

BENIGN FASCICULATIONS RESPONSIVE TO GABAPENTIN

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ABSTRACT - Fasciculations are symptoms present in a broad spectrum of conditions, ranging from normal manifestations to motor neuron diseases. They also represent the main picture of benign fasciculation syndrome. We report a case of such syndrome: a 48-years-old woman complaining about fasciculations for three decades who remained with the symptoms even after the compensation of a disclosed hyperthyroidism. The introduction of gabapentin rendered control of her fasciculations. The available data in the literature about the therapeutic approaches for fasciculations are revised, as long as the rare reports of evolution from patients with "benign" fasciculations to cases of amyotrophic lateral sclerosis, underlining the importance of following the patients with fasciculations.

KEY WORDS: benign fasciculations, gabapentin, motor neuron disease, amyotrophic lateral sclerosis.

Fasciculações benignas responsivas à gabapentina

RESUMO - Fasciculações são sintomas presentes em um amplo espectro de condições, desde manifestações normais até doenças do neurônio motor. Elas representam também o principal aspecto da síndrome de fasciculações benignas. Relatamos um caso desta síndrome: uma paciente de 48 anos com queixas de fasciculações por três décadas que, mesmo após a compensação de um quadro de hipertireoidismo, permaneceu com os sintomas. A introdução de gabapentina levou a controle das fasciculações. Os dados disponíveis na literatura sobre as abordagens terapêuticas para fasciculações são revisados, assim como os raros relatos de evolução de pacientes com fasciculações "benignas" para casos de esclerose lateral amiotrófica, salientando a importância do seguimento dos pacientes com fasciculações.

PALAVRAS-CHAVE: fasciculações benignas, gabapentina, doenças do neurônio motor, esclerose lateral amiotrófica.

Fasciculations are visible rapid slight contractions that occur spontaneously in an intermittent manner in voluntary muscle fibres¹. They are due to twitches of bundles of muscle fibers, most probably motor units². Fasciculations may arise both in the peripheral and in the central portion of the motor neuron, and probably represent changes in the conductive properties of the ionic gates, i.e., fluctuations in the ionic gradients along the axonal membranes, a fact demonstrated by some experimental studies³. Fasciculations are present in a broad spectrum of clinical conditions, some of them ominous illnesses as motor neuron diseases. They may also be an occasional normal manifestation in many people or the continuous main picture of benign entities.

Therapeutic approaches for fasciculations are

scarse, a fact that turns important any report of successful treatment.

CASE

A 48-year-old white woman looked for neurologic advice with a complaint of trembles in the muscles of her arms, legs, trunk, neck, and face since she was teenager. She reported that the trembles had become slightly more intense in the last ten years, provoking a discomfort in her muscles and making her to be ashamed of wearing short clothes in the summer because the surrounding people could notice the trembles. She denied any other current or past disease, and had three pregnancies which elapsed without abnormalities. On the last months before the neurologic consultation she had begun to feel fatigue and was losing weight.

At the time of the first neurologic consultation a complementary investigation was ordered. The electromyog-

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Received 14 November 2006, received in final form 8 June 2007. Accepted 8 August 2007.

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raphy (EMG) revealed widespread fasciculation potentials during the muscle rest, without any other abnormality. The following blood tests rendered normal results: blood counts, erythrocyte sedimentation rate, fasting glucose, uric acid, total and fractional cholesterol, triglycerides, tests for syphilis and human immunodeficiency virus, creatinine, electrolytes (sodium, potassium, magnesium, and calcium), alanine aminotransferase, aspartate aminotransferase, and bilirubin. The creatine kinase (CK) presented variable results which oscillated between the normal range and slightly increased levels (from 113.0 to 337.0 U/L). The only tests that were clearly abnormal were those of thyroid function: thyroid-stimulating hormone (TSH) was 0.01 μ U/mL (normal range from 0.3 to 5.0), free thyroxine (FT4) 3.46 ng/dL (from 0.75 to 1.8), total thyroxine (T4) 13.8 μ g/dL (from 5.0 to 12.0), and total triiodothyronine (T3) 308.0 ng/dL (from 75.0 to 220.0). On the other hand, both antimicrosomal and antithyroglobulin antibodies showed normal results.

After the diagnosis of hyperthyroidism, propylthiouracil 100 mg PO a day was initiated. In the following five months the tests of thyroid function returned to normal range but the fasciculations remained unchanged. Face to the suspicion of benign fasciculation syndrome, gabapentin was introduced based on the report of Romano concerning the benefits of its use in the control of fasciculations in patients with amyotrophic lateral sclerosis (ALS)⁴. Its doses were gradually increased until the patient noticed the disappearance of fasciculations, which was reached with 400 mg TID.

The patient has been accompanied for five years, and no other clinical or neurological abnormality has appeared in this period. She tells that if she takes gabapentin only a few hours after the time prescribed fasciculations resume. She presently has to obey the 8 hours interval between each dose of the drug. No evidence of weakness or muscle wasting has been detected during this period.

DISCUSSION

Fasciculations generally are visible and occur spontaneously in an intermittent manner in voluntary muscle fibres, but may be imperceptible when occurring in deep muscles¹. When observed in the EMG they are called fasciculation potentials. These are spontaneous motor unit potentials of five to twelve milliseconds' duration, of widely varying amplitude (300 microvolts – 2 millivolts) and occurring irregularly at a rate of approximately 1-50/min⁵.

In many people fasciculations can be normally found in voluntary muscles, generally in a focal and episodic manner. The face and limbs are commonly affected. Most of those who have such manifestations do not search medical advice since they are unaware of them, or consider them normal. Members of professional areas related to health services sometimes get worried about these occasional symptoms, since they had learned about the clinical picture and prognosis of motor neuron diseases. They are more com-

mon in men, have a predilection for hands and feet and may be related to the height, weight, and anxiety⁶. In this setting, no other pathological signs like weakness or muscle atrophy are apparent. The EMG must be normal, except by fasciculation potentials.

A myriad of clinical and neurological conditions can present with fasciculations^{5,6}, but are generally accompanied by other symptoms and signs that aid to ascertain the diagnosis. For instance, fasciculations may be associated with acute viral infections or exceptionally be a delayed manifestation of poliomyelitis or myelitis⁷, hyperthyroidism (thyrotoxicosis), nerve root or trunk compression⁵, or cervical spondylosis⁵. If the associated symptoms and signs of the "benign" conditions are absent, fasciculation may present a difficult but important diagnostic problem⁵. Even the focal distribution of fasciculations in some muscles, a fact that could resemble a restricted neurological disease, is not a categorical benign sign since motor neuron diseases not rarely begin with local involvement and widespread afterwards.

An illness generally considered benign is the *muscular pain-fasciculation syndrome*⁸, also called *benign fasciculation syndrome*⁹. The clinical pattern of benign fasciculations frequently includes muscle cramps and local pain, symptoms that may worsen with physical activity and lessen with rest. Occasionally, some patients also complain about numbness or tingling⁸.

The differential diagnosis of benign fasciculation syndrome must be accomplished with judgement⁶, since it includes other entities that may present solely with fasciculations in the beginning, but can develop more ominous symptoms and signs later. Indeed, some patients initially diagnosed as having benign muscle fasciculations may evolve to motor neuron disease^{10,11}. Fortunately, such evolution is not the rule but underlines the importance of accompanying these patients for at least five years. It was suggested that fasciculations represent a state of hyperexcitability that precedes the neuron death in case of motor neuron disease¹². This is the more serious condition that manifest with such symptoms. Its adult paradigm is ALS, a fatal illness which combines fasciculations with progressive muscle weakness and wasting, often with a focal beginning but with posterior spread to most, if not all, skeletal muscles of the body. ALS commonly comprises a few years from the first symptoms to death. The only treatment available, riluzole, can only slow the evolution.

The distinction between benign and "malign" fasciculations must be accomplished taking into ac-

count the configuration of the motor potential in the EMG (amplitude, morphology, and phases) and the presence or absence of other forms of spontaneous activity (fibrillation, positive sharp wave). In ALS the fasciculation potentials are irregular, have intervals of 3.5 seconds, are unstable and very complex¹³. Instead, in the case of benign fasciculations the interval between potentials has about 0.8 seconds, and these are more regular, stable, and simple¹³. In fact, the interval differentiation of fasciculation potentials between motor neuron diseases and benign conditions was already established by Trojaborg and Buchthal in 1965¹⁴. Besides, in motor neuron disease the maximum amplitude is 30 percent lower in fasciculation units reflecting a smaller density of their fibers than in voluntarily activated motor units¹⁴. The electrodiagnostic identification of this form of fasciculation is aided by the detection of co-existing denervation⁵, which can also occur in motor neuropathy, radiculopathy or some myelopathies. Benign fasciculation syndrome is unaccompanied by signs of denervation⁵.

The treatment of fasciculations is symptomatic and based mainly in antiepileptic drugs, as phenytoin and carbamazepine, usually with only partial relief¹⁵. Recently, gabapentin proved to decrease fasciculations and cramps both in benign syndromes and ALS^{4,15}. This drug acts as membrane stabilizer, lessening the excitability of peripheral nerve and modulating neuron receptors. It has an inhibitory effect on the release of dopamine and norepinephrine, rendering an increase of GABAergic concentration in several brain areas. Doses from 300 to 600 mg three times a day are reported to be effective and safe.

In the present paper the case of a female patient

with fasciculations for three decades illustrates the benefit of gabapentin in *benign fasciculation syndrome*. Five months before the introduction of gabapentin a state of hyperthyroidism was discovered and successfully treated. At present the patient has the thyroid disease under control but remains with fasciculations when she discontinues gabapentin.

Acknowledgements – The authors wish to thank the patient who kindly authorized the publication of this case report.

REFERENCES

1. Mitsikostas DD, Karandreas N, Coutsopebras P, Piperos P, Lyaidaki SC, Papaleorgiou C. Fasciculation potentials in healthy people. *Muscle Nerve* 1992;21:533-555.
2. Denny-Brown D, Pennybacker JF. Fibrillation and fasciculation in voluntary muscle. *Brain* 1938;61:311-334.
3. Wettstein A. The origin of fasciculations in motor neuron disease. *Ann Neurol* 1979;5:295-300.
4. Romano JG. Reduction of fasciculations in patients with amyotrophic lateral sclerosis with the use of gabapentin. *Arch Neurol* 1996;53:716.
5. Richardson AT. Muscle fasciculation. *Arch Phys Med Rehabil* 1954;35:281-286.
6. Buainain RP, Moura LS, Oliveira ASB. Fasciculação. *Rev Neurociencias* 2000;8:31-34.
7. Fetell MR, Smallberg G, Lewis LD, Lovelace RE, Hays AP, Rowland LP. A benign motor neuron disorder: delayed cramps and fasciculation after poliomyelitis or myelitis. *Ann Neurol* 1982;11:423-427.
8. Hudson AJ, Brown WF, Gilbert JJ. The muscular pain-fasciculation syndrome. *Neurology* 1978;28:1105-1109.
9. Blehrud MD, Windebank AJ, Daube SR. Long term follow-up of 121 patients with benign fasciculations. *Ann Neurol* 1993;34:622-625.
10. Fleet WS, Watson RT. From benign fasciculations and cramps to motor neuron disease. *Neurology* 1986;36:997-998.
11. Eisen A, Stewart H. Not-so-benign fasciculation. *Ann Neurol* 1994;35:375.
12. Carvalho M, Swash M. Cramps, muscle pain and fasciculations: not always benign? *Neurology* 2004;63:721-723.
13. Carvalho M, Swash M. Fasciculation potentials: a study of amyotrophic lateral sclerosis and other neurogenic disorders. *Muscle Nerve* 1998;21:336-344.
14. Trojaborg W, Buchthal F. Malignant and benign fasciculations. *Acta Neurol Scand* 1965;13(Suppl):S251-S254.
15. Serrao M, Cardinali P, Rossi P, Parisi L, Tramutoli R, Pierelli F. A case of myokymia-cramp syndrome successfully treated with gabapentin. *Acta Neurol Scand* 1998;98:458-460.