Upper Limb Proximal Form of Benign Monomelic Amyotrophy: on Purpose of 2 Cases

Amiotrofia Monomélica Benigna Forma Proximal de Membro Superior: a Propósito de 2 Casos.

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Abstract

Benign monomelic amyotrophy (BMA) is a rare form of motor neuron disease of unknown cause and it's characterized by weakness and muscular atrophy restricted to an upper or lower limb, usually in the distal part, absence of upper motor neuron signs and self limited course. In this report we describe the clinical and electromyographic features of two young men with BMA in the proximal portion of the right upper limb, a location of BMA rarely described in the literature.

Keywords: *Benign monomelic amyotrophy; Neuromuscular diseases; lower motor neuron.*

Resumo

Amiotrofia Monomélica Benigna (AMB) é uma entidade rara do neurônio motor, de causa desconhecida, caracterizada por fraqueza muscular e amiotrofia restritas a 1 membro superior ou inferior, frequentemente em terço distal, sem comprometimento da via piramidal e curso autolimitado. Descrevemos os achados clínicos e eletroneuromiográficos de 2 pacientes jovens com AMB na porção proximal do membro superior, localização raramente descrita na literatura.

Palavras-Chave: *Amiotrofia Monomélica Benigna, Doenças Neuromusculares, Neurônio Motor Inferior.*

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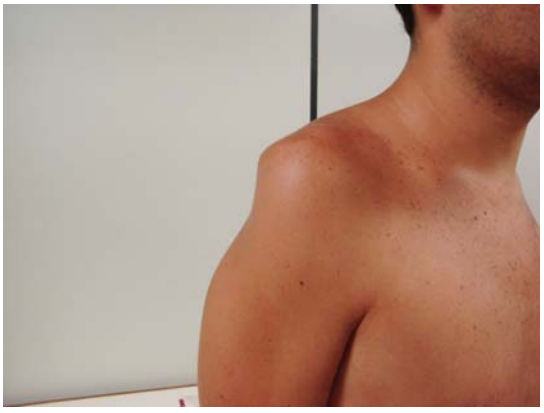
Introduction

Benign monomelic amyotrophy (BMA) is a rare form of motor neuron disease of unknown cause, characterized by clinical deficit in a limited number of myotomes [1-2]. Its occurrence is sporadic, and the onset, generally insidious, frequently occurs during the second or third decade of life, and has a male preponderance [1,3]. Clinically, it is characterized by weakness and muscular atrophy restricted to an upper or lower limb (usually in the distal, or more rarely, in the proximal part), absence of upper motor neuron signs and self limited course [3-4]. The pattern on electromyography (EMG), associated to histological evidences of neurogenic amyotrophy are suggestive of the anterior horn cell lesion [3,5-6]. In this report we describe the clinical and electromyographic features of two young men with BMA in the proximal portion of the right upper limb.

Case Reports

Case 1

A 23-years-old man, Caucasian, medical student, was admitted in the Neuromuscular Disorders Inpatient Division of Antonio Pedro Teaching Hospital in May 2004, with a 2-years history of insidious onset, gradually progressive weakness and atrophy of the proximal part of right upper limb associated to difficulty in abduction movement (Figure 1). The neurologic examination revealed atrophic changes in the scapular girdle muscles of the right side. The muscle power according to Medical Research Council was grade 3 in the shoulder girdle muscles (Table 1) [7]. There was no weakness or wasting in the left upper limb or both lower limbs. Apart from the absence of the right bicipital and estiloradial reflexes, the deep reflexes were normal in all four limbs. There were no sensory, pyramidal tract or bulbar signs. Fasciculations and tremor were absent. The illness had attained a stationary phase at the end of 4 years. Electromyography (EMG) showed re-duced motor action potentials in the right deltoid muscles. The infraspinatus, biceps and deltoid muscles showed signs of denervation, with the infraspinatus group also present-ing fasciculations. There was mild fibrillation in the first interosseous muscle on the left and high amplitude long duration motor unit potentials of the right lateral vastum muscle. Both motor and sensitive nerve conduction studies as well as a cervical spinal cord magnetic resonance image (MRI) was normal.



1. Case 1 - Marked atrophy of right deltoid muscle.

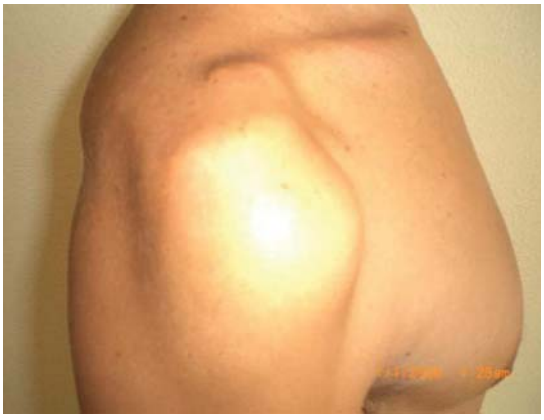


Figure 2 . Case 2 - Atrophy in the proximal part of upper right limb.

Case 2

A 22-years-old man, Caucasian, engineer student, was evaluated in the Neuromuscular Disorders Inpatient Division of Antonio Pedro Teaching Hospital in December 2007, with an 11-years history of insidious onset, gradually progressive weakness and atrophy of the right shoulder. At age 18 he started a weight lifting program with the intent to increase the muscular strength of the affected region. After six months of daily training, he noted that the force and resistance of the muscles was even more compromised. The amyotrophy and weakness increased and some functional abilities and sport activities were compromised. In December 2005 he had two subluxations after swimming. At this time the symptoms were considered as an orthopedic problem. He received the diagnosis of BMA in December 2007. The neurologic examination revealed atrophy, weakness and fasciculations in the proximal muscles of right upper limb (Figure 2). The muscle power according to Medical Research Council was grade

3 in the shoulder girdle muscles (Table 1) [7]. There was no weakness or wasting in the left upper limb or both lower limbs. Apart from the absence of the right bicipital and estiloradial reflexes, the deep reflexes were normal in all four limbs. There were no sensory, pyramidal tract or bulbar signs. The illness had attained a stationary phase at the end of 4 years. Electromyography (EMG) revealed denervation and neurogenic recruitment followed by reinervation in the proximal muscles of right upper limb. The cervical spinal cord magnetic resonance image (MRI) was normal.

Table 1 . Paresis in proximal muscles of the upper right limb (Medical Research Council).

Muscles	Case 1		Case 2	
	Right	Left	Right	Left
Deltoid	3	5	3	5
Teres minor	3	5	3	5
Teres major	3	5	3	5
Subescapular	3	5	3	5
Infraspinatus	3	5	3	5
Supraspinatus	3	5	3	5
Biceps	3	5	4	5
Triceps	5	5	4	5
Flexor digitorium superficialis and profundus	5	5	5	5
Interosseous	5	5	5	5

Discussion

BMA, in contrast to other lower motor neuron disorders such as spinal muscular atrophy, is essentially a sporadic condition [8]. Familial occurrence of BMA is rare [9]. Although rare in western countries, is a common condition in Japan and India, where, in the latter, constitutes 12,8% of the cases of motor neuron disorders [10]. There are no study which investigates its incidence and prevalence in westerns countries.

Generally the onset is insidious with a slow progression over 2–4 years followed by a spontaneous stabilization. The majority of patients developed symptoms between the ages of 18 and 22 years [5,11]. The patients with upper limb involvement usually have mean age significantly younger (19,8 years) than those with lower limb (28,5 years) compromise [6]. The case of our second patient deserves attentions for its precocious onset (11years), this fact is contrary to the majority reports, although there are series reporting from 2 to 30 years [12].

The disease is characterized by weakness and muscular atrophy restricted to a single upper or lower limb [3]. There are some reports of bilateral involvement, which in these cases are markedly asymmetrically [6]. The hand and forearm muscles are the most affected in the upper limb, generally sparing the brachioradialis, giving the appearance of an oblique amyotrophy, and its also called "Hirayama disease" [13].

Our patients presented a rare form of BMA, which affects the arm and shoulder muscles, instead of the distal muscle that is commonly reported by other authors. Rare cases have been reported with only proximal upper limb involvement [11,14-15]. In a series of 21 patients, there was one case that had a severe atrophy and mild weakness of the left shoulder and arm [11].

Despite significant atrophy, muscle strength is relatively well preserved in BMA [1]. In a study realized by Gourie-Devi, with 44 patients, 68.2% presented mild disability [5]. In a 44-patient study by Gourie-Devi [5], the disease progression was seen in 84% of the cases, up to 5 years in 79,5%, 6 years in one and 8 years in another patient. Our both patients present a slow progression of the symptoms followed by a stationary phase.

The cranial nerves, pyramidal tracts, extrapyramidal system, cerebellum and sensory system are spared [15]. The deep reflexes can be normal or absent [11], as seen in our patients. Some patients can present, in the upper limb, an irregular tremor of the fingers (minipolymyoclonus), present in rest and aggravated by stress and voluntary actions [6]. Less common features are coldness of hands, hyperhidrosis, aggravation of motor symptoms on exposure to cold and abnormalities of sympathetic skin response [16]. None of our patients showed these symptoms. Fasciculations appear to be rare [8], although our second patient presented them.

The etiopathogenesis of this disorder remains unknown, however, various postulations have been considered to be contributing factors, such as viral infections, atopy, vascular insufficiency of the spinal cord, heavy physical activity, and focal cord atrophy as a result of stretching of the cord during flexion of the neck [17-21]. Possible risk factors for this disorder are unknown as well, although a correlation between BMA and strenuous occupation and immobility following injury had been suggested [22-23]. Several patients originated from India suggest that specific environmental factors, ethnic background, or cultural and behavioral habits may be

involved in the susceptibility to disease [24]. There was no history of poliomyelitis, cervical trauma, fracture or surgery of the left upper limb and there was no exposure to toxins or heavy metals or symptoms to suggest allergic phenomenon or atopy in our patients. A genetic cause is also suggested by the observation of rare familial cases [24]. It is still uncertain why BMA is a relatively non-progressive disease, unilateral, affecting only the lower motor neurons, sparing the long tracts, and its predilection for young males [6,8].

EMG studies are essential to define BMA. It shows chronic neurogenic changes in the affected muscles, with or without evidence of active denervation (fibrillation and positive sharp waves). These abnormalities may also be found not only in the weak muscles, but also in clinically unaffected segments of the same limb, in the contralateral limb or in the lower limbs [1,11]. Freitas et al.[11] detected evidence of denervation in the contralateral limb in a patient with lower limb amyotrophy and mild denervation of the limb of the same side in two patients. Similar observations have been made by some other authors [3,25-26]. Nerve conductions are usually normal except for the findings of a motor neuronopathy (reduced compound muscle action potentials, prolonged F-wave latencies, and slight slowing in motor fibers in the affected limb) in severe cases [1].

MRI of the spinal cord is usually normal, although studies of cervical spinal cord have demonstrated localized unilateral or asymmetrical spinal cord atrophy in the lower cervical segments corresponding to the side of the muscle atrophy and weakness [27]. In both of our patients we did not observe any consistent finding in MRI. MRI of affected muscles demonstrates atrophy and replacement with adipose tissue [28].

The creatine kinase value is normal or slightly elevated [4]. Laboratory study results, including genetic studies for spinal muscular atrophy (SMN gene deletion) and antibodies to gangliosides have been negative [29]. The histological features of the affected muscles reveal neurogenic atrophy, fiber type grouping, hypertrophic fibers, and secondary myopathic characteristics [3,22-26]. The only autopsy study on a patient with BMA showed reduction in the number of large and small nerve cells of the anterior horn and degenerative changes in the remaining neurons with thinning of the anterior roots at the C7 to T1 segments, and there was no ischemic lesions in the cervical cord or vascular abnormalities [19].

Differential diagnosis includes classic motor neuron disease such as amyotrophic lateral sclerosis (ALS), distal spinal muscular atrophy and post-poliomyelitis syndrome. ALS can be differentiated by age of onset, absent bulbar and pyramidal signs, and lack of spreading to the other limbs. In distal spinal muscular atrophy the wasting is bilateral and often symmetrical and positive family history in many cases. Post-poliomyelitis syndrome can be distinguish by a definite history of poliomyelitis with residual and stable amyotrophy and weakness for a period of 10 years followed by progressive loss of strength and muscle atrophy occurring asymmetrically. Other conditions such as syringomyelia, tumors, arteriovenous malformations, spondylosis, and herniated discs have sensory involvement and characteristic radiological findings. BMA should be distinguished from multiple motor neuropathies when the amyotrophy is distally in the upper limb, and in this disease there is an evidence of conduction block in motor nerves and high serum titers of anti-GM1 ganglioside antibodies. A chronic focal myositis, can be differentiate by an elevated serum CPK, and the EMG and the muscle histologic features [6,11]. The diagnosis of BMA can only be made after disease stabilization and when theses disorders are excluded [4,30-31].

Conclusion

The diagnosis of BMA should be considered in cases of slowly progressive unilateral amyotrophy restricted to one limb followed by stabilization, and with neurogenic changes in the EMG. The benign nature of the disease, the lack of spread to other limbs and the restriction of the disease process to the lower motor neurons should be emphasized in these cases. Our patients were similar to those previously described, however the location in the proximal aspect of upper limb is, up to now, rarely described in the literature.

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