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associated with obsessive-compulsive disorder: case report**

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# **Thermocoagulation for the Treatment of Anorexia Nervosa Associated with Obsessive-Compulsive Disorder: Case Report**

***Termocoagulação para tratamento de anorexia nervosa associada a transtorno obsessivo compulsivo: relato de caso***

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**Running title:** Thermocoagulation for the treatment of anorexia nervosa

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**Abstract**

Anorexia nervosa (AN) and obsessive-compulsive disorder (OCD) are two psychiatric disorders that often overlap or are diagnosed as distinct disorders in the same individual. Although neurosurgical treatment is currently reserved for patients with refractory chronic OCD, it has been evidenced that it is also effective for the treatment of AN, since these two disorders share some pathophysiological neurocircuits. This study aimed to report the case of a patient with AN, OCD, schizophrenia, and comorbid depression who underwent thermocoagulation of the nucleus accumbens, associated with anterior cingulotomy and anterior capsulotomy, all of them bilaterally. Follow-up carried out 16 months after the procedure showed substantial improvement in AN, OCD, and schizophrenia symptoms, demonstrating the effectiveness of this type of intervention in patients refractory to conservative treatment.

**Keywords:** stereotaxic technique, radiofrequency, anorexia nervosa, obsessive-compulsive disorder, schizophrenia

**Resumo**

A anorexia nervosa (AN) e o transtorno obsessivo-compulsivo (TOC) são dois transtornos psiquiátricos que muitas vezes se sobrepõem ou são diagnosticados como transtornos distintos no mesmo indivíduo. Embora o tratamento neurocirúrgico seja atualmente reservado para pacientes com TOC crônico refratário, foi evidenciado que também é eficaz para o tratamento de AN, uma vez que esses dois distúrbios compartilham alguns neurocircuitos fisiopatológicos. Este estudo teve como objetivo relatar o caso de uma paciente com AN, TOC, esquizofrenia e depressão comórbida, submetida a termocoagulação de nucleus accumbens em associação com cingulotomia anterior e capsulotomia anterior, todos bilateralmente. O seguimento realizado 16 meses após o procedimento mostrou melhora substancial de AN, TOC e sintomas de esquizofrenia, demonstrando a eficácia desse tipo de intervenção em pacientes refratários ao tratamento conservador.

**Palavras-chave:** técnica estereotáxica, radiofrequência, anorexia nervosa, transtorno obsessivo-compulsivo, esquizofrenia

## Introduction

Anorexia nervosa (AN) is a psychiatric and eating disorder characterized by distorted perception of body size, weight, and shape, which leads to a radical eating restriction and/or excessive and purgative behaviors in order to achieve an idealized body.<sup>1,2</sup> It is usually accompanied by other psychiatric disorders such as major depression, generalized anxiety, obsessive compulsive disorder (OCD), and personality disorders, in addition to the risk of predisposition to alcohol use disorders as well as drug abuse and addiction.<sup>3</sup>

The average age at onset of AN ranges between 15 and 19 years, and it affects about 0.7% of the people worldwide, in a female–male ratio of 10:1.<sup>2</sup> The mortality rate is the highest among all psychiatric disorders, ranging from 6% to 11%, and the most frequent causes of mortality are suicide and medical complications.<sup>4</sup> An estimated 21% of patients diagnosed with AN present with severe chronic cases, and those affected for over 10 years are unlikely to recover.<sup>5</sup>

Obsessive compulsive disorder (OCD), in turn, is an anxiety disorder that consists in the overlapping of obsession, defined as uncontrollable, repetitive, persistent, and stereotyped ideas or thoughts, which generates great anxiety, fear, and anguish, and compulsion, characterized by repetitive behaviors or mental acts induced by obsessive thoughts.<sup>6,7</sup> Obsession is a cause of great suffering and, in most cases, compulsion is a subterfuge.

Neurosurgery is a treatment predominantly indicated to patients presenting with chronic OCD refractory to conservative treatment. However, a strong correlation between AN and OCD has been evidenced, since the prevalence of OCD in patients with AN ranges from 35% to 44%, whereas AN is observed in up to 10% of women with OCD.<sup>8,9</sup> In addition, recent studies in children and adults diagnosed with OCD or AN show converging lines of evidence, suggesting that the two disorders involve the same regions of the cortico-striatal-thalamic-cortical circuit.<sup>10–13</sup> Moreover, the association of the etiopathogenesis of OCD with AN is possibly the explanation for the recurrence of restrictive eating behaviors after the pharmacological neuromodulation of the limbic circuitry and the use of ablative surgical techniques for the treatment of

OCD.<sup>5,14–16</sup> The targets frequently used in these surgical procedures are nucleus accumbens, anterior cingulate, and anterior capsule.<sup>5,12–14</sup>

Taking into consideration the current surgical approaches, the surgical treatment of AN associated with OCD is a viable option, since it can relieve suffering and improve the quality of life of patients with these disabling disorders, and is more cost-effective than conventional treatments.<sup>5,17–19</sup> For patients with chronic and refractory AN associated with OCD, several studies suggest that the adoption of two or more surgical procedures should be considered.<sup>5,20</sup> Therefore, this study aimed to report the case of a patient with AN, OCD, schizophrenia, and comorbid depression who underwent thermocoagulation of the nucleus accumbens, associated with anterior cingulotomy and anterior capsulotomy, all of them bilaterally.

## **Case Report**

This study was approved by the Ethics Committee of the Pontifícia Universidade Católica de Goiás (CAAE: 33641220.5.0000.0037). It was conducted following the principles of the Helsinki Declaration<sup>21</sup> and the Resolution 2.165/2017, which regulates neuropsychosurgeries in Brazil.<sup>22</sup> The patient signed a written consent.

A 39-year-old female patient diagnosed with AN, OCD, schizophrenia, and comorbid depression, weighing 48 kg (body mass index = 17.02), was referred by two independent psychiatrists to a tertiary referral neurosurgical unit in Goiânia, GO, Brazil, in July 2019. The symptoms of AN were distorted body image, cachexia, and uncontrollable thoughts about food, weight, and shape. She had an extremely restricted dietary pattern, consuming little to no food for many consecutive days, due to an unavoidable desire to lose weight, and had constant and intense abdominal cramps. Although she was never satisfied with the weight she reached, she believed she was on the right path, and that motivated her to continue losing weight. Nonetheless, whenever she ate, she exaggerated the amount of food and, immediately afterwards, vomited. She reported that after a few years, vomiting became spontaneous, with no need for self-inducing it. In addition, she used laxatives and exercised excessively aiming to lose weight.

She was diagnosed with AN at the age of 17. The lowest weight achieved was 35 kg, which generated important anatomical-functional repercussions such as reduced muscle strength, gait impairments, and syncope. Since the beginning of the disease, the patient had several mandatory hospitalizations and treatments.

Onset of OCD symptoms occurred at the age of 18. The patient had recurrent obsessive thoughts, which forced her to perform compulsive rituals that impaired her quality of life and social life. The most obvious compulsions were for buying and cleaning, mainly washing the same clothes several times a day. According to the patient, neither the avoidance behavior nor the performance of compulsive acts was able to ward off obsessive thoughts, having a significant impact on her life.

The patient also had schizophrenia, characterized by the presence of disabling visual and auditory hallucinations, usually involving seeing deceased people or hearing their commands for suicide and escape, and a past history of several depressive episodes. The delusions of persecution were constant, and together with the depression due to her comorbidities led her to attempted suicide in 2015.

Before the initial appointment, she had been undergoing treatment with a combination of benzodiazepines, selective serotonin reuptake inhibitors, and antipsychotics, with a small beneficial effect on OCD, but with no significant improvements in AN, schizophrenia, or depression. Due to the long-term stigmatizing psychiatric conditions, she has always lived with her parents and had significant impairments in social life and unstable relationships with friends and family members, especially her father.

### *Preoperative assessment*

A quali-quantitative assessment was carried out preoperatively based on the subjective history reported by the patient and her mother, as well as on the scores of the questionnaires applied. At first, an outpatient clinical examination was performed and the following variables were analyzed: anthropometric measurements (weight and body mass index – BMI), AN, OCD, relationship between AN and OCD, psychiatric comorbidities (depression and schizophrenia), and the interference of the underlying diseases in her quality of life. During anamnesis, the diagnostic criteria according to



the DSM-5 for all the disorders previously diagnosed were identified and confirmed.<sup>6</sup> Subsequently, the clinical data were quantified through the application of four questionnaires.

To assess the presence and type of eating disorders, the Eating Disorder Inventory-3 (EDI-3) was used.<sup>23</sup> Additionally, the Eating Disorder Examination Questionnaire (EDE-Q) was applied to assess the severity of behaviors and attitudes secondary to eating disorders.<sup>24</sup>

Regarding the assessment of OCD, the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) was used.<sup>25</sup> This instrument was developed and validated with the objective of measuring the severity of OCD symptoms. Its essential feature is the capacity to assess the severity of OCD symptoms regardless of the types of compulsion presented by the patient.

The Hamilton Depression Rating Scale (HDRS) was used to assess the severity of depressive symptoms, acting as an indirect measure of the biopsychosocial impact of underlying disorders on the patient's mood and social life.<sup>26</sup> This is the most widely used clinician-administered depression assessment scale.

### *Surgical procedure*

The complete previous medical history, neuropsychological assessment, psychiatric diagnoses, and results of the questionnaires were examined by a multi-professional team. Confirmation of the diagnosis of OCD refractory to treatment and chronicity of this condition (over 10 years) were in accordance with the inclusion criteria for OCD stereotactic neurosurgery.<sup>16</sup>

The stereotactic procedure was performed in July 2019, with the patient under general anesthesia, guided by computed tomography and magnetic resonance imaging fusion. Based on the experience of the neurosurgery team and on evidence that the use of multiple targets in the same surgical procedure increases its effectiveness, with low postoperative morbidity,<sup>27</sup> the surgeons decided to perform the ablation of the nucleus accumbens, associated with anterior cingulotomy and anterior capsulotomy, all of them bilaterally. Thermocoagulation was carried out using a 244-

mm long electrode, with exposed tip 4 mm in length and 1.5 mm in diameter, at 70°C for 70 s.

### *Postoperative assessment*

During the hospitalization period, the postoperative assessment of the patient was performed subjectively, based on her daily evolution. Posteriorly, she was monitored twice, 1 week and 1 month after hospital discharge, by telephone conversations and message exchange.

In November 2020, the definitive assessment of the patient's clinical evolution was performed in a video interview, due to the pandemic, applying the same questionnaires of the preoperative phase. The interview was structured to allow the comparison between the preoperative and postoperative clinical data. It aimed to verify the efficacy of the neurosurgical procedure in the treatment of her most evident psychiatric disorders, AN and OCD, and also to analyze qualitatively, through the patient's own perceptions, the changes provided by this therapeutic strategy in her daily life.

The surgical procedure had a positive effect on AN, since it favored body weight gain of 14.5 kg in 16 months (Table 1). During the interview, the patient reported a drastic improvement in her interpersonal relationships, quality of life, mood, and mainly body self-perception, because she currently perceives herself as a healthier person. She reached complete remission of vomiting, and she considers it one of the most important results of the surgery in her life. Nowadays, she eats in a balanced and healthy way, without feeling guilty or sad. The patient affirmed she had absolute improvement in the organic and functional complaints reported before the surgery such as abdominal cramps and nausea. However, she still uses laxatives due to frequent constipation, a problem not completely solved after surgery.

She experienced a substantial improvement in OCD symptoms after the procedure, completely breaking the cycle of compulsive buying and achieving a drastic decrease in cleaning rituals. In addition, the patient had an important improvement in schizophrenia and depression symptoms, perhaps the factors that most contributed to her psychological distress and social isolation preoperatively. She reported that, after surgery, both visual and auditory hallucinations completely disappeared.

**Table 1** Patient assessment preoperatively (baseline) and 16 months after stereotaxic neurosurgery

Type of assessment	Result	
	Preoperatively	Postoperatively
Body weight (kg)	48	62.5
Body mass index	17.02	22.14
Eating Disorder Inventory-3 (EDI-3)	Binging-purging anorexia nervosa with bulimia	Improbable eating disorder
Eating Disorder Examination Questionnaire (EDE-Q)	5.1	0.05
Yale-Brown Obsessive Compulsive Scale (Y-BOCS)	33	8
Hamilton Depression Rating Scale (HDRS)	43	4

Classification scores at baseline and at 16-month follow-up improved for both primary psychiatric disorders (AN and OCD) as well as for the secondary one (depression) (Table 1). The results of EDI-3 showed that she met the classification criteria for the subtype “binging-purging” of AN and extremely severe bulimia at the beginning of the study, but at follow-up the patient no longer met the criteria for any eating disorders. Moreover, the EDE-Q score significantly improved 16 months after the procedure.

Compared to the preoperative baseline, the severity of OCD symptoms, measured using Y-BOCS, decreased by 25 points 16 months after surgery. The assessment of depression using HDRS revealed substantial improvement of symptoms in the postoperative period as well.

## Discussion

The simultaneous and substantial drop in the scores of the applied questionnaires after 16 months of the procedure corroborates the hypothesis that the targets classically implicated in the reverberation of an anomalous neuronal circuitry of the OCD also extend to AN.<sup>19</sup> The AN of this patient was classified as the “binging-purging” subtype, because after long periods of fasting, she ingested large amounts of food and then caused vomiting due to the feeling of guilt that dominated her.<sup>7</sup> A Chinese experimental study that investigated the effects of the ablation of the nucleus accumbens, using stereotactic surgery, in patients with AN not responsive to clinical treatment, showed substantial increase in patients' physiological drive to eat,<sup>20</sup> corroborating the findings of our study, given that the patient in this report had considerable weight gain postoperatively.

The surgical treatment also provided substantial suppression of OCD symptoms, improving the patient's quality of life, inasmuch as this disorder is a source of great psychological distress.<sup>6</sup> Thus, the thermocoagulation approach proved to be an excellent alternative to conservative treatment in refractory and chronic OCD cases, in line with the results of other studies.<sup>28</sup>

Although the primary objective of this study did not involve assessing the benefits of the proposed treatment to control the symptoms of schizophrenia, given that this disorder was not the major complaint that motivated the patient to seek help, based on the patient report, confirmed by her family, the auditory and visual hallucinations prior to the surgical procedure completely disappeared postoperatively. This finding substantiates the hypothesis of some authors that patients with refractory schizophrenia may also benefit from neurosurgical approaches, such as deep brain stimulation and stereotactic surgery.<sup>29</sup>

## Conclusion

Thermocoagulation of brain areas whose circuits are classically implicated in the pathogenesis of OCD, AN, and schizophrenia proved to be effective in the long term for the study patient. The results of the applied questionnaires showed complete resolution of AN and symptoms of schizophrenia, important remission of OCD symptoms, and substantial improvement in patient's quality of life and general condition. The substantial decrease in HDRS score suggests a relationship with the alterations in limbic circuits caused by surgery. Nevertheless, this hypothesis needs validation in future analytical studies. Although the surgery performed was indicated because of refractory OCD, the results of this study corroborated its effectiveness in the simultaneous treatment of AN and visual and auditory hallucinations due to schizophrenia as well.

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#### Conflict of Interests

The authors have no conflict of interests to declare.

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