of the research and found 223 articles. Of which, 119 articles were about the use of NM in the study and diagnostic of different manifestations of cancer, 61 about another the use of radiopharmaceutical in diagnostic different diseases, 13 were about something kind of manifestation problem in the body, such as, osteomyelitis, coronary disease, between other manifestation, 5 were about other organs diseases as pulmonary infection, and another 3 works covering use of NMI in study dopaminergic syndrome and Tourette. We found 22 works written about psychiatric conditions. Alzheimer (7), or Parkinson (6), or ADHA (1), or dementia (4), or epilepsy (1), or psychosis (2), or obsessive compulsory disease (1), were some of those conditions and presenting NMI evaluations and were considered to this work.

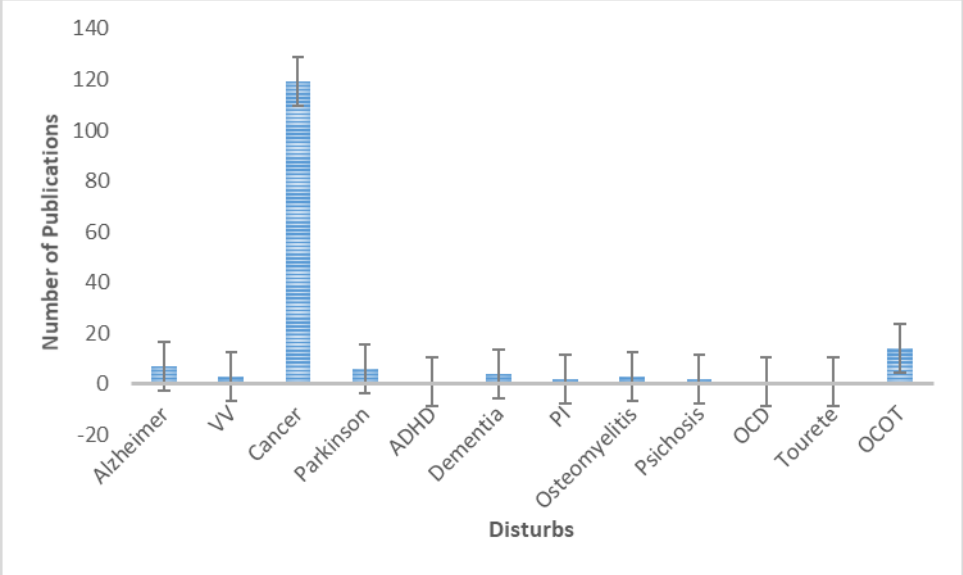

Figure 1: Types of disturbs publications with 5 years of research cited on PubMed.

VV: Vessel Vasculitis; ADHD: Attention Deficit/ Hyperactivity Disorder; PI: Pulmonary Inflammation; OCD: Obsessive Compulsive Disorder; OCOT: Other's Cited One Time.

In Table 1 we show the objective, methodology, results and conclusion of all of the articles selected for this work.

Table 1: The principal characteristics of the works searched.

Article	Objective	Methods	Results	Conclusion
Carey, 2021 [15]	Systematic review was to identify the brain regions involved in anxiety in Parkinson's disease based on neuroimaging studies and to interpret the findings against the background of dysfunction of the fear circuit and limbic cortico-striato-thalamo-cortical circuit	Studies assessing anxiety symptoms in PD patients and studies using magnetic resonance imaging, positron emission tomography, or single-photon emission computed tomography were included	Reduced gray-matter volume of the amygdala and the anterior cingulate cortex; an increased functional connectivity and the cortico-striato-thalamo-cortical limbic circuit were reported.	Anxiety is associated with structural and functional changes in both the hypothesized fear and the limbic cortico-striato-thalamo-cortical circuits.
Chen 2017 [16]	Deep brain stimulation of the subthalamic nucleus (STN-DBS) has become an effective treatment strategy for patients with Parkinson's disease.	13 PET/SPECT studies concerning STN-DBS effects on resting-state brain activity in Parkinson's disease, and also investigated whether these affected regions were functionally connected to constitute an effective network.	STN-DBS reduced brain activity in the right thalamus, bilateral caudal supplementary area, and the left primary motor cortex, and it increased brain activity in the left thalamus during rest.	It shed light on the mechanisms of STN-DBS treatment from a network perspective and highlight the potential therapeutic benefits of targeted network modulation.
Ghaffari-Rafi, 2020 [17]	The objective of this systematic review is to elucidate what diagnostic pathways clinicians globally utilize.	Utilizing the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) and the Cochrane Handbook of Systemic Reviews of Interventions, we conducted a systematic review through MEDLINE, Embase, and CENTRAL.	All but two articles required neuropsychological assessment. Six required neuropsychiatric assessment. Two protocols mentioned assessing the patient's support network. One an occupational evaluation and making all surgery decisions in a multidisciplinar	Socioeconomic restrictions appear to play a role in determining which tests are utilized in the investigatory pathway not just for developing countries. Overall, even amongst expert examiners there is significant variation throughout

			y management conference. Magnetic resonance (MR) spectroscopy was required at two institutes.	epilepsy centers globally, in selecting candidates and working up patients.
Haghavan, 2020 [18]	To examine the underlying genetic basis for brain amyloidosis in the preclinical phase of Alzheimer disease.	The Anti-Amyloid Treatment in Asymptomatic Alzheimer Disease Study (n = 3154), was the PET screening. Six smaller, longitudinal cohort studies (n = 1160) provided additional amyloid PET imaging data with existing genetic data.	4314 analyzed participants, a novel locus for amyloidosis was noted within *RBFOX1* ($\beta = 0.61$, $P = 3 \times 10$) in addition to APOE. The RBFOX1 protein localized around plaques, and reduced expression of RBFOX1 was correlated with higher amyloid-β burden and worse cognition during life in the Religious Orders Study and Rush Memory and Aging Project cohort.	The findings of this study suggest that *RBFOX1* is a novel locus that may be involved in the pathogenesis of Alzheimer disease.
Hirjak, 2020 [19]	We undertook a systematic review searching for neuroimaging studies using motor/behavioral catatonia rating scales/criteria and NCRS published up to March 31, 2019.	19 neuroimaging studies. Studies using motor/behavioral catatonia rating scales/criteria depict cortical and subcortical motor regions mediated by dopamine as neuronal and biochemical substrates of catatonia.	Studies relying on NCRS found rather aberrant higher-order frontoparietal networks which, biochemically, are insufficiently modulated by gamma-aminobutyric acid (GABA)-ergic and glutamatergic transmission.	In sum, this systematic review points out the difference between motor/behavioral and NCRS based classification of catatonia on both neuronal and biochemical grounds.
Jiang, 2020 [20]	The purpose of this study is to evaluate the efficacy of 11C-CFT PET combined with 18F-FDG PET in the diagnosis of early PD.	We will search 7 electronic databases (PubMed, EMBASE, Web of Science, Cochrane library, PsycINFO, AMED, and Scopus), ongoing	We will integrate the existing randomized controlled trials to evaluate the value of 11C-CFT PET combined with 18F-FDG PET	Our study may prove that 11C-CFT PET combined with 18F-FDG PET can effectively diagnose early PD.

		trials and grey literature to collect related randomized controlled trials and will use Review Manager Software 5.2 and STATA Software 16.0 for analysis and synthesis.	in the diagnosis of early PD.	
Kaasinen, 2019 [21]	We compared striatal presynaptic dopaminergic function in MSA Parkinsonism variant (MSA-P), MSA cerebellar variant (MSA-C), PSP, CBS, and PD using combined quantitative data from all published studies.	The PubMed database was searched from inception to August 2018 for the terms "dopamine" OR "dopaminergic" AND "PET" OR "SPECT" OR "SPET" and keywords related to PD, MSA, PSP, and CBS. In total, 1,711 publications were identified.	Thirty-five studies with 356 MSA-P patients, 204 PSP patients, 79 CBS patients, and 62 MSA-C patients were included in the meta analysis. Caudate nucleus and putamen DAT function was clearly lower in PSP than in PD and MSA-P and was clearly lower in MSA-P than in MSA-C. Although not significant because of limited data, aromatic L-AADC results paralleled the DAT findings.	Striatal presynaptic DAT function is clearly lower in PSP patients than in PD and MSA-P patients and is clearly lower in MSA-P patients than in MSA-C patients
Kong 2020 [22]	We aimed to conduct a metaanalysis to assess the efficacy of using 18F-FP-CIT positron emission tomography (PET) and 123I-FP-CIT single-photon emission computed tomography (SPECT) of dopamine transporters in patients with PD in order to provide evidence for clinical decision-making.	Searched the PubMed, Embase, Wanfang Data, and China National Knowledge Infrastructure databases to identify the relevant studies from the time of inception of the databases to 30 April 2020. Six PET studies, including 779 patients with PD and 124 healthy controls, which	Patients with PD showed significantly reduced 18F-FP-CIT uptake in three brain regions [caudate nucleus, anterior putamen, and posterior putamen. Significant decreases of 123I-FP-CIT uptake were also observed in the caudate and putamen.	Our findings indicate that both 18FFP-CIT PET and 123I-FP-CIT SPECT imaging of dopamine transporters can provide viable biomarkers for early PD diagnosis.

		met the inclusion criteria.		
Kunkle 2019 [23]	To identify LOAD risk loci, we performed a large genome-wide association metaanalysis of clinically diagnosed LOAD (94,437 individuals).	Identify 20 previous LOAD risk loci and new genome-wide loci (*IQCK*, *ACE*, *ADAM10*, *ADAMTS1*, and *WWOX*), two of which (*ADAM10*, *ACE*) in a recent genome-wide association (GWAS)-by-familial proxy of Alzheimer's or dementia. The neurological and immune-mediated disease haplotype HLA-DR15 as a risk factor for LOAD.	Pathway analysis implicates immunity, lipid metabolism, tau binding proteins, and amyloid precursor protein (APP) metabolism, showing that genetic variants affecting APP and Aβ processing are associated not only with early-onset autosomal dominant Alzheimer's disease but also with LOAD.	Analyses of risk genes and pathways show enrichment for rare variants ($P = 1.32 \times 10$), indicating that additional rare variants remain to be identified.
Martinez 2017 [24]	To determine the DTA of the F-flutemetamol PET scan for detecting people with MCI at time of performing the test who will clinically progress to ADD, other forms of dementia (non-ADD) or any form of dementia at follow-up.	We searched MEDLINE, Embase, PsycINFO, BIOSIS Citation Index, Web of Science Core Collection, including the Science Citation Index and the Conference Proceedings Citation Index, LILACS, CINAHL, ClinicalTrials.gov, and the World Health Organization International Clinical Trials Registry Platform, ALOIS, the Cochrane Dementia & Cognitive Improvement Groups specialized register of dementia studies. Using the Science Citation	It was evaluated in 243 participants from two studies. The studies reported data on 19 participants with two years of follow-up and on 224 participants with three years of follow-up. Nine participants converted at two years follow-up and 81 converted at three years of follow-up. Progression from MCI to ADD at two years of follow-up had a sensitivity of 89% and a specificity of 80%. Progression from MCI to ADD at three years of follow-up had a	We cannot recommend routine use of F-flutemetamol in clinical practice. F-flutemetamol has high financial costs; therefore, clearly demonstrating its DTA and standardizing the process of the F-flutemetamol modality is important prior to its wider use.

		Index identifying any additional relevant studies.	sensitivity of 64% and a specificity of 69% by visual assessment.	
Meyer 2017 [25]	Oriented review on the use of 18F-FDG PET in neurodegenerative parkinsonism provides the clinical practitioner with an update on the clinical demand and rationale for 18F-FDG PET imaging in parkinsonism, typical 18FFDG PET patterns and their value for differential diagnosis of parkinsonism, and an outlook on the promising role of 18F-FDG PET for diagnostic assessment and risk stratification in cognitive impairment in Parkinson disease.	Review of the literature about the use of 18F-FDG PET in diagnosis parkinsonism.	Taken together, these findings indicate that posterior cortical hypometabolism has an importance of which the nuclear medicine practitioner should be aware.	Although it is probably premature to propose clinical use of posterior cortical hypometabolism as a predictor of cognitive decline in PD, this finding may prompt further examinations and special consideration under specific circumstances.
Mondragón 2019 [26]	A systematic review of this literature was performed, following the Preferred Reporting Items for Systematic Reviews and Meta Analyses statement, on PubMed, EMBASE, and PsycINFO databases.	Reporting Items for Systematic Reviews and Meta Analyses statement, on PubMed, EMBASE, and PsycINFO databases.	Twenty-five articles met all inclusion criteria. Specifically, four brain connectivity and 21 brain perfusions, metabolism, and activation articles.	Although the current evidence suggests differences in activation between AD or MCI patients with anosognosia and healthy controls, more evidence is needed exploring the differences between MCI and AD patients with and without anosognosia using resting state and task related paradigms.
Muñoz-Neira 2019 [27]	A systematic review to explore the neural correlates of altered insight in FTD and associated syndromes was conducted. Insight was fractionated to examine whether altered insight into different neuropsychological/behavioral objects is	6 databases (Medline, Embase, PsycINFO, Web of Science, BIOSIS and ProQuest Dissertations & Theses Global) were interrogated between 1980	15 relevant papers were found out of 660 titles screened. The studies included suggest that different objects of altered insight are associated with distinctive	These results reflect to a certain extent those observed in other neurodegenerative conditions like Alzheimer's Disease (AD) and also other brain disorders.

	underpinned by different or compatible neural correlates.	and August 2019.	brain areas in FTD.	Nevertheless, they should be cautiously interpreted due to variability in the methodological aspects used to reach those conclusions.
Ossenkoppele 2021 [28]	To perform a systematic review and meta-analysis of the bvAD literature and use the outcomes to propose research criteria for this syndrome.	A systematic literature duplicate search in PubMed/MEDLINE and Web of Science databases. Studies reporting on behavioral, neuropsychological, or neuroimaging and, when available, providing comparisons with typical amnestic predominant or behavioral variant frontotemporal dementia. This analysis involved random-effects meta-analyses on group-level study results of clinical data and systematic review of the neuroimaging literature, and following Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines.	83 studies, including 13 suitable for meta-analysis. Data were collected for 591 patients. Cases with bvAD showed more severe behavioral symptoms than tAD and a trend toward less severe behavioral symptoms compared with bvFTD Meta-analyses of cognitive data indicated worse executive performance in bvAD *vs.* tAD but not compared with bvFTD Cases with bvAD showed a nonsignificant difference of worse memory performance compared with bvFTD but did not differ from tAD The literature revealed 2 distinct bvAD neuroimaging phenotypes: an AD-like pattern with relative frontal sparing and a relatively more bvFTD-like pattern.	These data indicate that bvAD is clinically most similar to bvFTD, while it shares most pathophysiological features with tAD. Based on these insights, we propose research criteria for bvAD aimed at improving the consistency and reliability of future research and aiding the clinical assessment of this AD phenotype.
Patel 2020 [29]	Alzheimer's disease (AD)	we conducted a	Identified genes	Taken together,

	starts decades before clinical symptoms appear. Low-glucose utilization in regions of the cerebral cortex marks early AD. To identify these regions, we conducted a voxel-wise meta-analysis of previous studies conducted with positron emission tomography that compared AD patients with healthy controls.	voxel-wise meta-analysis of previous studies conducted with positron emission tomography that compared AD patients with healthy controls.	that show spatial correlation across the cerebral cortex between their expression and this hypometabolism . 39-year-old male noted a neurofibrillary tangle in the entorhinal cortex. Signal recognition particle (SRP)-dependent co-translational protein targeting genes, which encode primarily cytosolic ribosome proteins, are highly expressed in the hypometabolic regions.	our molecular characterization reveals a link to AD-associated hypometabolis m that may be relevant to preclinical stages of AD.
Plaven-Sigray 2018 [30]	This study examined whether patients with first-episode psychosis and schizophrenia had altered TSPO levels compared with healthy control subjects.	PubMed was searched for studies comparing patients with psychosis with healthy control subjects using second-generation TSPO radioligands.	Five studies, with 75 participants with first-episode psychosis or schizophrenia and 77 healthy control subjects, were included. From the posterior distributions, mean patient–control differences in standardized VT values were 20.48 for frontal cortex, 20.47 for temporal cortex, and 20.63 for hippocampus.	The lower levels of TSPO observed in patients may correspond to altered function or lower density of brain immune cells.
Smailagic 2018 [31]	To update the evidence and reassess the accuracy of 18F-FDG-PET for detecting people with MCI at baseline who would clinically convert to Alzheimer's disease (AD) dementia at follow-up.	A systematic review including comprehensive search of electronic databases from January 2013 to July 2017, to update original	24 studies were examined across all semi-quantitative and quantitative metrics, exploratory analysis for conversion of	There is some evidence of higher and more consistent accuracy in studies using computer aided metrics in specialized

		searches (1999 to 2013). All key review steps, including quality assessment using QUADAS 2, were performed independently and blindly by two review authors. Meta-analysis could not be conducted due to heterogeneity across studies.	MCI to AD dementia showed highly variable accuracy; half the studies failed to meet four or more of the seven sets of QUADAS 2 criteria. Variable accuracy for all metrics was also found across eleven newly included studies published in the last 5 years. The most consistently high sensitivity and specificity values were reported for the single case statistical parametric mapping metric in 6 out of 8 studies.	clinical settings. Robust, methodologically sound prospective longitudinal cohort studies with long (≥5 years) follow-up, larger consecutive samples, and defined baseline threshold(s) are needed to test these promising results.
van der Straten 2017 [32]	To explore whether variability in the study methods (e.g., type of therapy) and patient characteristics (e.g., level of symptom improvement) could explain variability in the results, we performed additional meta-regressions.	Positron emission tomography (PET) and single photon emission computed tomography (SPECT) studies that investigated cerebral blood flow or glucose metabolism in patients with OCD before and after pharmacological or psychological treatment.	It revealed small reductions in activity in the caudate nucleus and orbitofrontal cortex after treatment with a serotonin reuptake inhibitor or cognitive behavioral therapy. The analyses for the caudate nucleus showed no significant effect of the type of treatment.	These results show that pharmacological and psychological treatments reduce resting CSTC circuit activity, and provide further support for the CSTC circuit model in OCD.
Van Hooijdonk 2022 [33]	We systematically reviewed the evidence for dopaminergic alterations demonstrated by in-vivo imaging studies in humans at increased risk of developing psychosis, covering clinical, genetic,	According with PRISMA guidelines, review protocol was registered in PROSPERO. All studies utilized PET, SPECT, or	The striatal dopamine $D_{2,3}$ receptor availability is unaltered in all have high-risk groups compared with	It seems likely that all these high-risk groups can be stratified into multiple subgroups, with varying risks to

	and environmental high-risk groups.	NM-MRI methods to collect data concerning the dopamine system during test and or following pharmacological, behavioral, or cognitive challenges.	healthy individuals; striatal dopamine synthesis is increased in some clinical and genetic high-risk individuals relative to controls people while DScs is depressed in cannabis-using environmental high-risk individuals.	develop psychosis, transition rates, and underlying neurobiology. The present results support the hypothesis that dopaminergic abnormalities occur before high-risk individuals develop psychosis.

Discussion

In the revised literature six works were about Parkinson disease,[15,16,20-22,25] seven were about Alzheimer, [18,23,24,26,28,29,31] two were about psychosis,[30,33] and only one was about epilepsy or ADHA or dementia or obsessive-compulsive disorder.

As we know, the substantia nigra is the black substance because the presence of melanin pigment causes it to appear black to the naked eye. It has two parts, one of which is functionally equivalent to the globus pallidus interna. The other part degenerates in Parkinson's disease. Parkinsonism is characterized by rigidity and tremor and is associated with depression in more than 30 percent of cases.[34] All the searched works about Parkinson disease,[15,16,20-22,25] were agreed to affirm the characteristics of the disease in nuclear medicine images were anxiety,[15] stimulation of subthalamic nucleus,[16] well diagnostic by these methods,[20-22] and the cognitive impairment.[25]

The most common clinical disorder of memory is Alzheimer's disease. Alzheimer's disease is characterized pathologically by the degeneration of neurons and their replacement by senile plaques and neurofibrillary tangles. [35] Clinicopathological studies have suggested that the cognitive decline is best correlated with the loss of synapses.[36] Initially, the parietal and temporal lobes are affected, with relative sparing of the frontal lobes. This pattern of degeneration correlates with the early loss of memory, which is largely a temporal lobe function.[37] Also, syntactical language comprehension and visuospatial organization, functions that rely heavily on the parietal lobe, are impaired early in the course of Alzheimer's disease. In contrast, personality changes, which reflect frontal lobe function, are relatively late consequences of Alzheimer's disease. There is an association with a genetic basis for brain amyloidosis,[18] or dementia,[23,24] or correlation with anosognosia.[26] A behavioral variant was founded,[28] and the association with ribosomal genes that increases the microglial activation.[29] This disease could be followed by nuclear medicine images to confirm the diagnosis.[31]

The word psychosis is used to describe conditions that affect the mind, where there has been some loss of contact with reality.[38] When someone becomes ill in this way it is called a psychotic episode. During a period of psychosis, a person's thoughts and perceptions are disturbed and the individual may have difficulty understanding what is real and what is not. Symptoms of psychosis include delusions (false beliefs) and

hallucinations (seeing or hearing things that others do not see or hear). Other symptoms include incoherent or nonsense speech, and behavior that is inappropriate for the situation.[39] A person in a psychotic episode may also experience depression, anxiety, sleep problems, social withdrawal, lack of motivation, and difficulty functioning overall.[40] Positron emission tomography studies determinate the glial protein translocation,[30] and dopaminergic alterations in patients with psychosis characteristics,[33] showing that the use of nuclear medicine images could be a tool in the diagnosis of the disturb.

Epilepsy is a disorder of the brain characterized by repeated seizures.[41] A seizure is usually defined as a sudden alteration of behavior due to a temporary change in the electrical functioning of the brain. The use of SPECT is a tool for the ancillary diagnosis.[17]

ADHD can last into adulthood. Some adults have ADHD but have never been diagnosed.[42] The symptoms can cause difficulty at work, at home, or with relationships. Symptoms may look different at older ages, for example, hyperactivity may appear as extreme restlessness. Symptoms can become more severe when the demands of adulthood increase.[19]

Dementia is the loss of cognitive functioning thinking, remembering, and reasoning to such an extent that it interferes with a person's daily life and activities. Some people with dementia cannot control their emotions, and their personalities may change.[27]

Obsessive-Compulsive Disorder (OCD) is a disorder in which people have recurring, unwanted thoughts, ideas or sensations (obsessions) that make them feel driven to do something repetitively (compulsions). The repetitive behaviors, such as hand washing, checking on things or cleaning, can significantly interfere with a person’s daily activities and social interactions.[32]

Many people without OCD have distressing thoughts or repetitive behaviors. However, these thoughts and behaviors do not typically disrupt daily life. For people with OCD, thoughts are persistent, and behaviors are rigid. Not performing the behaviors commonly causes great distress. Many people with OCD know or suspect their obsessions are not realistic; others may think they could be true (known as limited insight).[43] Even if they know their obsessions are not realistic, people with OCD have difficulty disengaging from the obsessive thoughts or stopping the compulsive actions.

All those brains disturb were following by nuclear medicine images and helped the psychiatric to made a correct diagnostic about the disease that committed the brain of those people, and also helped for the evolution of the treatment.

Conclusion

Nuclear medicine images are a tool to diagnose and following the brains disturb giving to the physicians a good matter to treat their patients. The psychiatric have a well-done work to do with this resource to treat and diagnostic his patients, following their evolution during the treatment with drugs or psychiatric way.

References

1. Goldenhart AL, Senthilkumaran S. Nuclear medicine test. In: StatPearls [Internet]. Treasure island (FL): StatPearls publishing; 2022 Jan.
2. Lee LIT, Kanthasamy S, Ayyalaraju RS, Ganatra R. The current state of artificial intelligence in medical imaging and nuclear medicine. BJR Open. 2019;1(1):20190037.

3. Crișan G, Moldovean-Cioroianu NS, Timaru DG, Andrieș G, Căinap C, Chiș V. Radiopharmaceuticals for PET and SPECT imaging: a literature review over the last decade. Int J Mol Sci. 2022;23(9):5023.
4. National Research Council (US) and Institute of Medicine (US) Committee on State of the Science of Nuclear Medicine. Advancing Nuclear Medicine Through Innovation. Washington (DC): National Academies Press (US); 2007. 3, Nuclear Medicine Imaging in Diagnosis and Treatment.
5. Hagan CT, Mi Y, Knape NM, Wang AZ. Enhancing combined immunotherapy and radiotherapy through nanomedicine. Bioconjug Chem. 2020;31(12):2668-78.
6. Beyer T, Bidaut L, Dickson J, Kachelriess M, Kiessling F, Leitgeb R, et al. What scans we will read: imaging instrumentation trends in clinical oncology. Cancer Imaging. 2020;20(1):38.
7. Young PNE, Estarellas M, Coomans E, Srikrishna M, Beaumont H, Maass A, et al. Imaging biomarkers in neurodegeneration: current and future practices. Alzheimers Res Ther. 2020;12(1):49.
8. Mongelli F, Georgakopoulos P, Pato MT. Challenges and opportunities to meet the mental health needs of underserved and disenfranchised populations in the United States. Focus (Am Psychiatr Publ). 2020;18(1):16-24.
9. Wainberg ML, Scorza P, Shultz JM, Helpman L, Mootz JJ, Johnson KA, et al. Challenges and opportunities in global mental health: a research-to-practice perspective. Curr Psychiatry Rep. 2017;19(5):28.
10. Stroup TS, Gray N. Management of common adverse effects of antipsychotic medications. World Psychiatry. 2018;17(3):341-56.
11. Gautam S, Jain A, Gautam M, Vahia VN, Grover S. Clinical practice guidelines for the management of depression. Indian J Psychiatry. 2017;59(Suppl 1):S34-50.
12. Bandelow B, Michaelis S, Wedekind D. Treatment of anxiety disorders. Dialogues Clin Neurosci. 2017;19(2):93-107.
13. Jales RLC, Santos-Filho SD. Approaches of nuclear medicine in psychiatry: perfusion against function, the psychiatric question. EC Clinical and Medical Case Reports 3.3 (2020): 01-05
14. Jales RLC, Santos-Filho SD. Psychiatric diagnostic confirmed by cerebral simple proton emission computed tomography (SPECT). Jap J Clin & Med Res. 2021;1(1):1-3.
15. Carey G, Görmezoğlu M, de Jong JJA, Hofman PAM, Backes WH, Dujardin K, et al. Neuroimaging of anxiety in parkinson's disease: a systematic review. Mov Disord. 2021;36(2):327-39.
16. Chen HM, Sha ZQ, Ma HZ, He Y, Feng T. Effective network of deep brain stimulation of subthalamic nucleus with bimodal positron emission tomography/functional magnetic resonance imaging in Parkinson's disease. CNS Neurosci Ther. 2018;24(2):135-43.
17. Crișan G, Moldovean-Cioroianu NS, Timaru DG, Andrieș G, Căinap C, Chiș V. Radiopharmaceuticals for PET and SPECT imaging: A literature review over the last decade. Int J Mol Sci. 2022;23(9):5023.
18. Raghavan NS, Dumitrescu L, Mormino E, Mahoney ER, Lee AJ, Gao Y, et al. Association between common variants in RBFOX1, an RNA-binding protein, and brain amyloidosis in early and preclinical Alzheimer disease. JAMA Neurol. 2020;77(10):1288-98.
19. Hirjak D, Kubera KM, Wolf RC, Northoff G. Going back to Kahlbaum's psychomotor (and GABAergic) origins: is catatonia more than just a motor and dopaminergic syndrome? Schizophr Bull. 2020;46(2):272-85.

20. Jiang L, Wang X, Li P, Feng Z, Shi X, Shao H. Efficacy of 11C-2b-carbomethoxy-3b-(4-fluorophenyl) tropane positron emission tomography combined with 18F-fluorodeoxyglucose positron emission tomography in the diagnosis of early Parkinson disease: A protocol for systematic review and meta-analysis. Medicine (Baltimore). 2020;99(51):e23395.
21. Kaasinen V, Kankare T, Joutsa J, Vahlberg T. Presynaptic striatal dopaminergic function in atypical parkinsonism: A meta-analysis of imaging studies. J Nucl Med. 2019;60(12):1757-63.
22. Kong Y, Zhang C, Liu K, Shukla AW, Sun B, Guan Y. Imaging of dopamine transporters in Parkinson disease: a meta-analysis of 18F/123I-FP-CIT studies. Ann Clin Transl Neurol. 2020;7(9):1524-34.
23. Kunkle BW, Grenier-Boley B, Sims R, Bis JC, Damotte V, Naj AC, et al. Genetic meta-analysis of diagnosed Alzheimer's disease identifies new risk loci and implicates Aβ, tau, immunity and lipid processing. Nat Genet. 2019;51(3):414-30.
24. Martínez G, Vernooij RW, Padilla PF, Zamora J, Flicker L, Cosp XB. 18F PET with flutemetamol for the early diagnosis of Alzheimer's disease dementia and other dementias in people with mild cognitive impairment (MCI). Cochrane Database Syst Rev. 2017;11(11):CD012884.
25. Meyer PT, Frings L, Rücker G, Hellwig S. 18F-FDG PET in Parkinsonism: differential diagnosis and evaluation of cognitive impairment. J Nucl Med. 2017;58(12):1888-98.
26. Mondragón JD, Maurits NM, De Deyn PP. Functional neural correlates of anosognosia in mild cognitive impairment and Alzheimer's disease: a systematic review. Neuropsychol Rev. 2019;29(2):139-65.
27. Muñoz-Neira C, Tedde A, Coulthard E, Thai NJ, Pennington C. Neural correlates of altered insight in frontotemporal dementia: A systematic review. Neuroimage Clin. 2019;24:102066.
28. Ossenkoppele R, Singleton EH, Groot C, Dijkstra AA, Eikelboom WS, Seeley WW, et al. Research criteria for the behavioral variant of Alzheimer disease: A systematic review and meta-analysis. JAMA Neurol. 2022;79(1):48-60.
29. Patel S, Howard D, Man A, Schwartz D, Jee J, Felsky D, et al. Donos-specific transcriptomic analysis of Alzheimer's disease-associated hypometabolism highlights unique donor, ribosomal proteins and microglia. eNeuro. 2020;7(6):1-11.
30. Plavén-Sigray P, Matheson GJ, Collste K, Ashok AH, Coughlin JM, Howes OD, et al. Positron emission tomography studies of the glial cell marker translocator protein in patients with psychosis: A meta-analysis using individual participant data. Biol Psychiatry. 2018;84(6):433-42.
31. Smailagic N, Lafortune L, Kelly S, Hyde C, Brayne C. 18F-FDG PET for prediction of conversion to Alzheimer's disease dementia in people with mild cognitive impairment: An updated systematic review of test accuracy. J Alzheimers Dis. 2018;64(4):1175-94.
32. van der Straten AL, Denys D, van Wingen GA. Impact of treatment on resting cerebral blood flow and metabolism in obsessive compulsive disorder: a meta-analysis. Sci Rep. 2017;7(1):17464.
33. van Hooijdonk CFM, Drukker M, van de Giessen E, Booij J, Selten JP, van Amelsvoort TAMJ. Dopaminergic alterations in populations at increased risk for psychosis: A systematic review of imaging findings. Prog Neurobiol. 2022;213:102265.
34. DeMaagd G, Philip A. Parkinson's disease and its management: Part 1: disease entity, risk factors, pathophysiology, clinical presentation, and diagnosis. P T. 2015;40(8):504-32.

35. De Ture MA, Dickson DW. The neuropathological diagnosis of Alzheimer's disease. Mol Neurodegener. 2019;14(1):32.
36. Nelson PT, Alafuzoff I, Bigio EH, Bouras C, Braak H, Cairns NJ, et al. Correlation of Alzheimer disease neuropathologic changes with cognitive status: a review of the literature. J Neuropathol Exp Neurol. 2012;71(5):362-81.
37. de Flores R, Wisse LEM, Das SR, Xie L, McMillan CT, Trojanowski JQ, et al. Contribution of mixed pathology to medial temporal lobe atrophy in Alzheimer's disease. Alzheimers Dement. 2020;16(6):843-52.
38. Gaebel W, Zielasek J. Focus on psychosis. Dialogues Clin Neurosci. 2015;17(1):9-18.
39. Calabrese J, Al Khalili Y. Psychosis. [Updated 2022 Jul 21]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-.
40. Maj M, van Os J, De Hert M, Gaebel W, Galderisi S, Green MF, et al. The clinical characterization of the patient with primary psychosis aimed at personalization of management. World Psychiatry. 2021;20(1):4-33.
41. Stafstrom CE, Carmant L. Seizures and epilepsy: an overview for neuroscientists. Cold Spring Harb Perspect Med. 2015;5(6):a022426.
42. Song P, Zha M, Yang Q, Zhang Y, Li X, Rudan I. The prevalence of adult attention-deficit hyperactivity disorder: A global systematic review and meta-analysis. J Glob Health. 2021;11:04009.
43. Freckelton I. Obsessive compulsive disorder and obsessive-compulsive personality disorder and the criminal law. Psychiatr Psychol Law. 2020;27(5):831-52.