LETTERS TO THE EDITOR

The rostrocaudal gradient for somatosensory perception in the human postcentral gyrus

Anatomical organisation of the primate postcentral gyrus has been described in terms of several different cytoarchitectures.[1 2] Powell and Mountcastle stated that the area 3 was a typical koniocortex with granular cells, whereas in areas 1 and 2 the morphological characteristics changed gradually to the homotypical parietal association cortex in the monkey *Macaca mulatta*.[1] Iwamura *et al* reported the physiological correlates on the anatomical rostrocaudal axis in monkeys.[2] The ratio of skin neurons to total neurons was the largest in area 3b and decreased gradually toward the caudal part of the postcentral gyrus.[2] Specific types of stimulation such as rubbing of the skin in certain directions were effective in activating some of the caudal part of the postcentral gyrus. The anatomical and physiological data in the primate lead to the reasonabe hypothesis that there is a rostrocaudal functional gradient within the postcentral gyrus. This notion may explain why a lesion in the postcentral gyrus causes varied sensory disturbance in various people.

A 49 year old right handed man suddenly developed dysaesthesia in the right hand. This recovered gradually, but 1 month later he still had an impaired tactile recognition for objects. His voluntary movements were skillful. Deep tendon reflex was slightly exaggerated in his right arm. Babinski's sign was absent. His language was normal. Brain MRI on the 35th day after the onset showed a laminar necrosis on the caudal edge of the lateral portion of the left postcentral gyrus (figure).

Somaesthetic assessment was done during the 21–28th days of the illness.

Elementary somatosensory functions were assessed, including light touch (long fibre cotton), pain (pinprick), thermal sensation (cold and hot water), joint position sense (tested by the ability of the patient to identify flexion or extension of fingers with closed eyes), and vibration sense (128-Hz tuning fork).

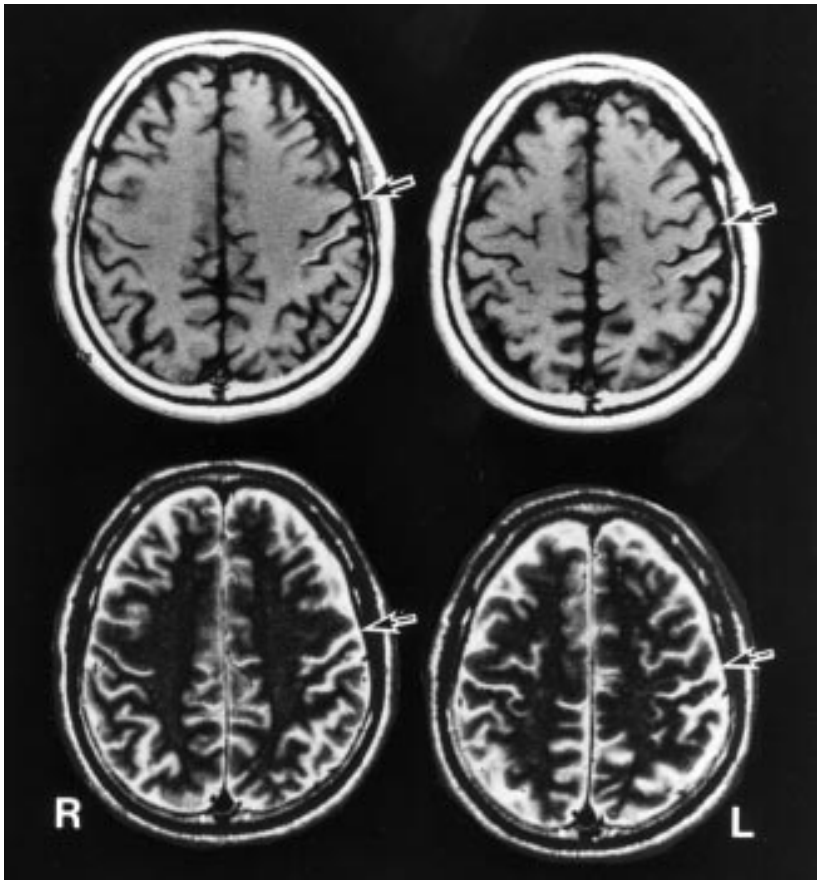
Intermediate somatosensory tasks were carried out. For two point discrimination, the examiner placed a pair of plastic needles of a slide caliper on the index finger pad of the patient, who had his eyes closed, and asked him to answer the number of touched needles, "one" or "two". For tactile localisation the examiner touched a point on the right or left hand of the patient, who had his eyes closed, with a brush, then asked him to indicate the point by touching the place with the first finger of the counter hand. For weight perception, the patients were asked to arrange the stimuli in a correct order of the weight with either the left or right hand. The stimuli were six metal plates of equal size, shape, and texture weighing 50, 60, 70, 80, 90, and 100 g. For texture perception, we prepared six wooden plates of an identical size and shape, on which one of six different textures (sandpaper, felt, wood, wool, fine grain, synthetic rubber) were mounted. The patient palpated one texture by either hand with his eyes closed. Then he was asked to select tactually a correct one among the six textures. For shape perception (three dimensional figures) the patient palpated one of the five wooden objects (cylinder, cube, sphere, prism, and cone) with his eyes closed. Then he was asked to explain the shape verbally. For extinction, the examiner delivered light and brief tactile stimuli, using the tips of the index fingers, to the dorsal surface of left, right, or both hands of the patient.

For tactile object recognition, the 15 objects that are used in the naming list of the Western aphasia battery test were presented to either hand. For naming of objects, the patient was asked to name a single manipulated object. In matching of objects, the patient first grasps a single object among a selection of five objects, and then he was asked to select the correct object among the five.

In elementary sensory function, the test for light touch, pain, thermal sensation, joint position sense, and vibration sense demonstrated no abnormalities for both hands. The results of intermediate sensory tests showed that in all tests, except for shape perception, we could detect no disturbance in both hands. He could not discriminate the shape with his right hand. The correct responses were 5/5 with the left hand and 0/5 with his right hand. The correct responses in the tactile naming test were 2/15 for the right hand and 15/15 for the left hand. The correct responses of the tactile-tactile matching test was 4/15 with his right hand and 15/15 with his left hand. So the abilities of tactile recognition and tactile-tactile matching were disturbed with the right hand.

According to Delay, disturbances of the tactile process in the cortex are classified into at least three types.[3] Ahylognosia is a distubance in the ability to discriminate materials. Amorphognosia is a disturbance in the differentiation of forms. Tactile agnosia is the inability to recognise the identity of objects in the absence of ahylognosia and amorphognosia. In Delay's terms, our patient showed amorphognosia but not tactile agnosia. Iwamura and Tanaka suggested that the hand region of area 2 in the rhesus monkey is concerned with the tactile perception of the discrimination of certain object forms.[4] The lesion localised at the equivalent cortical region. This region thus may be critical for the tactile discrimination for shape.

Rich intrinsic corticocortical connections are demonstrated within the rhesus monkey's postcentral gyrus, starting from Brodmann area 3b and projecting to areas 1 and 2.[5] This corticocortical connection may be a main route of inputs to area 2. This suggests that within the postcentral gyrus somatosensory information is processed from primary sense reception to integrating and more associating stages. The results from our patient are compatible with the notion that in the caudal portion of the human postcentral gyrus the more complex process such as shape perception is processed.



Brain MRI of the patient. Transaxial T1 weighted (above) and T2 weighted images (below) are shown. The T1 weighted image disclosed a high intensity lesion distributed laminarly in the caudal edge of the left postcentral gyrus (Brodmann 1–2). Arrows indicate the left central sulcus.

K TAKEDA
Department of Rehabilitation, Tokyo Metropolitan Institute for Neuroscience, Tokyo Metropolitan Organisation for Medical Research, Tokyo, Japan

K TAKEDA
Y SHOZAWA
M SONOO
T SHIMIZU
Department of Neurology, School of Medicine Teikyo University, Tokyo, Japan

T KAMINAGA
Department of Radiology, School of Medicine Teikyo University, Tokyo, Japan

Correspondence to: Dr Katsuhiko Takeda, Department of Neurology, Japanese Red Cross Medical Center, Hiroo 4–1–22, Tokyo, 1–22, Shibuya-ku 150–8935, Japan

Correspondence to: Dr Katsuhiko Takeda
k-takeda@umin.ac.jp

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Isolated spastic paraparesis leading to diagnosis of Friedreich's ataxia

Friedreich's ataxia is the most common hereditary ataxia. This neurological disorder was initially defined by the association of ataxia, cerebellar syndrome, and pyramidal signs. Atypical forms are increasingly recognised. The gene was mapped to 9q13-q21.1 in 1988 and identified in 1996. We report on a patient with a spastic paraparesis, of which molecular analysis confirmed the diagnosis of Friedreich's ataxia.

A 39 year old woman without any past condition presented with difficulty in walking since the age of 20. Neurological examination showed a spastic paraparesis, with tetrapyramidal signs, including generalised brisk reflexes, bilateral Babinski's signs, and clonus at the knees and ankles. Spasticity only concerned the lower limbs and spared the arms. Spastic paraparesis resulted in impaired walking at the time of the examination. No other neurological abnormalities were found; notably, proprioception and vibration sense, and cerebellar function were normal. No sensory symptoms were noted. No skeletal deformities were found. All hematological investigations (including lactate and pyruvate concentrations, cholesterol, apolipoproteinemia, Vitamin E, very long chain fat acid concentrations, arylsulfatase, and hexosaminidase activities) were normal. Electromyography, sensory and motor nerve conduction studies in the upper and lower limbs, including sural nerve action potentials (right sural nerve action potential 7 μV, normal>6 μV; left sural nerve action potential 8 μV, normal>6 μV) were normal. Cardiological tests (electrocardiography, transthoracic echocardiography) were normal. Cerebral and spinal resonance MRI were normal. No familial condition was found, except the sister who presented the same symptoms. No mutations involved in mitochondriopathies were found (3243tRNAleu, 8344tRNALys, nt 8993). The molecular analysis of the gene coding for Friedreich's ataxia was performed by Southern blotting from DNA extracted from peripheral blood and showed two abnormal expansions of 2.5 kb and 3.1 kb on the chromosome 9q13-q21.1 (Dr M Schmitt, CHRU de Strasbourg, France). These expansions correspond to 830 and 1030 repeats. Diagnosis of Friedreich' s ataxia identified by an isolated paraparesis was definitevely retained.

Friedreich's ataxia, an autosomal recessive disorder, is one of the most common hereditary ataxias. The frequency of the gene is close to 1/90 in the general population and the prevalence of the disease is estimated to be 1/50 000. Diagnosis is classically based on the association of recessive inheritance, onset before the age of 25, progressive ataxia of the four limbs, loss of deep tendon reflexes, pyramidal signs, cerebellar dysarthria, distal loss of position and vibration sense, and electrophysiological evidence of axonal neuropathy.[1] Association of pes cavus, scoliosis, cardiomyopathy, hearing loss, diabetes, and retinal disease are inconstantly seen. By contrast, atypical clinical symptoms are increasingly encountered—for example, late onset, brisk reflexes, spasticity, and slow progression of the disease,[2] and idiopathic ataxia.[3] Friedreich's ataxia is a genetically homogeneous condition. The frataxin gene was mapped to 9q13-q21.1 in 1988,[4] and identified in 1996.[5] The mutations are most often GAA expansions located in the first intron.[5–7] Normal alleles range from 6 to 36 GAA repeats, whereas pathological alleles range from 90 to 1300 repeats. Ninety six per cent of patients are homozygous for GAA trinucleotide repeat expansions in the first intron of the frataxin gene. The remaining patients are compound heterozygotes for a GAA expansion and point mutations (missense, nonsense, and splice site mutations).[5 7] Frataxin, the protein encoded by the gene, is a protein associated with the inner mitochondrial membrane.[8] It is thought to regulate the flux of iron in or out the mitochondria. Identification of the mutated gene allowed the correlation of certain phenotypes with genotypes. Larger expansions of the GAA repeats are correlated with an earlier age of onset, a faster progression of the disease, and additional clinical manifestations such as cardiomyopathy, pes cavus, scoliosis, and extensor plantar responses.[6] The length of the expansion explains 50% of the variability of age at onset only. Other factors are certainly involved in the phenotype variability. We note that the correlations were established from expansions measured in lymphocytic DNA. We cannot exclude the possibility of somatic mutations. Thus, the length of expansion in affected tissues would be different from the length found in lymphocytes. Some punctual mutations (D122Y, G130V) are correlated with a mild phenotype.[7] Previous reports have noted that patients with Friedreich's ataxia could present with spasticity, usually associated with other neurological signs.[9] Our report of isolated paraparesis confirmed again that the phenotypic range of Friedreich's ataxia is much broader than previously considered.[3 6] In addition, the spastic paraparesis presented by our patient could be related to the cases of mitochondriopathies presenting with spastic paraplegia. Similar clinical symptoms in these two diseases can be an additional argument for the implication of frataxin in mitochondrial function.

G CASTELNOVO
B BIOLSI
A BARBAUD
P LABAUGE
Department of Neurology. CHU de Montpellier-Nîmes. CHU Caremeau. Avenue du Pr Debré. 30029 Nîmes Cédex. France

M SCHMITT
Service de diagnostic génétique (Pr JL Mandel). CHRU de Strasbourg. Faculté de Médecine. 11 Rue Humann. 67086 Strasbourg. Cédex. France

Correspondence to: Dr P Labauge
labauge@hotmail.com

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Marked increase of interleukin-6 in injured human nerves and dorsal root ganglia

Nerve injury, particularly of the brachial plexus, may result in lifelong disability and chronic pain, despite technically excellent reconstructive surgery. Studies of molecular changes in injured nerves may identify new treatments to enhance the success of nerve repair, such as with recombinant human neurotrophic factors. Interleukin-6 (IL-6) is a member of the neuropoietic cytokine family that includes ciliary neurotrophic factor (CNTF), leukaemia inhibitory factor (LIF), and oncostatin M. As there is increasing evidence of a neurotrophic role for IL-6 in animal models of nerve injury and inflammation,[1 2] we have studied, for the first time in humans, IL-6 protein in injured and control peripheral nerve and dorsal root ganglia, using specific immunoassay, immunocytochemistry, and western blotting. We report a most remarkable increase of IL-6 concentrations in acutely avulsed dorsal root ganglia and injured nerves.

Proximal and distal injured nerve segments were obtained from six adult patients with traction brachial plexus injury, ranging from 2 weeks to 10 weeks after trauma. Injured dorsal root ganglia were collected from seven adult patients with brachial spinal root avulsion injuries (central axotomy), ranging from 3 days to 15 months after trauma. Tissue removal was a necessary part of the surgical repair procedure; in all cases