HIRAYAMADISEASE: DESCRIPTION OF A CLINICAL CASE IN A YOUNG FEMALE PATIENT

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La malattia di Hirayama: descrizione di un caso clinico di una giovane paziente di sesso femminile

Summary

Hirayama’s Disease (HD) is a rare condition affecting young people with a male preponderance. It is a focal distal upper arm atrophy with unilateral or asymmetric bilateral involvement of C7, C8 and T1 spinal segments.

We report a young female patient with clinical and electrophysiological findings suggestive of HD. On the basis of the clinical, EMG, and radiological findings, we have excluded a restricted form of motor neuron disease (monomelic muscular atrophy), or a limited form of multifocal motor neuropathy, and chronic left-sided cervical radiculopathy or spinal compressive disease.

Key words: Benign monomelic amyotrophy, cervical radiculopathy, motor neuron disease

Introduction

The first description of juvenile segmental muscular atrophy appeared in 1959, when Hirayama described 12 patients (Hirayama, 1959). This condition, also known with the name of Hirayama Disease (HD), was previously thought to be restricted to Japan and South Asia, and a rarity among westerners. In recent decades a steady number of cases have been reported from European countries (Serratrice, 1991); (Rigamonti et al., 2004).

This disease has also been called with many different names: juvenile asymmetric segmental spinal muscular atrophy (Pradhan et al., 1997); segmental muscular atrophy of distal upper extremity with juvenile onset (Saito, 1977); monomelic amyotrophy (Gourie-Devi et al., 1984); and benign focal amyotrophy (Adornato et al., 1978).

The diagnosis is made on the basis of the clinical features: a type of localized motor neuron involvement from the seventh cervical to the first thoracic spinal segment with motor deficit of the distal upper limb either unilaterally or bilaterally in an asymmetric manner; however, one of the most consistent features is the striking unilaterality in the majority of cases.

This usually sporadic disorder affects predominantly males in the 2nd or 3rd decade of life. It is now apparent, as the disorder became more frequently recognized, that onset can be later in life, and with a higher frequency in women than hitherto appreciated (Van den Berg-Vos et al., 2003).

It typically exhibits an insidious onset, slow progression, and often a self-limiting course (Hirayama, 1991).

We report a case of young woman with a history of amyotrophy confined to her left arm and hand. Clinical and electrophysiological findings were suggestive of HD.

A condition with insidious onset and predominantly unilateral muscular atrophy in the hand and...
forearm challenges the differential diagnosis with several conditions that also cause localized amyotrophy of the distal arm. All these diseases, including syringomyelia, amyotrophic lateral sclerosis, cervical spondylotic myelopathy, and spinal cord tumour, should be differentiated from Hirayama Disease.

HD merits consideration in any patient presenting pure lower motor neuron weakness of one upper limb. While obviously not treatable, the benefit in making the diagnosis of HD is to spare the patient “a label” with a much more malignant neurological disorder such as a motoneuron disease.

Of course it must be in the clinician’s mind that many cases of HD make progress, albeit extremely slowly. Furthermore, the debate about whether this condition represents a focal form of primary lower motor neuron degeneration or the local consequence of anatomical variations in the cervical spine continues, making prognostic perspectives uncertain.

Case Report

A 25-years-old woman first came to our observation in January 2007, with a three-year history of slowly progressive distal weakness and atrophy of the left hand and forearm. The clinical course stabilized after one-year progression. Sensory symptoms or cramps were never referred.

She denied any history of neck or back pain or any bulbar dysfunction. The family history, as well as the patient’s past medical and social history were not significant. She had polio immunization during childhood and did not recall any symptoms to suggest poliomyelitis.

Neurological examination revealed relevant atrophy of the left hand intrinsic muscles, prevalent in the hypothenar and interosseous muscles. Overall left hand strength deficit was grade 3/4 on the MRC scale. A muscle wasting to a lesser degree was present in the left forearm flexor muscles, sparing brachioradialis muscle. The proximal muscles of the left arm, including deltoid and biceps, were normal and exhibited normal power.

Reflexes in all four limbs were preserved, symmetrical, and the great toes were flexor on plantar stimulation. Sensory examination and cranial nerves were normal. There were no signs of the corticospinal tract involvement in the upper or lower extremities. Ataxia, tremor, extra pyramidal signs, fasciculations, cramps at rest and after exercise, sphincter abnormalities were all absent.

Serum creatine kinase and other blood and urine laboratory tests, including electrolytes and liver functions, EKG and chest radiology, were all normal. Antinuclear auto-antibodies (ANCA, ENA, ANA) and anticardiolipin antibodies were absent, and thyroid hormones were in the range.

The patient underwent a complete neuro-physiological study. Motor nerve conduction studies of the left median and ulnar nerves, by recording from abductor pollicis brevis (APB) and abductor digitii minimi (ADM) muscles respectively, showed normal conduction velocities over the proximal and distal segments from Erb’s point to wrist, including F wave too. CMAP (compound muscle action potential) amplitudes of the median nerve were still in the normal range, while low-amplitude ulnar cMAP was recorded from ADM muscle.

There were no signs of conduction block. The motor nerve conduction studies of homologous right arm were normal. Sensory nerve conduction studies demonstrated normal median, ulnar and superficial radial sensory nerve action potentials (SNAPs) in both upper extremities.

Electromyographic needle examination showed chronic neurogenic changes consisting in high-amplitude (4-8 mV), long duration motor unit potentials (MUPs), with moderate to severe loss of MUs in the left hand muscles and in the left forearm flexor muscles (flexor carpi radialis, flexor carpi ulnaris).

Positive sharp-waves and fibrillation potentials at rest were limited to left first dorsal interosseous (FDI), APB and ADM muscles. Electromyographic examination of multiple right upper and lower limb muscles was entirely normal. These findings were compatible with an anterior horn cell disorder involving levels C7 through T1 of the spinal cord.

Somatosensory (SEP) and motor (MEP) evoked potentials recorded from median and ulnar nerves were also normal in amplitude and latencies.

MRI study of the cervical spinal cord with and without gadolinium did not show any compressive or intrinsic spinal cord lesion. Dynamic flexion-extension MRI of the cervical spinal cord was not considered to be necessary at that time.

Discussion

The clinical and electrophysiological findings in our patient are consistent with the diagnosis of non-progressive juvenile spinal muscular atrophy of the distal upper limb, or Hirayama Disease.
In the present case, results of the neuro-physiological examination give essential basic indications for differential diagnosis. Nerve conduction studies do not show the presence of focal motor conduction block along two or more nerves, so excluding multifocal motor neuropathy (MNN). Normal motor and sensitive nerve conduction also excludes any entrapment neuropathies, such as anterior interosseous syndrome or the cubital tunnel syndrome.

The EMG findings, confirming an underlying neurogenic disorder, ruled out a possible distal myopathy.

Clinically, the deep tendon reflexes of the affected arm were normal and symmetric; signs of upper motor neuron involvement, sensory abnormalities, or ataxia and extra pyramidal signs were absent; cranial nerve functions were normal as well. All this could be enough to exclude a motor neuron disease or other neuro-degenerative conditions.

In this regard, the differential diagnosis with the motor neuron disease (MND) and the spinal muscular atrophies (SMA) can be a delicate challenge.

NMD is by definition a much more progressive disorder, and most notably proximal muscle involvement is often present within months of distal wasting appearing. There is a general agreement on the fact that progression to NMD can only conclusively be excluded if there is no progression beyond the upper limb within three years (Talbot, 2004).

In our patient both clinical and neurophysiological features do not demonstrate a more widespread involvement of limbs or bulbar muscle.

SMA is an heterogeneous group of diseases of genetic origin and variable distribution, characterized by slowly progressive pure lower motor neuron degeneration (Talbot and Davies, 2003).

In contrast to several form of SMA, HD is essentially a sporadic condition. To exclude in our patient a juvenile form (SMA type 3), we proposed the molecular genetic analysis for deletion of exon 7 of the SMN1 gene, but the patient refused.

In any case clinical manifestation and electrodiagnostic examination of our patient are quite lacking of the basic features for a diagnosis of SMA: difficulty in walking, generalized or limb-girdle type weakness, fasciculations, EMG findings consistent with active and diffuse denervation.

Another possible diagnosis, neuralgic amyotrophy, can be suspected but we did not find any typical antecedent of this condition in the history of our patient.

Therefore, lacking of pain located in the shoulder with abrupt intense onset, and the contemporary or successive evidence of upper plexus involvement, do not encourage this possibility.

Simple radiographic study of the cervical spine showed neither cervical rib, nor other abnormalities that can be referred to neurogenic outlet thoracic syndrome such as enlarged C7 transverse process. Clearly any patient with unexplained weakness and wasting of the upper limb merits a RM scanning of the cervical and upper thoracic spinal cord in order to exclude a structural lesion, both intrinsic and extrinsic.

In our patient MRI imaging studies of the spinal cord were unable to demonstrate an intra-medullary damage, comprising syringomyelia, expansive spinal lesions, or cervical root compression.

On the other hand, the aetiology of HD remains unexplained so far and the pathogenesis is still debated. Various Authors have suggested that localized distal atrophy in the hand and forearm may be caused by ischemia at C7 to T1 levels of the spinal cord due to previous trauma, (Kwan et al, 2004) or vigorous exercise and excessive neck flexions (Restuccia et al, 2003).

In one autopsy study there was no ischemic lesions in the cervical cord, and no vascular abnormalities (Hirayama et al, 1987).

This report suggested a focal loss of spinal motor neurons without any compressive pathogenesis. In another more recent study non-specific ischemic lesions in the anterior portion of the spinal cord were observed (Hirayama, 2000).

This focal venous ischemia arises through compressive flattening of the lower cervical cord. However it remains unclear why this should give rise to a disorder that is relatively “non-progressive”, so frequently unilateral and so exclusively affecting lower motor neurons (Talbot, 2004).

References


