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LETTER TO THE EDITOR

Radiation therapy did not alleviate complete paralysis due to metastasis of lung adenocarcinoma to thoracic vertebrae until four months later

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To the Editor,

When malignant bone tumors metastasize into the spinal canal, the ensuing morbid sequelae includes not only pain but also paresthesia, weakness, and even complete paralysis. In such cases, because treatment delay by only two to three hours may cause permanent nerve injury, prompt treatment is necessary [1,2].

Since symptoms in association with paralysis impair the quality of life (QOL), surgery for decompression and the combined administration of steroids and radiation therapy may be selected [1,3,4]. In any case, once complete paralysis appears, recovery is difficult to achieve and active treatment may not be selected. Here we report a case in which difficulty in walking due to complete paralysis was alleviated by treatment and the ability to walk was not restored until four months later.

Case report

On February 1, 2009, a 42-year-old male was admitted to the hospital with a chief complaint of lumbago of an unidentified cause. Although a manual muscle test of (MMT) grades 3–4 was recognized on admission, weakness in both lower limbs and difficulty in walking appeared on the same night and muscle strength weakened to MMT grades 1–2 on the next day (Table I).

(Subsequent descriptions of days of treatment and/or events are numbered from the day of admission, which was day one). Furthermore, on day 3, foot joints and the right large toe showed MMT grades 0 and 1, respectively, and other parts showed MMT grade 0. No paresthesia was recognized.

On day 5, numbness around the anus, incapable plantar flexion of the toe, and disappearance of voluntary movement of the anal sphincter appeared and all criteria for complete paralysis were satisfied. In terms of sensation, only incomplete paresthesia was observed, and numbness at the lower abdomen and the sense of touch on both lower limbs remained. Since bladder and rectal disturbance was detected and an urge to urinate and/or defecate was absent, a urethral catheter was inserted.

Computed tomography (CT) for exploration of the cause revealed a lung lesion (right upper lobe S3, 32 mm in diameter) and a metastatic bone lesion invading into the spinal canal at the tenth thoracic vertebra (Figure 1a and b). The metastatic lesion to the thoracic vertebra was osteoblastic and expanding to the vertebral body and the right transverse process. The swelling compressed the spinal cord from the ventral side, causing stenosis of the spinal canal.

CT-guided biopsy of the primary lesion led to the diagnosis of adenocarcinoma. CT showed no metastasis to lymph nodes but only the primary lesion and metastasis to the tenth thoracic spine. Non-small cell lung carcinoma (NSCLC) was diagnosed and staged as cT2N0M1 (bone metastasis) [5].

On day 5, palliative irradiation was started at 30 Gy/10 sessions/2 weeks to the metastatic lesion at the tenth thoracic spine. To prevent symptom aggravation due to edema by radiation therapy, dexamethasone

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Table I. On the admission day (day 1), the MMT grade was 3–4, but the MMT grade rapidly deteriorated bilaterally on the next day.

	day 1		day 2	
	R	L	R	L
SLR (straight leg raising test)	80−	60+		
FNS (femoral nerve stretching test)	−	−		
Ilio psoas	4	4	1~2	1~2
Quadriceps	4	3	3	3
Tibialis anterior muscle	4	3	1~2	1~2
EHL (extensor hallucis longus)	4	3	2	2
FHL (flexor hallucis longus)	4	4	2	2
PTR (patellar tendon reflex)	+	+		
ATR (Achilles tendon reflex)	+	±		

8 mg/day was drip-infused from day 7 for nine days and at 4 mg/day thereafter for the remaining five days. For palliation of the pain by metastasis to the thoracic spine, oxycodone 10 mg/day was given from day 4 (on the day before beginning of radiation therapy) and the dose was gradually increased to 80 mg/day on day 20 with excellent pain control.

On day 24 (on day 20 after the beginning of radiation therapy), the pain was palliated and the dose was reduced. Since mutation in the epidermal growth factor receptor (EGFR) gene was confirmed, gefitinib was started on day 45 for systemic therapy. Another drug zoledronate was started on day 36 for palliation of bone-related events.

With the expectation of improving activities of daily life (ADL) by training of the upper limbs, rehabilitation to move to and from a wheelchair was started on week 3. On day 75 (55 days after the end of irradiation), there was reduction of abdominal and lumbar numbness and an urge to defecate appeared. Voluntary urination gradually became possible at four months. Furthermore, paralysis of the lower limbs was gradually alleviated during the same period and gradual but light movement of bilateral foot joints became possible, as well as the whole lower limbs below the knee joints.

Five months after admission, he was transferred to a rehabilitation hospital and rehabilitation was intensively started. He started training in a standing position and was able to walk with assistance or with a cane. Furthermore, he began to be able to urinate and to dress by himself albeit slowly.

One month later, he was able to walk in the room with a walker and/or a cane, and after two more months he was discharged from the hospital. Although needing to bear some weight on the cane, he began to be able to go up stairs.

Two months after discharge, he was able to walk without a cane. When he registered as a disabled person at the driving license center, the limitation of movement of his legs was mild, and he was judged to be able to drive a car without alterations.

Magnetic resonance imaging (MRI) eight months after radiation therapy revealed that the tenth thoracic vertebral body and bilateral transverse processes showed low signals by T1-weighted and T2-weighted images. This suggested osteoblastic bone metastasis, but there was almost no bone swelling or stenosis of the spinal canal. At the same level, the spinal cord was mildly atrophic and a T2-weighted image showed faintly high signals at the inner area (myelomalacia), which suggested that the spine had previously been under strong compression.

In addition, small bone metastatic lesions were found at the base of the spinous process of the 12th

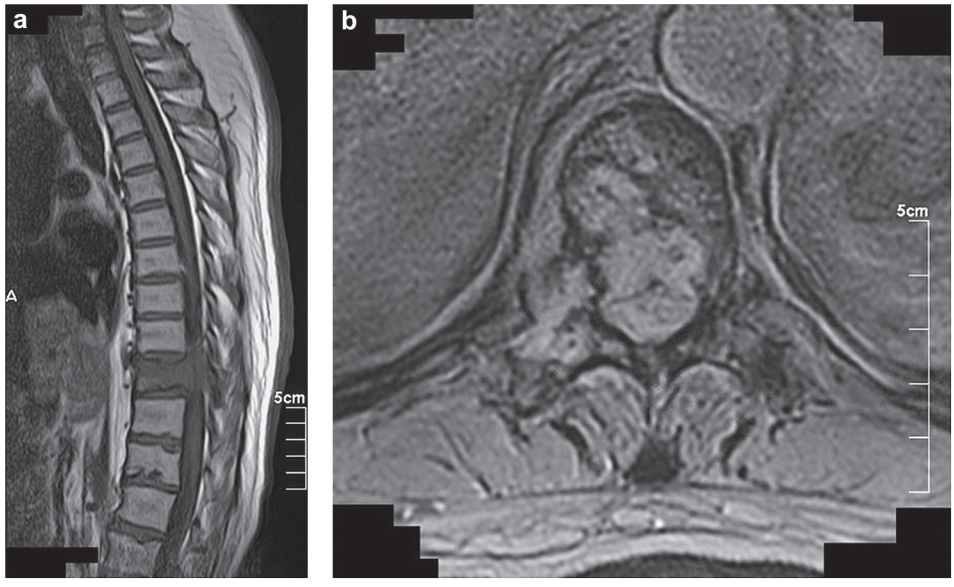

Figure 1. Osteoblastic metastatic bone tumor developing in the spinal canal at the tenth thoracic vertebra: (a), sagittal view; (b), horizontal view.

thoracic vertebra, but there was no evidence of stenosis of the spinal canal at other levels.

Discussion

It is not rare for paralytic symptoms of the lower limbs due to metastatic vertebral tumors to be eliminated by treatment. To our knowledge, however, no case report described that laminectomy and/or radiation therapy enabled walking more than one week after autokinetic motion of the lower limbs became impossible due to metastases to the thoracic vertebrae.

Rades et al. devised a scoring system to report an improvement rate based on the period for appearance of paralytic symptoms due to metastasis to vertebrae, motor functions at the beginning of irradiation, presence or absence of other lesions, and the kind of the primary disease [6].

According to the scoring system, the status before treatment in the present case showed 24 points in total (primary disease, lung adenocarcinoma = 5 points; period after diagnosis, 15 months = 6 points; organ metastasis, absent = 8 points; motor function before irradiation, paraplegia = 1 point; and speed of aggravation of motor paralysis, 1–7 days = 4 points), and the improvement rate based on this score was 6%.

Radiation therapy was started on the day when complete paralysis appeared in the present case, and the symptom improvement rate was markedly low. In this case, gefitinib was administered for treatment in addition to radiation therapy to the metastatic lesions. The dose of irradiation was 30 Gy/10 fr which has been shown effective as a dose for palliative irradiation [7], but not as a curative dose.

The effect of radiation therapy is often observed a few weeks after treatment, but at the latest symptoms are generally alleviated before eight weeks after treatment. Symptomatic improvement was observed after a long period of two to six months after radiation therapy. When complete paralysis is not alleviated even one month after treatment, the clinical judgment is that more recovery is difficult. However, recovery after a longer period was observed in the present case. This was attributed to the reduction in tumor size by gefitinib in addition to the inhibition of tumor growth by radiation therapy. Nevertheless, such recovery is more likely to be attributable not only to the multimodality therapy but also to the active rehabilitation by the patient. It minimized muscle weakening and at least improved QOL. Furthermore, given the contribution to the improvement in general conditions, it might have the effect of prolonging the life of the patient.

When paralytic symptoms due to metastatic lesions are established, treatment may not be performed in some cases because recovery cannot achieved. However, we experienced a case in which recovery was observed several months after treatment. In addition, in this case intervention with active rehabilitation greatly contributed to improving ADL even when the prognosis was poor.

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