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Metastatic disease of the spine

Metastatska bolezen hrbtenice

David Mernik,[1] Janez Ravnik,[2] Tamara Petrun[3]

Abstract

Tumours of the spine are either primary or secondary. The spine is the most common site where we find bone metastases. Up to 70% of patients with cancer develop a metastasis in the spine. Up to 10% of patients with cancer suffer from metastatic spinal cord compression. Metastases in the spine are 20 times more common then primary tumours. Very often they are the first sign of a systemic cancer disease that we find. The symptoms of metastatic spine disease are very varied. There are many different approaches to treatment, and there has been tremendous advancement in recent years, especially with the development of stereotactic radiotherapy. The tretment of metastatic spine disease is a very complex and important field of medicine. It takes an interdisciplinary and decisive approach to save the patient's critical spinal function. Not recognizing metastatic spinal disease or its inappropriate treatment usually has irreversible consequences.

Izvleček

Tumorji hrbtenice so primarni in sekundarni. Hrbtenica je najpogostejše mesto, kjer odkrijemo kostne metastaze. Do kar 70 % bolnikov z neoplazmo razvije metastazo v hrbtenici. Do 10 % bolnikov z neoplazmo utrpi metastatsko kompresijo hrbtenjače. Metastaze so kar 20-krat pogostejša neoplazma hrbtenice kot primarna neoplazma. Zelo pogosto je metastaza v hrbtenici prvi znak bolezni. Klinična slika je pestra in obstajajo različni pristopi k zdravljenju, ki so se precej spremenili v zadnjih letih. Revolucionarni uspeh je zdravljenje z uporabo stereotaktične radioterapije. Zdravljenje metastaz v hrbtenici je zelo pomembno in kompleksno področje, v katerem se prekriva veliko medicinskih strok in zahteva široko znanje in hitro ukrepanje. Pravilno diagnosticiranje in zdravljenje je ključnega pomena za bolnikovo kakovost življenja. Če se le ta bolezen ne prepozna in se nepravilno ali nepravočasno ukrepa, pa so posledice običajno nepopravljive.

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1 Introduction

Spinal tumours are either primary or secondary (metastases). Primary tumours originate from the spine or associated structures. Secondary tumours originate from distal organs and spread through the bloodstream and involve the spine (1). Rarely, metastasis can occur by direct invasion, through the lymphatic system or cerebrospinal fluid (i.e. drop metastasis) (2). Metastases contain cells that are similar to the primary tumour (1). The spine is the most common site of bone metastases (3,4). Up to 70% of patients with cancer develop spinal metastases (1,3-6). Up to 10% of patients with cancer develop metastatic spinal cord compression (3-10). Spinal metastases are 20 times more common than primary tumours (6).

Most tumours are located in the extradural space (6). Most commonly, the thoracic spine is affected (70%), followed by the lumbar spine (20%) (4). The initial anatomical site of spinal metastasis is the posterior part of the vertebral body. The pedicle is never the primary site of metastasis; even though the first sign of metastasis, visible on a plain radiograph, is pedicle destruction, it is only involved in the metastasis process after involvement of the vertebral body (11). However, there are exceptions. An example of a solitary metastasis in the spinous process has been described (12).

The highest incidence of metastatic spine disease (MSD) is between 40 and 65 years of age, which reflects the overall incidence of cancer (6). Prostate cancer, breast cancer and lung cancer are the source in half of all cases of spinal metastases. These are followed by kidney cancer, gastrointestinal cancer, thyroid cancer and haematological cancers (multiple myeloma, lymphomas) (4). The origin of the metastasis can usually be determined by the medical history, but in some patients, spinal metastasis is the first disease sign (13). Metastasis of unknown origin is the first disease sign in up to 7% of cancer patients (14). In a series of 201 patients in the tertiary neurosurgical unit in Austria, spinal metastasis was the first disease finding in as many as 40.3% of patients (15). Metastases can occur several years after successful completion of cancer treatment (1).

If vertebral body destruction is extensive enough, malignant spinal cord compression (MSCC) occurs (9,16,17). The term MSCC refers to the spinal cord as well as cauda equina (16). Spinal cord compression can be categorized into two phases. The early stage is curable and reflects the short duration of spinal cord compression caused by the tumour and is characterized by spinal oedema, venous congestion and demyelination. However, with prolonged spinal cord compression, an irreversible second phase occurs. The reason for this is a spinal cord infarction. Malignant compression requires immediate surgical intervention or immediate radiotherapy in highly radiosensitive tumours (myeloma, lymphoma) (8).

2 Clinical presentation

Spinal pain is the first and most common symptom (1,2,6). Pain in the thoracic spine is particularly suspicious, where degenerative pain is less common than in the lumbar or cervical spine (2). Initially, the cause of the pain is pressure on the periosteum (1). Palpation or percussion of the affected part can elicit pain (2,6). Typical pain due to a tumour begins gradually, intensifies over time and persists at night and at rest. Acute pain without known trauma is a symptom of a pathological fracture (1).

When pain worsens with movement of the affected segment, we speak of mechanical pain (or axial pain). It is suspicious for mechanical instability of the spine. This pain does not normally respond to conservative treatment (2,6). The Spine Oncology Study Group defined mechanical instability as the loss of spinal integrity as a result of a neoplastic process that is associated with movement-related pain, symptomatic or progressive deformity and/or neural compromise under physiological loads (18). If the metastasis causes compression of a spinal nerve, radicular pain occurs. Radicular pain can also be caused by a pathological fracture (1,2,6). In a patient with known cancer and new-onset back pain, the diagnosis is always MSD until it is excluded (6).

The second most common symptom is a neurological deficit. Muscle weakness, numbness and autonomic dysfunction occur (most commonly urinary incontinence) (2,6). Neurological deficit occurs due to metastatic pressure on the spinal cord, severe spinal deformity or fracture with retropulsion of tissue into the spinal canal (19). Brown-Sequard syndrome may occur with intradural and intramedullary metastases (6).

Malignant spinal cord compression (MSCC) is an urgent condition that requires immediate treatment (9). Studies have shown that MSCC is recognized very late in the course of the disease. The ability to walk after

treatment is directly associated with the ability to walk at the time of diagnosis. When the patient is no longer ambulatory, the likelihood of regaining function is minimal, and most will consequently need continuous care (16). Patients with paresis (but not plegia) become paraplegic within 24 hours in 28% of cases, which indicates the urgency of the condition (19). In a series of 248 patients with a radiographically confirmed diagnosis, 94% complained of back pain and/or radicular pain. Radicular pain was reported by 79% of patients (196/248). The mean pain intensity described by the visual analogue scale was 8/10; 29% reported 10/10 pain. The pain was described as sharp, shooting, deep and burning. The compression level did not correlate with the site of pain. Only 18% of patients were still ambulatory at the time of diagnosis. 85% of patients experienced weakness or difficulty walking. The mean duration of weakness was 20 days (range 7–120). There was no correlation between pain and walking ability (although physicians in clinical practice often attribute walking difficulty to pain). 68% noticed impaired sensation. 56% reported problems with urination (at least one occasion of an inability to urinate; a quarter reported urinary retention and 15% incontinence). Weakness on clinical examination was detected in 84% and sensory dysfunction in 58%. Clinically established levels of compression did not correlate with findings in imaging studies (16).

Delayed referral of a patient with spinal metastases with symptoms to a spinal surgeon is the strongest predictor of poor treatment outcome. Patients with MSD who underwent elective surgery had significantly better outcomes compared to patients who required acute treatment due to the development of alarming MSD symptoms (neurological deficit, mechanical instability). The elective group had less invasive procedures (52.9% vs. 13.3%), less blood loss (200 ml vs. 450 ml), shorter hospital stays (7 days vs. 13 days) and fewer complications (26.2% vs. 48%). This strongly emphasizes the importance of timely referral to a specialist (17). Several studies have noted a worrying trend of disproportionately frequent urgent referrals on weekends (especially on Fridays), indicating poor health system organization and poor recognition of the problem (15).

At an Oncology Orthopaedics Department in Poland, 854 patients were hospitalized for spinal metastases. The mean duration of primary disease before metastasis was 13 months (range 4–43 months); 81% of patients had a pathological fracture on admission and only 19% had metastasis without fracture (5).

3 Diagnosis

Early diagnosis of MSD should be the goal, and not waiting for unequivocal clinical signs of severe impairment. Establishing a diagnosis before the patient loses the ability to walk is crucial (16). Elective surgery should be pursued to avoid urgent referrals, so the diagnostic process should be rapid (17).

In addition to the medical history and clinical examination, imaging studies are a key part of diagnosis (19). The plain radiography is normally the first imaging study performed due to ease of access, use and an extremely low cost (2). In a study of 248 patients with MSCC, a plain radiograph correctly predicted compression levels in only 21% of patients (16). Radiographic changes are noticeable only when at least 50% of the cancellous bone in vertebrae is destroyed (1). The (absent) pedicle sign, also called the winking owl sign, is the first sign of metastasis on a plain radiograph (6).

Bone scintigraphy is a procedure in which a radioisotope is used to detect regions with increased bone remodelling, which can be used to detect metastases (1,2). It has a high sensitivity, but low specificity (a positive result occurs also in cases of infection or spondylosis) (1,6). In a series of 139 scintigraphs performed in patients with MSCC, it accurately predicted the level of compression in only 19% of cases (16).

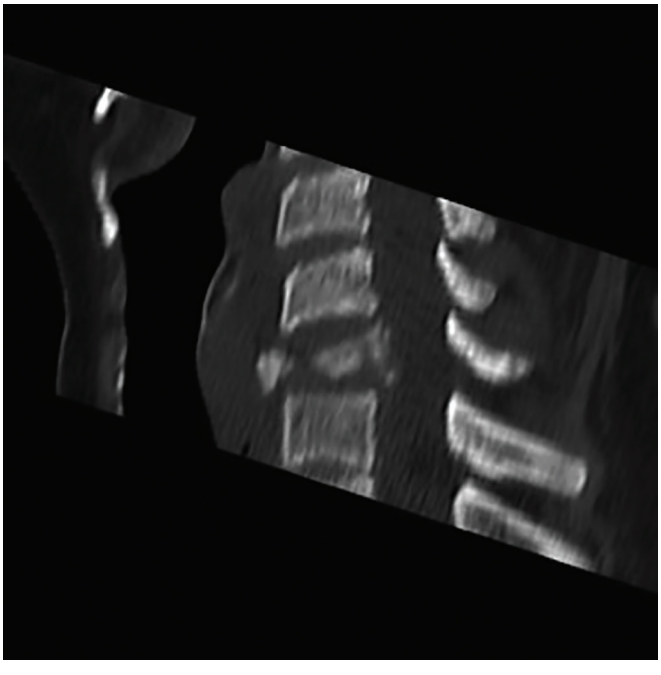

Figure 1: Computed tomography (CT) of breast cancer metastasis at the C6 level in a 50-year-old patient.

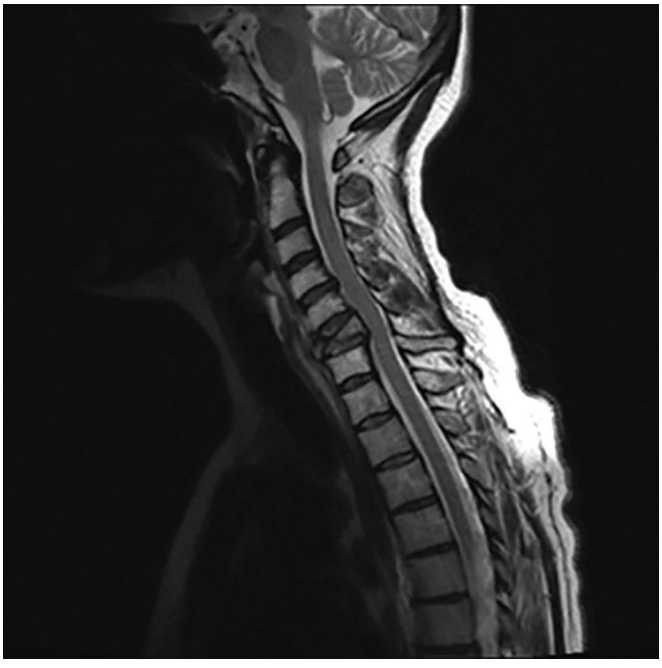

Figure 2: Magnetic resonance imaging of breast cancer metastasis at the C6 level in a 50-year-old patient.

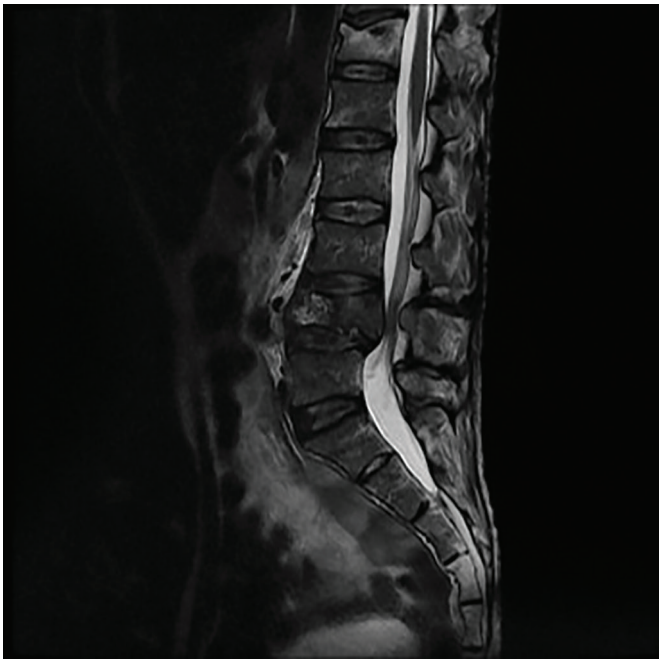

Figure 3: Magnetic resonance imaging of lung cancer metastasis at the L4 level in a 56-year-old patient.

Computed tomography (CT) is an imaging study that is suitable for showing bone structures and allows for differentiation of lytic and blastic lesions (2), as shown by Figure 1. Positron emission tomography (PET) detects increased fluorodeoxyglucose metabolism in cancer cells. It is used in combination with computed tomography (PET/CT). As it is expensive and has a high radiation burden, it should only be used if other imaging studies have been performed first (2). Its advantage is early detection of metastatic disease and high sensitivity (2,20).

Magnetic resonance imaging (MRI) is the gold standard for diagnosing MSD (1,2,6,16,20). This method allows for the best assessment of the bone marrow, spinal canal and the relationship of metastases to surrounding structures (1), as shown by Figures 2 and 3. Compared to other imaging methods (plain radiograph, CT, nuclear imaging) it is superior in accuracy, sensitivity and specificity (2). MRI is 98% sensitive and specific for the detection of vertebral metastases (21). T2 images obtained by MRI are useful for determining spinal cord compression. T1 and STIR images are effective in fracture detection. The addition of gadolinium (a contrast agent) allows for better recognition of vascular structures and tumour infiltration (2). Post-contrast fat suppression allows for differentiation of metastasis from bone marrow in borderline cases (6). Due to MRI clearly being the best diagnostic option, opting for a plain radiograph or scintigraphy before MRI is not indicated and only leads to delayed diagnosis (16). CT is used as an alternative to MRI when the patient has inserted osteosynthetic material that would cause metal-induced artifacts in MRI (2).

A patient with myelopathy (muscle weakness, sensory deficit, urinary incontinence) and a known diagnosis of cancer (or highly suspected cancer) should be admitted to hospital immediately. A patient with cancer and suspicious pain should have an urgent MRI when available (6).

In the case of a known history of cancer, the number of metastases is a fundamental issue. In case of metastasis of unknown origin, biopsy is crucial for histological confirmation of the diagnosis. Biopsy is also performed in case of differential diagnostic ambiguity (e.g. the patient has two primary cancers or non-cancerous disease is suspected) (22). This can be done in several ways: as fine needle aspiration, Tru-Cut biopsy, incisional or excisional biopsy. Due to the possibility of tumour seeding in the biopsy tract, biopsies must be performed far from neurovascular structures by using small incisions which could then be removed along with the tumour mass during the definitive surgical procedure (1). In the case of metastasis of unknown origin, in addition to routine laboratory tests, testing for tumour markers, PSA, thyroid function tests and protein electrophoresis is performed. Whole-body MRI, chest-abdomen-pelvis CT and PET/CT are useful imaging tests for locating the primary tumour. The biopsy should be the last in a series of tests as it weakens the affected bone and can lead to a pathological fracture (22,23).

4 Treatment

The remarkable development of MSD treatment techniques has made it very difficult to decide on the right treatment regimen. Treating a patient with MSD requires a multidisciplinary approach and the combined knowledge of an oncologist, spinal surgeon, radiologist and pain specialist (24).

4.1 The NOMS framework

To help with the choice of therapy, the NOMS framework, a modern, sophisticated and reliable model for the treatment of patients with MSD, has been developed. (25,26). The NOMS decision framework consists of the neurologic, oncologic, mechanical, and systemic considerations (24). It can be applied in practice and enables a multidisciplinary approach and continuous development by introducing novel treatment methods (26).

4.1.1 Systemic disease

Patients with metastases are usually considered incurable with very different but limited survival times (18). There is currently no proven effective cure for MSD, so treatment is aimed at maintaining function (27). Patients need to be in good general condition so they can tolerate the planned procedures (26). The benefits of any treatment must be weighed against the burden of the underlying disease, and the potential benefits of treatment must be weighed against the risks. The patient may have such a short survival time that they would not gain any benefit from the procedure. Realistic treatment options should be presented to the patient, along with a discussion about treatment goals (18).

The presence of symptomatic systemic disease in key organs (brain, lungs, liver) reduces the need for urgent interventions for minimally affected patients with spinal metastases. If the patient is in poor general condition (Karnofsky score ≤ 40) and is expected to survive ≤ two months, we opt for external radiation therapy and palliative care to minimize the side effects of treatment (18).

Surgery is usually acceptable if survival is estimated at three months or more (2,3). As decisions on surgery are made by surgeons, they should be well aware of the prognostic factors that determine survival (3). The histologic type of primary tumour has the greatest impact on survival (22). The median survival at diagnosis of spinal metastasis varies greatly depending on the primary tumour origin. Lung cancer has the worst median survival at 3.9 months. Prostate cancer has a median survival of 18.8–24 months, and kidney cancer 24.5 months. Breast cancer has the best prognosis at a median survival of 24–80 months (27). We need to be aware that there is tremendous variability in survival even within individual histological types of cancer. If the patient's lung cancer has mutations that allow modern targeted therapy, their survival is extended from a few months to several years (24). The ability to walk before surgery has a statistically significant effect on survival. The presence of multiple metastases, pathological fractures and cervical metastases do not affect survival (27).

There are a number of predictive scoring systems that are supposed to allow survival assessment. The Tokuhashi and Tomita scores are the most commonly used, although there is no consensus on the best scoring system. There are studies that favour other scoring systems (2). A comparison of six scoring systems (Tomita, Tokuhashi, Van der Linden, Bauer, Rades, Bollen) estimated that the Bollen system was the most accurate with an estimated four month accuracy of 75% (28). Due to the constant and significant progress in primary disease treatment (development of new forms of systemic treatment), we must be sceptical about the use of scoring systems or even abandon them altogether (2,27,29). There are no grade 1 evidence to support these systems. When the usefulness of these systems was evaluated in retrospective studies, they proved to be unreliable (27).

4.1.2 Mechanical instability

The pain that accompanies spinal metastasis is either due to the effect of the tumour (the pressure of the tumour on the periosteum) or mechanical in nature (pain is present during movement, but absent at rest). Mechanical pain is a sign of possible spinal instability. It is important the patient is seated when assessing mechanical pain. It is a common mistake for physicians to examine the patient in the supine position and assume they are without pain as the patient does not report pain in the supine position (8). The Spinal Instability Neoplastic Score (SINS) is used to assess mechanical instability of the spine. This is the first evidence-based and easy-to-use spine instability assessment system (22). SINS allows easy communication between different clinical specialists and spinal surgeons (30). The sensitivity of SINS for the determination of unstable lesions and potentially unstable lesions is 96%, while the specificity is 80% (2). Recognition of instability is crucial,

as it significantly affects the choice of treatment method (22). Patients with a high SINS score (13-18) have a clear indication for surgical stabilization and their condition significantly improves after surgery (24).

4.1.3 Neurologic assessment

The neurologic assessment includes a clinical neurological examination (signs and symptoms of myelopathy, radiculopathy, motor and sensory deficits) and assessment of the spinal cord compression risk on MRI (18). Bilsky et al developed a scale that allows the definition of spinal cord compression based on MRI imaging (31). The Bilsky scale has become commonplace among spinal oncologists (18). A patient who develops a motor neurological deficit due to solid cancer metastasis needs immediate surgical decompression (32). Exceptions are the completely radiosensitive cancer types (18).

4.1.4 Oncologic assessment

The oncologic assessment considers the best possible treatment according to the type of tumour. Different histological types of tumours are treated very differently, with systemic therapy, surgery or radiation (8). There are three crucial properties of a tumour: radiosensitivity, radioresponsiveness, and vascularity. Radiosensitivity is the sensitivity of cancer cells to the destructive effect of ionizing radiation, thus achieving better local control of the tumour. It affects the choice of radiation dose. Radioresponsiveness is a reflection of the rate at which a tumour shrinks in response to radiation. This property is important in tumours that cause spinal cord compression and influences the decision whether to perform decompression by radiation or surgery. Vascularity is the amount of blood vessels contained in a tumour and is especially important in the surgical approach (18).

4.2 Corticosteroids

Corticosteroids are well established in spinal metastases treatment. They are thought to help reduce oedema and inflammation, which is supposed to help with spinal cord compression. It is also thought to have a direct cytotoxic effect on certain haematogenous types of cancer (lymphoma, myeloma) and occasionally even on breast cancer. Dosing and guidelines for use are still unclear and vary widely in practice (33). When prescribing corticosteroids exclusively for MSCC, a review of the literature conducted by Cochrane found that there were no significant beneficial effects of corticosteroid treatment compared to placebo. This does not apply to the general treatment of spinal metastases. It is clear that high doses (96 mg dexamethasone per day) are associated with serious side effects that were not observed at lower doses (16-32 mg dexamethasone) (34). Although there is no quality literature on corticosteroid therapy in case of compression, Kumar et al, after a review of the literature, suggest treating MSD with an initial intravenous bolus of 10 mg dexamethasone, followed by 16 mg dexamethasone orally daily. After definitive treatment, corticosteroids should be tapered off (35).

4.3 Supportive therapy with bisphosphonates and denosumab

Bisphosphonates are a group of drugs that inhibit osteoclast activity and thus reduce osteolysis stimulated by spinal metastases. They reduce the risk of pathological fracture, relieve lytic pain and prevent hypercalcaemia (2). Bisphosphonates reduce mortality, associated with bone metastases, and also improve quality of life. They are also cost effective. Denosumab has been shown to be slightly more effective compared to zoledronic acid (36).

4.4 Systemic therapy

Systemic treatment is an integral part of long-term management of spinal metastases. Therapy varies according to the histological type of the tumour (2). It is rarely used as a stand-alone treatment, except in the case of highly chemosensitive tumours such as lymphoma, seminoma and neuroblastoma (33). Oncology has advanced tremendously in the treatment of cancer, and genetic analysis with targeted therapy represents a revolution in the treatment of certain types of cancer and has significantly extended the expected survival of patients (24,25,29,30,37). Due to the extensive clinical applications of systemic therapy, it is important that spinal surgeons are aware of new findings in the field of systemic cancer treatment (30).

4.5 Radiotherapy

Radiotherapy is the basic treatment for patients with spinal metastases. It achieves pain relief and local control of tumour growth or its reduction (2,18,33). It can be a stand-alone treatment or treatment in combination with surgery or other treatment. Almost all cases are treated with radiotherapy in various forms: radiotherapy with external radiation, stereotactic radiotherapy and stereotactic radiosurgery (18).

External radiation therapy is most commonly used (18,33). An area of the body, which also includes healthy tissue, is irradiated. As the spinal cord is highly sensitive to radiation, the dose is limited (21). External radiation therapy is fractionated. Single fraction radiotherapy is three times more likely to require re-irradiation than multiple fraction radiotherapy. There is evidence that multiple fraction radiotherapy provides better local control than single fraction radiotherapy (18). Patients with estimated good survival should receive more fractions and should be offered long-term follow-up (34). Knowledge of the tumour's radiosensitivity is crucial for the implementation of external radiation therapy (18). Tumours that respond well to external radiation therapy are haematological neoplasms and certain solid tumours (breast cancer, prostate cancer and germinomas). In radioresistant tumours (kidney cancer, colorectal cancer, melanoma, sarcoma, thyroid cancer, hepatocellular carcinoma, non-small cell lung cancer), local control is achieved in less than 50% (24,30,33). In radiosensitive tumours, external radiation therapy is an excellent stand-alone therapy for MSCC; it is less successful in other histological types of cancer (24).

Stereotactic radiosurgery and stereotactic radiotherapy are terms that can be used interchangeably in the context of the spinal metastasis treatment (2). Stereotactic surgery was developed in Sweden to treat central nervous system metastases. When the same principle was used 20 years later to treat pathology outside the central nervous system, this technique was called stereotactic radiotherapy (38). High radiation doses are precisely focused on the tumour under imaging guidance. Normally, one to five fractions are used (2). Compared to conventional radiotherapy, three times the bioeffective dose of radiation can be applied without damaging vital structures near the metastasis (18). These novel radiotherapy techniques allow permanent control of all metastases regardless of histological type and have thus virtually eradicated the concept of radioresistant tumours. Statistical analyses report up to 98% successful local control four years after treatment (39). Currently, the danger of neurological damage is too great (due to the proximity of vital structures) to use stereotactic radiotherapy in MSCC (24). In the absence of MSCC, stereotactic radiation can be used as definitive treatment (25).

4.6 Surgery

The surgical approach to MSD treatment has changed dramatically in recent decades. The established surgical practice before the end of the 20th century was posterior decompression (laminectomy), but this led to poor treatment results. Because metastatic spinal cord compression is anterior to the spinal cord, such an intervention did not eliminate the cause of the problem at all, but caused additional spinal instability. Later, decompression by ventral resection of the tumour was developed (2,7,8,27,29). The basis of surgical treatment of spinal metastases is the removal/debulking of the tumour to alleviate the pressure on surrounding neural tissue, followed by instrumented fusion (40), as shown in Figure 4.

In 2005, Patchell et al published a ground-breaking study in which they demonstrated markedly better outcomes in MSCC treatment in the group treated with decompressive surgery followed by radiotherapy compared with the group treated with radiotherapy alone. In particular, the neurological outcome was markedly better (the ability to walk was 62% in the group that was treated with surgery and radiotherapy vs. 19% in the group that was treated with radiotherapy alone). Radiosensitive tumours were excluded from the study (33).

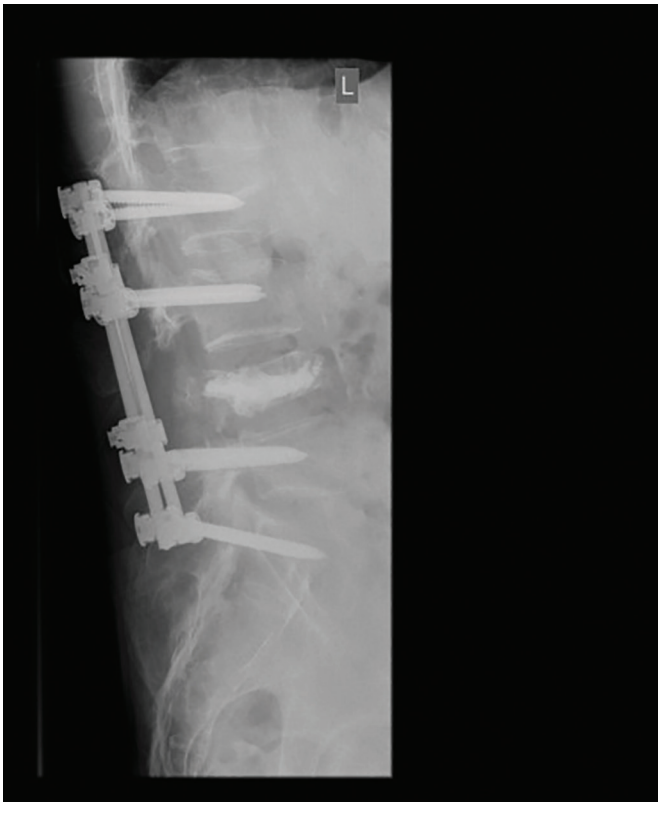

Figure 4: Radiographic image after surgery (posterior approach, spinal canal decompression, multilevel fixation and vertebroplasty of the affected vertebral body) due to lung cancer metastasis at the L4 level in a 56-year-old patient.

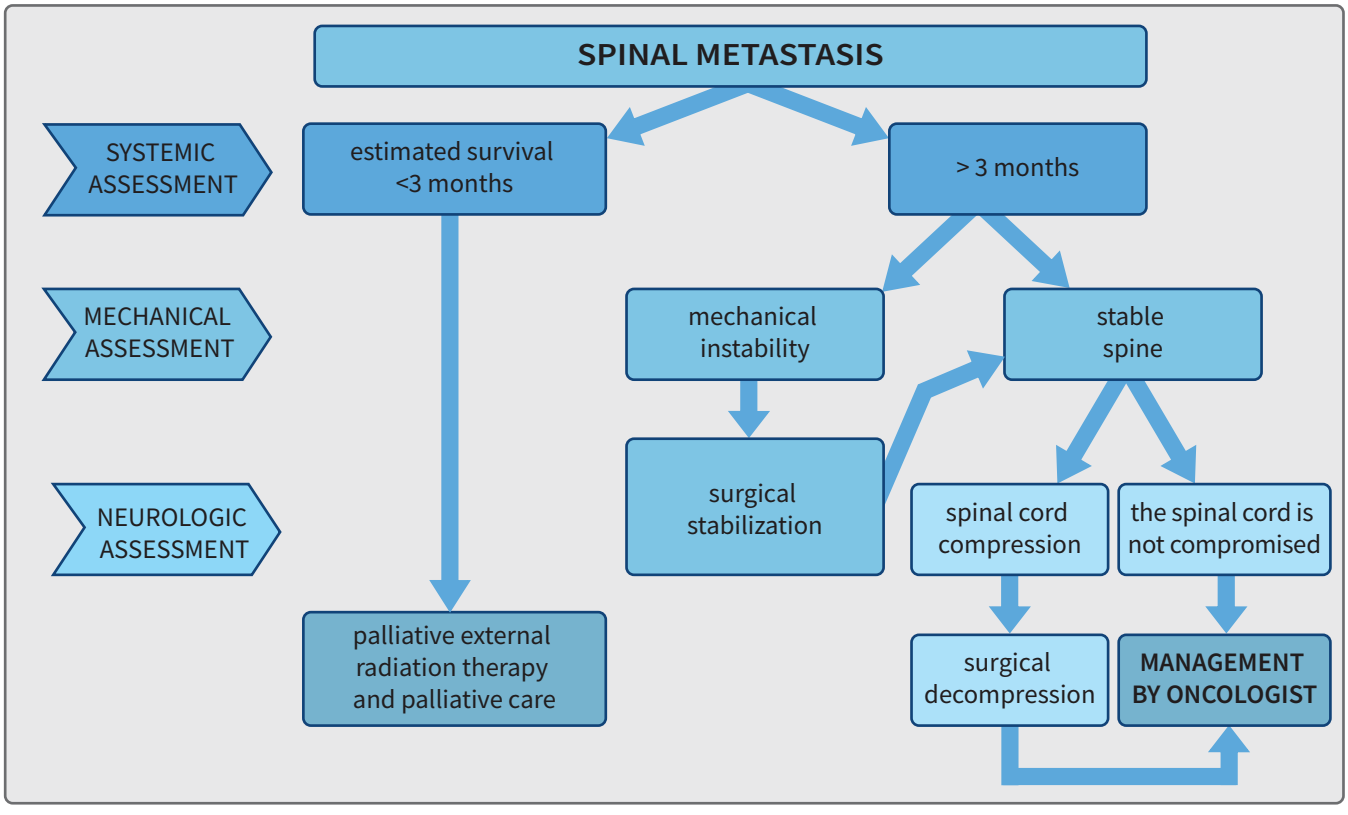

Figure 5: Algorithm for spinal metastasis treatment.

Surgical treatment is not in its essence oncological, which means that surgery alone is not locally curative. The recurrence rate in one series of patients was extremely high (96% at four years) (42). Kaloostian et al published an analysis of various surgical procedures for MSD treatment: laminectomy with or without radiotherapy achieved neurological improvement in 46%, laminectomy with radiotherapy and posterior stabilization in 62%, and anterior decompression with stabilization was most successful with neurological improvement in 68% of cases (19).

Patients with good systemic disease control and a solitary metastasis are suitable candidates for en bloc resection. In the case of thyroid and kidney cancer, such an approach is even more appropriate due to the rich vascularity of the metastases, making it risky to directly involve the metastasis during surgery. In the case of pheochromocytoma, en bloc resection is also more appropriate because of the risk of a sympathomimetic effect (8). Kwon et al showed that patients who responded to adjuvant therapy had significantly better survival with gross total resection compared with patients who underwent subtotal resection. In case of non-response to adjuvant therapy, the extent of resection does not affect survival (43).

Separation surgery is a procedure used to treat MSD in which tumour resection is limited to removing only the part of the tumour that is in contact with neural elements, creating a 2–3 mm space between the tumour and the spinal cord. This allows for safe stereotactic radiotherapy 2–4 weeks after surgery (2). The goal is to achieve 360˚ decompression, which allows complete expansion of the dura and nerve roots. Incomplete separation is more frequently associated with disease recurrence (18,24). The transpedicular approach is optimal (33). Due to the destabilization of the spine during surgery, the spine must be surgically stabilized at the same time (18). When using separation surgery with hypofractionated radiotherapy, local tumour progression was observed in only 4.1% after one year (44).

Clear indications for surgery are mechanical instability, MSCC due to a radioresistant tumour, preparation for stereotactic radiotherapy (separation surgery) and local tumour management in case radiotherapy cannot be used (18). Complications and the need for repeat surgery are an obvious problem of surgical treatment, which we must take into account when deciding on surgery (33).

Vertebroplasty and kyphoplasty are minimally invasive procedures used to treat pathological fractures,

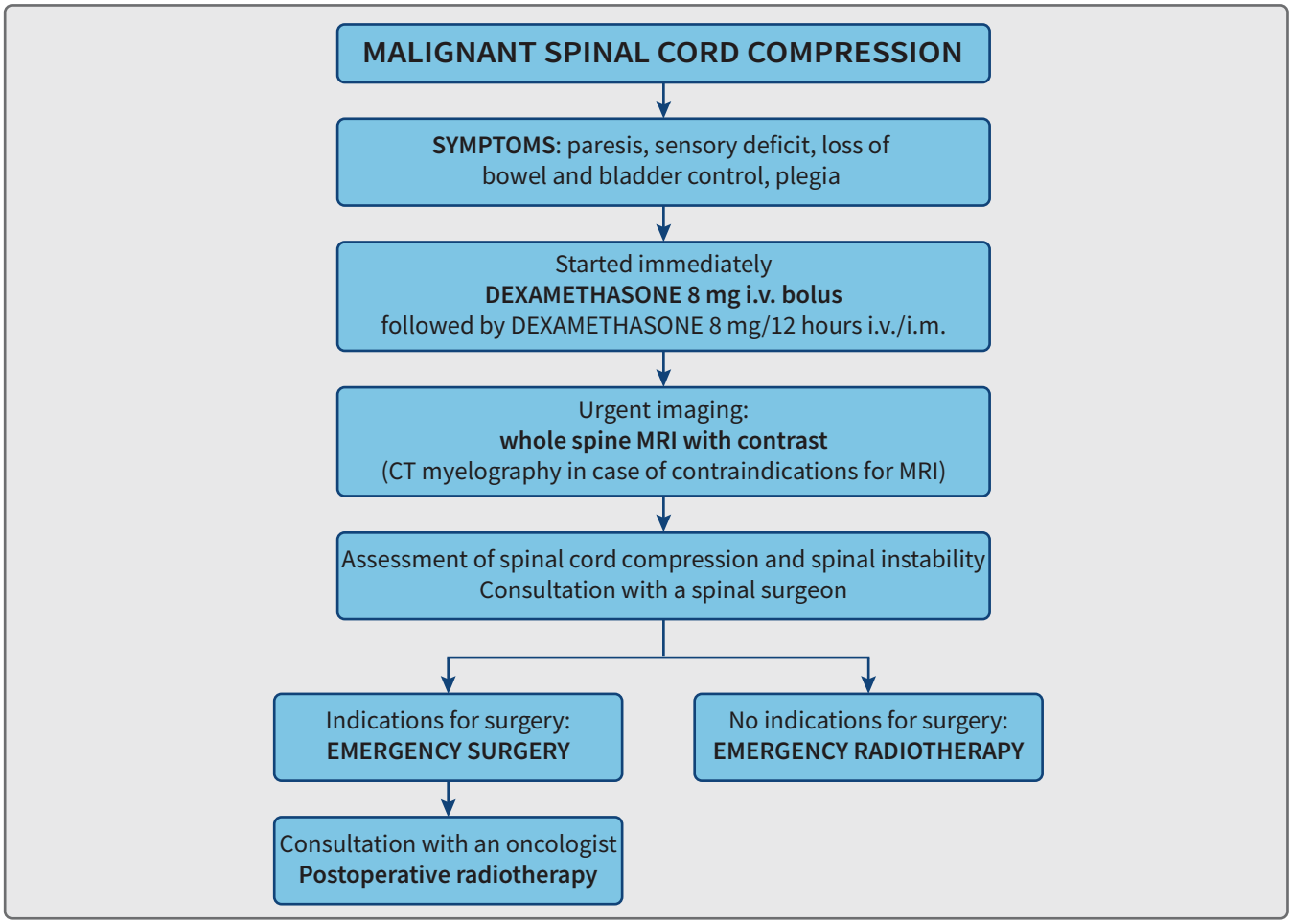

Figure 6: Algorithm for malignant spinal cord compression management.

provided that the spine is stable (2,7,18). Kaloostian et al state in their meta-analysis that vertebroplasty achieves an improvement in mobility in 62% and an improvement in pain in 91%. In the same analysis, they reported that kyphoplasty improves mobility in 69% and pain in 93% (19).

Itshayek et al reviewed the literature on the topic of timing of surgery and radiotherapy. They found that the use of radiotherapy was safe for at least a week before the procedure or afterwards (45).

5 Proposed treatment algorithm by the authors

It is clear that prompt and appropriate treatment of a patient with MSD is extremely important. A patient with a history of cancer and suspicious spinal pain should have an MRI performed as soon as possible. A patient with myelopathy (muscle weakness, sensory deficit, loss of bowel or bladder control) with known cancer should be admitted to hospital immediately and whole spine MRI with contrast should be performed immediately (to exclude multilevel spinal cord compression). If MSCC is suspected, the patient should receive anti-oedematous therapy with corticosteroids (dexamethasone 8 mg i.v. bolus, followed by dexamethasone 8 mg/12 hours i.v./i.m./p.o.). On the basis of imaging studies, predicted outcome and consultation with a spinal surgeon, further treatment follows. Appropriate management in patients with spinal metastasis is explained by an algorithm, as shown in Figure 5. Management of MSCC is shown in Figure 6.

Conflict of interest

None declared.

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