Case report

Higher adherence to the Mediterranean diet is associated with reduced tics and obsessive-compulsive symptoms: A series of nine boys with Obsessive-Compulsive Tic Disorder

Une plus grande adhésion au régime méditerranéen est associée à une réduction des tics et des symptômes obsessionnels compulsifs : une série de neuf garçons atteints du Trouble du Tic Obsessionnel-Compulsif

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A R T I C L E   I N F O

Article history:
Received 31 January 2019
Accepted 23 April 2019
Available online 9 July 2019

Keywords:
Gilles de la Tourette syndrome
Mediterranean Diet
Tics
Obsessive-Compulsive Disorders
Case management

A B S T R A C T

Tics and obsessions-compulsions are consistent phenotypes of the Obsessive-Compulsive Tic Disorder (OCTD), frequently associated with male gender, sensory phenomena, and impulsive behaviors. These clinical symptoms were reported to influence eating behaviors, but literature also showed that food patterns or dietary supplements could alleviate the clinical spectra, thus suggesting the existence of a bidirectional association. We present a series of 9 boys with OCTD from Italy whose unhealthy food habits were corrected through a nutritional counseling. The education focused on promoting a balanced diet through non-specific Mediterranean dietary advice. After one month, YGTSS (Yale Global Tic Severity Scale) and Y-BOCS (Yale-Brown Obsessive Compulsive Scale) scored a significant reduction, but the quality of life diminished. First, we conclude that healthier dietary patterns may be associated with an amelioration of tics and obsessive-compulsive traits in boys who are diagnosed with the same conditions. Second, the impact of nutritional interventions on the quality of patients’ life, especially if underage, should always be considered. Certainly, the treatment of OCTD must be multidisciplinary and should include neuropsychiatrists, clinical psychologists, and nutritionists. The nutritional counseling should be as comprehensive as possible to promote a balanced diet, and inform about nutritional side effects of drugs or potential food-drug interactions.

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R É S U M É

Les tics et les obsessions-compulsions sont des phénomènes cohérents du Trouble du tic obsessionnel-compulsif (TTOC), fréquemment associés au sexe masculin, aux phénomènes sensoriels et aux comportements impulsifs. Ces symptômes cliniques pourraient influencer les comportements alimentaires, mais la littérature a également montré que les schémas alimentaires ou les compléments

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https://doi.org/10.1016/j.nupar.2019.04.004

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1. Introduction

Gilles de la Tourette syndrome (GTS) is a neurodevelopmental movement disorder characterized by motor and phonic tics [1]. Obsessions and compulsions may be present, thus depicting the more severe phenotype termed Obsessive–Compulsive Tic Disorder (OCTD) [2] that is frequently associated with male gender, sensory phenomena, and impulsive behaviors [3]. Considering the phenotype complexities and the high level of functional impairment caused by OC symptoms, a tailored, personalized, and multidisciplinary treatment is considered a priority. Pharmacological treatment primarily comprises antipsychotics and antidepressants, which are known, among other factors, to be associated with higher risks for cardiometabolic disorders [4] probably because of appetite and metabolic alterations. Moreover, patients’ OC behaviors can further vitiate food habits [5], and impulsive eating was reported to be present in about 40% of patients with tics [6]. Other than environmental factors, bad eating choices may be also driven by an altered sensory sensitivity [7]. Considering complementary medicine approaches, different food patterns or dietary supplements were frequently reported to alleviate clinical symptoms. For instance, supplements, sugar-free diets, gluten-free diets, or oligo-antigenic diets were investigated with positive results [8], mainly attributed to gut microbiota modulations [9]. In 2016, the standard of care of Tourette’s Syndrome and Movement Disorders Centre in Milan, Italy was implemented with a nutritionist for those patients that required a nutritional support [6]. Low baseline adherence to the Mediterranean diet (MD), learned helpfulness for previous attempts to lose weight, family environment affecting food habits, displeasure of body image, fear of gain in body weight, nutrition-related side effects of pharmacological therapy, or impulsive eating have since been managed. With boys disproportionately affected by tics, here are presented and reviewed 9 similar cases of OCTD male children that were admitted to the Centre and who experienced an amelioration of clinical symptoms after a non-specific nutritional counseling. No other similar cases that could have been included in this report were excluded. All patients displayed a general consent to use their medical information for research purposes. In order to provide consistent and transparent information, the Case Report (CARE) guidelines (https://www.care-statement.org/resources/checklist) for reporting case reports/case series were followed.

2. Report of the cases

Nine boys suffering from OCTD, with a mean age of 14.4 ± 2.4 years (11; 18), were admitted non-consecutively at Tourette’s Syndrome and Movement Disorders Centre in Milan, Italy between January and March 2018 for an ordinary control of the clinical symptoms. The neurologist and the clinical psychologist visited the patients who all were previously known for being partial treatment-responders. No past interventions, comorbidities, or OC traits that could affect food habits were known. Tic severity with social impairment and OC symptoms were evaluated through the Yale Global Tic Severity Scale (YGTSS) and the Yale-Brown Obsessive Compulsive Scale (Y-BOCS), respectively. The perceived health-related quality of life (QOL) was also assessed to monitor satisfaction through a visual analog scale for children. Baseline treatment related variables were summarized in Table 1. A total of 6 out of 9 boys reported to do vigorous sport >2 times per week. Because of testified unhealthy eating behaviors, patients were referred to the nutritionist for a nutritional evaluation. The MD pattern — i.e. the food lifestyle universally recognized as the healthiest — was assessed through the KIDMED index [10], which effectively investigates the MD adherence in children and youths between 2 and 24 years old. Because of the low baseline adherence, as evidenced by a mean KIDMED score of 3 ± 1.7 (0-5), patients and their parents were addressed for the nutritional counseling.

All boys were under age and showed a moderate Y-BOCS score, therefore it was not recommended to impose diet restrictions in order to avoid future food insecurities or expose to potential eating problems. Boys and their parents were educated to pursue better eating habits as follows: to eat more than one fruit every day, to consume vegetables more than once a day, to consume fish at least 2–3 times/week, to avoid fast food restaurants, to eat pulses more than once a week, to consume pasta or rice almost every day, to consume nuts at least 2–3 times/week, to use olive oil, to have breakfast with dairy products, to take two yoghurts and/or some cheese daily, to avoid commercially baked goods, pastries, sweets, or candies. Dietary recommendations focused on the KIDMED items to increase the score ≥ 8 points, which corresponds to a high adherence. The counseling sessions lasted one hour each and ended with the delivery of a nutritional booklet that summarized all abovementioned information. After one month, patients were scheduled for a 1-month follow-up visit and same neurologist, clinical psychologist, and nutritionist monitored the progresses of dietary habits, neuropsychiatric symptoms, and quality of life.

Results were reported in Table 2.

3. Comments

After the nutritional counseling that focused on promoting the Mediterranean pattern, the KIDMED score increased significantly, whilst both YGTSS and Y-BOCS scores decreased significantly...
Table 1  
Treatment related variables of nine boys with OCTD.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Pharmacological therapy</th>
<th>Antipsychotics</th>
<th>Antihypertensive</th>
<th>Antiinflammatory</th>
<th>Anxiolytic</th>
<th>Antidepressant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aripiprazole Pimozide</td>
<td>Clonidine</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>HaloperidolPromazine</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Delorazepam</td>
</tr>
<tr>
<td>3</td>
<td>Risperidone</td>
<td>–</td>
<td>Topiramate</td>
<td>–</td>
<td>–</td>
<td>Sertraline</td>
</tr>
<tr>
<td>4</td>
<td>Risperidone</td>
<td>–</td>
<td>Topiramate</td>
<td>–</td>
<td>–</td>
<td>Fluvoxamine</td>
</tr>
<tr>
<td>5</td>
<td>Tiapride Pimozide</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>Aripiprazole</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>61 ± 15</td>
</tr>
<tr>
<td>7</td>
<td>Perphenazine</td>
<td>Clonidine</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Sertraline</td>
</tr>
<tr>
<td>8</td>
<td>Pimozide</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Paroxetine</td>
</tr>
<tr>
<td>9</td>
<td>Ziprasidone</td>
<td>Clonidine</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Gitalogram</td>
</tr>
</tbody>
</table>

Table 2  
Progress of dietary, neuropsychiatric, quality of life scores after the nutritional counseling.

<table>
<thead>
<tr>
<th>Section 2.1</th>
<th>Before nutritional counseling</th>
<th>After nutritional counseling</th>
<th>Δ (after – before)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First visit</td>
<td>+ 30 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KIDMED</td>
<td>3.0 ± 1.7 (0.0; 5.0)</td>
<td>6.6 ± 1.9 (6.0; 11.0)</td>
<td>+5.6 ± 1.4</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Body weight</td>
<td>65.8 ± 17 (45.2; 97.4)</td>
<td>64.6 ± 17.9 (40.0; 96.5)</td>
<td>–1.2 ± 2.3</td>
<td>0.192</td>
</tr>
<tr>
<td>YGTSS</td>
<td>60.0 ± 20.7 (35.0; 92.0)</td>
<td>46.9 ± 25.0 (4.0; 89.0)</td>
<td>–13.1 ± 11.4</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Y-BOCS</td>
<td>15.6 ± 5.3 (7.0; 22.0)</td>
<td>7.9 ± 5.3 (0.0; 18.0)</td>
<td>–7.7 ± 2.7</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>QOL</td>
<td>78.9 ± 16.5 (50.0; 100.0)</td>
<td>68.8 ± 26.8 (5.0; 90.0)</td>
<td>–10.1 ± 22.8</td>
<td>0.342</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section 2.2</th>
<th>ΔKIDMED</th>
<th>ΔYGTSS</th>
<th>ΔY-BOCS</th>
<th>ΔQOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔKIDMED</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ΔYGTSS</td>
<td>0.265</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ΔY-BOCS</td>
<td>0.786</td>
<td>–0.477</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>ΔQOL</td>
<td>0.039</td>
<td>0.377</td>
<td>–0.176</td>
<td>1</td>
</tr>
</tbody>
</table>

Continuous values were reported as mean ± standard deviation (min; max). All values were skewed and were analyzed through the Wilcoxon signed-rank test. Spearman’s correlation was used to analyze associations between the delta (Δ) changes of KIDMED, YGTSS, Y-BOCS, and QOL.

4. Conclusions

The primary “take-home message” from this case series is that the MD may be associated with an amelioration of tics and OC traits in boys who are diagnosed with OCTD. Despite these conclusions may not be generalized beyond the context of these cases, it is reasonable to think that healthier eating habits would contribute to promote an overall physical and mental well-being that may positively influence clinical symptoms in patients with the same conditions. Whether the nutritional education may have acted directly through gut microbiota modifications [8] or indirectly through the amelioration of OC traits, the better adherence to the MD is important for the cardiometabolic risk prevention. Moreover, the nutritional education is most effective at a young age when passive learning is more efficient.

Second, health professionals should always consider the impact of a nutritional intervention on the quality of life of the patient, especially if underaged. Certainly, the MD is much more enjoyable and acceptable than other dietary approaches that focus on food restriction or that take away the pleasures of attending birthday parties or other community meetings. The sooner the boys begin to follow a restrictive and/or selective dietary regime, such as the gluten-free diet or the oligo-antigenic diet, the more likely they are to give up precociously because of its social incompatibility. Especially for children who report a low severity of tics or OC traits, to pursue a diet that has only partial evidence to alleviate clinical symptoms, is not acceptable. Patient’s and caregiver’s information and education is the safest way to pass on awareness and reasoning, and these latter should be the purpose of the nutritional counseling.

Third, the treatment of OCTD must be multidisciplinary and should include neuropsychiatrists, clinical psychologists, and nutritionists. The role of the nutritional support appears increasingly valuable not only in managing the nutrition-related side effects of drugs or impulsive eating, but it also in ameliorating clinical symptoms. Future studies are required to investigate the effects of specific foods or dietary patterns in larger neuropsychiatric populations, with any nutritional intervention being as comprehensive as possible to include the promotion of a balanced diet [5], information about nutritional side effects of drugs (e.g. alteration of...
orexigenic/anorexigenic signals) [11], potential food-drug interac-
tions [12].

Disclosure of interest

The authors declare that they have no competing interest.

References

Psychiatric Association; 2013.
the phenotype of Obsessive-Compulsive Tic Disorder (OCTD): a multidisci-
Socio-demographic and clinical characterization of patients with Obsessive-
Compulsive Tic-related Disorder (OCTD): an Italian multicenter study. J
Psychopathol 2018;24:148–53.
Association of Tourette Syndrome and chronic tic disorder with metabolic and
obsessive-compulsive disorder in relation to diet: two case reports. Encephale
implications. 9th Meeting of European Society for the Study of Tourette Syn-
drome — COST International Conference for Tourette Syndrome. Warsaw;
2016.
[7] Smith B, Rogers SL, Blissett J, Ludlow AK. The role of sensory sensitivity in
predicting food selectivity and food preferences in children with Tourette syn-
[8] Ludlow AK, Rogers SL. Understanding the impact of diet and nutrition on
symptoms of Tourette syndrome: a scoping review. J Child Health Care
biota transplantation on a child with Tourette Syndrome. Case Rep Med
Food, youth and the Mediterranean diet in Spain. Development of KIDMED,
Mediterranean Diet Quality Index in children and adolescents. Public Health
Dietary neurotransmitters: a narrative review on current knowledge. Nutrients
2018;10(5):E581.
Food bioactive compounds and their interference in drug pharmacoki-