Choreic Movements as Manifestation of Hyperthyroidism in an Adolescent at the Onset of Graves' Disease

Valeria Calcaterra[1,2,*] Marco Burrone[2,3,*], Dario Dilillo[2,3] and Gian Vincenzo Zuccotti[2,3]

[1]*Pediatric and Adolescent Unit, Department of Internal Medicine, University of Pavia, Pavia, Italy*

[2]*Department of Pediatrics, "V. Buzzi" Children's Hospital, Milan, Italy*

[3]*"L. Sacco" Department of Biomedical and Clinical Science, University of Milan, Milan, Italy*

Abstract: *Objective;* Nervous system dysfunction, including irritability, emotional lability and hyperkinesia are the signs and symptoms frequently observed in hyperthyroidism; chorea and/or choreoathetosis have also been reported in adults and rarely in pediatric age.

Case report; We described the case of a 12-year-old boy with bilateral choreiform movements of the arms at the onset of the Graves' disease. The patient was treated with metimazole and chorea disappeared with euthyroidism.

Discussion; Hyperthyroidism is to be considered an unusual cause of chorea in childhood. Every child and adolescent with choreiform movements should be examined also for thyroid function.

Keywords: Chorea, Graves' Disease, Hyperthyroidism, Thyroid.

INTRODUCTION

Graves' disease (GD) is the most frequent cause of hyperthyroidism in the pediatric age [1, 2]. Pediatric GD represents about 15% of thyroid disorders during childhood and accounts for only 1–5% of all subjects with GD [3]. It is an autoimmune disorder resulting from thyrotropin (TSH) receptor stimulation by autoantibodies, that may occur at any age, with an increase of frequency with age, reaching the peak during adolescence [1-3]. Usually, the patients show the classic symptoms and signs of hyperthyroidism, with changes in behaviour, irritability, emotional lability, fatigue, nervousness, palpitations, tremor, sleep disturbance [1]. The muscle weakness and cognitive dysfunction may occur as neurologic manifestations of hyperthyroidism, but other involuntary movement disorders such as chorea, choreoathetosis, ballism, and truncal flexion have also been reported in adults [4-15] and rarely in pediatric age [16-19].

We described an adolescent presented with bilateral choreiform movements of the arms at the onset of the Graves' disease, that disappeared with euthyroidism.

*Address correspondence to this author at the Pediatric and Adolescent Unit, Department of Internal Medicine and Therapeutics, University of Pavia, Via Aselli 1, 27100 Pavia, Italy;
Tel: +39 0382 986356;
E-mail: valeria.calcaterra@unipv.it
*Equal contribution

CASE REPORT

Anamnesis A 12-year-old boy was admitted to the Department of Pediatrics of V. Buzzi Children's Hospital with a one month history of mood swings and disturbances of behaviour (agitation, anxiety and depression) associated with palpitations, headache, abdominal pain, nausea, vomiting, heat intolerance and occasionally dyspnea.

In the last 4 months he had also a weight loss of 4 kg associated with involuntary movement of the limbs, more evident in the last one month. There was no recent history of infection or sore throat. The family history was negative for neurologic or autoimmune disorders.

Physical examination On admission, physical examination showed an increased pulse pressure (127/69 mmHg) and tachycardia (150 beats per min); the temperature and respiratory rate were normal.

The presence of choreiform movements of the limbs were noted, best evident with the outstretched of the hands. The patient presented also with facial grimacing and accelerated speech, without dysarthria. No other neurological signs or symptoms were present. The remaining examination was normal.

Painless thyromegaly was also noted. There was not exophthalmos or other ocular signs.

Complementary exams Thyroid ultrasonography (Philips EPIQ 5 ultrasound machine) confirmed

E-ISSN: 2311-8687/20

diffusely enlarged thyroid with a normal thyroid blood flow.

Laboratory evaluation included an abnormally high serum fT4 (36 pmol/L, normal value 9-19.3 pmol/L) and fT3 (> 30.7 pmol/L, normal value 3.5- 6.3 pmol/L), undetectable TSH (normal value 0.5- 4.2 mIU/L), with elevated levels of antithyroid peroxidase (> 600 UI/mL, normal value < 34 UI/mL), anti- thyroglobulin (538 UI/mL, normal value <115 UI/mL) and thyroid receptor-directed autoantibodies (13 IU/L, negative < 2.9 IU/L). Serum TSH, FT4 and FT3 assays are based on chemiluminescence immunoassay (Abbott Diagnostics, Rome, Italy). Serum anti-Tg Ab and anti-TPO Ab are based on electrochemiluminescence assays (Roche Diagnostics, MB, Italy) and TSH/TRAb assay is a fluoro-immuno-enzymatic method (Thermo Fisher Diagnostics, MI, Italy).

ECG showed presence of sinus tachycardia with nonspecific intraventricular delay in absence of structural heart disease on the echocardiogram. The ophthalmoscopic evaluation was regular. An awake electroencephalogram was normal. Laboratory evidence did not show recent streptococcal infection.

The report was conducted ethically in accordance with the Declaration of Helsinki. The parents gave their informed consent to publish the case.

Diagnosis and treatment The patient received a diagnosis of Graves' disease, and treatment with methimazole (20 mg/day divided into 3 doses) and propranolol (60 mg/day) was started.

Follow up The signs and symptoms of hyperthyroidism progressively disappeared after medication, with improvement in involuntary movements. Two months later, receiving methimazole (15 mg/day divided into 2 doses) the patient became euthyroid and he stopped propanolol. The choreic movement disappeared and the patient disclosed a normal neurological examination.

During follow-up, no recurrence of chorea or other neurological symptoms was observed.

DISCUSSION

Chorea is a hyperkinetic movement disorder characterized by irregular, flowing, non-stereotyped, random, involuntary contractions affecting mostly distal limbs, but also neck muscle and face [20]. These movements are usually worsened by anxiety and stress and subsides during sleep. Chorea may be the expression of a wide range of disorders, including metabolic, endocrine, infectious, autoimmune-inflammatory, vascular, and neurodegenerative diseases as well as drug induced syndromes [21-26].

In childhood, sydenham chorea is the most common cause of chorea and it is one of the clinical manifestations of acute rheumatic fever, a nonsuppurative sequela of group A streptococcus infection [21]. Among other immune-mediated disorder, chorea is a possible neurologic manifestation of systemic lupus erythematosus [23], specially when associated with antiphospholipid antibodies. Finally, it was also described like an uncommon manifestation of other immune diseases such as Behçet syndrome, Sjögren syndrome, some vasculitis [22], celiac disease [24, 25], sarcoidosis [26] and Graves' disease [4-15].

Chorea is rarely described as neurological manifestations of the hyperthyroidism in adults, affects less than 2 percent of these patients [4-15, 27]. Less information are available in the literature on pediatric age and only 4 patients are reported [16-19]. Seeherunvong T., *et al* [17] described the case of a 9 years old girl with Graves disease and the unique combination of chorea and ataxia that both resolved after treatment of hyperthyroidism. Pozzan G.B., *et al* [18] reported case of a young girl in whom chorea was the main manifestation of thyrotoxicosis and receded and disappeared as the patient became euthyroid. Yu J.H., *et al* [16] presented a17-year-old adolescent girl with Graves disease and unique combination of acute chorea and decreased cerebral perfusion, with resolution of symptoms after treatment. Marks P., *et al*. [19] reported a 16-old girl presented with severe thyrotoxicosis and choreo-athetoid movements which were abolished by treatment of thyrotoxicosis. As in our case, chorea is usually abolished after successful treatment of thyrotoxicosis, supporting that in Graves disease, chorea is believed to represent a direct effect of thyrotoxicosis on the central nervous system [28].

In all types of chorea it has been noted an exacerbation of dopamine agonists production and an amelioration of the condition with dopamine antagonist. Even though the pathogenic mechanism is not fully elucidated, hyperthyroidism may induce a reversible increased sensitivity of the dopaminergic receptor site in the corpus striatum [28]. A functional modification of adrenergic receptors has been also suggested and supported by the fact that the chorea disappears when treated with a beta blocker and worsens with isoproterenol challenge [29]. Additionally, as reported by Yu J.H., *et al* [16] a relationship between chorea, Graves disease, and abnormal cerebral perfusion could be not excluded.

In conclusion, hyperthyroidism is to be considered an unusual cause of chorea in childhood. Every child and adolescent with choreiform movements should be examined also for thyroid function.

FUNDING: This research received no external funding

CONFLICTS OF INTEREST: The authors declare no conflict of interest.

REFERENCES

[1] Léger J, Oliver I, Rodrigue D, Lambert AS, Coutant R. Graves' disease in children. Ann Endocrinol (Paris) 2018; 79(6): 647-55. https://doi.org/10.1016/j.ando.2018.08.001

[2] Srinivasan S, Misra M. Hyperthyroidism in children. Pediatr Rev 2015; 36(6): 239-48. https://doi.org/10.1542/pir.36-6-239

[3] De Luca F, Alessi L, Bruno E, Cama V, Costanzo D, Genovese C, *et al*. Graves' disease in childhood: new epidemiological, pathophysiological and therapeutic insights. Minerva Pediatr 2016; 68(1): 66-9.

[4] Park J, Kim JG, Park SP, Lee HW. Asymmetric chorea as presenting symptom in Graves' disease. Neurol Sci 2012; 33(2): 343-45. https://doi.org/10.1007/s10072-011-0679-0

[5] Sudo K, Tashiro K. Hyperthyroidism-associated chorea. Lancet 1998; 352(9123): 239. https://doi.org/10.1016/S0140-6736(05)77847-8

[6] Cretel E, Amoura Z, Piette JC. Hyperthyroidism-associated chorea. Lancet 1998; 352(9123): 239. https://doi.org/10.1016/S0140-6736(05)77846-6

[7] Arifi B, Gupta S, Sharma S, Daraboina A, Ahuja S. A Case Report of Chorea Associated with Hyperthyroidism. J Clin Diagn Res 2016; 10(2): PL01. https://doi.org/10.7860/JCDR/2016/17299.7277

[8] Lucantoni C, Grottoli S, Moretti A. Chorea due to hyperthyroidism in old age. A case report. Acta Neurol 1994; 16(3): 129-33.

[9] Willshaw ME, Atria A, Ferrer S. Hyperthyroidism and choreoathetosis. Rev Chil Pediatr 1986; 57(6): 573-74. https://doi.org/10.4067/S0370-41061986000600023

[10] Muthipeedika JM, Moosa A, Kumar A, Suchowersky O. Bilateral chorea-ballism associated with hyperthyroidism. Mov Disord 2005; 20(4): 512; author reply512. https://doi.org/10.1002/mds.20436

[11] Ristić AJ, Svetel M, Dragasević N, Zarković M, Koprivsek K, Kostić VS. Bilateral chorea-ballism associated with hyperthyroidism. Mov Disord 2004; 19(8): 982-83. https://doi.org/10.1002/mds.20119

[12] Shahar E, Shapiro MS, Shenkman L. Hyperthyroid-induced chorea. Case report and review of the literature. Isr J Med Sci 1988; 24(4-5): 264-66.

[13] Clements MR, Hamilton DV, Siklos P. Choreoathetoid movements and thyrotoxicosis. J R Soc Med 1981; 74(10): 777. https://doi.org/10.1177/014107688107401017

[14] Fidler SM, O'Rourke RA, Buchsbaum HW. Choreoathetosis as a manifestation of thyrotoxicosis. Neurology 1971; 21(1): 55-7. https://doi.org/10.1212/WNL.21.1.55

[15] Delwaide PJ, Schoenen J. Hyperthyroidism as a cause of persistent choreic movements. Acta Neurol Scand 1978; 58(5): 309-12. https://doi.org/10.1111/j.1600-0404.1978.tb02892.x

[16] Yu JH, Weng YM. Acute chorea as a presentation of Graves disease: case report and review. Am J Emerg Med 2009; 27(3): 369.e1-369.e3. https://doi.org/10.1016/j.ajem.2008.05.031

[17] Seeherunvong T, Diamantopoulos S, Berkovitz GD. A nine year old girl with thyrotoxicosis, ataxia, and chorea. Brain Dev 2007; 29(10): 660-61. https://doi.org/10.1016/j.braindev.2007.04.002

[18] Pozzan GB, Battistella PA, Rigon F, Zancan L, Casara GL, Pellegrino PA, *et al*. Hyperthyroid-induced chorea in an adolescent girl. Brain Dev 1992; 14(2): 126-27. https://doi.org/10.1016/S0387-7604(12)80102-1

[19] Marks P, Anderson J, Vincent R. Choreo-athetosis with severe thyrotoxicosis. Postgrad Med J 1979; 55(649): 830-31. https://doi.org/10.1136/pgmj.55.649.830

[20] Cardoso F, Seppi K, Mair KJ, Wenning GK, Poewe W. Seminar on choreas. Lancet Neurol 2006; 5(7): 589. https://doi.org/10.1016/S1474-4422(06)70494-X

[21] Punukollu M, Mushet N, Linney M, Hennessy C, Morton M. Neuropsychiatric manifestations of Sydenham's chorea: a systematic review. Dev Med Child Neurol 2016; 58(1): 16-28. https://doi.org/10.1111/dmcn.12786

[22] Zijlmans JC. Vascular chorea in adults and children. Handb Clin Neurol 2011; 100: 261-70. https://doi.org/10.1016/B978-0-444-52014-2.00018-5

[23] Groothuis JR, Groothuis DR, Mukhopadhyay D, Grossman BJ, Altemeier WA. Lupus-associated chorea in childhood. Am J Dis Child 1977; 131(10): 1131-34. https://doi.org/10.1001/archpedi.1977.02120230077014

[24] Lefter S, Corcoran L, McAuliffe E, Khan R, Burke L, Regan M, *et al*. Coeliac disease presenting with chorea. Pract Neurol 2020; 20(2): 144-47. https://doi.org/10.1136/practneurol-2019-002396

[25] Andrade C, Rocha H, Albuquerque A, Sá MJ. Gluten chorea. Clin Neurol Neurosurg. 2015; 138: 8-9. https://doi.org/10.1016/j.clineuro.2015.07.009

[26] Ataya A, Harman E. Images in clinical medicine. Hemichoreoathetosis in neurosarcoidosis. N Engl J Med 2015; 372(21): e27. https://doi.org/10.1056/NEJMicm1407763

[27] Roquer J. Neurological manifestations of hyperthyroidism]. Neurologia. 1992; 7(2): 65-72.

[28] Klawans HI, Shenkar DM. Observations on dopaminergic nature of hyperthyroid chorea. J Neural Transm 1972, 33: 73-81. https://doi.org/10.1007/BF01244729

[29] Hayashi R, Hashimoto T, Tako K, Efficacy of propranolol in hyperthyroid-induced chorea: a case report. Mov Disord 2003; 18(9): 1073-76. https://doi.org/10.1002/mds.10477

Received on 2-9-2020 Accepted on 7-10-2020 Published on 11-10-2020

DOI: https://doi.org/10.12974/2311-8687.2020.08.5