

# Chronic spastic atrophic hemiparesis with benign course

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*We present the clinical and neuroimaging data of 4 patients (mean age: 62 years, range 54-67; mean follow-up: 19.5 years, range: 26 months-29 years) with chronic spastic atrophic hemiparesis (CSAH). Neuroimaging findings were non specific, CT scan and MRI showing white matter lesions located within the centrum semiovale in two cases, parieto-occipital lobe and pons in one case each. This study underlines that patients with CSAH may have a good long-term prognosis. MRI studies may demonstrate associated lesions within the white matter or brainstem and are advisable in all subjects with CSAH, but further studies are necessary to clarify the nature of the observed lesions.*

**Key Words:** Mills syndrome — chronic spastic atrophic hemiparesis (CSAH) — MRI — CT scan.

## Introduction

Chronic spastic atrophic hemiparesis (CSAH) may result from several diseases such as a slowly evolving focal lesion within the cerebral hemisphere involving parietal lobe (explaining so-called "parietal lobe atrophy"), unilateral amyotrophic lateral sclerosis (ALS), idiopathic degeneration of pyramidal tracts (so-called Mills syndrome), multiple sclerosis (especially in its early stages) and diseases of the cervical spinal cord. So many different etiologies imply very different therapeutic strategies and prognosis (both *quoad vitam* and *quoad valetudinem*), and this makes an accurate diagnosis imperative.

In some cases, however, definite diagnosis is prevented by a lack of pathological confirmation and a descriptive formulation (CSAH) must be used in these instances. We report 4 cases of CSAH with a long follow-up and benign course that, to our knowledge, have not been previously described.

## Report of cases

*Case 1.* - This man was first hospitalized in 1959, when aged 38; he complained of L sided weakness since age 25, and reported a slow onset with arm and leg involvement from the beginning, but a predominant impairment of the leg. The course was very slowly progressive, with minor functional impairment. Neurological examination showed L facial palsy of central type, mild L spastic hemiparesis with extensor plantar response and absence of abdominal reflexes on the L; muscle wasting was present, proximally predominant in the arm and distally in the leg, but neither fasciculations or sensation defects. CSF examination, EEG, skull x-ray and blood tests were normal. Widening of subarachnoid spaces over the L convexity was present at air pneumoencephalography.

He was re-examined 29 years later, in June 1988. Resting tremor and rigidity in the L arm had appeared since age 62, but he complained only of

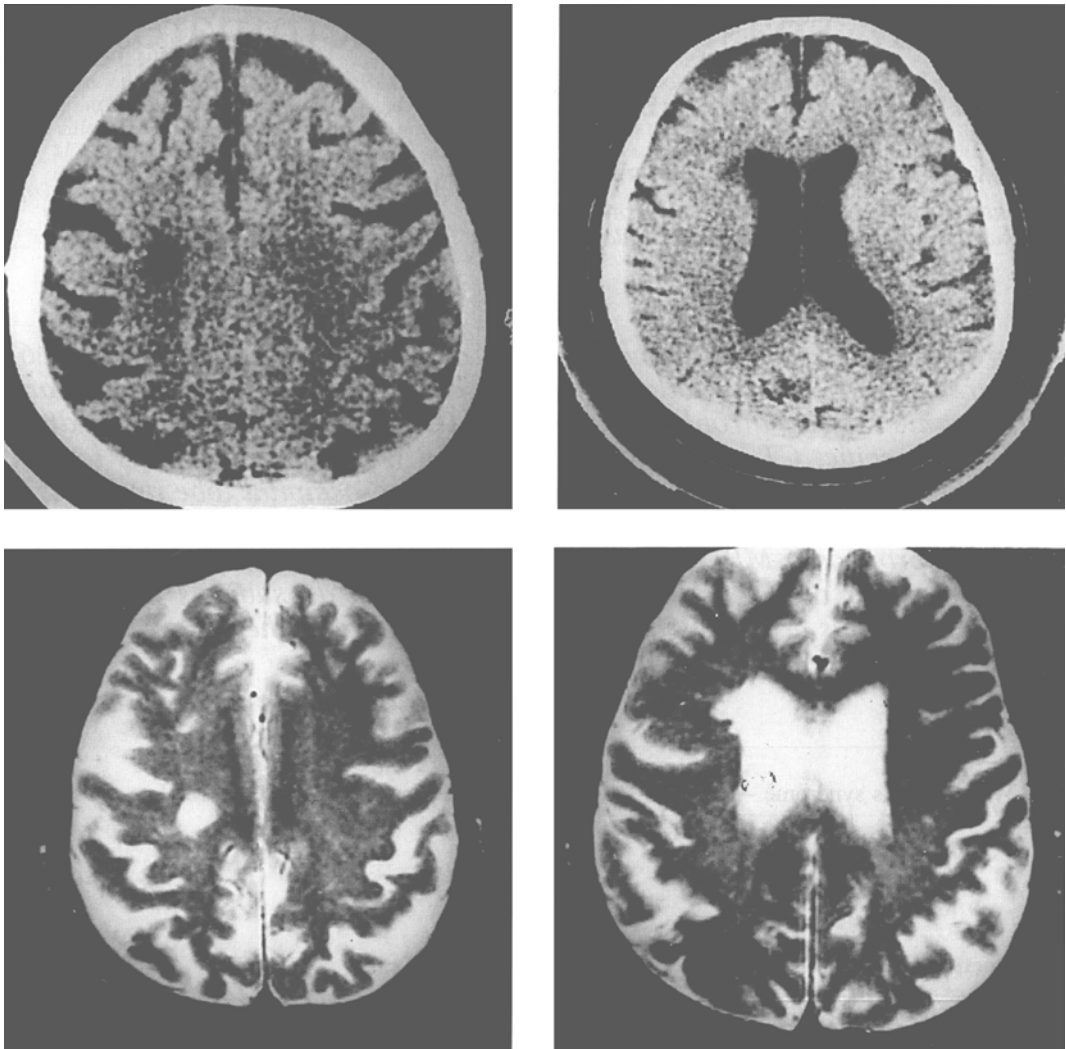


Fig. 1. Case 1. CT scan (A and B) and MRI (T2-weighted image) (C and D) showing two lacunar lesions at the R centrum semiovale and head of caudate.

moderate impairment of gait and object handling with his L hand. Weakness and atrophy appeared unchanged, and cogwheel phenomenon was present in the L arm. EMG examination was normal. Cerebral CT scan and MRI (Fig. 1) showed two R sided lesions in the centrum semiovale and head of caudate. Muscle CT scan showed diffuse atrophy involving all the muscle groups in the L calf and thigh.

**Case 2.** - A man presented in 1961, when aged 40, because of progressive L sided weakness dating back three years. He did not seek medical care

before coming to our Institute. His leg was first involved. Clinical examination showed mild to moderate L sided spastic hemiparesis, hyperreflexia with absent abdominal and cremasteric reflexes on the L and a proximally predominant, non-segmental muscle atrophy on the same side. A Babinski sign on the L and a questionable response on the R were found on plantar stimulation, but no sensation defects. CSF, EEG and blood examination were normal.

At follow-up, in July 1987, the patient was still independent. L hemiparesis appeared unchanged while atrophy was slightly increased. EMG

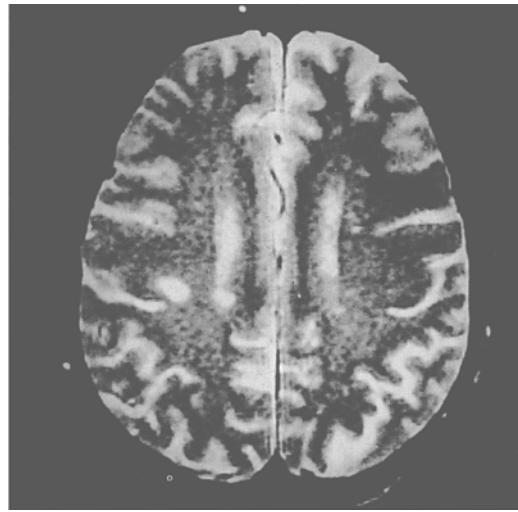


Fig. 2. Case 2. CT scan (A) showing a small lacunar lesion in the anterior arm of the L internal capsule (arrow). MRI (B) (T2-weighted image) showing multiple small periventricular hyperintense foci and an area of high-signal density in the R centrum semiovale, not detected by CT scan.

showed no alterations. Cerebral CT scan (Fig. 2a) revealed a hypodense lesion in the anterior limb of the L internal capsule; MRI showed multiple hyperintense foci in periventricular areas and a greater lesion in the R centrum semiovale (Fig. 2b). Muscle CT scan was not performed.

**Case 3.** - A 40-year-old man was hospitalized in 1967 because of a walking disorder which had started two years earlier when he complained of

slowly progressive weakness in the L leg. Neurological examination revealed mild hyposthenia and spasticity in the L leg, increased tendon reflexes, extensor plantar response and absence of abdominal reflexes on the L. Mild L sided distally predominant muscle wasting was observed, together with lowered skin temperature. Fasciculations and sensation defects were otherwise absent. CSF, EEG, skull X-ray and routine blood examination were normal. Pneumoencephalography revealed mild internal hydrocephalus at the R hemisphere.

We evaluated the patient again in February 1988, when he was 61: mild distal hyposthenia in the L arm was also present and muscle wasting in the L leg was slightly increased. Spontaneous movements on the L were weaker but nowhere abolished, the patient still being independent; hypothermia persisted. EMG examination was normal. CT scan (Fig. 3) showed R ventricular enlargement prominent in the trigone and the occipital horn, and a hypodense area at the R parieto-occipital border zone. CT scan of the L calf and thigh revealed atrophy of all muscle groups. The patient refused MRI.



Fig. 3. Case 3. Transverse CT scan. R parieto-occipital hypodense lesion (cortical-subcortical).

**Case 4.** - This 54 year old woman was referred for neurological examination in September 1989 while hospitalized for gallstones. Clinical history revealed a 10-year mild weakness with difficulty in climbing stairs and transient pins and needles-like sensation in the R leg. When aged 53 she also complained of a slight difficulty in handling small objects with the R hand. Neurological ex-

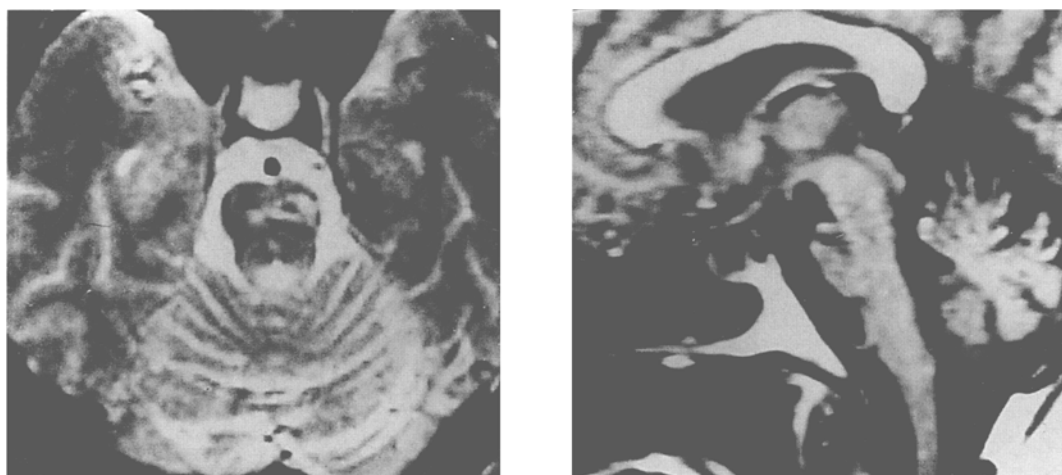


Fig. 4. Case 4. MRI showing a L sided lesion within the pons, involving the pyramidal tract zone (A: axial T2-weighted image; B: sagittal T1-weighted image).

amination revealed R sided spastic hemiparesis with facial palsy of the central type, hyperreflexia and extensor plantar response. Abdominal reflexes were absent on both sides. Mild hypothermia, with a sock-like distribution, was found at the R foot and a slight distally predominant muscle atrophy on the R. Normal findings were obtained at EMG, EEG, skull and chest X-ray, routine blood examination, visual and brainstem evoked responses.

CT scan revealed only slight enlargement of the subarachnoid spaces in the posterior fossa. MRI (Fig. 4) showed a L sided hyperintense lesion within the basis pontis, at the pontomesencephalic junction. The lesion slightly extended beyond the midline.

At follow-up, 26 months later, both clinical and MRI findings were unchanged.

### Discussion

We have reported 4 patients with a syndrome of chronic spastic atrophic hemiparesis (CSAH), whose clinical features, listed in the table, may be summarized as follows: 1) a strictly unilateral and "pure" pyramidal disorder, without signs of lower motor neuron involvement; 2) a slow onset and a slow progression without major functional impairment and/or death; 3) associated muscle atrophy on the affected side; 4) an ascending course (from lower to upper limb). Additional features may be hypothermia of paretic limbs and facial nerve palsy.

CSAH may be viewed as a syndrome with different underlying etiologies such as ALS, multiple sclerosis, expanding lesions within the cerebral hemispheres and rare cases of Mills syndrome.

TABLE I. Clinical features of CSAH patients.

	Sex Age (ys)	Age at onset	Follow up (ys)	Slow progr- ession	Spastic hemipa- resis	Exten- sor plantar res- ponse	Absent abdom- inal reflex	Ascend- ing course	Muscle atrophy	Facial palsy	Hy- poth- ermia
Case 1	M/67	25	29	+	+	+	+	-	+	+	-
Case 2	M/66	37	26	+	+	+	+	+	+	-	-
Case 3	M/61	38	21	+	+	+	+	+	+	-	+
Case 4	F/54	44	2.2	+	+	+	+	+	+	+	+

+ Sign present

- Sign absent.

The neurologist confronted with CSAH has therefore to address differential diagnosis among the heterogeneous diseases with very different prognosis and treatment.

In our cases expanding cerebral lesions were ruled out by neuroimaging studies and clinical follow-up. A diagnosis of ALS was unlikely because extensive studies failed to demonstrate any clinical and/or EMG sign of lower motor neuron involvement; furthermore, both autonomy in daily living and mean survival from onset were much greater than expected for ALS. Multiple sclerosis was unlikely in our patients because of the absence of a relapsing-remitting course, absence of multifocality and temporal disc pallor at fundus examination, normal findings at cerebrospinal fluid examination (patients 1 through 3) and visual and brainstem evoked potentials (patient 4).

We also considered a diagnosis of primary degeneration of the pyramidal tracts or Mills Syndrome, the diagnostic criteria of which include: 1) a slowly progressive spastic hemiparesis with ascending course (distal to proximal, and lower to upper limb), associated on the affected side with: 2) vasomotor disturbances (hypothermia and/or cyanosis), 3) muscle atrophy without a segmental distribution, no fasciculations or signs of denervation on electrical examination, 4) absence of objective sensory loss, cerebellar, extrapyramidal signs and sphincter disturbances [15]. Our cases fulfil these criteria.

Mills Syndrome is referred to as a "spinal form" of unilateral ascending paralysis on the basis of only post mortem examination showing degeneration of direct and crossed pyramidal tracts in the spinal cord, extending into the pons [10, 13]. However, the hypothesis that Mills Syndrome may be also due to hemispheric lesions was suggested by Cossa et al [3, 4] on the basis of several findings pointing to intracranial involvement in some cases, such as facial palsy and wasting of the tongue, and cortical atrophy involving mainly the motor cortex at air pneumoencephalography and biopsy. Because of the absence of further pathological and neuroimaging data the question of the lesion site (spinal, cortical or both) is unsettled at present.

Mills Syndrome has been distinguished into primary (or idiopathic) forms and secondary forms [15]. The latter may result from multiple sclerosis [12], ALS [2, 8, 9, 14], diseases of cervical spinal cord due to spondylosis [1], anomalies of cervical

spine [6] and atlanto-occipital joint [7]. Given the hypothesis that idiopathic Mills Syndrome is the result of primary degeneration of pyramidal tracts, the question of its relationship to ALS remains unanswered. Indeed, idiopathic Mills Syndrome is sometimes simply considered a variant of ALS ("hemiparetic or Mills variant of ALS") [2, 8, 9, 14, 17]. In a recent report [5] it has been described in association with multiple lacunar infarcts of the periventricular and subcortical white matter. So, a multiple etiology for idiopathic forms of Mills Syndrome may be hypothesized.

In our cases the nature of the observed white matter lesions (WMLs) remains uncertain, since they are not specific and pathological confirmation is not available; moreover, some of them may be chance findings in aged patients. Even the causal relationship between WMLs and CSAH cannot be demonstrated beyond doubt, due to the long time interval between onset and neuroimaging studies. Such a relationship, however, is strongly suggested by the concordance between side of lesions and clinical findings.

The clinical course and the young age at onset in our cases makes a vascular etiology unlikely (though this statement may well be untrue for individual cases), and the long slowly progressive course without other signs of central nervous system involvement makes a diagnosis of multiple sclerosis improbable.

Explanation of muscle atrophy in CSAH is based on damage to the parietal lobe or fibers descending from it, since atrophy is a well-known feature of such lesions, even in the absence of sensory defects [16]. Vegetative disturbances such as hypothermia and cyanosis may result from lesions within the supranuclear regulation apparatus of the autonomic nervous system descending from the frontal lobe and limbic system together with corticospinal fibers.

In conclusion, our cases of CSAH lack pathological confirmation so that diagnosis remains undefined; they could be cases of idiopathic Mills Syndrome with associated cerebral lesions, but this hypothesis remains unproven. Our study shows that MRI is useful in making a differential diagnosis between CSAH and ALS or allied disorders which may mimic CSAH. At all events, patients with WMLs and CSAH may have a good prognosis and are to be kept distinct from ALS patients. Further studies are necessary in order to clarify the nature of the WMLs observed.

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## Sommario

Vengono presentati i dati clinici e neuroradiologici relativi a quattro pazienti (età media 62 anni, range 54-67; follow-up medio 19,5 anni, range 26 mesi-29 anni) affetti da emiparesi cronica spastica ed atrofica (CSAH). La TAC e la RMN cerebrale hanno evidenziato la presenza di lesioni localizzate nel centro semiovale in due casi, in regione parieto-occipitale e a livello del ponte in un caso ciascuno. Questo studio sottolinea il fatto che i pazienti con CSAH possono presentare una prognosi favorevole a lungo termine. Lo studio con RMN cerebrale può evidenziare lesioni a livello della sostanza bianca emisferica o del tronco cerebrale ed è pertanto indicato in tutti i soggetti con CSAH. Tuttavia, ulteriori studi sono necessari al fine di chiarire la natura delle lesioni osservate.

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## References

- [1] ABOULKER J., METZGER J., DAVID M., et al.: *Les myélopathies cervicales d'origine rachidienne*. Neuro-chirurgie. 11:87-198, 1965.
- [2] BONDUËLLE M.: *Amyotrophic lateral sclerosis*. In: Vinken P.J., Bruyn G.W. eds. *Handbook of Clinical Neurology*. Amsterdam: North Holland Publishing Company, Vol. 22, pp. 281-349, 1975.
- [3] COSSA M.P.: *Une nouvelle preuve de l'origine cérébrale du syndrome de Mills*. Rev. Neurol. 103:323-324, 1951.
- [4] COSSA P., MARTIN P., LOMBARD H., et al.: *Révision du Syndrome de Mills*. Presse Méd. 60:419-420, 1952.
- [5] DALLA VOLTA G., MAGONI M., VANGI D., VIGNOLO L.A.: *Role of MRI in the diagnosis of Mills Syndrome*. Ital. J. Neurol. Sci. 10:519-521, 1989.
- [6] GUILLAIN G., MOLLARET P.: *Syndrôme de Klipper-Feil, avec quadriplégie spasmodique, variété étiologique particulière de l'hémiplégie spinale ascendante chronique*. Rev. Neurol. 1:436-444, 1931.
- [7] LABAUGE R., MENARD A., SIMON L.: *Hémiplégie ascendante et progressive de type Mills avec malformation de la charnière cervico-occipitale*. Rev. Neurol. 103:469-474, 1960.
- [8] MALIN J.-P., POBURSKI R., REUSCHE E.: *Klinische varianten der amyotrophen lateralsklerose: hemiplegischer typ der ALS und Mills Syndrome. Ein kritischer ruckblick*. Fortschr. Neurol. Psychiat. 54:101-105, 1986.
- [9] MARIE P., CHATELIN C., BOUTTIER H.: *Forme hémiplégique de la Sclérose Latérale Amyotrophique*. Bull. Méd. (Paris) 43:925-930, 1919.
- [10] MILLS K.C.: *A case of unilateral progressive ascending paralysis, probably representing a new form of degenerative disease*. J. Nerv. Ment. Dis. 27:195-200, 1900.
- [11] MILLS K.C., SPILLER W.G.: *A case of progressively developing hemiplegia, later becoming triplegia, resulting from primary degeneration of the pyramidal tracts*. J. Nerv. Ment. Dis. 30:385-97, 1903.
- [12] MILLS K.C.: *Unilateral ascending paralysis and unilateral descending paralysis. Their clinical varieties and their pathologic causes*. J.A.M.A. 47:1638-1645, 1906.
- [13] MILLS K.C.: *A case of crural monoplegia probably representing the early stage of a unilateral ascending paralysis due to degeneration of the pyramidal tracts*. J. Nerv. Ment. Dis. 115:115-116, 1906.
- [14] O'REILLY D.F., BRAZIS P.W., RUBINO F.A.: *The misdiagnosis of unilateral presentations of amyotrophic lateral sclerosis*. Muscle and Nerve 5:724-726, 1982.
- [15] RONDOT P.: *Mills' syndrome*. In: Vinken P.J., Bruyn G.W., eds. *Handbook of Clinical Neurology*. Amsterdam: North Holland Publishing Company, Vol. 1, pp. 202-205, 1975.
- [16] SILVERSTEIN A.: *Diagnostic localizing value of muscle atrophy in parietal lobe lesions*. Neurology 5:30-55, 1955.
- [17] VICTOR M., ADAMS R.: *Principles of Neurology*. New York, McGraw Hill, p. 890, 1985.