The Comorbidity Between Eating Disorders and Alcohol Misuse:

Biological and Psychological Perspectives Illustrated by a Case Report

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Anorexia nervosa (AN) is the second most lethal psychiatric disorder behind substance use disorders.[1] Patients with comorbid AN and alcohol use disorder (AUD) have 10 times the risk of mortality compared to patients without AUD.[1] Patients with AN have an increased risk of developing AUD[2]: 1 in 5 patients with any eating disorder will abuse alcohol in their lifetime.[3] In this report, we highlight associations between AN and AUD, emphasizing biological and psychological aspects of both conditions.

Case Report

Ms D is a 57-year-old woman with a medical history of osteoporosis, headaches, gastroesophageal reflux

Table 1.
Biological and Psychological Similarities Between AN and AUD

Biological	Psychological
Genetic overlap Genome-wide association studies focusing on single-nucleotide polymorphism hereditability have found a significant association between both entities.[7]	***Character traits*** Impulsivity, rigidity, desire for control and uniqueness, novelty-seeking attitudes, feelings of inadequacy, and obsessional thinking can be seen in both conditions.[6] Patients with AUD and AN have a higher prevalence of depression and borderline personality disorder when compared to AN only.[21]
Endocannabinoid system The activation of endocannabinoid receptors is associated with the impulsivity and anxiety seen in many psychiatric conditions, including AUD and AN.[8] Anandamide, a cannabinoid 1 endogenous receptor ligand, appears to have a role in the appraisal of food. As a result of chronic food deprivation, individuals with AN seem to have elevated levels of anandamide.[9] Cravings in persons with AUD appear to occur secondary to high levels of anandamide, and during periods of abstinence, the levels of this endocannabinoid are suppressed.[10]	***Intrapsychic conflicts*** Alcohol consumption and food restriction/vomiting were initially framed as a maladaptive way to cope with frustration stemming from an arrest in the oral phase of psychosexual development (oral fixation). More recent studies conceptualize AN and AUD as attempts to self-medicate to decrease negative affects such as rage, shame, depression, traumatic memories, and low self-esteem.[22] The resistance to engage in treatment in both entities can be hypothesized as the repetitive self-infliction of pain due to an unstable sense of self and the presence of a harsh superego that makes individuals feel they do not deserve help.[22]
Brain reward circuits The regions involved in reward stimuli are the ventral striatum, amygdala, anterior insula, ventromedial prefrontal cortex, and orbitofrontal cortex, and the areas involved in the regulation of addictive food/alcohol intake are the anterior cingulate cortex and dorsolateral prefrontal cortex.[6] Functional brain MRIs demonstrate activation of the ventral striatum in patients with both disorders.[11,12] Metabolic brain imaging studies report abnormalities in glutamate binding on the anterior cingulate cortex in both AN and AUD.[13,14] Preliminary evidence suggests that modern neuromodulation techniques such as transcranial magnetic stimulation[15] or transcranial direct current stimulation[16] targeting the dorsolateral prefrontal cortex may be an alternative for treating refractory cases of AUD and AN.	***Defense mechanisms*** Some of the ego defenses found in AN and AUD initially help ward off negative feelings but can eventually perpetuate dysfunctional interpersonal relationships. These defense mechanisms[23,24] include the following: Projection: "You keep talking about my problems, but maybe you are just envious and secretly desire to be like me." Acting out: "I am angry with my family, so I am going to start drinking/restricting from food." Splitting: "My friends who criticize me are all hypocrites." Dissociation: "All my problems are gone once I start drinking/vomiting." Denial: "I can stop whenever I want." Rationalization: "This is my way of dealing with stress; I have seen others do worse things."
Nutritional deficiencies Vitamin B_1 deficiency presenting as Wernicke-Korsakoff syndrome has been classically associated with AUD, but patients with AN can also present with this condition given their restricted oral intake. Two major signs seen in nonalcoholic Wernicke-Korsakoff syndrome are weight loss and vomiting, which represent a diagnostic challenge as such features may be part of a disordered eating diathesis.[17,18] Vitamin B_3 deficiency (pellagra) is a rare but often overlooked complication in both AN and AUD. In cases of AN where purging is more prominent, gastrointestinal symptoms are common and can obscure the diagnosis of pellagra.[19] In the presence of prolonged, refractory alcohol-related delirium, pellagra should be considered as a possible etiology if major nutritional deficits are present.[20]	***Cognitive distortions*** Biased thinking needs to be challenged during the treatment of AN and AUD to regulate feelings and promote recovery. Some of the common distortions[25,26] seen in these conditions are as follows: Emotional reasoning: "I feel less anxious when I do it, so I cannot give it up." Minimization and maximization: "It is not as bad as everyone says." Mental filtering: "I did great for 6 months, but now that I relapsed, everything is ruined." Catastrophizing: "I will never get better." Labeling: "I am unlovable because of my behaviors."

Abbreviations: AN = anorexia nervosa, AUD = alcohol use disorder, MRI = magnetic resonance imaging.

Table 2.
Benefits and Side Effects of Psychotropic Agents in AN and AUD

Medication[a]	AUD	AN
Trazodone 50–100 mg nightly	Treats insomnia stemming from alcohol, but it may lower the seizure threshold and cause excessive sedation when combined with alcohol. Furthermore, patients with AUD may already have a degree of hepatic injury, so routine liver enzymes should be obtained if this medication is prescribed due to its association with hepatotoxicity.	May cause orthostatic hypotension and have an arrhythmogenic effect, so close monitoring is advised when used in patients with AN, as they are already prone to syncopal episodes and arrhythmias.
Mirtazapine 15 mg nightly	Can be beneficial for alcohol-induced depressive features and insomnia; however, it can cause excessive sedation if used concomitantly with alcohol.	Increases appetite given its antihistaminergic properties and may reduce eating-related anxiety, but patients with AN may not be open to try it given its well-known association with excessive weight gain.
Paroxetine 20–40 mg daily	Decreases anxiety and depression related to alcohol use. Nevertheless, due to its short half-life, it requires strict adherence for positive results, which may represent a barrier in AUD patients given their erratic behaviors. Also, due to its anticholinergic properties it can lower the seizure threshold and cause cognitive dysfunction, a problem that may already be present in subjects with chronic AUD, thus requiring close monitoring.	Might be useful for eating-related anxiety and may cause more weight gain when compared to other antidepressants, which is desired in these patients. Yet, it can be associated with gastrointestinal side effects including nausea and vomiting, which can worsen the already frail nutritional status of individuals with AN.
Fluoxetine 20 mg daily	Helpful for anxiety and depression that can be comorbid with AUD, and it has a long half-life, so irregular adherence is less problematic. Nonetheless, it may be associated with unpleasant activation, agitation, and anxiety during the first weeks of treatment, which could make alcohol withdrawal more difficult to tolerate.	Several studies endorse its benefits in eating disorders (bulimia nervosa mostly), and it can reduce vomiting frequency, a common feature present in patients with AN.[30,31] However, it has been associated with hyponatremia, and these patients are at higher risk for electrolyte imbalances given their baseline malnutrition.
Olanzapine 2.5–5 mg nightly	Might decrease impulsivity associated with AUD given its antidopaminergic qualities and can treat psychosis secondary to alcohol withdrawal. However, it can cause excessive sedation and potential respiratory depression if mixed with alcohol.	Indicated for weight stabilization and to treat the quasipsychotic body image misperception associated with AN. Nonetheless, it can cause QTc interval prolongation, and as individuals with AN are already at risk for arrhythmias due to their electrolyte anomalies, this medication must be utilized in a cautious manner.

[a]The doses mentioned here are the ones our patient used but do not necessarily reflect therapeutic doses.
Abbreviations: AN = anorexia nervosa, AUD = alcohol use disorder.

disease, irritable bowel syndrome, major depressive disorder, AN, anxiety, and AUD. She was referred from neurology for outpatient psychiatric consultation given her complex psychiatric history.

Ms D describes disordered eating behaviors including food avoidance and restriction, with compensatory behaviors such as self-induced vomiting; use of laxatives, diuretics, and enemas; and extreme exercise. Her eating problems stem from early childhood experiences revolving around control and sibling rivalry. Although her current body mass index is 15 kg/m^2, she continued to weigh herself daily, believing she was overweight. She also reports neurovegetative symptoms of depression, comorbid anxiety, and history of abuse but denies trauma-related symptoms. Ms D began using alcohol in college but then transitioned to daily alcohol use in her 40s. She continues to use alcohol on a daily basis to stimulate her appetite.

Complete blood count, comprehensive metabolic panel, thyroid function tests, vitamin levels, and estradiol parameters are all within normal range, but her lipase level is increased. Recent brain magnetic resonance imaging with and without contrast revealed evidence of a remote ischemic event in the frontal area with no acute anomalies, and cortical volume is age appropriate. The psychiatry team recommended that Ms D transition from paroxetine to fluoxetine and initiate olanzapine to target insomnia, poor appetite, impulsivity, and depression. She declined medications for AUD or referrals to eating disorder programs.

After a subsequent follow-up with her primary care provider, olanzapine was initiated, and she was advised to decrease her alcohol intake. She declined to start fluoxetine, fearing side effects and hepatotoxicity, instead opting to continue paroxetine. She initially reported benefit from olanzapine, though subsequently self-discontinued it after reporting insomnia and palpitations. She ultimately elected to transfer care to her local community mental health center to access more comprehensive psychiatric care.

Discussion

AN and AUD share several biological and psychological features. As an example, both entities can exhibit cardiac dysfunction.[4,5] Likewise, given their underlying deficits in oral intake, patients with AN and AUD are prone to hypokalemia and hypomagnesemia, which can lead to QTc prolongation and subsequent limitations in the use of psychotropic agents.[6] Other biopsychological characteristics seen in both disorders are described in Table 1. These include genetic aspects,[7] alterations in the endocannabinoid[8–10] and brain reward systems,[6,11–16] nutritional deficiencies,[17–20] character traits,[6,21] intrapsychic conflicts,[22] defense mechanisms,[23,24] and cognitive distortions.[25,26] A clear illustration of the psychological complexities seen in both AUD and AN was the degree of cognitive dissonance present in this patient: she considered herself to be overweight, but she also used alcohol to stimulate her appetite—the natural outcome of an increase in appetite is weight gain, which was also her biggest

fear. Noteworthy, as subjects with AN and AUD suffer from complex medical comorbidities,[4,5,19,20] routine monitoring of side effects is advised when prescribing psychotropic agents. The patient described here tried different antidepressants and antipsychotics for her symptoms, including medications that had been utilized years before our initial encounter with her. The advantages and disadvantages[27–31] of these specific agents when treating individuals with AN and AUD are delineated in Table 2.

Conclusion

AN and AUD share similar etiologic factors. Exploration of biologic, psychodynamic, and cognitive-behavioral aspects in AN and AUD is key for treatment purposes. Comorbid AN and AUD carry a poor prognosis, and pertinent screenings should be in place when providing care to these populations.[32] Patients with comorbid AN and AUD may benefit from a multimodal treatment approach involving pharmacotherapy and psychotherapy. When feasible, both entities should be treated concurrently. Several interventions have evidence for both AN and AUD such as self-help approaches, cognitive-behavioral therapy, psychodynamic psychotherapy, dialectical behavior therapy, family and couples therapy, and motivational interviewing.[32] Psychiatrists, especially those working in embedded/collaborative care settings, can assist with diagnosing and treating these comorbid conditions. Treatments for both AN and AUD are individualized and must take into consideration each patient's intrinsic motivation and readiness for change.

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