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DOPAMINE AND SEROTONIN IN SCHIZOPHRENIA: A COMPARATIVE THEORETICAL STUDY

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ABSTRACT: *Neurotransmitters are signaling molecules that travel across the synaptic space to interact with receptors. In this study, the relationship between serotonin and dopamine was highlighted in schizophrenia. Serotonin and dopamine have individual roles in the progression of the disease, but interesting results have focused on an interactive role. Earlier research works have highlighted that the serotonin system inhibits the dopaminergic function at the level of origin of the dopamine system in the mid-brain as well as at the terminal dopaminergic field in the fore-brain. To conclude, the therapeutic success of clozapine and risperidone have revealed that two systems act as an avenue for superior therapeutic actions in schizophrenia.*

KEYWORDS: Neurotransmitter, dopamine, serotonin, schizophrenia, Rorschach technique.

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INTRODUCTION

Chemical neurotransmission is the process involving the release of a neurotransmitter by one neuron and the binding of the neurotransmitter molecule to a receptor on another neuron. The process of chemical neurotransmission is affected by most drugs used in psychiatry.

Though it is evident in earlier research works which are believed to exert these effects making by blocking dopamine type 2 (D_2) receptors, virtually all antidepressants are believed to exert their effects mainly by blocking dopamine 2, but it is not applicable in serotonin-dopamine antagonism.

Criteria for a Neurotransmitter

(1) The molecule is synthesized in the neuron.

(2) The molecule is present in the presynaptic neuron and is released on depolarization in a physiologically significant amount.

(3) When administered exogenously as a drug, the exogenous molecule mimics the effects of the endogenous neurotransmitter.

(4) A mechanism in the neurons or the synaptic cleft acts to remove or deactivate the neurotransmitter.

Dopamine and serotonin are the selected transmitters for the present study.

Dopamine is the product of the catecholamine synthetic pathway, whereas serotonin is derived from distinct precursors. A detailed analysis includes neuro-transmitters in psychiatry—knowledge of their autonomy, their life cycle (synthesis, serotonin, reuptake and degradation), receptors and the drugs that modify their activity (Kaplan & Sadock 2010).

Patients who take dopamine receptor antagonists after have roughly threefold elevated prolactin levels because the blockade of dopamine receptors in the tracts eliminate the inhibitory effect of dopamine.

In the past, the potency of antipsychotic compounds has been correlated with their affinity for the D_2 receptor. Because blockade of dopamine receptors, particularly D_2 receptors, has been associated with the efficacy of antipsychotic drugs, long-term administration of dopamine receptor antagonists results in an upregulation in the number of dopamine receptors present. This upregulation may be involved in the development of tardive dyskinesia.

A new class of highly effective anti-psychotic agents—called the serotonin-dopamine antagonists because they block predominantly the serotonin type 5-HT_2 and to a lesser extent, the D_2 receptors—is associated with a greatly reduced risk of development of parkinsonian side effects and tardive dyskinesia. Not only do they treat the positive symptoms of schizophrenia, effectively treated by pure D_2 receptors antagonists (psychosis, hallucination, agitation), they improve the negative symptoms of schizophrenia (blunted affects, ambivalence, catatonia).

The dopamine hypothesis of schizophrenia grew from the observations that drugs that block dopamine receptors; for example, Haloperidol have an antipsychotic activity (amphetamine) and can induce psychotic symptoms in non schizophrenic persons when given in a sufficiently

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high dose. The dopamine hypothesis remains the leading non chemical hypothesis for schizophrenia, but room is being made for a role of serotonin based on the therapeutic success of the serotonin-dopamine antagonists. A recent series of studies showed the plasma concentrations of HVA which, in fact, are reduced in many patients with schizophrenia who respond to antipsychotic drugs.

Dopamine may also be involved in the pathophysiology of mood disorders. Dopamine activity may be low in depression and high in mania. Amphetamines with potential dopamine activity are highly effective anti depressants; Laro dopa can cause mania and psychosis in some patients with parkinsonian side effects. Research works are also indicative of low levels of dopamine metabolites in depressed patients (Kaplan & Sadock, 2010).

The major site of serotonergic cell bodies is in the upper pons and the mid brain. Serotonin life cycle is associated with catecholamines; serotonin is synthesized in the axonal terminal. Seven types of serotonin receptors are now recognized: 5-HT, through 5-HT with numerous subtypes, for example (Bn Spar), a clinically effective anxiolytic, clozapine, the prototypical serotonin-dopamine antipsychotic agent. Again, it is evident that tricyclic drugs and MAOgs respectively block the uptake and the metabolism of serotonin and norepinephrine, thus increasing the concentration of both neurotransmitters in the synaptic cleft. Fluoxetine is one of the selective serotonin uptake inhibitors. Pa Fluxetine (Paxil), Setraline (Zolot), Fluvoxamine (Luvox) and Citalopram (Calexa) are all associated with minimal adverse effects. Venlafaxine blocks the reuptake of both serotonin and norepinephrine.

The principal association of serotonin with a psychopathological condition is with depression, as suggested in the biogenic opine hypothesis of mood disorders. This hypothesis is simply that depression is associated with too little serotonin (Kaplan & Sadock 2007).

With the introduction of a variety of new drugs, serotonin is one of the exciting areas for research in anxiety disorder and schizophrenia, in addition to its role in depression; for example, the causes of anxiety were thought to be treated by benzodiazepines. With the success of SSRGs and Buspirone, which are effective anti anxiety agents, the theory of anxiety needed its place. Similarly, schizophrenia was previously thought to result from an imbalance of dopamine, but since the therapeutic success of the serotonin-dopamine hypothesis, it now calls for a second thought, both the dopamine-serotonin function (Kaplan & Sadock, 2010)

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METHODOLOGY

Retrospective analysis was done. A case study method was applied in this present investigation. However, the aim is not to make statements only about the concrete case. Rather, it is a typical and particularly instructive example for a more general problem. Here, case study raised the question of how to select the case under study in a way that permits more general conclusions to be drawn from analyzing it (Fluck, U, 2009).

The case study captured the process under study in a very detailed and exact way. It is not restricted due to an intended compatibility and is able to fully use the potential of certain methods.

Here, sampling is purposive. Retrospectively, the 'Rorschach' responses with medication were analyzed, aiming at a reconstructive case.

Limitations of the Design

Concentration on one case of ten leads to the problem of generalization. Thus, replication of the present study is needed for exploring the present issues under consideration (Flick, U, 2009).

Tools: The Rorschach Inkblot Test. The purpose of the Rorschach technique is to provide a relatively standardized situation in which behavior can be observed. The assumption is that on the basis of a limited sample of behavior, it will be possible to predict other kinds of behavior on the part of the participant. As a projective technique, the Rorschach test has further characteristics of providing a relatively ambiguous stimulus situation which will enable the participant to optimally reveal his individuality of functioning. For most cases, discrete responses are obtained. However, the three chief questions should be as follows: Is verbalization a response or a mere remark? Is verbalization a response or is it rejected or discarded in favor of another concept? Is verbalization a response in its own right which can serve as a unit of scoring or is it merely part of another response? (Klopfer & Klopfer, 1956).

Secondary Source of Data

The participant was a 36-year-old gentleman; his orientation was intact, showing a somewhat positive attitude towards professionals. But he had negative symptoms of schizophrenia—blunted affect, negativity and over-valued ideas. He did not take any initiative in his daily and professional lives.

The case was diagnosed as schizophrenia.

His responses to Rorschach are as follows: F responses average K & K are present; there is absence of Fc responses, but 'C' responses were scattered there. Absence of 'M' responses are noticed. A few FM and Fc responses are there.

Some responses are given below:

(1) 'It looks like a butterfly.'
(2) 'Two animals are playing.'
(3) 'It seems like a ghost.'
(4) 'Shapes like monsters.'
(5) 'A butterfly is flying.'

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(6) 'It also looks like monsters.'
(7) 'Rabbits are playing.'
(8) 'Looks like the Eiffel Tower.'
(9) 'Cluster of animals.'
(10) 'Blood spreads everywhere.'

Interpretation

Most of the responses are of animals; apart from these, blood and ghosts are evident.

Location-wise, most of the responses are larger details, not the whole response. No smaller details are noticed.

Reaction time of all the stimulations, Rorschach Ink Blot Test (RTBT), are within 35 seconds.

As the responses are only a few, sequence analysis is also needed—Sequence, Content, Determinants and Location analyzed from Klopfer and Klopfer's viewpoint.

He has perceived the figures which are mostly categorized by 'form responses.' Analysis reveals he has a certain capacity for concentration, but sometimes attention is disturbed through flightiness or fatigue; he shows regression. The primary color responses are the representation of impulsivity. They have to do with almost instinctive affectivity and have their roots in the most highly stressed affective psychism.

The scattered color represents affective instability, excitability and non adaptive affectivity.

A large number of FM responses reveal that an associational activity is therefore created, which is directed towards memory impressions of animal figures and exercises a stereotyping influence.

Color from responses indicate instability, sensitivity and suggestibility.

The absence of texture responses reveals affectional derivatives along with instability.

Location-wise in the majority of cases, D responses indicate the patient is practical rather than theoretical, eschewing the abstract, and tangible.

Content analysis shows that it is clear and evident that an associational activity is therefore created, which is directed towards memory impressions of animal figures and exercises a stereotyping influence on the responses.

Anatomical response is indicative of his hypochondriacal brooding.

Most of his responses are popular in nature, with participation in collective thought and popular ways of sensing things.

He has given animal responses to a greater extent and anatomical responses to a lesser extent.

In short, it could be stated that content analysis is indicative of immaturity, impulsivity and inadequacy. Moreover, it is coupled with instinctual needs, sometimes beyond his control.

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Sequence analysis consists of a card response in which each response is translated into concepts derived from the basic interpretation hypothesis.

Secondly, the highly individualized and flexible interpretative approach of sequence analysis presents a formidable problem in validation research.

The popular response is shown in Card I, that is, a winged creature, using the blot as a relatively simple outline.

In the second card, color disturbances are noticed; this is the first card where color is introduced but the client could not identify with it.

In Card III, a human figure in the form of a ghost is seen, unable to establish strong emotional bonds.

Repressed psycho-social needs are seen from this Card IV.

The patient has seen the popular response from Card V.

Again, in the Card VI, no shading response is seen, which is strongly indicative of affectional deprivation.

Avoidance of color responses in Card VIII reveals color shocks; it could be described as emotional upheaval.

Again, color shocking is reflected in the response of Card IX, which refers to lack of integration between thought and emotional behaviour.

In Card X, emotional liability is reflected from scattered responses.

CONCLUSION

So, it could be stated that he has shown a stereotyped vision of the world around him. The absence of texture responses reveals affectional deprivation along with impulsivity. Further analysis reveals hypochondrial brooding resulting in withdrawal and isolation. The form level in most of the figures indicate his impoverished intellectual functioning. Color disturbances and, in some instances, color shocking are corroborated so that his emotive functions are disturbed.

Considering case history, mental status examination and illness history, it reveals that he is suffering from psychotic disturbances, schizophrenia in nature.

But the interesting part of his history is he had been given typical psychotic medicines; initially chlorpromazine Haloperidol and Thiothixene had been given to him. But there was no improvement. But as from the mental status examination, it is clear and evident that depressive thought contents are there; mood fluctuates then it was diagnosed as “Schizoaffective” disorder. Clozapine and “Risperidone” were provided. Effective improvement is seen. “Dopamine-Serotonin antagonists” had been played well, which helped in stabilizing psychological equilibrium. Further research works are called for for replication of present studies.

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So, to sum up the concept of Dopamine-Serotonin antagonists along with psychological diagnosis, coupled with dialectical behavior therapy, it is found to be fruitful in complex cases recently.

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