# Spinal cord decompression and stabilization in malignant lesions of the spine

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*20 patients with neurologic deficit and pain from malignant spinal tumors (7 primary) underwent 28 decompression and stabilization procedures. Their mean age was 57 (30–74) years and 11 were women. Indications for stabilization were pathological spine fractures or a previous spinal decompression procedure. An anterior procedure was used in 2 patients with disease limited to 1 or 2 levels. A posterior procedure was used in 10 patients with widespread disease and unsatisfactory condition. Anteroposterior procedures in 1 or 2 stages were performed on 8 patients in satisfactory general condition with a malignant lesion at 1 or 2 levels and an unstable spine. Patients were submitted to radio- and/or chemotherapy postoperatively. Survival of patients treated for primary malignant tumors averaged 30 months and was 11 months for metastatic disease. 16 of the patients, especially those with nonmetastatic disease, had substantial relief of pain. Neurologic recovery was achieved in all of the anterior and combined anterior-posterior procedures and in 60% of the posterior decompressions. Complications included failure of the instrumentation in 2 cases, skin breakdown in another 2 and dislodgment of the autograft in 1.*

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With the recent advances in oncologic therapy, an increasing number of patients with metastatic disease is surviving longer. Life expectancy, however, is reduced in most patients with symptomatic spinal metastases, as they usually also have advanced metastatic disease (Berrretoni and Carter 1986). In recent years, a more active approach towards surgical treatment of symptomatic spinal metastasis has evolved, facilitated by improvements in diagnostic imaging and also by refinements in spine surgery. Both benign and malignant tumors of the spine can lead to instability, often increased by decompression, which in such cases should be combined with stabilization.

Anterior decompression and stabilization has been reported to yield excellent results, but sometimes at a cost of rather high mortality (Kaneda et al. 1984, Kostuik 1983, Kostuik et al. 1988, McAfee and Zdeblick 1989).

Decompression can be achieved in a simpler way by a posterior procedure with stabilization of only as few segments as necessary with a transpedicular technique. Decompression is achieved either indirectly by realigning the spine in cases where vertebral collapse has caused shortening and angular deformity, or directly by resection of laminae, hypertrophied pedicles or epidural tumor growth (Siegal and Siegal 1985, Tokuhashi et al. 1990).

This retrospective study addresses the techniques and out come of 28 spinal stabilization procedures in 20 patients who presented with pain, neurological deficit and spinal instability secondary to malignant disease.

## Patients and methods

From January 1986 to January 1996, 28 decompression–stabilization procedures were performed in 20 patients at the KAT, METAXA and YGEIA Hospitals under the direction of the senior author. All patients had neurologic deficits. The evaluation included medical records, radiologic examinations, and an interview and examination of the surviving patients. 20 patients presented with malignant tumors (7 primary and 13 secondary lesions). Their average age was 55 (30–74) years and 11 were women. Primary malignant tumors included plasmatocytoma (4), Hodgkin (1), lymphoma (1) and chordoma (1). The primary sources of metastatic disease were the prostate (1), kindney (2), testis (1), Ewing sarcoma of the humerus (1), chest (1), breast (2), thyroid (1) and unknown (3).

*Indications:* The indications for surgery were: 1) pathologic fracture with instability, 2) impending pathological fracture, or 3) neurological deficits

which required decompression. The specific type of stabilization procedure and the decision for either anterior, posterior or combined procedures depended on: 1) the tumor type and the anticipated response to treatment, 2) the extent of destruction of the anterior and/or posterior columns and 3) the general medical condition of the patient and expected survival.

The indications for decompression for neurological deficits remained constant throughout the period of the study, although the preference for anterior decompression over posterior decompression increased. Patients who presented with a slowly increasing neurological deficit and a predictable response to nonoperative treatment were not considered surgical candidates, unless marked instability of the spine was present. Patients who presented with a rapid onset of neurological deficits were surgically decompressed, regardless of the expected tumor response to therapy. In general, no patient with complete neurologic loss was considered a candidate for decompression. Anterior decompression was restricted to patients with primary or metastatic disease, ideally limited to 1 vertebral body segment or where a major kyphosis existed.

Neurological deficits were classified in 3 categories: 1) normal, 2) minor – minor neurological impairment permitting unaided ambulation and 3) major – severe neurological impairment preventing unaided ambulation. Substantial recovery was considered to be a return to ambulation or complete recovery of a minor deficit. Bowel and bladder function were analyzed separately. Significant recovery was considered return to voluntary control of both.

*Surgical procedures:* The specific surgical reconstruction depended on the location of tumor. Methylmethacrylate was generally reserved for patients with a life expectancy of less than 1 year. 5 procedures (3 patients) were performed in the cervical region, consisting of anterior vertebrectomies and vertebral body replacement with iliac autograft. 2 patients also underwent posterior stabilization with 2 Roy-Camille (1986) cervical plates. Postoperative immobilization of the neck was achieved with a 4-poster cervicothoracic brace for 3 months. 2 patients had plasmatocytoma and 1 a lymphoma, with minor neurological impairment in 2 patients and major in 1.

17 patients had tumors in the thoracic and lumbar spine. 1 patient underwent an anterior procedure only, while 10 patients had posterior procedures (Figure 1). The remaining 6 patients had combined anterior and posterior surgery (Figure 2). A variety of stabilization procedures were used, including anterior spondylodesis without instrumentation and with autograft, anterior spondylodesis supplemented with anterior fixation devices, and anterior spondylodesis with a titanium cylinder filled with autograft or methylmethacrylate. Posterior surgery, included laminectomies for spinal cord decompression, and various spinal implants. Patients were kept in a thoracolumbar brace for 6 months postoperatively. All 20 patients were had postoperative chemo- and/or radiotherapy.

Follow-up of the 7 patients with primary malignant lesions of the spine averaged 30 months and of the 13 patients with metastases 11 months.

## Results

Relief of pain was uniformly accomplished in primary malignant tumors, but it was difficult to control in patients with metastatic disease. 16 (9 with metastatic disease) of all 20 patients had good to excellent relief of spinal pain or radicular symptoms.

15 of the 20 patients had substanial recovery of their neurological deficits which were major in 18 patients. Of these, 13 could ambulate unaided. None of these 18 patients had a complete loss of bowel and bladder function, but 5 had severe dysfunction, that remained unaltered after surgery. Overall, 9 patients with major neurological deficit underwent an anterior decompression procedure, either as single surgery (3 cases) or as the first stage of the combined anterior-posterior procedure (6 cases). All of them achieved substantial recovery.

2 major instrumentation failures occurred in the thoracic region. In 1 case where a TSRH–Danek instrumentation system was applied to correct the kyphotic deformity created by vertebral body destruction by a chordoma, the upper hooks dislodged 3 months postoperatively, without deterioration of the neurologic status, despite worsening of the kyphosis. This patient also had skin deterioration because of previous radiotherapy. The patient underwent reimplantation of the hooks and plastic reconstruction of the skin.

The second patient had an Isola-Acromed instrumentation system with pedicle screws for stabilization of the middle thoracic spine, following extensive posterolateral laminectomies for decompression. Neurologic recovery was excellent, but 6 months postoperatively the kyphotic deformity increased severly with extensive destruction of thoracic vertebrae due to multiple metastases and the lower pedicle screws broke (Figure 1). The patient refused further surgery. Another patient experienced a burning feeling along the thoracotomy incision for 6 months which spontaneously subsided, and there was 1 case of thrombophlebitis which required prolonged anticoagulant therapy.

Only 1 patient developed increased neurologic def-

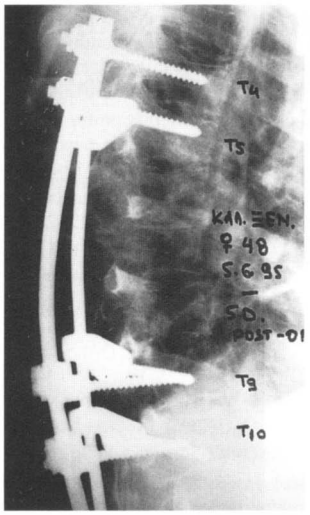
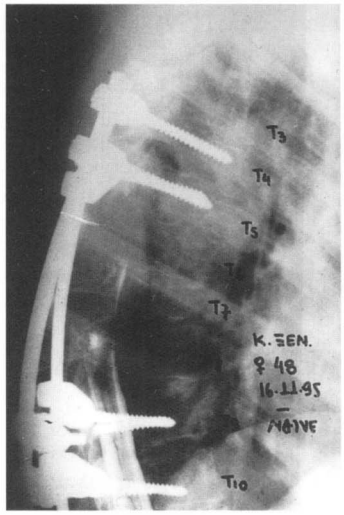



*Figure 1. Posterior fixation of the middle thoracic spine with a pedicle fixating Isola-Acromed device, following multiple-level laminectomies for spinal cord decompression.*




*Myelogram 6 months postoperatinely. Severe destruction of the vertebral bodies with mechanical failure of the device and increased kyphosis. Complete stop of the constrast medium at the level of the 5th thoracic vertebra.*

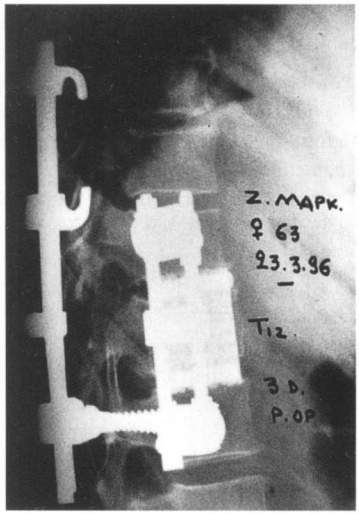



*Figure 2. T12 vertebrectomy (body) done in a a one-stage anterior-posterior procedure. The body was replaced by a titanium cylinder filled with autogenous bone graft and fixed anteriorly with a Kaneda device. Posterior stabilization was achieved by a pedicle-hook device.*

icits after surgery. The iliac autograft dislodged during a psychotic crisis and impinged on the cervical spinal cord resulting in an immediate neurological deficit of his arm. Within a few hours, the graft was repositioned and a posterior stabilization of the cervical spine with two Roy-Camille plates was performed.

## Discussion

Radiation therapy often ameliorates the pain caused by a spine tumor (Brolund 1982, Hall and Mackay 1973). However, if instability or cord compression ensues or radiation therapy fails to control the mass, surgery shaould be considered. 5 of our patients received radiotherapy prior to surgery and 16 after surgery. To what extent pain relief and improved function was attributable to surgery or postoperative oncologic treatment is unclear (Tokuhashi et al. 1990).

Decompressive laminectomy has been criticized because of the ensuing instability and for inadequate decompression of anterior lesions (O'Neil et al. 1988). However, for posterior lesions in patients with advanced metastatic disease who can not tolerate major surgery, laminectomy is indicated (Hall and Mackay 1973).

Multilevel spinal involvement or intractable pain with or without neurological deficit are often treated adequately with posterior or posterolateral decompression and segmental stabilization (Tokuhashi et al. 1990). In the thoracic spine one or more roots may be sacrificed, thus allowing anterior decompression from a posterolateral approach. Again, stabilization is better achieved with segmental fixation and the liberal use of cement (Tokuhashi et al. 1990). 10 of our patients, who had posterior surgery only, survived mean 11 months and 7 of them experienced a substantial reduction in pain. Using segmental fixation of the spine, mobilization with the aid of braces was possible a few days after the operation. Patients with neurologic deficit due to anterior compression of the spinal cord should, however, be treated with anterior decompression and stabilization (Kaneda et al. 1984, Kostik 1983), to avoid quadro-paraplegia and pain from an unstable spinal segment. 2 patients with plasmatocytoma, who underwent anterior decompression and stabilization achieved pain relief and substantial neurologic recovery during the 3-year follow-up. Stabilization techniques for anterior surgery vary from autogenous iliac crest grafts to more rigid anterior implants (Kostuik 1983, Siegal and Siegal 1985). A complementary posterior fixation of the spine, however, is usually mandatory in cases where mobile areas—cervical, thoracolumbar and lumbar—of the spine are involved (Siegal and Siegal 1985). Since anterior implants, such as the titanium cylinder, the kaneda implant, etc, provide limited torsional stiff-

ness, an additional posterior fixation performed in one or in two stages is required. In our 2 cases with instrumentation failure, the spinal columns had been previously destroyed with major thoracic kyphotic deformities. The posterior instrumentation was mechanically at high risk from the beginning. Thoracic kyphotic deformities due to tumor isolated to one or at most two levels, are better treated anteriorly.

Substantial neurologic recovery occurred in both patients with anterior decompressions, in 6 of 10 with posterior decompressions and in all 8 with combined anterior and posterior surgery. However, the number of patients is small and we can only suggest that better results may be achieved with anterior surgery.

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