Imagined movements cause pain and swelling in a patient with complex regional pain syndrome

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Complex regional pain syndrome type 1 (CRPS1) is characterized by pain, swelling, and sudomotor and motor dysfunction. The affected limb is exquisitely sensitive, and gentle movements can exacerbate symptoms. Local or spinal mechanisms, or both, may mediate symptoms, including pain. Evidence of altered sensorimotor processing suggests that symptoms may also be mediated by cortical mechanisms.[1] This clinical note reports on findings from one patient with CRPS1 in whom imagined movement of the affected limb, without local muscle activity or movement, increased pain and swelling.

Case report. A woman aged 34 years sought treatment for CRPS1 of the left hand 17 months after an uncomplicated wrist fracture. Management involved performance of a motor imagery task in which she was shown 56 pictures of a hand in various postures (28 left hands and 28 right hands) and was required to imagine adopting the hand posture shown without moving her hand. After performing the task, the patient reported increased pain and swelling in the affected limb.

The motor imagery task was repeated 7 days later. Before and after the task, which took ~3 minutes, pain intensity was assessed using a 10-cm visual analogue scale anchored with "no pain" and "worst possible pain," and finger swelling was assessed using the circumference of the second, third, and fourth digits midway between the metacarpophalangeal and proximal interphalangeal joints (Beiersdorf–Jobst hand-measuring tape, Charlotte, NC). Measures were repeated 60 minutes after the task, during which time the patient sat quietly with her affected hand placed comfortably on her lap.

The following day, to confirm that any effect of motor imagery was associated with the affected hand, the task was repeated, but pictures of the left (affected) hand were removed, and each picture of the right hand appeared twice in random order.

Muscle activity during the task. To verify that there was no muscle activity during the motor imagery tasks, EMG activity was recorded using surface electrodes (DE-2.3, Delsys, Boston, MA; preamplified 1000×; band filtered, 20 to 450 Hz) placed over the wrist extensors and wrist flexors and the biceps brachii of each arm. To verify that any effect was not caused by autonomic arousal, heart rate and galvanic skin response (GSR) were monitored. The patient was asked whether the task was stressful.

During the task, there was no detectable EMG activity or increase in heart rate, although there was a GSR, which was consistent with low-level autonomic arousal, that commenced ~10 seconds before completion of the task. Pain and swelling were greater post-task but had returned to pretask values at 60 minutes. Thus, the data corroborated the patient's report from 7 days earlier. This effect was not observed for performance of the second (unaffected hand only) task (figure). The patient indicated that neither task was stressful, which suggested the slight GSR observed in the first study was consequent to an increase in pain.

Discussion. In this patient, imagined movements caused an increase in pain and swelling in the painful hand. The effect was not mediated by changes in muscle activity or by a stress response because there was no change in EMG or heart rate and only a late GSR, which was more consistent with a response to pain. Finally, imagined movements of the unaffected hand did not elicit the effect.

Pain associated with imagined movements appears consistent with modern theories of pain that emphasize a common process underlying motor-behavioral outputs and pain, but those theories do not offer a neural correlate of that process.[2,3] Possible mechanisms underlying the effect may involve the posterior parietal cortex, which contains representations of working body schema and is active during imagined and executed hand movements.[4] This region also contains neurons that combine nociceptive and other sensory inputs to provide an integrated output pertaining to threat to bodily tissue.[5] In a chronically active and sensitized nociceptive system, perhaps activation of the body schema for the affected part is sufficient to elicit such an output. That output could evoke swelling in the limb via projections to the amygdala, the internal circuits of which are thought to be capable of associating autonomic responses with specific behaviors.[6] Alternatively, attention to the affected limb or preparing to move the affected limb may activate descending facilitatory projections from the rostroventral medulla to spinal nociceptive neurons.[7]

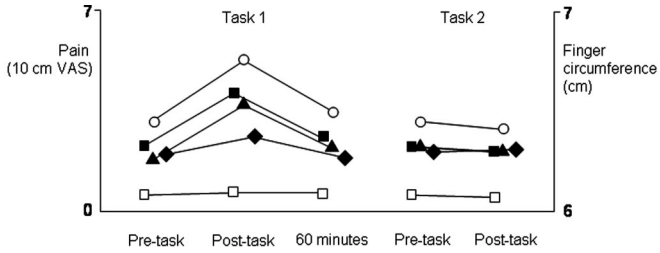

Figure. Pain (open circles) and circumference (cm) of the second digit (filled squares), third digit (filled triangles), and fourth digit (filled diamonds) of the affected hand and the second digit of the unaffected hand (open squares) before, after, and 60 minutes after the first task and before and after the second task.

In summary, imagined movements caused an increase in pain and swelling, even though there was no muscle activity or movement of the limb. Although the mechanisms are not understood, this finding implies that symptoms of CRPS1 may be mediated in part by cortical mechanisms associated with movement of the affected part.

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State-specific projections through 2025 of Alzheimer disease prevalence

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State-specific estimates of[1] urrent and future prevalence of Alzheimer disease (AD) are necessary for state planning because states vary greatly in population age structures, which determine disease prevalence.[1] We calculated prevalence rates using AD incidence estimates from a population study[2] of a geographically defined biracial (black and white) community of Chicago, National Center for Health Statistics data,[3] and US Census Bureau Data. We used data from the 2000 census[4] for 2000 estimates and state-specific mortality and population projections[5] corresponding to middle-series estimates for the national population for future years. This approach is similar to that used for previous estimates and projections of nationwide prevalence of AD.[6,7]

Current numbers of people with AD in each state depend strongly on total population size and proportion of the population affected. The latter, in turn, depends on the proportion of the total population in older age groups. Of seven states with ≥200,000 persons affected by AD in the year 2000, two (Pennsylvania and Florida) have high proportions of their total populations affected (2.3%), two (California and Texas) have low proportions affected (1.3%), and the remaining three (New York, Illinois, and Ohio) have approximately average proportions.

Future prevalence of AD may be characterized in four ways: future absolute number of affected persons, increase in the number with AD relative to the current number, change in percentage of the total state population affected, and change in the age distribution of affected persons. The 10 states predicted to have the highest absolute numbers of persons with AD in 2025 (California, Florida, Texas, New York, Pennsylvania, Ohio, Illinois, North Carolina, Michigan, and New Jersey) are the same 10 with the largest numbers in 2000 (please see the supplementary web table at www.neurology.org). However, the percentage increases in numbers with AD (figure) vary greatly, from 0% for Pennsylvania to 74% for Texas among these 10 states and from 0 to 127% among all states. Five states (Utah, Arkansas, Colorado, Wyoming, and Nevada) are expected to experience increases of >100%. These five states currently have small proportions of their population of all ages affected, but these proportions will increase as their relatively young populations age. All but four states (Rhode Island, Pennsylvania, Hawaii, and New Jersey) and the District of Columbia will experience increases in the proportion of the population with AD. In 2005, the percentage of persons with AD will range from a low of 0.9% of the total population of Alaska to a high of 2.9% of the total population in Florida. In 2025, the age distribution of persons with AD will be older. Currently, the highest proportion of persons with AD who are aged ≥85 is 46% among Iowa, Kansas, and North Dakota. By 2025, persons aged ≥85 will constitute 46% of those with AD in the average state and ≥50% in seven states (Hawaii, North Dakota, South Dakota, Minnesota, Iowa, Rhode Island, and Connecticut).

The current numbers of persons with AD and anticipated future increases in prevalence for individual states vary substantially from the average for the entire United States, 44%, by 2025 using similar methodology.[7] The states with the largest percentage increases (see figure) are all from the Western part of the country and most currently have relatively low absolute numbers of affected residents. Conversely, the states with the lowest rates of increase all are eastern and have substantial numbers of affected persons now. By 2025, in most of these states, the proportion of persons with AD who are aged >85 years will increase substantially, increasing the likelihood that they will have multiple health problems and suggesting that the burden of providing health services for older persons with AD will increase. Every state will experience a substantial increase in one or more measures of burden: number of people affected, proportion of the population of all ages affected, and older age distribution of the people with AD.

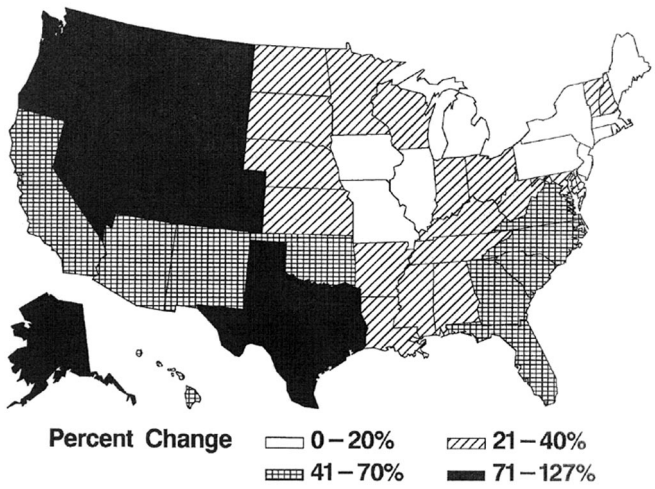

Figure. Percentage change in numbers of persons affected by Alzheimer disease expected between 2000 and 2025 in each state.

Strengths of our approach include use of AD occurrence estimates from a rigorously conducted population study that included blacks and use of incidence rates to estimate population prevalence. Weaknesses include not having substantial participants from other ethnic minority groups, including Hispanics, and that no single community study exactly represents any individual state. For residents of all states, the best response is to render these estimates inapplicable by seeking effective means of preventing AD.

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Prolonged interval between vertebral artery dissection and ischemic stroke

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Vertebral artery dissection (VAD) usually presents with posterior headache or neck pain followed within hours or days by posterior circulation stroke. We describe a patient with acute lateral medullary infarction 2 months after investigations for neck pain, which was subsequently identified as VAD.

Case report. A man aged 38 years was admitted after awakening with left-sided headache, right facial numbness, altered taste over the right side of his tongue, diplopia in all directions of gaze, vertigo, unsteadiness, and difficulty swallowing. Examination disclosed bilaterally restricted eye abduction, reduction in conjugate elevation, reduced pinprick sensation over the right cheek, midline ataxia, and a right extensor plantar.

Diffusion-weighted MRI performed the day after presentation demonstrated an acute left lateral medullary infarct (figure, A), and T1-weighted MRI with fat suppression demonstrated an intramural hematoma of the left vertebral artery, confirming the clinical suspicion of VAD (figure, B). A flow void was present in the left vertebral artery.

He was given the anticoagulant warfarin as secondary prevention against additional embolic complications. The patient's condition improved to allow discharge, with plans for follow-up scans at his local hospital to assess patency after 6 months.

Two months before the acute presentation, he had been investigated in the United States for a 10-day history of neck pain. There was little associated headache at this time. He recalled no previous trauma but reported worsening after spinal manipulative (chiropractic) therapy (SMT). Neurologic examination at that time had revealed no abnormalities. Head and cervical spine MRI performed at this presentation (i.e., after SMT) had been reported as normal, and his symptoms had responded, although not abated completely, to a reducing course of prednisolone. Review of this earlier MRI revealed absence of the left vertebral artery flow void and high signal in the region of the left vertebral artery, which, in retrospect, is consistent with dissection causing complete vertebral occlusion (figure, C). No specific vascular imaging had been performed at this presentation. There was no reported additional trauma in the interim 2 months between presentations.

Discussion. Our patient's imaging suggests a VAD had been present shortly after his initial presentation with neck pain, although his ischemic event occurred some 2 months later without further precipitant. Although classically a short interval between dissection and consequent stroke is accepted, this case indicates that the time frame from VAD to presentation with an ischemic event may be considerably longer than previously recognized.

The close temporal relationship of VAD to trauma has been the subject of case reports, but in clinical practice this is clouded by the often trivial nature of the insult and the recalled trauma being relatively distant in time compared with the generally accepted time frame.

The nature of the subsequent ischemic event is uncertain; however, given that no vertebral flow void was identified initially, but was present at time of his later presentation, it may be postulated that an embolic etiology after recanalization is likely.

The relationship of SMT to VAD is controversial. It has been estimated that between 1 in 200,000 and 1 in 1.7 million chiropractic neck manipulations are followed by stroke; however, whether this is a causal association has been debated, given that the neck pain associated with VAD may result in a chiropractic consultation.[1] This was the pattern in this patient, and it is unclear whether the initial neck pain that prompted SMT was consequent to dissection or whether the SMT itself caused VAD. A recent case-control study reported SMT to be associated independently with VAD, even after controlling for neck pain, suggesting causality in either the pathogenesis of the dissection or the subsequent ischemic complication.[2]

The possible influence of trauma may be further underestimated if longer intervals between dissection and ischemia than previously accepted occur. This carries clinical recognition and medicolegal implications because even remote trauma may be the precipitant of an ischemic stroke consequent to dissection.

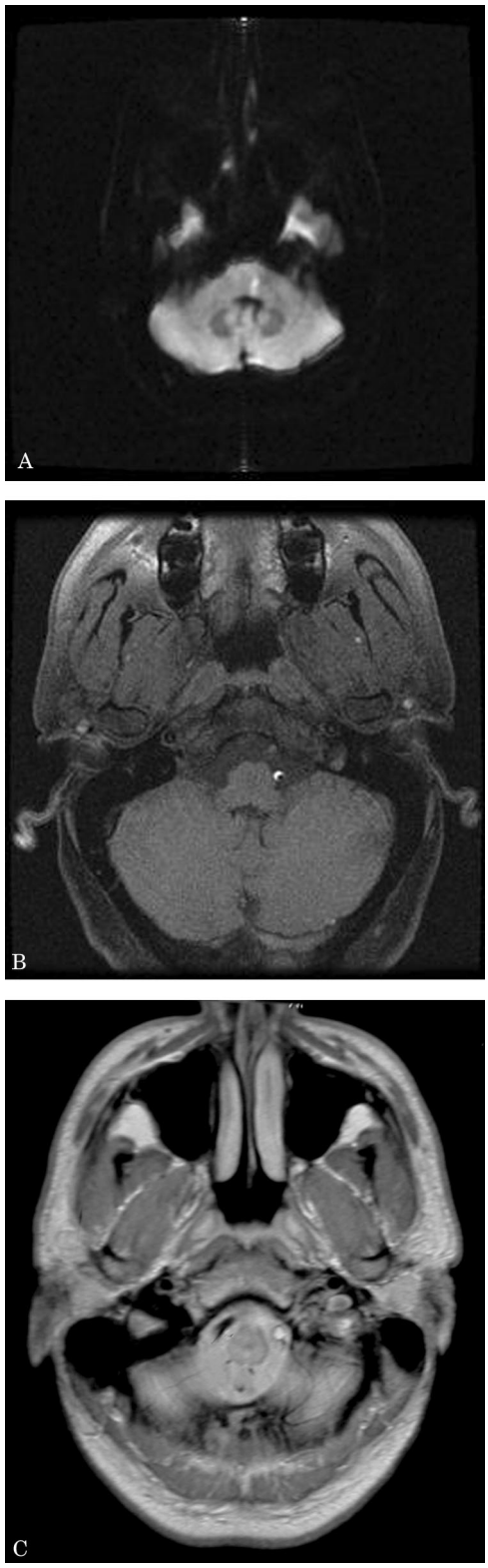

Figure. MRI appearances on admission. (A) Diffusion-weighted MRI with acute lateral medullary infarct. (B) Axial T1-weighted MRI with fat suppression demonstrating intramural hematoma within the left vertebral artery. (C) Earlier MRI demonstrating absence of the left vertebral artery flow void and intraluminal high signal.

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Carotid artery dissection after prolonged head tilting while holding a newborn baby to sleep

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Case report. A Chinese woman aged 41 years sought treatment at the Prince of Wales Hospital in Hong Kong in November 2001 for sudden-onset right eye blindness. She had good heath in the past and had a normal spontaneous nontraumatic delivery 2 months previously. She had acute loss of vision predominantly affecting the lateral aspect of right eye, which gradually resolved in few days with mild residual blurred vision. There was no preceding headache, neck pain, or other neurologic complaints. There was no recent history of trauma or exercise that involved excessive neck movement, such as yoga. On detailed questioning about any recent abnormal posture or exercise, she reported she had constant neck tilting to the right side every night since her baby was born 2 months earlier, so that her head was in constant contact with her newborn baby during sleep because the constant contact gave her psychological comfort. Physical examination was unremarkable except for the presence of a right carotid bruit. Examination of the eyes and fundi was normal.

Routine blood tests, including complete blood count, clotting profile, antinuclear antibody, and antiphospholipid antibody, were normal. Brain CT, EKG, and transesophageal echocardiogram were normal. However, carotid duplex ultrasound of the neck showed a long segmental stenosis of the right internal carotid artery with 70% reduction in diameter. Subsequent MRA and MRI 5 days after the onset of symptoms showed a dissection of the right internal carotid artery with intramural hematoma and intimal flap (figure, A). A false lumen was present suggesting that the dissection was there long before the onset of symptom. The right styloid process was found to be longer than the left one on CT of skull base (styloid process length, right, 30 mm; left, 26.6 mm; width at midpoint, right, 2.6 mm; left, 1.6 mm). Dynamic CT angiography of the extracranial carotid arteries with the head rotated showed a close proximity of the tip of the right styloid process to the proximal right internal carotid artery (figure, B through D). She was diagnosed with a symptomatic dissection of the right internal carotid artery. She was treated with anticoagulation for 3 months and had no additional visual disturbance or other neurologic deficit afterward.

Discussion. Spontaneous carotid artery dissection accounts for 2.5% of all strokes and 5 to 25% of strokes in young patients. It affects all age groups with a distinct peak in the fifth decade.[1] There is no overall sex preference; on average women are ~5 years younger than men at the time of dissection. Inherited connective tissue disorder (e.g., Ehlers–Danlos syndrome and Marfan syndrome), fibromuscular dysplasia, hyperextension, and rotation or chiropractic manipulation of the neck were known causes of this disorder.[1] Prolonged head tilting has been implicated as a cause of carotid dissection. A recent study reported carotid dissection after neck tilting during prolonged telephone conversation.[2] An elongated styloid process in this patient was thought to contribute to the injury to the carotid artery. In our patient, no precipitating factor for dissection could be identified apart from prolonged neck tilting. Furthermore, the styloid process was longer in the side

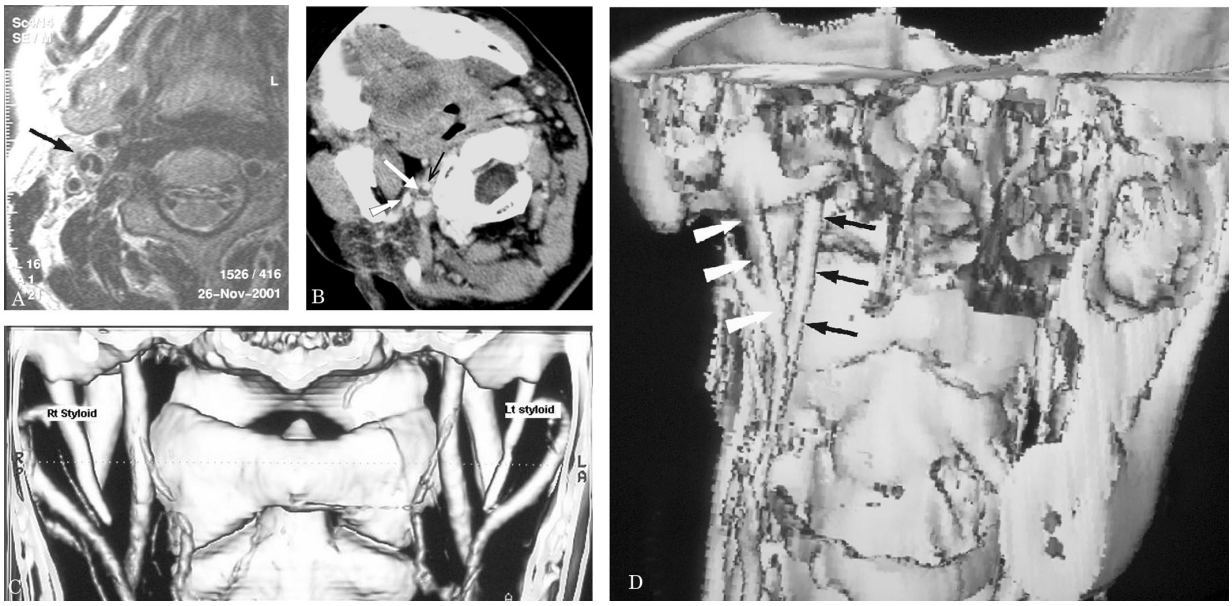

Figure. (A) MRI of the neck shows a false lumen of the right internal carotid artery opening into the true lumen (arrow). (B) Axial contrast-enhanced dynamic source image shows the subintimal hematoma (long/white arrow) between the true lumen (black arrow) and the right styloid process (short/white arrow). (C) Three-dimensional reconstruction of the CT angiogram with the head in neutral position shows a longer and broader styloid process on the right. (D) Three-dimensional reconstruction of the CT angiogram using surface-shaded display with the right mandible removed shows the elongated right styloid process (black arrows) pointing to the right internal carotid artery (white arrows) on rotation to the right.

where dissection occurred. A styloid process of ≥3 cm is regarded as elongated and is present in 4 to 7% of the population.[3] Moreover, the history of prolonged neck tilting posture during sleep every night also suggested that the styloid process might have caused damage to the carotid artery. We suggest that patients with carotid dissection should be asked about their sleeping posture, and new mothers should be advised not to sleep with their head excessively flexed laterally.

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Riluzole-induced neutropenia

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The glutamatergic antagonist riluzole was approved in 1995 for the management of ALS and has become its standard therapy.[1] Common side effects of the drug are nausea, asthenia, and reversible liver enzyme elevation.[2,3] Neutropenia is an extremely rare, not well-described, life-threatening adverse reaction of the drug. Only one case of reversible neutropenia associated with an inadvertent dose increase of riluzole to 200 mg/d has been reported previously.[4] A review of the pharmacodynamic and pharmacokinetic properties of riluzole in ALS reported only 3 cases of neutropenia among 4,000 patients who received the drug without any additional details.[5]

We report a patient who developed severe neutropenia in association with a standard dose (100 mg/d) of riluzole.

Case report. A woman aged 71 years with ALS was admitted to the hospital because of fever. She had a medical history of arterial hypertension and hypercholesterolemia and had undergone left mastectomy and breast reconstruction because of breast cancer 22 years earlier. She did not receive chemotherapy or radiotherapy. Three months before her admission, a diagnosis of ALS was made based on upper and lower motor neuron findings (clinical and EMG), and riluzole 50 mg twice daily was initiated. A complete blood cell count before riluzole therapy showed hemoglobin, 12.3 g/dL; platelets, 139 $\times$ 10^3/mm^3; and leukocytes, 4.8 $\times$ 10^3/mm^3 (neutrophils, 60%; lymphocytes, 29%; monocytes, 6%; and eosinophils, 4%).

On admission her oral temperature was 39.3 °C, and her physical examination was unremarkable for signs or source of infection. Her medication on admission included riluzole, 100 mg/d; atenolol, 50 mg/d; and ketotifen, 1 mg/d. Laboratory tests on admission were consistent with leukopenia and granulocytopenia: hemoglobin, 11.5 g/dL; platelets, 156 $\times$ 10^3/mm^3; and leukocytes, 1.24 $\times$ 10^3/mm^3. The leukocyte count differential was 18% neutrophils (absolute count, 0.22 $\times$ 10^3), 46% lymphocytes, and 27% monocytes. Blood and urine cultures were obtained. Blood for viral serologic tests was taken. A chest radiograph was normal. Empiric antibiotic therapy with piperacillin-tazobactam and amikacin, and filgrastim 300 mg/d subcutaneously were initiated.

The neutropenia was thought to be drug related, and an investigation of her medication favored riluzole as the possible offending drug; therefore, it was discontinued on admission. On hospital day 4, her leukocyte count increased to 7.33 $\times$ 10^3/mm^3 with an absolute neutrophil count of 5.22 $\times$ 10^3; filgrastim was stopped. Blood and urine cultures were sterile; fever subsided on day 6; and antibiotic drugs were discontinued. The patient was not rechallenged with riluzole and was discharged in good clinical condition.

Discussion. The management of ALS with riluzole, a benzothiazole antagonist of glutamatergic transmission, has become available recently in most countries. The exact mechanism of its action is unknown, but the drug decreases glutamate function via direct effects on the neurotransmitter itself and target receptors. In clinical studies, common side effects of riluzole included worsening of asthenia, dizziness, nausea, anorexia, and transient increase of liver enzymes levels.

Neutropenia, a severe, potentially life-threatening adverse effect of riluzole, is rare. Even in a dose-ranging study, in which an increased rate of adverse effects was noted in the higher dosing group, granulocytopenia was not reported.[3] To date only four patients have been reported: three were described among 4,000 patients that received riluzole therapy in the context of clinical trials, but no additional details are available;[5] one patient with reversible neutropenia was reported in the literature and was related to the accidental increase of the drug dosage from 100 to 200 mg/d.[4]

Myelosuppression is a common and anticipated adverse effect of cytotoxic chemotherapy. It is a potential but rare idiosyncratic effect with any other drug, but a recognized association with a number of high-risk agents justifies additional caution.[6] In our patient, severe neutropenia was observed 3 months after the initiation of a standard dose of riluzole. The onset of idiosyncratic occurrence of myelosuppression often is more insidious than with cytotoxic myelosuppression and may occur up to several months after drug exposure, as in our patient.[6] There is not a definitive test to prove an etiologic link in individual cases of drug-induced neutropenia. Recurrence on deliberate or inadvertent rechallenge provides the strongest evidence for drug-induced adverse reaction but cannot be recommended.[6] The patient we report was never rechallenged with the drug. Although several infections can cause leukopenia, the lack of detection of such disease, the selective granulocytic depression, and the recovery of neutrophil count after riluzole discontinuation make drug effect more likely.

No evident cause of neutropenia was found in this patient besides the drug-related interaction. Only riluzole therapy was discontinued, and neutrophil counts increased back to normal values several days after the suspected offending drug was suspended. The sequence of these events supports our assumption that reversible severe neutropenia was associated with riluzole therapy at a standard dose of 50 mg twice daily. The probability of the correlation between neutropenia and riluzole was assessed using the Naranjo probability scale, which yielded an estimation of "probable" for a drug-related interaction in this patient.[7]

Although this is an anecdotal case report, clinicians should be aware that a new-onset fever in a patient receiving riluzole treatment requires a complete blood cell count to exclude a potential life-threatening neutropenia.

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CSF tau and Aβ42 are not useful in the diagnosis of frontotemporal lobar degeneration

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Frontotemporal lobar degeneration (FTLD),[1] a neurodegenerative disorder presenting with a spectrum of behavior changes, executive disturbances, or aphasia, is often unrecognized. Patients with FTLD are many times considered to have a psychiatric disorder or Alzheimer disease (AD). Imaging studies and psychometric testing can be normal at an early stage.[2] CSF biomarkers have been considered in the diagnosis of FTLD. One study found that the combination of CSF tau and amyloid β(1–42) (Aβ42) provided assistance in the diagnosis of FTLD.[4] We investigated CSF tau and Aβ42 in FTLD compared with age-matched AD patients and cognitively healthy control subjects.

Methods. Thirty-five patients with FTLD (18 frontotemporal dementia, 11 semantic dementia, and 6 progressive nonfluent aphasia) were compared with 51 patients with probable AD[3] and 27 nondemented control subjects. All patients underwent a standard medical history, physical and neurologic examination, screening laboratory tests, psychometric tests, EEG, MRI, or CT. ^{99m}Tc-Hexamethylpropyleneamine oxide SPECT was performed in seven cases with normal or inconclusive findings on structural neuroimaging. Only patients whose clinical diagnoses were evaluated by a multidisciplinary team and supported by either structural or functional neuroimaging were included. All but two of the FTLD cases were sporadic. Genetic screening took place in one of the familial cases, yielding a P301L mutation. The clinical diagnosis was confirmed pathologically in one case, showing neuronal degeneration without tau pathology. The Clinical Dementia Rating Scale (CDR)[5] was used to assess dementia severity.

The control group consisted of 16 subjects with subjective memory complaints, who underwent the same examinations as the patients, 5 cognitively healthy subjects with a positive family history, as well as 6 healthy spouses of patients with no memory complaints.

CSF was obtained by lumbar puncture between the L3 to L4 or L4 to L5 intervertebral space after informed consent. Within an hour, CSF samples were centrifuged at 3,000 rpm for 10 minutes at 4 °C followed by storage in polypropylene tubes at −80 °C until analysis. CSF tau and Aβ42 were determined by sandwich ELISA (Innotest β-amyloid$_{(1—42)}$ and Innotest hTAU-Ag; Innogenetics, Ghent, Belgium).

Results. Clinical, demographic, as well as CSF tau and Aβ42 data are displayed in the table. No significant differences in CSF tau between the FTLD subgroups were found. In progressive nonfluent aphasia, Aβ42 was lower than in frontotemporal dementia ($p = 0.033$) and semantic dementia ($p = 0.015$).

A cut-off value of 908 pg/mL for CSF tau distinguished FTLD from AD at a sensitivity of 86% and a specificity of 26%. To distinguish FTLD from controls, a CSF tau cut-off of 193 pg/mL yielded a sensitivity of 86% at a specificity of 41%. For CSF Aβ42, a cut-off value of 315 pg/mL distinguished FTLD from AD at a sensitivity of 86% and a specificity of 59%. The number of FTLD patients that was correctly classified by a CSF tau range between 193 and 908 pg/mL and a CSF Aβ42 value higher than 315 pg/mL was 21 (60%).

Discussion. Even though significant differences were found, there was extensive overlap of CSF tau and Aβ42 values between FTLD, AD, and control subjects. In a relatively young population where the a priori chance of FTLD is at best 50%,[6] the positive predictive value of a CSF tau value between 193 and 908 pg/mL combined with a CSF Aβ42 value higher than 315 pg/mL would be 51% with a negative predictive value of 52%, which is not above chance level. Therefore, we conclude that measurement of tau and Aβ42 in CSF is not useful for the diagnosis of FTLD.

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Table *Clinical and demographic data and values of CSF biomarkers*

Data	FTLD, n = 35	AD, n = 51	Controls, n = 27	Statistical significance
Age, y	61 (51–85)	63 (53–78)	66 (39–76)	$p = 0.497$
Sex, M:F	23:12	22:29	11:16	$p < 0.001$*
CDR	1 (0.5–2)	1 (1–3)	—	$p = 0.009$*
Disease duration, y	3 (1–11)	4 (1–11)	—	$p = 0.014$*
CSF tau, pg/mL	353 (49–1,740)	632 (195–1,822)	298 (95–993)	FTLD vs AD, $p = 0.002$* FTLD vs controls, $p = 0.029$*
CSF Aβ42, pg/mL	565 (178–1,225)	298 (124–592)	634 (232–1,243)	FTLD vs AD, $p < 0.001$* FTLD vs controls, $p = 0.125$

Values are medians (range).

* Significant differences. For statistical analysis, nonparametric tests were used (Kruskal–Wallis, Mann–Whitney); differences in male/female distribution were analyzed using the χ^2 test.

FTLD = frontotemporal lobar degeneration; AD = Alzheimer disease; CDR = Clinical Dementia Rating Scale; Aβ42 = amyloid β (1–42).