pigmented carcinoma invading the thyroid and the right wall of the trachea. He was treated with ablative of the right thyroid lobe, thyrеectomy, and three courses of chemo-
therapy (CCDP, 5FU) followed by radiation therapy (70 Gy) and upper mediastinum (45 Gy) with a 20 Gy dose in the sub-glottic area. The calculated total radiation dose received on the spinal cord was 48 Gy at the C6 level (maximal dose at 2 cm high on the spinal cord) and 42 Gy at the cervical region (including C7) and 41 Gy for T1. There was no development of the mass on regular CT scans. The only treatment was thyroid hormones after surgery.

Three years after finishing radiation therapy and after transient parasthesia of the hands and a Lhermitte sign (lasting less than two weeks), the patient developed progressive wasting and weakness of both hands and forearm extensors. He had no symptoms in the legs nor sphincter disturbance. We found no sensory abnormality (except a questionable reduction of tactile perception on the inside of the arm) nor any muscle mass loss, and tendon reflexes were present except supinator and triceps jerks on both sides. Neurological examination else-
where was normal.

Electromyographic examination showed fibrillation, giant potentials and some fasci-
culations in right and left hand muscles, and reduced recruitment in forearm extensors. The signal intensity of the arm muscles and muscles of the face and legs were normal. Motor conduction velocities, distal motor latencies, and amplitude of sensory potentials were normal in all limbs. Values of somato-
motor evoked potentials were in the normal range after median and posterior tibial stimulation. Haematological, biochemical, and hepatic routine tests, thyroid hormones, lipidogram, syphilitic serology, viral serology, serum creatine phosphokinase concentra-
tions were normal. Cerebrospinal fluid was normal for cellular count, biochemistry and protein electrophoresis.

Cervical MRI was performed five months after the end of ablative therapy and showed some abnormalities on a 1.5 Tesla superconductive magnet (Magnetom Siemens). Two excitations and a display matrix of 256 × 256 were used; the section thickness was 4 mm. Sagittal and axial studies showed a cystic lesion with well defined borders and a signal isointense with respect to CSF on T1 weighted images (TR = 500 ms, TE = 15 ms) and T2 weighted images (TR = 10 ∗ 10, TE = 27 ms) within the spinal cord from C4 to C6 and a smaller cavity behind the body of the atlas (figure). There was no enhancement of this image after IV injection of gadolinium and the cerebellar tonsils showed no ectopic position. The fatty replacement of spinal bone marrow due to radiation therapy accounted for the high signal intensity of the cervical spine on the same level. The thoracic MRI was normal. There was no change in neurological condi-
tion after eight months.

This case fulfills the strict criteria estab-
lished for an accurate diagnosis of radiation myelopathy: 1) the site of irradiation included the area of radiation; principal neurological manifesta-
tions compatible with the irradiated portion of the cord; other possible aetiologies such as compression due to metastases excluded by neurological investigations; and a latent period of at least nine months before the development of symptoms. Radiation myelopathies may be divided into five main types:1-4 transient myelopathy (the more common and generally marked only by a Lhermitte sign); chronic progressive myelopathy; arrested radiation myelopathy; selective anterior horn cell injury or amyotrophy; and disseminated demyelination of the cen-
tral nervous system. Our patient was in the fourth category as there was weakness and amyotrophy without significant sensory change, sphincter disturbance, or clinical involvement of corticospinal tract. There was electrophysiological evidence of an involve-
ment of the anterior horn: giant potentials and normal motor and sensory conduction velocities. MRI data agree with this location. A coincidence, however, cannot be excluded but the only alternative diagnosis would be idiopathic syringomyelia for which the clini-
cal picture, without a considerable sensory problem, the rapid progression of symptoms, the absence of Chiarl or kyphoscoliosis would be atypical. There was no evidence for a syrinx secondary to an intraspinal tumour (thoracic MRI normal). Furthermore, before the wasting of the hands, a Lhermitte sign occurred, which is a common symptom of radiation myelopathies.

Nevertheless, to our knowledge such a clinical presentation has not previously been described. All reports of delayed lower motor neuron syndrome after radiation concern the legs, generally after irradiation for lym-
phomas or testicular malignant tumours.3,4 These motor neuron syndromes usually present as a progressive weakness of the legs without sensory or sphincter disturbance. Development stops after some months or years and so far the prognosis is better than in other forms of myelopathy. Signs suggestive of a cervical anterior horn involvement (muscle wasting, fasciculations, tendon reflex loss) have been mentioned in some cases but they were associated with corticospinal and long sensory tract lesions (mainly Brown-Sequard syndrome).

The pathogenesis of radiation myelopathies remains controversial, but vascular changes are almost constant and are considered as the primary damage rather than neuronal or immunological disorders. As the grey matter is classically considered less vul-
erable to radiation than white matter, the anterior horn is presumed to be less or not involved, although in several anatomical cases of radiation myelopathies an extension of lesions towards the anterior horns has been reported.5-8 There are no well documented anatomical reports of motor neuron syn-
dromes after radiation and some controversy exists as to the site of lesions (anterior horn, motor anterior roots, or plexus), but clinical and electrophysiological data from most cases suggest an involvement of the anterior horns.7

We know of only one report of MRI data from a patient with motor neuron syndrome of the legs and the site of spinal cord images were normal.8 In a case reported by Lechavalier et al a patient had Brown-Sequard syndrome after radiation with prox-
imal wasting and weakness of the left arm. Histological examination of the cervical spinal cord showed a centrospherical necrosis with complete neuronal loss of the left anterior horn. Perhaps in our case the spinal cord on MRI was secondary to necrosis involving the cervical anterior horn.

References

10. Kristensson O, Melgard P, Schmidt AV, Radia-

Figure Sagittal T1 weighted SE (500 ms) 15 ms image showing cystic hypertensive cavity affecting spinal cord from C4 to C6 without ectopic tonsils. Note fatty replacement of cervical spine bone marrow from C2 to C6, responsible for hyperignal on T1 weighted images.


The incidence of muscle cramp

In true muscle cramp there is sudden involuntary and painful shortening of muscle and visible or palpable knotting of muscle often with abnormal posture of the affected joint which is relieved by stretching or massage.1 Early reports on muscle cramp data on muscle cramp are scarce and based upon empiricism. Wilder in 1940 found that 19% of young soldiers, 33% of workers in a silk mill, and 67% of medical staff suffered from medically explicated muscle cramp. The incidence in a group of internal, neurological, and psychiatric patients was 40%.3 In a study in 1947 of 100 men and 100 women aged 15-80 years, Hall found that 5% had suffered from cramp; of those aged 50 years or more, 70% had suf-
fed.4 Of 121 college students questioned in 1956, Norris found that 115 had experienced spontaneous muscle cramp at least once, 18

being woken from sleep more than twice a month, usually by cramp in the calf muscles.1
We studied the incidence of muscle cramp in adults in The Netherlands.

Telephone ownership in The Netherlands is universal. After a study to estimate the incidence of muscle cramp and indicate the extent of the sample, 780 numbers were randomly selected from the telephone directory by a computer (95% confidence interval 17.5% to 22.5% for an estimated frequency of 20%). These numbers were dialled by a single interviewer. Numbers answered by people under 18 years or not Dutch were disregarded and a new randomly drawn telephone number dialled. Telephone numbers of businesses, shops, institutions, foundations, corporations, societies, and unions were excluded and new numbers were dialed to these numbers at different times of the day and week until all could be contacted. When co-operation was refused by a subject, another number was dialed. No record was kept of the refusal rate, estimated to be less than 5%. Non-respondents may have been selectively less likely to have symptoms. Thus minimum estimates of incidence were calculated. Interviews were made on weekdays from 0800 hours until 2200 hours, from 12 November until 5 December 1988. In total 240 men and 540 women were interviewed (median age 44 years). Sampling was inherently biased because of an under-representation of the work-weekend, which are mostly not at home during office hours. It probably over-represents women, non-working, ill, and disabled people. Data were therefore corrected for the age and sex distribution of The Netherlands in 1988, though this would not correct for illness and occupation.

Subjects who agreed to fill out a questionnaire and admitted suffering from cramp more often than 20 times in 1988 received a form. An equal number of subjects who agreed to fill out a questionnaire but did not suffer from cramp received a questionnaire as an internal standard. A random sample of subjects who agreed to fill out a questionnaire but suffered from muscle cramp less than 20 times a year also received a form. The overall response rate for the postal survey was 82% (90 men, 245 women). Seventeen questionnaires were filled out by persons other than the subjects interviewed by telephone, and seven were not filled out correctly. A total of 311 questionnaires were analysed. In the telephone interviews and questionnaire, cramp was defined as a sudden involuntary muscle contraction accompanied by hardening of muscle but lasting no longer than 10 minutes. The telephone interviewer excluded other types of muscle or limb pain by repeatedly emphasising this definition. Writer’s cramp and other occupational cramps probably represent task-specific dys-tonias and were excluded from the study.

The incidence calculated from telephone interviews and questionnaires was adjusted for age and sex distribution (Ia). Sensitivity and specificity of data collection by telephone interviews were 86% and 71% respectively, compared with data collection from the questionnaire. The real incidence of muscle cramp in the general population (Ia) was computed from equations, Ia = Imm x universal. A (1 hour) x (1 – specificity) Imm = (Ia – 0.29)/57.

The table shows the real incidence of muscle cramp calculated from the telephone interview study.

<table>
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<tr>
<th>Age Group</th>
<th>Men</th>
<th>Women</th>
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<tbody>
<tr>
<td>18–39 yrs</td>
<td>26%</td>
<td>48%</td>
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<td>31%</td>
<td>32%</td>
</tr>
<tr>
<td>60+ yrs</td>
<td>52%</td>
<td>58%</td>
</tr>
<tr>
<td>Total</td>
<td>28%</td>
<td>44%</td>
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Muscle cramp is difficult to diagnose in a community survey. The criteria we used, however, were sufficiently stringent. The proportion of the adult population of The Netherlands that had at least a single muscle cramp in 1988 was estimated at 36%. This high incidence agrees with empirical data from previous studies.6 Occurrence of cramp may thus be considered as nothing unusual in otherwise healthy adults. Age adjusted incidence ratios showed a 3.2 female preponderance, which was not accounted for by pregnancy associated muscle cramp, as women beyond childbearing age were particularly affected (table). Age had little effect on the proportion of the population suffering. Nevertheless, older people suffering from cramp had attacks more often than younger people (data not shown). At any age, muscles in calves (84%) and feet (39%) were most often affected. Men showed a slight tendency for cramp in calves (74% v 78%) and arms and hands (25% v 11%) whereas women more often suffered from cramp in feet and toes (53% v 25%). Wearing high-heeled shoes may part in account for this. Pregnancy was the most important risk factor predisposing to muscle cramp (odds ratio 6:3; 95% confidence interval 1:0 to 38:6). Musculoskeletal pain and stiffness also correlated with muscle cramp (2:8; 1:1 to 7:2). Irritation from over-casted, overloaded, or over-stretched joints, tendons, or muscles may provoke cramp.7 Subjects with generalised muscle twitching and fasciculations are prone to developing cramp.8 In our survey, however, the correlation between fasciculations and muscle cramp was insignificant (1:6; 0:9 to 2:8).

Reported incidence of at least one muscle cramp in Dutch adults in 1988

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This well known annual round-up of neuroscience topics has continued since 1902. An interesting feature is the format, the style of Currier’s comments shows even more informality than before, containing pertinent remarks and many personal chatty asides which considerably enliven the text.

Any attempt to capsize the literature in Neurology and Neurosurgery can be seen as tempting a neurological Armageddon. There are now available many publications of abstracts, advances and trends; the individual reader’s preference rests with his assessment of the articles selected, the adequacy of the abstract, and the presentation. Once again the Year Book seems to have forgotten nothing of significance. The skill required to produce such intelligible, readable abstracts and commentaries is self-evident.

The preface records the sad passing of Ruskin De Jongh on August 21, 1990: “In northern Michigan there was a most unusually beautiful shimmering display of northern lights . . . it was not hard to believe, as probably the Indians did, . . . that there was a message intended, perhaps a signal of some happening, such as the death of a great chief.”

With such touches, it is irresistible.

JMS PEARCE

Footnotes