

Endoxifen for the Management of Pathological Gambling in a Male Patient Who Overinvested in Cryptocurrency: A Case Report

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ABSTRACT

Gambling is a high-risk activity that can be addictive and has both financial and personal repercussions. There is an association between gambling risk and intensive engagement in cryptocurrency trading. The management of gambling disorder has relied on medications including naltrexone and selective serotonin reuptake inhibitors (SSRIs), which have certain limitations including adverse effects and the need for longer treatment, respectively. This case report describes the use of adjunctive endoxifen in a male patient who had overinvested in cryptocurrency. The patient had used his own funds and had borrowed as well as stolen money for this purpose. The patient was counseled and treated with endoxifen, which successfully helped him overcome the habit of cryptocurrency gambling. Endoxifen is a protein kinase C (PKC) inhibitor and PKC overactivity leads to impulsivity. Hence, the use of endoxifen could be an effective strategy in the management of gambling disorders. Larger studies exploring this approach are needed.

Keywords: Case report, Endoxifen, Impulsivity, Pathological gambling, Protein kinase C.

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INTRODUCTION

Gambling is an activity involving financial risk, wherein money is staked on outcomes that are dependent on chance.¹ Although financial market activity and gambling both entail financial risk, gambling is considered "high-risk" because it is influenced by chance, can have negative returns, can be addictive, and can cause financial ruin.² There is an association between gambling risk and intensive engagement in cryptocurrency trading, and individuals who trade in cryptocurrency have higher scores on gambling assessment scales. In addition, such individuals tend to be speculative investors. Gambling assessment scores are associated with the intensity of trading cryptocurrency with respect to time spent per day and level of expenditure.³

This report presents the case of a cryptocurrency trader who satisfies the ICD-10 diagnostic criteria for pathological gambling. A prolonged pattern of investing money in cryptocurrency, to the extent of borrowing and stealing in order to sustain the cryptocurrency investment led to family discord and financial losses. The patient was counseled and treated with endoxifen, which successfully helped him overcome the habit of cryptocurrency gambling. Informed consent was obtained from the individual mentioned in this study.

CASE DESCRIPTION

A 50-year-old male from the upper socioeconomic strata presented to the psychiatric outpatient department of a tertiary care hospital. The patient was a businessman and had been excessively involved in investing all his funds in cryptocurrency for the past three years. The patient's wife revealed that he had invested several lakh (one hundred thousand) rupees in cryptocurrency, sustained losses, and continued to invest money despite this.

The patient had incurred a huge loss in his business a few years ago which led to significant distress. In 2018, his family decided

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to seek help from a mental health professional for his low mood and crying spells. The patient later began by borrowing money from family members to leverage money using cryptocurrency, which he learned by himself after researching on the internet and learning about the cryptocurrency market. When he failed to leverage money, his relatives stopped lending him money anymore. This prompted him to steal a piece of jewelry from his sister-in-law, who was visiting his home. The patient then lied to his son about launching a new business venture to borrow Rs. 25 lakhs.

When the patient's family discovered the truth, they became outraged and had multiple arguments with the patient. The family then confiscated his phone and other gadgets, stopping him from leveraging money. This made the patient feel despondent, as he still expressed an interest in borrowing money. The patient reported he believed he could earn back the money he had lost and clear his debts. He ultimately started spending most of his time dealing with spot trading. Whenever his family intervened, his wife revealed

Table 1: Comparison of Gambling Symptom Assessment Scale (GSAS) scores at presentation and after 3 months of endoxifen treatment

<i>Parameter</i>	<i>At presentation</i>	<i>After 3 months of endoxifen treatment</i>
If you had unwanted urges to gamble during the past WEEK, on average, how strong were your urges?	Extreme (4)	None (0)
During the past WEEK, how many times did you experience urges to gamble?	2–3 times (2)	None (0)
During the past WEEK, how many hours (add up hours) were you preoccupied with your urges to gamble?	1–7 hours (2)	None (0)
During the past WEEK, how much were you able to control your urges?	Minimal (3)	Complete (0)
During the past WEEK, how often did thoughts about gambling and placing bets come up?	2–4 times (2)	None (0)
During the past WEEK, approximately how many hours (add up hours) did you spend thinking about gambling and thinking about placing bets?	1–7 hours (2)	None (0)
During the past WEEK, how much were you able to control your thoughts of gambling?	Minimal (3)	Complete (0)
During the past WEEK, approximately how much total time did you spend gambling or on gambling-related activities?	2–7 hours (2)	None (0)
During the past WEEK, on average, how much anticipatory tension and/or excitement did you have shortly before you engaged in gambling? If you did not actually gamble, please estimate how much tension and/or excitement you believe you would have experienced, if you had gambled?	Moderate (2)	None (0)
During the past WEEK, on average, how much excitement and pleasure did you feel when you won on your bet? If you did not actually win at gambling, please estimate how much excitement and pleasure you would have experienced, if you had won?	Moderate (2)	None (0)
During the past WEEK how much emotional distress (mental pain or anguish, shame, guilt, embarrassment) has your gambling caused you?	Severe (3)	None (0)
During the past WEEK how much personal trouble (relationship, financial, legal, job, medical, or health) has your gambling caused you?	Extreme (4)	None (0)
Total score	31	0
Interpretation*	Severe symptoms	None

*Interpretation of the GSAS score: Maximum score = 48; Extreme = over 40; Severe = 31–40; Moderate = 21–30; Mild = 8–20

the patient would get extremely irritable and restless. The son felt betrayed and stopped speaking to the patient, after which the wife of the patient brought him to the psychiatric department with much reluctance from the patient. This motivated the sufferer to seek psychiatric assistance.

The patient's behavior aligns with the symptoms of pathological gambling. His preoccupation with cryptocurrency, coupled with excessive time spent on trading platforms and emotional distress caused by fluctuations in the market, indicates an unhealthy relationship with digital assets. This behavior has caused strain in his personal life, leading to decreased productivity and strained relationships with the family members who are concerned.

Based on the above information, a diagnosis of pathological gambling based on ICD-10 was made. The initial assessments of the Gambling Symptom Assessment Scale (GSAS) revealed a score of 31 (Table 1). As per GSAS evaluation, the patient reportedly spent up to 7 hours per week on gambling or gambling-related activities with minimum control over the urge to gamble. Moreover, gambling caused severe emotional distress in the patient.

Psychoeducation and evidence-based pharmacological strategies were discussed. A shared decision was made to initiate endoxifen 8 mg along with aripiprazole 2 mg for a period of 3 months. Qualitative assessment post 3 months of endoxifen revealed that the patient was stable and had stopped leveraging money. Psychological assessment revealed a score of 0 on the GSAS (Table 1). As per GSAS evaluation at the end of treatment, the patient reported no urge to gamble with complete control over his thoughts of gambling. Furthermore, the emotional distress related to gambling had resolved.

During subsequent reviews, the family was psychoeducated regarding his condition, the middle face of therapy, the patient mentioned that he had not been leveraging any more money. The family reported they need not withhold any of the electronic devices from the patient. He expressed motivation to return to his family business soon. His family revealed he had been doing well and the patient has since sorted out the discord with the family members. His wife and son were elated with the progress. No adverse effects were reported. He continues to be on endoxifen.

DISCUSSION

Pathological gambling is characterized by maladaptive symptoms of disordered gambling. It leads to functional impairment and lowered quality of life, and can also lead to imprisonment, financial losses, and family problems including divorce. Individuals diagnosed with pathological gambling are noted to have higher levels of impulsivity. Additionally, family members of such individuals also display traits of impulsivity. Impulsivity has a complex pathophysiology, involving behavioral and psychological mechanisms.⁴

Impulsivity appears to be the result of overactive protein kinase C (PKC) activity, which results in impaired prefrontal cortical regulation. Protein kinase C plays a role in the regulation of pre- and post-synaptic neurotransmission. Overactive PKC action leads to distractibility, impulsivity, and impaired judgment. It may thus be useful to explore PKC as a target of pharmacological therapy for conditions linked to impulsivity.^{5,6} Endoxifen is a potent direct

inhibitor of PKC. This is unlike valproate which is an indirect inhibitor of PKC.⁶

Endoxifen has several advantages, such as a small size which enables it to cross the blood-brain barrier, lipid solubility, and an acceptable safety profile.⁷ Several animal model studies show that protein kinase inhibitors may be modulating reward-seeking behaviors. These early findings in the animal model studies may explain the improvement of impulse control. In this patient, endoxifen was selected based on its potent PKC inhibitory action which can be expected to address impulsivity, a core feature of gambling disorder.^{2,6,7} Other agents used for the management of gambling disorder include opioid receptor antagonists such as naltrexone. However, naltrexone is known to cause adverse effects such as nausea, dry mouth, and vivid dreams. While selective serotonin reuptake inhibitors (SSRIs) have been explored, higher doses and longer treatment duration are required for effective treatment.⁸ As endoxifen has a better safety profile and is considered to be efficacious in reducing impulsivity due to its unique mechanism (direct PKC inhibition),^{6,7} it was considered for this patient over other treatment options.

As expected, the patient responded well to the medication, reporting the absence of the urge to indulge in cryptocurrency trading, and a willingness to resolve family discord. An important observation is that leveraging tendencies are reduced in the patient. The patient has since been maintaining well, continuing to receive endoxifen 8 mg, without adverse effects.

Recent case reports have demonstrated the potential of endoxifen to be explored for the management of a variety of psychological disorders linked to impulsivity, including borderline personality disorder, alcohol dependence syndrome, and substance abuse in patients with bipolar disorder.^{9–11}

CONCLUSION

This case demonstrates the potential role of endoxifen in the management of patients diagnosed with pathological gambling. The GSAS score of the patient improved from 31 to 0 after endoxifen adjunctive treatment for 3 months. The patient reported no urge to gamble with complete control over his thoughts about gambling. Family members were elated with the progress of the patient.

In the future, studying the efficacy of endoxifen in impulse control behaviors would help elucidate the scope of use of this molecule and demonstrate its versatility. Additionally, dosing, tolerance, and long-term use in preventing lapses or relapses in addiction therapy should be studied.

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