

## A Case Report on Modafinil Dependence

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### ABSTRACT

Modafinil is a non-amphetamine stimulant frequently prescribed for the treatment of sleep disorders such as narcolepsy, obstructive sleep apnea syndrome, and shift work sleep disorder. Besides, literature also states that Modafinil enhances cognitive functions. Thus, its use among healthy individuals is increasing to enhance their alertness or to reduce fatigue. Similar effects of Modafinil have also been described in patients with psychiatric illness for treatment of cognitive dysfunction. Clinical research has shown that Modafinil improves symptoms in patients with major depression, schizophrenia, and attention-deficit hyperactivity disorder (ADHD). In early studies, it was stated that Modafinil is a well-tolerated drug with low addiction potential. This case report is one of the few case reports on Modafinil dependence

**Keywords:** Dependence, Modafinil, Non amphetamine, Stimulant

### INTRODUCTION

Modafinil is a non-amphetamine stimulant used in narcolepsy, obstructive sleep apnea and also circadian rhythm disorder in shift workers. <sup>(1)</sup> It has also been tried for disease related fatigue, attention deficit hyperactivity disorder, Alzheimer's disease, depression and cognitive impairment in schizophrenia. <sup>(2-6)</sup> Modafinil has been commercialized as a wake promoting drug in 2003. <sup>(7)</sup> Even though the mechanism of action is not clear, its pharmacological profile is notably different from the traditional psychostimulants, such as amphetamine, cocaine or methylphenidate. <sup>(8)</sup> A novel class of psychostimulants is eugeroics under which

Modafinil, adrafinil, and ampakine are categorized. Eugeroics are devoid of common side effects of traditional psychostimulants such as excess locomotor activities, anxiety, jitteriness or interference in recovery sleep. <sup>(9)</sup> Due to its dopaminergic activity and low abuse potential, Modafinil has also been used in treatment of cocaine, methamphetamine abuse and impaired cognitive functions in alcohol dependent individuals. <sup>(10-13)</sup> However, the recent reports reported the possibility of dependence in Modafinil due to its sensitivity to dopamine signalling in the brain.

### CASE DESCRIPTION

A 55 year old male, presented to Psychiatry Inpatient-department with complaints of irritability, suspiciousness and assaultive behavior increased since 2 years. On detailed evaluation, it was found that he had history of psychiatric illness since 30 years. The course of illness was gradual in onset and continuous characterized by auditory hallucinations, referential, infidelity and persecutory delusions leading to the progressive decline in social and occupational functioning. He was evaluated for the same and initially started on psychotropics. But patient was poorly compliant to medications. Since 7 years, he also complained of lethargy and decreased interest to work for which he was prescribed Modafinil 150 mg, along with the antipsychotics by a private practitioner. He reported improvement in symptoms. Hence, the treating psychiatrist advised to gradually taper & stop Modafinil. But, patient continued to use Modafinil & when denied

by the doctor (as it was indispensable), patient would obtain it over the counter (OTC). He claimed to have symptoms of worsening of lethargy, multiple aches, anxiety and disturbances in sleep pattern on skipping the Modafinil dose. Since 3 years, patient had increased his Modafinil use upto 300mg/day on his own after few hours of recurrence of symptoms. Patient would spend most of his time contemplating about procuring the drug rather than spending quality time with family/friends or even going for a job.

Past history of trihexyphenidyl abuse was noted. Patient also had bronchial asthma since childhood, with on and off medications for the same. Family history of psychosis in mother and younger sibling was present. Physical examination was within normal limits. ECG showed sinus rhythm. His investigations including haemogram, liver, renal & thyroid function test, lipid & glucose profile & neuroimaging were all within normal limits.

He was diagnosed to have Paranoid Schizophrenia-continuous (F20.00). Also, additional diagnosis of Modafinil dependence syndrome was made in view of evidence of craving, loss of control & unsuccessful efforts to cut down, withdrawal symptoms, tolerance & progressive neglect of alternative pleasurable or interest & increased amount of time spent on obtaining the substance (as per dependence criteria of ICD 10)

The dose of modafinil was tapered gradually. He initially reported of sleep disturbance, irritability, anxiety and lethargy. We started him on clonazepam for symptomatic management & his symptoms improved gradually. Following this, clonazepam was also tapered & stopped. Patient maintained well thereafter only on anti-psychotics.

## CASE DISCUSSION

Modafinil consists of R-enantiomer and S-enantiomer and the waking effect of R-enantiomer has a longer duration. Modafinil is known to act via its effects on

dopaminergic and noradrenergic (activation of alpha-1 receptors) neurotransmission. Its wakefulness and memory enhancing properties are mostly due these effects. Modafinil dependence can be attributed to its dopamine uptake blockade thereby increasing its concentration in dopaminergic areas of brain. <sup>(14)</sup> Modafinil promotes cognitive functions such as attention, learning and memory. Studies have been done on patients with mental disorders. One of the studies with schizophrenic patients with Modafinil administration, in addition to antipsychotic treatment had promising results suggestive of cognitive function improvement. <sup>(15)</sup> In this case, patient who had history of mental illness had symptoms of increased sleep in the morning and apathy. Modafinil was used to overcome these symptoms.

There are few case reports in the literature stating that Modafinil dependence can occur in patients with substance abusers, ADHD and patients with organic mental disease in order to enhance cognitive functions. This is also supported with the fact that two of the previously reported cases had concurrent history of alcohol and benzodiazepine dependence, and the third reported case had schizoaffective disorder and the other ADHD. <sup>(16-19)</sup> Similarly, in this case patient had history of Trihexyphenidyl abuse.

There is also a case of Modafinil associated psychosis and reports of withdrawal phenomenon. <sup>(20)</sup> Overdose of Modafinil is prone to cause insomnia, agitation, tachycardia and rise in blood pressure. <sup>(1)</sup>

There are no controlled trials or reports available for the treatment of Modafinil addiction. Treatment with antidepressants like Bupropion, Duloxetine and treatment with benzodiazepines like Clonazepam has been attempted in previously reported cases. <sup>(16-18)</sup> In this case, patient reported of sleep disturbances and anxiety which was managed with benzodiazepines.

## CONCLUSION

Studies have claimed that the abuse potential of Modafinil is less & psychoneuroimmunological approach is necessary to monitor its potential for abuse. But, this case report shows that modafinil abuse is not uncommon & clinicians have to bear in their mind about its abuse potential while prescribing it. In the recent years, there is an increase in modafinil use by night shift workers, high school students, athletes and career oriented people to increase work efficiency without sleep in the present competitive environment. This could be because of its easy accessibility over the counter. Hence, strict regulations in dispensing these medications must be ensured.

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